

Original Article

A Correlation of Symptomatology with Lung Function in Patients with Allergic Rhinosinusitis

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ABSTRACT

Background: Allergic rhinosinusitis is clinically defined as a symptomatic disorder of the nose induced by an IgE-mediated inflammation following allergen exposure to the membrane lining of the nose. It constitutes a global health problem. Both allergic rhinosinusitis and bronchial asthma are systemic inflammatory conditions that often coexist. **Objective:** The objectives of the study are to assess the pattern of allergic rhinosinusitis and to correlate nasal symptom score with lung volumes of patients with allergic rhinosinusitis. **Methods:** This is a prospective study of all the adult patients with clinically diagnosed allergic rhinosinusitis at the study center. Patients' biodata, symptoms, and signs were obtained using a specially designed form. The symptoms were scored using nasal symptom scoring protocol and the lung volumes determined using spirometry. The data were collated and analyzed using SPSS Version 15 statistical software. **Results:** There were 300 patients and another 300 nonallergic individuals as control. The most common presenting symptom was nasal congestion (98%), whereas the most common sign was engorged turbinates (91%). The most common trigger of allergic symptoms was dust (72.3%). Spirometric test results were below 90% on average in both sexes and significantly ($P < 0.05$) below those of the participants in the control group. A large number of patients with abnormal spirometry results have total nasal symptom scores of above 5 ($n = 119$), whereas few ($n = 7$) had symptom scores of 5 and below. There was a statistically significant correlation between high total nasal symptom score and abnormal spirometry ($\chi^2 = 72$, $P = 0.0001$). **Conclusion:** There is a significant correlation between nasal symptom score and reduced lung volumes in patients with allergic rhinosinusitis even in the absence of asthma.

KEYWORDS: Allergic rhinosinusitis, correlation, lung function

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INTRODUCTION

Allergic rhinosinusitis is clinically defined as a symptomatic disorder of the nose induced by an IgE-mediated inflammation following allergen exposure to the membrane lining of the nose.^[1] Both allergic rhinosinusitis and bronchial asthma are systemic inflammatory conditions that often coexist.

Allergic rhinosinusitis has been demonstrated to be an independent risk factor for the onset of asthma in children and adults.^[2,3] The presence of allergic rhinosinusitis is associated with worse asthma control in children and adults.^[4,5] Both rhinosinusitis and asthma

can be triggered by the same factors, whether allergic or nonspecific. Asthma is characterized by a reversible airflow obstruction and forced expiratory volume in 1 s is considered the main parameter to evaluate bronchial obstruction.^[6] Bronchial asthma is present in 20–50% of patients with allergic rhinosinusitis: While allergic rhinosinusitis is reported in about 80% of patients with bronchial asthma.^[3,7] However, the exact pathogenesis of

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this comorbidity remains controversial.^[1] Furthermore, spirometric studies have shown bronchial hyperreactivity in patients with allergic rhinosinusitis.^[8,9] In addition, studies have demonstrated a clear relationship between nasal symptom severity and bronchial hyperreactivity.^[9-11]

Prevalence studies of allergic rhinosinusitis in Nigeria are few. However, reports showed prevalence ranging between 29.6% and 39.7%.^[12-14] On the other hand, the prevalence of bronchial asthma worldwide was around 200 million with a mortality of around 0.2 million/year,^[15] with prevalence of between 6.6% and 15.2% in Nigeria.^[16,17]

Allergic rhinosinusitis and bronchial asthma are therefore prevalent in Nigeria, with previous studies reporting 39.7% (ISAAC 1998 report) and 15.2% for allergic rhinosinusitis and bronchial asthma, respectively.^[14,17] It is thus the aim of this study to assess the pattern of allergic rhinosinusitis and correlate nasal symptom score with lung volumes of patients with allergic rhinosinusitis in our environment. The limitations of the study included recall bias of symptoms by the patients and lack of facilities to conduct confirmatory tests for allergic rhinosinusitis.

METHODS

This study was a prospective, descriptive, cross-sectional study conducted on 300 consecutive eligible patients diagnosed clinically with allergic rhinosinusitis at the ENT clinic of Aminu Kano.

Teaching Hospital, Kano, that satisfied the inclusion criteria. An equal number of normal individuals matched in age and gender was recruited as control group. The control group included the following: Medical students, nurses, medical doctors, and other nonmedical staff of the hospital.

The study was carried out over a 6-month period in the year 2012.

This study was performed in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Ethical Review Committee of Aminu Kano Teaching Hospital. Informed consent was also obtained from each patient before recruitment.

This study included consenting patients who presented with two or more of the following symptoms: Nasal blockage/obstruction, excessive sneezing, excessive nasal itching, and anterior/posterior watery nasal discharge. Patients with history of sinonasal tumors, nasal polyps, diagnosis of asthma, contraindication to spirometry, or chronic chest disorder were excluded from the study.

The minimum sample size was determined using the Fischer's formula. An assumption of 23% was made by extrapolation from a previous study among the adult population in Turkey.^[18]

Therefore, $N = Z^2 P Q/D^2$

$N = 3.84 \times 0.23 \times 0.77/0.0025 = 272$

To allow for attrition, N was approximated to 300.

A specially designed form was used to record participants' biodata and occupation while their symptoms were scored using Lund's symptom score protocol. Subsequently, each participant had spirometry (Vitalograph ALPHA, AL 015019, made in Ennis, Ireland) and the data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 15 statistical software (SPSS Inc., Chicago, Illinois, USA).

RESULTS

Three hundred participants were recruited into the study group and another 300 matched in age and gender as a control group. There were 117 males (39%) and 183 (61%) females with M: F ratio of 1:1.6. The age of the participants ranged from 18 to 49 years and the mean \pm standard deviation was 29.3 ± 8.2 years. The majority of the participants were aged between 18 and 29 years (58%), with fewer individuals in the older age group (42%). Most of the participants (70%) had positive family history of atopy. Table 1 shows the general characteristics of the study population.

The most common trigger of symptoms reported by participants was dust allergy (72.3%) followed by allergy to smoke or kitchen fumes (44%). Table 2 shows self-reported triggers of allergic symptoms in the study population.

In both sexes, reduced lung volumes were more common in patients with allergic rhinosinusitis than in normal individuals. The differences in lung volumes were statistically significant between participants with allergic

Table 1: General characteristics of the participants (n=300)

| | Number of patients | Percentage |
|-------------------------|--------------------|------------|
| Age (years) | | |
| 18-29 | 174 | 58 |
| 30-49 | 126 | 42 |
| Sex | | |
| Female | 183 | 61 |
| Male | 117 | 39 |
| Family history of atopy | | |
| Yes | 210 | 70 |
| No | 90 | 30 |

Table 2: Triggers/causes of allergic symptoms in the participants

| Etiology | Number of patients | Percentage |
|----------|--------------------|------------|
| Dust | 217 | 72.3 |
| Smoke | 132 | 44 |
| Perfume | 118 | 39.3 |
| Pollen | 60 | 20 |
| Others | 46 | 15.3 |

Table 3: Spirometry test results for participants

| Parameters | Normal values | Study group | Control group | P |
|---------------------------|---------------------------------|-------------|---------------|---------|
| FeV ₁ (%) | | | | |
| Men | 80-120 | 85.4 (9.0) | 93.8 (9.6) | <0.0001 |
| Women | | 89.5 (12.7) | 94.0 (10.2) | <0.0001 |
| FVC (%) | | | | |
| Men | 80-120 | 80.7 (8.2) | 92.2 (8.8) | <0.0001 |
| Women | | 86.3 (11.8) | 92.9 (8.8) | <0.0001 |
| FeV ₁ /FVC (L) | | | | |
| Men | Within 5 of the predicted ratio | 0.9 (0.06) | 0.9 (0.1) | 0.008 |
| Women | | 0.9 (0.1) | 0.9 (0.1) | 0.026 |

Data are expressed in means (SD). FVC=Forced vital capacity; FEV₁=Forced expiratory volume in 1 s; SD=Standard deviation

Table 4: Classification of patients with allergic rhinosinusitis based on their symptom scores

| Symptoms | Absent | Mild | Moderate | Severe | Percentage |
|------------------|--------|------|----------|--------|------------|
| | (0) | (1) | (2) | (3) | |
| Nasal itching | 51 | 62 | 59 | 128 | 83 |
| Sneezing | 19 | 12 | 105 | 164 | 93.7 |
| Nasal congestion | 6 | 51 | 99 | 144 | 98 |
| Running nose | 12 | 64 | 93 | 131 | 96 |

Table 5: Cross-tabulation of total nasal symptom scores and spirometry interpretation

| Spirometry | Total nasal symptom scores | | |
|------------|----------------------------|-----|-----|
| | <6 | 6-8 | >9 |
| Normal | 37 | 44 | 93 |
| Abnormal | 7 | 13 | 106 |

rhinosinusitis and normal individuals ($P < 0.05$). Table 3 shows the spirometric test results for participants.

The most common symptom presented in the severe form among the participants in the study was sneezing ($n = 164$), but the majority of the patients had complaints of nasal congestion (98%) followed by running nose (96%). Table 4 shows the classification of patients with allergic rhinosinusitis based on their symptom scores.

A large number of patients with abnormal spirometry results have total nasal symptom scores of above 5 ($n = 119$),

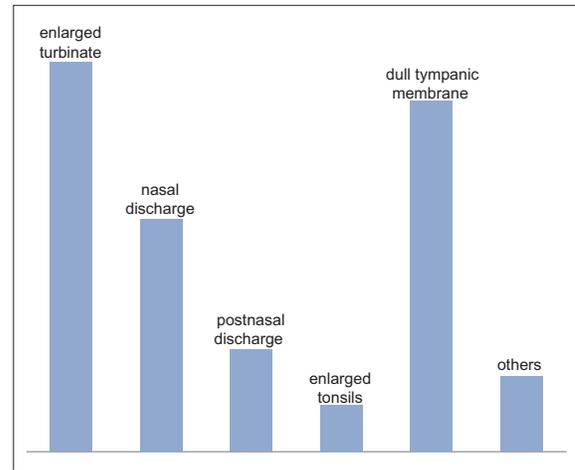


Figure 1: Distribution of physical findings in patients with allergic rhinosinusitis

whereas few ($n = 7$) had symptom scores of 5 and below. Table 5 shows a cross-tabulation of total nasal symptom scores of participants and spirometry interpretations.

There is a statistically significant correlation between high total nasal symptom scores of patients with allergic rhinosinusitis and abnormal spirometry readings ($\chi^2 = 72, P < 0.0001$).

The most common physical examination finding in the participants with allergic rhinosinusitis was engorged turbinates (91%), followed by dull tympanic membrane (82.3%) and anterior nasal discharge (56.7%). Figure 1 depicts the distribution of physical findings in participants with allergic rhinosinusitis.

DISCUSSION

Remarkable relationship exists between the upper and lower airways. In fact, some authors have found that the treatment of nasal symptoms in patients with asthma has led to good disease control.^[1,19,20] Allergic rhinosinusitis may contribute to worsen asthma through different pathophysiologic mechanisms: Postnasal dripping, naso-bronchial reflex, oral breathing, and systemic allergic inflammation.^[21]

In this study, the majority of patients with allergic rhinosinusitis were females. This is consistent with several studies worldwide,^[1,22-24] but in contrast with reports from some authors locally and internationally.^[12,25,26] The higher prevalence in females is attributed to a greater cough reflex sensitivity of the female airway, the impact of hormones on the airway, and physiological differences between men and women in airway reactivity to allergens.^[22]

Fifty-eight percent of patients with allergic rhinosinusitis were below the age of 30 years. This is similar to

findings by Desalu *et al.* in Ilorin, North-central Nigeria.^[12] The result is also consistent with the observation that the disease is common in childhood, peaks in the early 20 s, and then decreases.^[1,22,27]

A larger proportion of the participants have family history of allergic disease or atopy. This is similar to findings by Md.nawad *et al.* and Olusesi *et al.*^[23,24] Several studies on risk factors for allergic rhinosinusitis worldwide have shown that the strongest risk factor for the development of allergic symptoms has been a strong family history of allergic disease irrespective of the varying prevalence and environmental risk factors across populations and societies.^[28,29]

The most common reported trigger of allergic symptoms in this study was allergy to dust. Although skin sensitivity tests were not performed, the results were consistent with findings from other studies in Nigeria and other continents, where house dust was the greatest trigger of allergic rhinosinusitis,^[12,26-28,30,31] although most of the patients gave more than one cause of their allergic symptoms.

The majority of patients in this study presented with complaints of nasal congestion. This is different from reported findings in Nigeria and other parts of the world.^[19,24-26] However, the symptom with most severity was sneezing. Moreover, the most common physical finding in patients with allergic rhinosinusitis in this study was engorged inferior or middle turbinates, which is in agreement with reports by Lasisi *et al.* in Ibadan, Nigeria.^[25]

Spirometry results in this study showed that reduced lung volumes were more commonly found in patients with allergic rhinosinusitis than in normal individuals. This is consistent with findings from some longitudinal studies that associated allergic rhinosinusitis and the onset of bronchial hyperreactivity in adults.^[3,32]

Airway obstruction was found to be common in allergic rhinosinusitis patients with high total nasal symptom scores. This is similar to reports by Cirillo *et al.* and Ciprandi *et al.*, where nasal symptom intensity was found to be closely associated with bronchial hyperreactivity and reduced lung volumes.^[9-11]

The findings of this study, however, should be considered in the context of the potential limitations of the study.

CONCLUSION

High total nasal symptom scores are associated with airway obstruction in patients with allergic rhinosinusitis without asthma. The most common symptoms of allergic rhinosinusitis were nasal congestion and running nose.

However, the symptom most associated with high symptom score was sneezing.

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Conflicts of interest

There are no conflicts of interest.

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