

Evaluation of Impact of Allergic Rhinitis and Bronchial Asthma on Each Other: A Study in Tertiary Care Private Hospital, Dhaka Division, Bangladesh

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ABSTRACT

Background: Allergic rhinitis (AR) and Bronchial Asthma (BA) are common health problems that cause major illnesses and disabilities worldwide. These are common diseases worldwide affecting about 10–50 % of the population and their prevalence are increasing. Multiple factors contribute to the wide range of reported prevalence rates. Although allergic rhinitis (AR) is not a fatal disease, it alters the social life of patients, affecting learning performance and work productivity. Allergic rhinitis and bronchial asthma are two entities often coexisting. In fact, in recent years the concept “one airway, one disease” has been proposed. Many asthmatic patients, particularly those with allergic asthma, also have allergic rhinitis. It is now well understood that the epidemiological association between bronchial asthma and AR is very strong. In addition, the two entities seem to share common genetic and environmental risk factors, while the immunopathology of rhinitis and asthma are virtually the same. Current evidence indicates that co-morbid AR may have clinically relevant effects on asthma.

Objectives: The present study aimed to assess the impact of allergic rhinitis on bronchial asthma patients by determining the incidence of bronchial asthma in patients of allergic rhinitis and the incidence of allergic rhinitis in patients of bronchial asthma.

Material & Methods: This was a cross-sectional study carried out in the tertiary care private hospital in the Dhaka division. During the study period from January 2021 to December 2021(12 months), a total of 116 patients with both proven allergic rhinitis and bronchial asthma patients were enrolled in the study. All patients were subjected to an assessment of the status of asthma over a period of 1 year and were clinically reassessed monthly. In addition, for the recruited candidates, the initial total immunoglobulin E (IgE) levels were performed at the time of recruitment and repeated after 6 months and 1 year of the initiation of the course. Purposive sampling (non-randomized) was done according to the availability of the patients and strictly considered the inclusion and exclusion criteria. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Chi-Square test was used to analyze the categorical data.

Results: In the allergic rhinitis group, this consisted of 116 diagnosed patients with allergic rhinitis. The maximum number of patients in both the groups were in the age group of 30–45 years i.e. 47 (40.52%) and 42 (36.21%) in the AR and BA groups respectively 68 (58.62 %). The maximum numbers of patients were male 70.69% and 62.02% both AR and BA groups. The male: female ratio in the AR group was 2.41:1 whereas in the BA group male: female ratio was 1.64:1. In AR group 91(78.48%) were diagnosed to have bronchial asthma, whereas in the bronchial asthma group 103 (88.79%) were diagnosed to have allergic rhinitis. It was observed that patients with allergic rhinitis were likely to develop bronchial asthma, and patients with allergic rhinitis should be evaluated for bronchial asthma, for early detection and treatment of the comorbid condition.

Conclusion: The relationship between Allergic Rhinitis(AR) and Bronchial asthma(BA) is strongly supported by epidemiologic, pathophysiologic, and clinical evidence. The one-airway theory underlines the close interaction between upper and lower airways. The majority of asthmatic patients have AR. Both diseases exhibit an array of atopic manifestations all involving IgE-mediated responses leading to the release of inflammatory mediators into the nasal and bronchial systems. Genetic predisposition, organ susceptibility, and breathing patterns are likely to be involved in the development of bronchial symptoms in patients with rhino-sinusitis.

Keywords: Allergic rhinitis; Bronchial asthma; Bronchial hyper-responsiveness;

I. INTRODUCTION

Allergic rhinitis and bronchial asthma are two entities often coexisting. In fact, during recent years the concept “one airway, one disease” has been proposed. Many asthmatic patients, particularly those with allergic asthma, also have allergic rhinitis (AR). The mucosa of the upper and lower airways is continuous, and the type of inflammation in AR and asthma is very similar, involving T-helper type 2 lymphocytes, mast cells, and eosinophils. It is now well understood that the epidemiological association between bronchial asthma and AR is very strong. In addition, the two entities seem to share common genetic and environmental risk factors, while the immunopathology of rhinitis and asthma are virtually the same. Current evidence indicates that co-morbid AR may have clinically relevant effects on asthma. In recent years allergic rhinitis has been recognized to be an important risk factor for asthma ^[1].

It is now well understood that the epidemiological association between bronchial asthma and AR is very strong. Consequently, new knowledge about the pathophysiologic mechanisms of allergic inflammation of the human airways has resulted in better therapeutic strategies. In this study, a detailed presentation of the similarities between AR and bronchial asthma is performed giving emphasis on the interactions between the upper and lower airways and any associated clinical implications. The concept of “One Airway, One Disease” was highlighted in the ‘Allergic rhinitis and its Impact on Asthma’ guidelines and has arisen as a result of the now well-established link between the upper and lower airways ^[2]. Many patients with asthma particularly those with allergic asthma also have AR. In adults, it has been shown that AR has a major impact on asthma morbidity and that treatment of AR helps to improve asthma control ^[3].

AR is defined as immunoglobulin E (IgE) mediated inflammation of the nasal mucosa. Symptoms of allergic rhinitis are reversible and include nasal congestion/ obstruction, rhinorrhea, sneezing, pruritus, postnasal drip, chronic cough, throat clearing and conjunctivitis. Asthma is a chronic inflammatory disorder of the airways that results in reversible airway obstruction and bronchial hyper responsiveness (BHR) to a variety of stimuli. Asthma and allergic rhinitis are the most common allergic airway diseases with epidemic proportions and are both inflammatory diseases of the airways. The similarities between AR and asthma in epidemiological and pathophysiologic features suggest that AR and asthma represent the same syndrome, the chronic allergic respiratory syndrome ^[4].

Results of observational studies indicate that treating comorbid AR results in a lower risk of asthma-related hospitalizations and emergency visits. There is therefore evidence suggesting that comorbid allergic rhinitis is a marker of more difficult to control asthma and worsened asthma outcomes ^[5]. The diagnosis of AR could be made based on the clinical history and physical examinations ^[6] as well as a positive skin prick test ^[7]. The clinical history of AR includes recurrent excessive sneezing, nasal itching, nasal discharge, or nasal congestion or obstruction. The diagnosis of AR is made if at least two of these symptoms are present with a positive history of exacerbation with allergen exposure and a positive skin prick test ^[6].

II. MATERIALS AND METHODS

This study was conducted in the Department of *ENT & Head-Neck Surgery* of private hospital in Dhaka division over a period of 12 months. 116 diagnosed cases of allergic rhinitis and 116 diagnosed cases of bronchial asthma were recruited from patients attending OPD in the hospital. The data was recorded as per proforma after taking written informed consent and prior permission from the institutional ethics committee. Patients below 15 years of age, present or former smokers, patients with extensive lung parenchymal disease, severe cardiac disease and patients on bronchodilators (within 24 h) or steroids (in the last 2–3 weeks) were excluded from the study. All patients were subjected to detailed case history, nose examination and nasal endoscopy, chest examination which included auscultation, x-ray chest and hematological investigations—absolute eosinophil count and total IgE levels for diagnosis of allergic rhinitis and bronchial asthma. Data were tabulated and described in the form of percentages and ratios. Chi-square test was used for statistical analysis and P-value of 0.05 was considered significant.

III. RESULTS

The study was carried out during the period of January 2021 to December 2021. Total of 116 patients of each group with history, sign-symptoms and clinical examination suggesting Allergic rhinitis (AR) and Bronchial asthma (BA) disease attended the private hospital for treatment and were included in the study.

Table no 1: Age distribution of the patients

Age (years)	Allergic rhinitis (AR) (N = 116)		Bronchial asthma (BA) (N = 116)	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
15-29	11	9.48	8	6.90
30-45	47	40.52	42	36.21
46-60	22	18.97	21	18.10
61-75	29	25.00	33	28.45
≥ 75	7	6.03	12	10.34
Total	116	100.00	116	100.00
Mean±SD	32.20±10.96		35.23±12.56	
Range	(15 – 77) years			

Table no 1 shows the age distribution of the study patients, in the present study, it was observed that the age distribution of the patients ranged from 15 to 77 years. The maximum number of patients in both the groups were in the age group of 30–45 years i.e. 47 (40.52%) and 42 (36.21%) in the AR and BA groups respectively, followed by 46–60 years with 22 (18.97%) and 21 (18.10%) patients in the AR and BA group respectively. The mean age was 32.20 ± 10.96 and 35.23 ± 12.56 years in the AR and BA groups, respectively.

Table no 2: Distribution of the patients by sex

Sex	Allergic rhinitis (N = 116)		Bronchial asthma (N = 116)	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Male	82	70.69	72	62.02
Female	34	29.31	44	37.98
Total	116	100.00	116	100.00

Table no 2 shows the distribution by sex. The maximum number of patients was male 70.69% and 62.02% AR and BA groups respectively. The male: female ratio in the AR group was 2.41:1 whereas in the BA group male: female ratio was 1.64:1

Table no 3: Distribution of the patients by Areas

	Allergic rhinitis (N = 116)		Bronchial asthma (N = 116)	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Rural	55	47.41	40	34.48
Urban	61	52.59	76	65.52
Total	116	100.00	116	100.00

Table no 3 shows that the numbers of patients from urban areas were more in both the AR and BA group i.e. 61 (52.59 %) and 76 (65.26 %), respectively.

Table no. 4 Clinical presentation of the studied patients

Symptoms	Allergic rhinitis (N = 116)		Bronchial asthma (N = 116)	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Dyspnea/ Breathlessness	59	50.86	108	93.10
Wheezy chest	35	30.17	95	81.90
Rhinorrhea	109	93.97	80	68.97
Excessive sneezing	113	97.41	84	72.41
Nasal obstruction	101	87.07	85	73.28
Nocturnal asthma	14	12.07	107	92.24
Asthmatic attacks	18	15.52	104	89.66
Cough and expectoration	46	39.66	91	78.45
Allergic Conjunctivitis	27	23.27	21	18.10

The most common symptoms of allergic rhinitis was excessive sneezing seen in 113 (97.41%) and followed by rhinorrhea, which was present in 109 (93.97) patients. The most common symptom of bronchial asthma was breathlessness experienced by 108 (93.10 %). Cough and expectoration were seen in 46 (39.66 %) and 91 (78.45%) patients, followed by wheezing chest experienced in 35 (30.17 %) and 95 (81.90 %) patients of AR and BA groups, respectively. Nasal obstruction was seen in 101 (87.07%) and 85 (73.28%) patients of AR and BA groups respectively symptoms of bronchial asthma. Allergic Conjunctivitis was seen in 67 (57.76) and 87 (70.69) patients of AR and BA groups.

Table no. 5 Results of allergen sensitivity in Bronchial asthma patients and Allergic rhinitis patients

	Allergic rhinitis (N=116)		Bronchial asthma (N=116)	
	Number of patients	Percentage (%)	Number of patients	Percentage (%)
Dust	99	85.34	66	56.90
Cold	75	64.66	49	42.24
Weather Change	71	61.21	41	35.34
Mites	68	58.62	52	44.83
Smoke	51	43.97	37	31.90
Shrimps	12	10.34	8	6.90
Mixed pollens	33	28.45	19	16.38
Milk	6	5.17	0	-
Egg	6	5.17	1	0.86

In both the AR and BA groups dust was the most common allergen leading to aggravation of symptoms on exposure in 99 (85.34 %) and 66 (56.90%) patients. Exposure to smoke causes symptom aggravation in 34(40.96 %) and 26 (31.32 %) patients of AR and BA groups respectively. Another common factor for symptoms was cold in 75 (64.66%) and 49(42.24%) patients of both AR and BA groups. Weather change was another factor where patients in 71 (61.21) and 41 (35.34) of both AR and BA groups. However, the other common precipitating factor for symptom aggravation was Mixed pollens in 51 (43.97%) and 19 (16.38) patients in the both AR group and BA group. Shrimps were present in 12(10.34%) and 8 (6.90%) patients of AR and BA groups, respectively. Egg was seen in 6(5.17%) and 1(0.86%) patients in AR and BA group respectively.

Table no. 6: Association of Bronchial asthma with Allergic rhinitis patients and allergic rhinitis with bronchial asthma patients.

	Allergic rhinitis (AR) (N=116)	Bronchial asthma (BA) N=116	P-Value
Bronchial asthma present	91 (78.45%)	-	0.0001*
Bronchial asthma absent	25 (21.55)	-	
Allergic rhinitis present	-	103 (88.79)	0.0001*
Allergic absent	-	13 (11.21)	

* Statistically Significant

IV. DISCUSSION

AR and BA exhibit important similarities in their pathophysiology and involve common inflammatory mechanisms. The nasal and bronchial mucosa is histologically similar; both have ciliated pseudo-stratified columnar epithelium and an underlying basement membrane. The inflammation in rhinitis is similar to that seen in the bronchial mucosa of asthmatics, consisting mainly of mononuclear cells, lymphocytes, and eosinophils. Additionally, the cytokines, adhesion molecules, and other inflammatory mediators are the same in both diseases^[8]. Both AR and BA symptoms are triggered by atopic sensitization and the allergic cascade, resulting in the generation of allergen-specific IgEs. Circulating levels of allergen-specific IgEs, and the presence of increased total serum IgE is a risk factor for asthma even in non-allergic individuals^[9].

The association between the two diseases, with respect to time was evaluated using Chi-square test and was found to be significant in the present study; it was observed that the age distribution of the cases ranged from 15 to 72 years. The mean age in the AR group and BA group was 32.20±10.96 and 35.23±12.56 years respectively. These findings were in accordance with one study, which included patients between 15 and 77 years with a mean 30.68 ± 10.65 years^[10]. However, our study group differed from that of many other studies, since we excluded patients below 15 years of age and most of the other studies were conducted on patients less than 15 years of age. One study included children between 7 and 9 years of age^[11], whereas another study included patients aged between 16 and 75 years; and the mean age of the patients was 45.3 ± 16.2 years^[12].

Since ours is a tertiary care private hospital and children below 15 years, with airway diseases were treated by the department of pediatrics, and not by the department of ENT, hence this age group was excluded from our study. Male preponderance was seen in our study because the male population worked outdoors and was more prone to exposure to allergens such as dust, smoke, pollen and change in weather. Since the symptoms of AR and BA affected a male person's efficiency at work, they were more likely to seek medical help, than their female counterparts. In our study, the number of cases from urban areas was more in both the AR and BA groups. This was in accordance with the study, which showed that physician-diagnosed asthma with comorbid allergic rhinitis was more common in the urbanized population (68.5 %) ^[12].

The reason for an increased number of patients from urban areas can be attributed to increased air pollution, urbanization and industrialization of the suburbs. The increased prevalence of these conditions in the urban population may also be attributed to the hygiene hypothesis, which suggests that exposure to pathogens early in life protects against the development of atopic phenotypes by contributing to immune system

development. In the study conducted in Kolkata, the number of “blockers”, i.e. patients with complaints of nasal obstruction was higher than the number of sneezers-runners, i.e. who had excessive sneezing and rhinorrhea^[13]. In our study population, patients, in general, did not recognize rhinitis or allergy as a disease and presented to the hospital, only when they developed troublesome symptoms of breathlessness or excessive sneezing or persistent rhinorrhea. Only one study, mentions that comorbid asthma and AR disrupted the ability to get a good night’s sleep, concentrate at work/school, participate in leisure/ sports and to enjoy social activities^[14].

All the patients of both AR and BA presented to the hospital within 6 months of the development of the symptoms. None of the related studies mentions the duration of symptoms, at the time of presentation to the hospital. In the AR and BA group, the majority of patients complained of aggravation of symptoms on exposure to dust followed by smoke and pollen. According to one study dust was the most common triggering factor seen in 39.5 % of patients, followed by strong perfume odours and cold weather^[15]. Another study reported grass pollen to be the most frequent allergen, followed by house dust mites^[10]. A study revealed that, in comparison with their non-allergic counterparts, individuals sensitized to pollen (a seasonal allergen) had a tenfold increased risk for developing asthma, whereas those who were sensitized to dust mite (a perennial allergen) had a 50-fold increased risk for developing asthma^[16]. In our study, a significant number of patients were involved in agricultural activities and had exposure to dust and smoke while commuting two-wheelers, therefore they identified dust, smoke and pollen as the most common triggering factors in the aggravation of their symptoms. One study reported that in physician-diagnosed patients with asthma, 63.9 % had allergic rhinitis, which was lower in comparison to our study where approximately 78 % of patients of diagnosed BA had allergic rhinitis^[12].

Allergic conjunctivitis was the most common systemic manifestation seen in the groups. Our findings were in concordance with the study which also reported eye itching and watering to be the most frequent eye symptoms seen in 82.1 % of patients^[10]. Allergic conjunctivitis was seen in 51.9 % of patients in another study conducted in a medical centre in North-Western Tanzania^[15]. 61 % of adults experienced red, watery, itchy, or puffy eyes as reported in a study published elsewhere^[14]. In a study conducted in Karnataka, it was found that 700 out of 1141 subjects had allergic rhinitis for varying intervals before developing asthma. The study also reported that rhinitis often preceded asthma and a high proportion of patients, both children and adults, developed asthma within 06 months after the onset of rhinitis. Our study did not report a similar finding since we had a much smaller number of subjects and time duration was a limitation and we did not follow up with patients for more than 1 year. However other authors have also mentioned that the diagnosis of allergic rhinitis often precedes that of asthma^[17].

Limitations of the study: Although optimal care had been tried by the researcher in every steps of the study, but there were some limitations. Sample size was small. The study was conducted in the tertiary care private hospital. So, the study population might not represent the whole community. The sample was taken purposively. So there may be chance of bias which can influence the results.

V. CONCLUSION

This study revealed a high prevalence of allergic rhinitis in patients with bronchial asthma and also confirmed poor asthmatic control in asthmatics with associated allergic rhinitis. It is important to increase the awareness of the possible co-existence of the two airway diseases and the negative effects on asthma control. It was found that the patients with allergic rhinitis were likely to develop bronchial asthma after 06 months and this association between the two diseases with respect to time was found to be highly significant. Hence, it was observed that patients with allergic rhinitis were likely to develop bronchial asthma, and patients with allergic rhinitis should be evaluated for bronchial asthma, for early detection and treatment of the comorbid condition.

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