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Original Research Article

FREQUENCY OF ALLERGIC BRONCHOPULMONARY ASPERGILLOSIS (ABPA) IN PATIENTS ADMITTED WITH ACUTE EXACERBATION OF ASTHMA IN A TERTIARY CARE HOSPITAL IN KARACHI: A PROSPECTIVE OBSERVATIONAL STUDY

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Abstract: *Allergic Bronchopulmonary Aspergillosis (ABPA) is a hypersensitivity reaction to Aspergillus species and often complicates the clinical course of asthma, leading to more severe exacerbations and poor disease control. Despite its clinical relevance, the prevalence of ABPA in asthma patients remains under-reported, especially in developing countries like Pakistan.* ***Objective:*** *This study aimed to determine the prevalence of ABPA among patients admitted with acute exacerbations of asthma at a tertiary care hospital in Karachi, Pakistan.* ***Methods:*** *A prospective observational quantitative study was conducted at the Department of Pulmonary Medicine, Aga Khan Hospital University Karachi, Pakistan from January 2023 to December 2023 in Karachi. The study included 150 isolated patients of either gender, aged between 18 and 80 years, with a clinical diagnosis of asthma or those eligible for spirometry. Data collected included demographic details, past medical history, pulmonary function test results, and serological data for ABPA diagnosis. The presence of ABPA was confirmed by elevated serum total IgE concentration, specific IgE to Aspergillus fumigatus, and radiological findings. Statistical analysis was conducted using SPSS, with p-values < 0.05 considered statistically significant.* ***Results:*** *The study revealed an overall prevalence of ABPA in 20% of the 150 patients with acute asthma exacerbations. Serum total IgE concentration was significantly higher in the ABPA group (450 IU/mL) compared to the non-ABPA group ($p < 0.05$). Additionally, patients with ABPA had significantly lower FEV1 (60% predicted) compared to those without ABPA ($p < 0.05$).* ***Conclusion:*** *The study highlights a notable prevalence of ABPA among asthma patients experiencing acute exacerbations. This underscores the importance of raising clinical awareness and implementing timely diagnostic strategies for ABPA in asthma management, which could significantly improve patient outcomes.*

Keywords: Allergic Bronchopulmonary Aspergillosis, Asthma, Prevalence, Ige Levels, Acute Exacerbations

Introduction

Asthma is a long-term inflammatory disease affecting the respiratory tracts with inflammation, increased sensitization to stimuli, and airway variations. It has increased in different countries within the last few decades and is now believed to affect millions of people globally and contribute to morbidity and mortality (1). Karachi has particularly had many asthmatic patients, most of whom have problems that are associated with acute exacerbation, and these problems affect the patients and healthcare facilities. Such relapses are usually of sufficient magnitude to necessitate admission, and these just make the burden, both physical and economical, for patients and their families. They also lead to a low quality of life because people with such disorders cannot engage in physical activities, interact with others, or function optimally in society (2).

One other complication that may occur in patients with asthma is allergic bronchopulmonary aspergillosis, an allergy to Aspergillus fumigatus fungus. The ABPA can worsen asthma, primarily in patients with a poorly managed disease (3). This condition is characterised by breakthrough asthma coupled with eosinophilia and elevated serum IgE levels which complicate the management of this disease (4). According to some data, ABPA can reach 10-15% of all asthma patients (5).

There is a need for the authors to compare the incidence rate of ABPA in asthma patients with other population groups because, as this research has shown, once detected early, there are treatments available and clinical improvement. For instance, the most recent clinical study on this topic examines the correlation between the severity of asthma and fungal sensitization and points out that patients diagnosed with ABPA describe their attacks as more frequent and severe than patients without this condition (6). Therefore, this cross-sectional study on children with severe asthma showed that ABPA was rather prevalent and needed recognition in asthmatic patients (2).

When it comes to chronic pulmonary diseases, particularly asthma, one cannot afford to dismiss the magnitude of fungal diseases such as Allergic Bronchopulmonary Aspergillosis (ABPA); studies have shown that chronic pulmonary aspergillosis affects patients with other respiratory diseases, including COPD and asthma (7). Considering prolonged inflammation and structural changes in the lung tissue, it brings a pile of questions to the high patient susceptibility of these populations to fungal growth and sensitization. This correlation suggests that asthmatics are at the most significant risk or have the worst outcome in ABPA if or when their immune system is tender, as is the case during acute attack (8, 12). These adjustments may lead to augmentation of inflammation within the airways and

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additional disturbance of the fine balance, which governs the identification of the organisms that comprise the respiratory biofilm, which in turn emphasizes the need to watch potential sources of fungal pathogens in COPD sufferers.

Currently, the management of ABPA is limited to the use of systemic corticosteroids and antifungal agents. These traditional therapies have been chosen to reduce the inflow of fungus and inflammations but are not always aimed at achieving the optimum result for each individual. However, recent approvals of other targeted biologic therapies of specific relevancy include interleukin-5 (IL-5) inhibitors that have been found helpful in the management of severe asthma due to fungal sensitization. These biologics play a role in controlling inflammation due to eosinophils, a component that is usually elevated in ABPA. Because the treatment of ABPA has changed to personalized medicine, more emphasis has to be placed on the correct identification and description of patients with ABPA because the description will help in better treatment, resulting in improved outcomes for patients with ABPA (10).

The emerging literature on ABPA as a modifier in asthmatics has led to several works in this direction to ascertain its incidence and determinants. For instance, one of the few studies on children with poorly controlled asthma showed that Aspergillus sensitization was high, which may be true for this population (1). Therefore, more consideration must be given to assessing Aspergillus sensitization in adult asthmatics presenting with exacerbations, as this may improve the identification and treatment of the condition.

Moreover, the history of asthma compounded by the propensity to feature eosinophil bronchitis might predispose the subjects to fungal colonization and sensitization, culminating in ABPA (11). This inflammation can erode the airway structure, making patients more prone to develop fungus infections, and worsening their respiratory status. Awareness of this relationship is essential for clinicians because it demonstrates the potential for widespread screening for Asthma patients for related fungal infections, including ABPA, which can substantially alter the course of the disease and outcomes for the patient.

Considering these data, the present study would like to assess the prevalence of ABPA in patients admitted with acute severe asthma exacerbation at a tertiary care hospital in Karachi. Knowledge of the incidence of ABPA will help assess the effects of this disease for treating asthma and patients' conditions (12). This study is most important in the local setting since there is less knowledge regarding the distribution and prevalence of ABPA among asthmatics.

The purpose of this paper is to describe the demographic and clinical characteristics of asthmatic patients with ABPA to contribute valuable information on clinical management and potential research directions. Finally, it shall help in increasing the detection rate of ABPA in acute asthmatics so that timely diagnosis of this steroid-induced disorder, which is causing added morbidity to acute asthmatics, can be made, leading to a better quality of life in asthma patients.

To determine the frequency of ABPA in asthma patients admitted for acute exacerbation and analyze the demographic and clinical characteristics of these patients.

Methodology

In this particular study, a prospective observational design was employed to analyze the incidence of ABPA in patients with acute asthma exacerbation. This approach made it possible to obtain data in real-time, regarding the patients admitted to the hospital enabling clinical characterization of the disease and its progress. This study was carried out in Aga Khan University Hospital Karachi, a teaching tertiary care hospital with a special focus on respiratory illness. It was conducted at the Department of Pulmonary Medicine, Aga Khan Hospital University Karachi, Pakistan over One Year in the duration from January 2023 to December 2023 targeting to cover enough patient samples as well as enough time for data collection and initial analysis. The participants involved persons aged between 18 to 80 years from both sexes who either had clinical asthma diagnoses or had done spirometry at Aga Khan University Hospital. Children less than eighteen years of age, and patients with COPD, ILD or other structural lung diseases were excluded from this trial. Data collection was done using social investigation, and summarized forms were adopted to extract pertinent information on each of the participants. These were basic demographic questions, including age, gender, and socioeconomic status, to provide insight into the population being studied. Data related to clinical history were gathered, with most of the emphasis on the evaluation of asthma severity, frequency of asthmatic exacerbation, and the type of therapy tried in the past. A pulmonary functioning test from spirometry was performed to establish lung function, which is important in the diagnosis of asthma, and to determine if the patient had any airway blockage. Further, ABPA-specific serological assays were done to diagnose allergic bronchopulmonary aspergillosis. These were estimations of serum total IgE and specific IgE for Aspergillus fumigatus and reporting any pulmonary changes on the chest imaging. The collection of data was done by medical professionals to have credibility in the study. The systematic valuable approach to the diagnosis of ABPA helped the authors to provide detailed information about the incidence of ABPA among patients admitted for acute asthma exacerbation.

Results

One hundred and fifty patients were recruited in the study, and the mean age of the respondents was 42.3 years (SD = ± 12.7). Among the participants, 65(43.3%) were male, while 85(56.7%) were female. This shows that in this population, there are more females. The ages and gender of the study participants are presented in Table 1, as well as the age distribution and gender ratio. Knowledge of this specific demographic group of patients is important to address the problem of selecting patients who are at risk of developing ABPA and to place the results regarding the frequency and nature of factors affecting the exacerbation of asthma into context. These findings underscore that gender and age can be considered predictors of the course and treatment of asthma in this sample. (Table 1)

In the current study, the prevalence of ABPA was 20%, with 30 patients diagnosed out of the studied population. Such a

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high frequency specifies the necessity to consider ABPA as a frequent co-morbidity in patients with acute asthma exacerbation. A comparison of scores in ABPA with the severity of asthmatic symptoms revealed a strong correlation, with the value being less than 0.05. Given this finding, it can be hypothesized that patients with ABPA would have worse exacerbations compared to patients without ABPA, and this might point to the fact that ABPA might be the reason for exacerbations of asthma. These findings are useful in restating the fact that clinicians need to include ABPA in their differential diagnoses when treating patients with acute asthma exacerbation. (Table 2)
Patients with ABPA had higher total IgE levels, 450 IU/mL. Versus 250 IU/mL ($p < 0.01$) than patients without ABPA. This variance emphasizes the utility of IgE as an effective biomarker for detecting allergies connected with ABPA. In addition, spirometry showed that the patients with ABPA had lower FEV1, with a mean FEV1 per cent prediction of 60% compared with 75% in patients without ABPA. This result implies that ABPA leads to increased airway obstruction since respiratory signs and lung function of involved people are concerned. This result confirms the effect of ABPA on the severity of the disease and advises for early diagnosis and therapy of the disease in asthmatic patients since increased total IgE levels and decreased FEV1 have been seen in our study. (Table 3)
When demographic and clinical features were compared between the two groups, the frequency of asthma exacerbations was significantly higher in the patients with Allergic Bronchopulmonary Aspergillosis (ABPA), and the total IgE level was significantly higher in the same group of patients. This observation was made assuming that ABPA is related to even worse forms of asthma, which is an indication of the fact that managing asthma in patients with ABPA is a somewhat challenging task. The higher rate of exacerbations in those with ABPA means that clinicians should have a higher index of suspicion for this condition, especially in those whose asthma remains poorly controlled. ABPA can be diagnosed at its early stages, and indeed, proper treatment in its early stages can go a long way in preventing any severe asthma bouts among patients.

Table 1: Demographics of Study Participants

Demographic Variable	Total Participants (n=150	Percentage (%)
Age (Mean ± SD)	42.3 ± 12.7	-
Gender		
Male	65	43.3
Female	85	56.7

Table 2: Prevalence of ABPA among Patients with Acute Asthma Exacerbation

Diagnosis	Number of Patients	Percentage (%)
ABBA	30	20
Non-ABPA	120	80

Table 3: Clinical Characteristics of Patients with and without ABPA

Clinical Characteristic	ABPA (n=30)	Non-ABPA (n=120)	p-value
Total IgE (IU/mL)	450 (± 150)	250 (± 100)	< 0.01
FEV1 (% predicted)	60 (± 20)	75 (± 15)	< 0.01
Exacerbation Frequency	3.2 (± 1.5)	2.0 (± 1.0)	< 0.05

Discussion

The purpose of this study was to identify the rate of ABPA in patients presenting an acute state of asthma exacerbation in a tertiary care hospital in Karachi; by evaluating the results, the authors found out that 20% of the patients presented the ABPA, which points at a high prevalence of this disease among patients with severe asthma attacks. Such prevalence is significant, mainly because when compared with other analogous settings, similar or even slightly higher rates were documented in other existing research. These results indicate that ABPA is not very well known as a complication of asthma therapy, especially in cases of long-term inadequate asthma therapy (1)(2). Because of the critical impact of ABPA on asthma outcomes and management, there is a marked need for healthcare practitioners to search for this condition. Given the increased understanding of the concept of ABPA, clinicians in the care of asthma and asthmatics will be in a position to diagnose and manage the exacerbations of asthma in an attempt to improve the quality of care of identified patients. The demographic variables of the participants suggested that more females in the sample had Allergic Bronchopulmonary Aspergillosis (ABPA), as other authors confirmed that females might be more susceptible to allergic diseases. Such gender differences suggest that hormonal influences or differences in immune responses may be responsible for the higher patient vulnerability in women. The patients who filled out this study were 42.3 years old, which confirms middle age as a population affected by asthma and ABPA. Also, the study pointed out that compared to patients without ABPA, those with ABPA had Higher total IgE levels. This is in line with the diagnostic criteria for ABPA, where the identification of the IgE is believed to play the role of identifying allergies and guiding the management of the clients (3). Additionally, the spirometry assessment of the current demonstrated that patients with ABPA had lower FEV1, revealing the worst obstructive pattern illness. This finding indicates that ABPA could worsen respiratory signs and affect asthma patients' quality of life by reducing lung function. Since increased ABPA levels correlate with decreased lung function and increased airway obstruction, extremely careful evaluation of any patient with an acute asthmatic exacerbation may be significant as this may reduce the outcome substantially. Most importantly, patients with ABPA are found to have more exacerbations which also implies that this diagnosis should be made in clinical practice. In case ABPA is diagnosed in the initial stage, then its management can be done well with the use of intercessions as well as therapies, thereby decreasing the effects of severe asthma episodes on the patients (4). As for the clinical characteristics, the

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identified comparisons between COPD patients with and without ABPA indicated the group differences in terms of asthma exacerbation pattern and total serum IgE levels. These disparities help explain the continued need for periodic screening of ABPA in asthmatic patients with frequent relapses or those with poorly controlled asthmatic symptoms. For early detection of ABPA, appropriate treatment, including the use of antifungal products and other measures could be taken to reduce ABPA-related morbidity.

Conclusion

The present investigation also shows considerable morbidity of Allergic Bronchopulmonary Aspergillosis (ABPA) in patients with asthma exacerbations, as 20% of them are confirmed with the diagnosis. The results underscore the importance of clinician awareness of ABPA when managing patients with severe asthma presenting new symptoms, along with a history of high total IgE and frequent exacerbation. Hence, identifying ABPA early really and managing the condition has an immense influence on the patients since morbidity levels will be checked, and the quality of life of the patients will be enhanced. Thus, to enhance understanding of ABPA and asthma management, it is necessary to perform additional studies to determine the approaches to identify these patients and offer the most efficient treatment plan. Lastly, the knowledge of ABPA within clinical practice will have to improve since it will greatly contribute to the overall care of asthma patients, specifically of patients with ABPA.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-AKU-097/23)
Consent for publication
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Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

WARIS ALI (Resident)
Coordination of collaborative efforts.
Study Design, Review of Literature.
JAVAID AHMED KHAN (Professor)
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Data acquisition, and analysis.
Manuscript drafting.

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