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ORIGINAL ARTICLE

Frequency of allergic asthma among diagnosed cases of bronchial asthma presenting in Gulab Devi Chest Hospital Lahore

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ABSTRACT

Background: Bronchial asthma is a heterogeneous chronic respiratory condition characterized by airway inflammation and variable airflow limitation. Among its various phenotypes, allergic asthma is the most common, particularly in younger individuals and those with a history of atopy. This study aim was to determine the frequency of allergic asthma among the bronchial asthmatic patients.

Material and Methods: This cross-sectional study was conducted at the Department of Pulmonology, Gulab Devi Chest Hospital, Lahore, from April 28 to July 27, 2025. A total of 379 patients aged 12–75 years were enrolled through non-probability consecutive sampling. Serum IgE levels were determined using ELISA. Chi-square test assessed associations, while independent sample t-test compared mean age between allergic and non-allergic asthma patients.

Results: Among the 379 asthma patients, 219 (57.8%) were identified as having allergic asthma. The condition was more prevalent in females (61.5%) than males (53.2%), though the difference was not statistically significant ($p = 0.321$). Allergic asthma was most common in the 12–30-year age group (66.7%, $p = 0.027$). Elevated serum IgE (>200 IU/mL) is significantly associated with allergic asthma ($p < 0.001$).

Conclusion: Allergic asthma constitutes a major phenotype among bronchial asthma patients, particularly in younger individuals and those with elevated IgE and allergen exposure. Incorporating basic immunologic testing and environmental history into routine asthma assessment can facilitate early identification and enable more targeted, effective management strategies.

Keywords: Bronchial asthma, Allergic asthma, IgE levels, Allergen exposure.

BACKGROUND

Asthma is a chronic inflammatory airway disease characterized by episodic reversible airway obstruction that variably presents with cough, wheezing, shortness of breath, or chest tightness.[1] It happens to individuals of any age group and is frequently established during the childhood years, though in some cases it may occur in adults as well.[2] Asthma is a very heterogeneous disease with regard to diagnosis, age of presentation, severity, underlying inflammatory process, triggers, natural history, and response to therapy. It affects about 300 million people of all ages worldwide, with an estimated 250,000 deaths each year.[3] Among the Pakistanis, the asthmatics prevalence was 15%. The global prevalence of asthma varies widely from country to country, however, ranges between 4.3%- 8.6%.[4]

Differential underlying pathophysiological pathways in asthma are associated with distinct asthma phenotypes. These phenotypes can be classified by their clinical phenotype, such as early-onset, late-onset, and obesity-associated asthma, or by their inflammatory phenotype, including allergic and non-allergic eosinophilic (Th2-high) or non-eosinophilic (Th2-low) asthma,[5,6] and are largely derived from cohorts that included participants with severe asthma.[7] Atopic asthma is brought about by a T helper 2 (TH2) and IgE-dependent immunologic reaction to environmental allergens and it is characterized by acute-phase (immediate) and late-phase reactions. Important mediators are the TH2 cytokines IL-4 and IL-5 and IL-13. Others that are being found to be significant in some asthmatics include IL17 and IL9. The important inflammatory cell in nearly all types of asthma is eosinophil; other inflammatory cells are mast cells, neutrophils, and T lymphocytes.[8]

Diagnosis of asthma had been proceeding only in the most simplistic manner (largely to an unaided clinical history and examination, and too frequently a trial of a medication like short-acting bronchodilators).[9] Even

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though no gold standard single test is available to use during diagnosis of asthma, there are multiple objective tests that can be employed to support diagnosis of asthma including physiological testing like an obstructive spirometry with bronchodilator reversibility and airway hyperresponsiveness. Along with that, non-invasive assessment of the airway inflammation of an individual, namely the exhaled nitric oxide or peripheral eosinophilia of the blood, should be mentioned to detect those with an allergic or eosinophilic phenotype.[10] Allergic asthma is recognized as a major phenotype of bronchial asthma, there is limited evidence from Pakistan, particularly regarding its frequency among diagnosed asthma patients using serum IgE quantification. Existing studies seldom incorporate objective biomarkers like IgE in local populations, leaving a gap in understanding the true burden and guiding phenotype-specific treatment strategies. The aim of looking into this is to identify the prevalence of allergic asthma in relation to all known/diagnosed patients of asthma by quantifying the level of serum IgE at Gulab Devi hospital.

MATERIAL AND METHODS

This cross-sectional study took place at the Department of Pulmonology, Gulab Devi Chest Hospital, Lahore from 28th April 2025 to 27th July 2025, having received approval from the Institutional Review Board (IRB). To establish our study parameters, an extensive review of existing literature was performed. From this analysis, we determined a sample size of 379 participants utilizing the World Health Organization (WHO) sample size calculator. This determination was based on a 5% margin of error, a 95% confidence level, and the prevalence of infertility at 56.2%.[11] A non-probability consecutive method of sampling was used for the sampling process.

All the patients presenting to the Gulab Devi hospital with bronchial asthma having the age between 12 to 75 years were included in this study. Asthmatic patients with comorbidities such as cardiovascular diseases and chronic pulmonary diseases were also excluded.

All patients provided written agreement before the enrolment, and their confidentiality was maintained at all levels. The institutional ethics committee's approval was also obtained prior to beginning the study. Demographic data, including age, sex, family history of allergy, contact number, and address, were recorded on a pre-designed proforma by the principal investigator. 5mL of blood was collected from all the patients with standard protocol. Sample was centrifuge to separate the serum and then Serum IgE levels were measured using an ELISA kit to assess allergic sensitization. A typical serum IgE ELISA involves adding serum standards and samples to microplate wells coated with antibodies, followed by incubation and washing. Next, a biotinylated antibody and an enzyme-conjugated antibody are added and washed away. After adding a substrate, a color develops that is then stopped and read by a microplate reader to determine IgE concentration.

Data were entered and analyzed using Statistical Package for Social Sciences version 26. Frequencies and percentages were calculated for qualitative variables such as gender and presence of allergic asthma, while means and standard deviations were calculated for quantitative variables such as age. The chi-square test was applied to assess the significance of associations and independent sample t test is used to mean age comparison between allergic and non-allergic asthma patients considering a p-value of <0.05 as statistically significant.

RESULTS

Out of 379 asthma patients, 219 (57.8%) had allergic asthma, while 160 (42.2%) were classified as non-allergic. Allergic asthma was more common in females (128/208; 61.5%) than males (91/171; 53.2%), though the difference was not statistically significant ($p = 0.321$). Younger age groups were significantly more affected—66.7% of those aged 12–30 had allergic asthma compared to 55.4% in ages 31–50 and 53.6% in 51–75 years ($p = 0.027$).

The mean age of patients with allergic asthma was significantly lower at 38.9 ± 14.7 years compared to 44.8 ± 15.3 years in the non-allergic asthma group ($p = 0.012$).

Elevated serum IgE levels (>200 IU/mL) were found in 201 (91.8%) of allergic asthma patients versus only 58 (36.3%) in the non-allergic group ($p < 0.001$), confirming the IgE-mediated pathophysiology of allergic asthma. Additionally, a family history of allergy was more common in allergic asthma cases (142 (64.8%) vs. 77 (35.2%); $p < 0.001$), while 121 of the non-allergic group reported no such history. Dust exposure was the most frequently reported trigger among allergic asthma patients, affecting 179 out of 219 (81.7%) versus 91 out of 160 (56.9%) non-allergic patients ($p < 0.001$). Pollen sensitivity was also

significantly higher in allergic asthma (65.7% vs. 36.3%; p = 0.002). Pet dander (69 vs. 21; p = 0.014) and mold exposure (47 vs. 17; p = 0.041) were also more commonly associated with allergic asthma.

Table-I: Demographic and clinical characteristics associated with allergic asthma (n = 379).

Variable	Category	Total Patients	Allergic Asthma n (%)	Non-Allergic Asthma n (%)	p-value
Gender	Male	171 (45.1%)	91 (53.2%)	80 (46.8%)	0.321
	Female	208 (54.9%)	128 (61.5%)	80 (38.5%)	
Age Group (years)	12–30	102 (26.9%)	68 (66.7%)	34 (33.3%)	0.027
	31–50	139 (36.7%)	77 (55.4%)	62 (44.6%)	
	51–75	138 (36.4%)	74 (53.6%)	64 (46.4%)	

Table-II: Mean age comparison between allergic and non-allergic asthma patients.

Group	Mean Age (years) ± SD	Test Applied	p-value
Allergic Asthma (n=219)	38.9 ± 14.7	Independent Samples t-test	**0.012**
Non-Allergic Asthma (n=160)	44.8 ± 15.3		

Table-III: Association of elevated serum ige levels among asthma subtypes (n=379)

Variable	Category	Allergic Asthma (n=219)	Non-Allergic Asthma (n=160)	p-value
Serum IgE	>200 IU/mL	201 (91.8%)	58 (36.3%)	<0.001
	≤200 IU/mL	18 (8.2%)	102 (63.7%)	
Family History of Allergy	Present	142 (64.8%)	39 (24.4%)	<0.001
	Absent	77 (35.2%)	121 (75.6%)	

Table-IV: Association of environmental triggers with allergic asthma.

Environmental Trigger	Allergic Asthma (n=219)	Non-Allergic Asthma (n=160)	p-value
Dust Exposure	179 (81.7%)	91 (56.88%)	<0.001
Pollen	144 (65.73%)	58 (36.25%)	0.002
Pet Dander	69 (31.50%)	21 (13.13%)	0.014
Mold	47 (21.46%)	17 (10.63%)	0.041

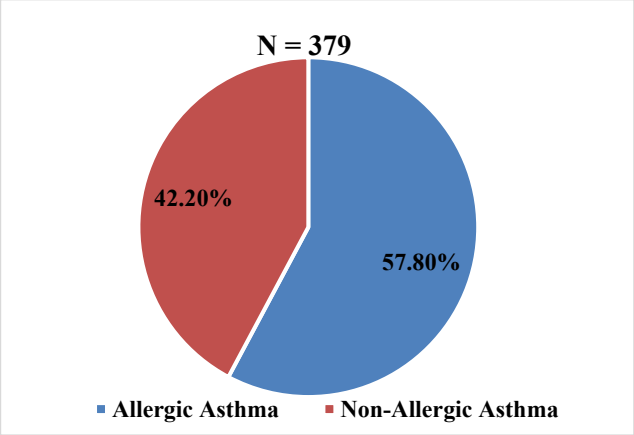

Figure-I: Frequency of allergic and non-allergic asthma.

DISCUSSION

This study investigated the frequency and characteristics of allergic asthma among patients already diagnosed with bronchial asthma. Among the 379 enrolled patients, 57.8 percent were identified as having allergic asthma. This aligns closely with a study from Rawalpindi and Islamabad in Pakistan that reported ~56.2% prevalence of allergic asthma among adult bronchial asthma patients using total serum IgE and skin prick testing.[11] The similarity suggests that allergic asthma constitutes a majority phenotype in local clinical populations.

The gender distribution in this study showed a higher percentage of allergic asthma in females (61.5%) compared to males (53.2 %), though this difference was not statistically significant. Previous research offers varied results, with some studies suggesting that allergic asthma is more prevalent in males during early life, while others report a shift toward female predominance in adulthood.[12] The results here appear to align more closely with the latter trend, possibly influenced by hormonal or behavioral factors. Age was significantly associated: the youngest age group (12–30 years) had the highest proportion of allergic asthma (66.7%), decreasing to around 53-55% in older age groups, with a significant p-value (0.027). This conforms to broader epidemiological patterns documented in Finland, where the incidence and proportion of allergic asthma are highest in youth and decline with increasing age at diagnosis. Similarly, in that Finnish population, median age at diagnosis for allergic asthma was ~19 years, versus ~35 years for non-allergic asthma.[13] The decreasing frequency of allergic asthma in older age groups could reflect immunologic changes with aging or the emergence of non-allergic phenotypes over time.[14]

It has been discovered that the levels of IgE in serum is highly linked to allergic asthma. High IgE concentration

was found in most of the cases of allergic asthma and this showed that IgE-mediated hypersensitivity to allergic asthma is indeed involved in the pathology.[15] Exposure to dust, pollen, pet dander and mold was found to be more common in patients with allergic asthma as revealed by environmental triggers analysis. These results are similar to those found in clinical reports that allergic asthma tends to be precipitated by exposure to allergens and environmental control interventions are important in controlling the symptoms.[16]

Regarding environmental triggers, our results showed that dust exposure (81.7%), pollen, pet dander, and mold are significantly more frequent in allergic asthma echo earlier findings from Pakistan. The Rawalpindi/ Islamabad study identified house dust mite sensitization as most common (≈33%), followed by pollens and grasses.[11] In Karachi schoolchildren, dust exposure was also prominent as a predisposing factor for asthma and other allergic disorders.[17]

The mean age difference allergic asthma group being significantly younger (38.9 ±14.7 yrs vs non-allergic 44.8±15.3) also aligns with the concept that allergic asthma tends to present earlier. The Abbottabad study in children and adolescents supports this age-related pattern of IgE involvement and symptom severity.[18]

This study is significant because it demonstrates that elevated serum IgE levels are strongly associated with asthma severity and exacerbations among Pakistani children and adolescents, consistent with findings by Aziz *et al*.,[18] who observed significantly more frequent exacerbations and hospitalizations in high IgE groups compared to normal IgE groups. Identifying a high prevalence of allergic asthma (≈58%) among diagnosed asthma patients underscores the clinical utility of phenotype-stratification, aligning with results that anti-IgE therapies such as omalizumab significantly improve asthma control in moderate-to-severe allergic asthma patients with multiple allergic comorbidities, as shown by Soong *et al*.[19] and Gon *et al*. These findings suggest that using IgE as a biomarker in local clinical settings can guide more targeted treatment strategies and potentially reduce morbidity in allergic asthma patients.

LIMITATIONS OF THE STUDY

This study has certain limitations. It was conducted at a single tertiary care hospital, which may limit the generalizability of findings to the broader population. The cross-sectional design restricts causal inferences between elevated IgE and allergic asthma. Environmental exposures and allergen sensitivities were assessed through patient history rather than objective testing, introducing possible recall bias. Additionally, genetic predisposition and long-term outcomes were not explored, warranting further multicenter, longitudinal studies.

CONCLUSIONS:

It is concluded that allergic asthma is highly prevalent among patients diagnosed with bronchial asthma, with a frequency of 57.8%. Allergic asthma was more commonly observed in younger individuals and showed significant associations with elevated serum IgE levels and exposure to environmental allergens such as dust, pollen, and pet dander. Although gender and hospitalization rates did not show statistically significant differences, the overall findings underscore the importance of routine evaluation for allergic sensitization in asthma patients.

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CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Jamshaid Ahmad: Substantial contribution to study design, data collection, manuscript drafting, final approval, accountable for all aspects of publication.

Zaheer Akhtar: Acquisition of data, analysis and interpretation of data, final approval, accountable for all aspects of publication.

Fatima Saeed: Data interpretation, result writing, final approval, accountable for all aspects of publication.

Muhammad Bilal Liaqat: analysis and interpretation of data, critical review, final approval, accountable for all aspects of publication.

Nafees Ahmad: Critical review, final approval, accountable for all aspects of publication.

Hafiz Muhmmad Umair: Manuscript drafting, critical review, final approval, accountable for all aspects of publication.

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