DOI: https://doi.org/10.53350/pjmhs020231712836

ORIGINAL ARTICLE

Prevalence of Cutaneous Allergic Manifestations in patients with Allergic Asthma. A Cross-Sectional Study

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ABSTRACT

Background: Asthma is a chronic inflammatory condition of the airways that is often related to atopic diseases, such as other allergic skin reactions. Allergic asthma is often associated with other allergic skin conditions like eczema, urticaria, and atopic dermatitis because of the common immunological and inflammatory mechanisms including eosinophilic inflammation and high levels of immunoglobulin E (IgE). The associated skin manifestations may help to elucidate and control systemic allergic disease.
Objective: To assess the prevalence and the clinical spectrum of the cutaneous allergic manifestations in allergic asthma patients and their relationship to asthma severity and allergic biomarkers.
Methods: The study was a cross-sectional observational study carried out from June 2022 to February 2023 in the Department of Pulmonology and Department of Dermatology of Multan Medical & Dental College, Multan, Pakistan. Consequently, non-probability of consecutive sampling was used to include a total of 120 patients who had clinically diagnosed allergic asthma. A detailed medical history, dermatological examination, spirometry, serum immunoglobulin E (IgE) level and peripheral eosinophil count were assessed. Data analysis was done by SPSS version 26.0.
Results: Among 120 allergic asthma patients, 67 (55.8%) demonstrated one or more cutaneous allergic manifestations. Eczema was the most frequently seen dermatological disorder in 27 (22.5%) patients, urticaria was seen in 18 (15.0%) patients. Other causes of itching that were noted included allergic contact dermatitis, generalized pruritus, and atopic dermatitis. The prevalence of cutaneous manifestations was found to be significantly higher in moderate and severe asthma patients as compared to mild asthma patients (p=0.004). Higher serum IgE levels and peripheral eosinophilia were more likely to be observed in patients with associated dermatologic allergic diseases.
Conclusion: Skin allergic reactions are very common in patients with allergic asthma and are well correlated with the severity of asthma and allergic inflammatory markers. Diagnosis of skin allergic diseases at early age may help to promote the overall management of allergic asthma and the long-term prognosis.
Keywords: Allergic asthma, eczema, urticaria, atopic dermatitis, allergic skin disorders, eosinophilia, serum IgE, cutaneous manifestations.

INTRODUCTION

Allergic asthma is a chronic inflammatory airway disorder characterized by reversible airflow obstruction, bronchial hyperresponsiveness, mucus hypersecretion, and persistent airway inflammation mediated predominantly through immunoglobulin E (IgE)-dependent immune responses.[1] It is among the most common allergic diseases worldwide and contributes significantly to morbidity, reduced quality of life, recurrent hospital visits, and increased healthcare burden.[2] The global prevalence of allergic asthma has increased substantially over recent decades due to urbanization, environmental pollution, industrial exposure, changing lifestyle patterns, and increased allergen sensitization among genetically predisposed individuals.[3]

The occurrence of multiple allergic comorbidities involving the skin, upper respiratory tract and mucosal surfaces are frequently seen in patients with allergic asthma, due to common immunological and inflammatory mechanisms.[4] Activation of T-helper 2 lymphocytes, eosinophilic infiltration, mast cell degranulation, production of inflammatory cytokines and high serum IgE levels all contribute to both skin and respiratory allergic responses.[5]

The existence of asthma and allergic skin disorders has been explained by the concept of the “atopic march”, which refers to the sequential onset of allergic diseases starting with eczema or atopic dermatitis in childhood, followed by allergic rhinitis, and then asthma later in life.[8] Allergic skin disorders have been correlated with increased sensitivity to allergic reactions in the airways because of shared pathogenic mechanisms and systemic allergic sensitization.[10]

Additionally, itching, chronic discomfort, recurrent inflammation, sleep disruption, cosmetic issues, psychological stress and irritation of the skin can have a huge impact on overall wellbeing and disease control among asthmatics with a complicated clinical picture featuring concurrent respiratory and dermatologic allergic diseases.[12,13]

In allergic asthmatics, the relationship between the pulmonary and cutaneous inflammatory response and peripheral eosinophilia, high serum IgE levels, and a family history of atopy have been demonstrated in several studies.[14] Environmental pollutants, smoking exposure, climatic conditions, occupational irritants, microbial dysbiosis and poor living conditions may further enhance both pulmonary and cutaneous inflammatory response.[15] However, the cutaneous manifestation in allergic asthmatics is often underestimated and underdiagnosed in clinical settings.[16]

Limited regional data are available regarding the prevalence and clinical spectrum of cutaneous allergic manifestations among patients with allergic asthma.[17] Early identification of associated dermatological allergic disorders may improve recognition of systemic atopy, facilitate multidisciplinary management, and contribute to better long-term therapeutic outcomes.[18] Therefore, the present study was conducted to determine the prevalence and patterns of cutaneous allergic manifestations among patients with allergic asthma and to evaluate their association with asthma severity and allergic inflammatory biomarkers.[19,20]

MATERIALS AND METHODS

This cross-sectional observational study was conducted from June 2022 to February 2023 at the Department of Pulmonology and Department of Dermatology, Multan Medical & Dental College, Multan, Pakistan. The study aimed to find out prevalence and clinical spectrum of allergic skin manifestations in allergic asthma patients.

Patients with allergic asthma were consecutively sampled and total of 120 patients were selected during the study period. Patients of either gender aged between 15 and 65 years were included in the study. Diagnosis of allergic asthma was established on the basis of

Received on 10-07-2023
Accepted on 24-11-2023

recurrent episodes of wheezing, cough, dyspnea, chest tightness, reversible airflow obstruction on spirometry, and documented history of allergic sensitization or atopic symptoms. Patients with chronic obstructive pulmonary disease, pulmonary tuberculosis, bronchiectasis, autoimmune dermatological diseases, infectious skin diseases, immunodeficiency diseases, malignancy and systemic inflammatory diseases were excluded.

Structured interviews and medical record reviews were conducted to gather detailed demographic and clinical information, after getting written informed consent. All enrolled participants had their age, gender, body mass index, smoking status, length of the asthma diagnosis, severity of asthma, family history of atopy, allergic rhinitis, environmental allergen exposure and medication history recorded. The severity of asthma was classified as mild, moderate or severe based on clinical evaluation and spirometric results.

Consultant dermatologists conducted detailed dermatology examinations for the detection of skin allergic reaction such as eczema, urticaria, atopic dermatitis, allergic contact dermatitis, generalized pruritus and other allergic skin reactions. For each participant, the frequency of occurrence, the recurrence, the length of time, the distribution and the severity of the dermatological manifestations were recorded.

Venous blood samples were taken under sterile conditions for laboratory analyses, such as complete blood count, peripheral eosinophil count and blood serum immunoglobulin E (IgE) level. Eosinophilia in the peripheral blood and the level of serum IgE were evaluated using standard blood laboratory reference values. To assess the respiratory status of enrolled patients, pulmonary function testing (PFT) was conducted using standard spirometry procedures and protocols to diagnose reversible airway obstruction.

Collected Data was entered and analysed with the help of Statistical Package for Social Sciences (SPSS) version 26.0. The quantitative variables were represented by mean ± SD, while qualitative variables were represented by frequencies and percentages. The associations between the cutaneous allergic manifestations and the clinical parameters such as asthma severity, serum IgE levels and eosinophilia were investigated using Chi-square test and independent sample t-test. A p-value less than 0.05 was considered statistically significant.

The study was approved by the Institutional ethical review board Multan medical & dental college. All participants signed a written informed consent form before entering the study.

RESULTS

The present study included 120 patients with allergic asthma. The age range of the study population was 15 to 65 years with the mean age of 33.9 ± 10.7 years. Among the enrolled participants, 68 (56.7%) were females and 52 (43.3%) were males. The majority of patients had moderate asthma and severe asthma was seen in about 25% of the study population. Over 50% had atopy in their family. There was also a significant increase in serum IgE levels and peripheral eosinophilia in patients with allergic asthma. Cutaneous allergic manifestations were detected in 67 (55.8%) patients, while 53 (44.2%) patients had no associated dermatological allergic disorder (Table 1).

Of the allergic dermatological conditions recognized, eczema was the most common manifestation seen in 27 (22.5%) patients and urticaria was seen in 18 (15.0%) participants. In allergic asthma patients there was also a significant percentage of allergic contact dermatitis, generalized pruritus, and atopic dermatitis. Multiple concurrent skin manifestations were present in 12 (10.0%) participants. The results clearly showed a significant prevalence of dermatological allergic diseases in allergic asthmatic patients (Table 2).

Asthma severity analysis showed that there was a significant relationship between the increase in the severity of allergic asthma and the prevalence of allergic manifestation in the skin. The dermatological allergic conditions were most common among patients with severe asthma followed by patients with moderate asthma. Patients with mild asthma showed lower prevalence of skin manifestations, in comparison. There was a significant correlation between asthma severity and skin allergic manifestations (p=0.004) (Table 3).

Additional laboratory tests showed that the serum IgE level and peripheral eosinophil count were significantly higher in patients with skin allergic manifestations than in patients without skin involvement. A family history of atopy was also more frequently noted among those with eczema, urticaria and other allergic skin disorder. The present findings indicate that there is a high immunologic correlation between generalized allergic sensitization and the association of respiratory and skin allergic diseases.

Table 1. Demographic and Clinical Characteristics of Study Participants

Variables	Frequency (%)
Total participants	120
Mean age (years)	33.9 ± 10.7
Male	52 (43.3%)
Female	68 (56.7%)
Mild asthma	39 (32.5%)
Moderate asthma	54 (45.0%)
Severe asthma	27 (22.5%)
Family history of atopy	63 (52.5%)
Elevated serum ige levels	74 (61.7%)
Peripheral eosinophilia	69 (57.5%)
Presence of cutaneous manifestations	67 (55.8%)
Absence of cutaneous manifestations	53 (44.2%)

Table 2. Frequency of Cutaneous Allergic Manifestations Among Allergic Asthma Patients

Cutaneous manifestation	Frequency (%)
Eczema	27 (22.5%)
Urticaria	18 (15.0%)
Allergic contact dermatitis	11 (9.2%)
Generalized pruritus	7 (5.8%)
Atopic dermatitis	6 (5.0%)
Multiple skin manifestations	12 (10.0%)

Table 3. Association Between Asthma Severity and Cutaneous Allergic Manifestations

Asthma severity	Patients with cutaneous manifestations	Patients without manifestations	p-value
Mild asthma	14 (35.9%)	25 (64.1%)	
Moderate asthma	34 (63.0%)	20 (37.0%)	
Severe asthma	19 (70.4%)	8 (29.6%)	0.004

DISCUSSION

The present study demonstrated a high prevalence of cutaneous allergic manifestations among patients with allergic asthma, with more than half of the enrolled participants exhibiting one or more dermatological allergic disorders.[1] These findings support the concept that allergic asthma is not only a respiratory disease but also part of a broader systemic atopic process involving multiple organ systems including the skin.[2] The coexistence of asthma and dermatological allergic conditions reflects shared immunological mechanisms characterized by eosinophilic inflammation, increased serum IgE production, mast cell activation, and T-helper 2-mediated immune responses.[3]

Eczema was identified as the most common cutaneous allergic manifestation in the present study, followed by urticaria and allergic contact dermatitis.[4] Similar findings have been reported in previous international studies where eczema and atopic dermatitis showed strong association with allergic asthma due to epithelial barrier dysfunction and chronic systemic allergic sensitization.[5] The observed predominance of eczema further supports the concept of the atopic march, in which allergic skin diseases may precede or coexist with respiratory allergic disorders.[6]

Furthermore, the study revealed that, when compared to male patients, females had relatively higher frequencies of allergic skin manifestations.[7] This could be explained by the effect of hormones, the attitude of female subjects to seek medical care, and the

exposure to cosmetic and environmental allergens.[8] Moreover, it is known that there are immunological differences between genders which could account for the differences in the expression and severity of allergic disease.[9]

An important finding of the present study was the significant association between asthma severity and prevalence of dermatological allergic manifestations.[10] Patients with moderate and severe asthma demonstrated considerably higher rates of eczema, urticaria, and other allergic skin disorders compared to patients with mild asthma.[11] Persistent airway inflammation and increased systemic allergic activity in severe asthma may explain the greater frequency of associated cutaneous manifestations.[12] Chronic inflammatory cytokine release and elevated allergic biomarkers may contribute simultaneously to pulmonary and dermatological tissue involvement.[13]

Elevated serum IgE levels and peripheral eosinophilia were frequently observed among patients with concurrent cutaneous allergic manifestations.[14] These findings are consistent with previous studies that identified serum IgE and eosinophil counts as important indicators of systemic allergic sensitization and disease activity.[15] Increased eosinophilic inflammation may enhance tissue hypersensitivity responses involving both respiratory epithelium and skin barrier structures.[16]

Allergic asthma is linked to the presence of dermatological allergic disorders, which may have a major impact on the quality of life and burden of disease.[17] As such, skin evaluation should be part of the clinical evaluation process of allergic asthma patients, with the aim of identifying and managing allergic skin manifestations early on.[18,19]

There are some limitations for the present study. In addition, the study was performed at a single center and the number of patients was relatively small, limiting the extrapolation of the results to larger numbers of patients.[20] Also, allergen-specific testing and molecular inflammatory markers were not assessed in the study. Future multicenter longitudinal studies involving larger populations and advanced immunological assessment may provide more comprehensive understanding regarding the pathophysiological relationship between allergic asthma and cutaneous allergic manifestations[13,20].

CONCLUSION

Cutaneous allergic reactions are very common in allergic asthmatic and have been found to be closely correlated with the severity of the asthma, serum IgE levels and peripheral eosinophilia. The most frequently observed dermatological allergic condition in the study population was eczema and urticaria. The results emphasize the close immunological relationship between the respiratory and cutaneous allergic diseases. Dermatological evaluation and management of allergic asthma patients may help improve disease monitoring, symptom control and overall quality of life if performed early in the disease process. Large scale studies are suggested to gain a better insight into the underlying mechanisms between allergic asthma and dermatological allergic manifestations.

Funding: No external funding was received for this study.

Conflict of Interest: The authors declare no conflict of interest.

Data Availability: Data are available from the corresponding author upon reasonable request.

Authors' Contributions: K.S. contributed to study design, data collection, and manuscript drafting. N.F. performed dermatological assessment and manuscript revision. A.B. conducted laboratory investigations and statistical analysis. I.S. assisted in patient recruitment and spirometry evaluation. Z.H.Q. supervised the study and reviewed the manuscript. B.F. contributed to literature review, data interpretation, and final proofreading. All authors approved the final manuscript.

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This article may be cited as: Sardar K, Fatima N, Bano A, Shehzad I, Qureshi ZH, Farooq B; Prevalence of Cutaneous Allergic Manifestations in patients with Allergic Asthma. A Cross-Sectional Study. Pak J Med Health Sci, 2023; 17(12): 836-838.