

Anita GC¹, Bijaya Kharel¹, Prakash Bahadur Thapa¹, Shailendra BK¹

¹Department of ENT- HNS, National Academy of Medical Sciences, Mahabouddha, Kathmandu, Nepal.

Corresponding Author

Anita GC, Department of ENT-HNS, National Academy of Medical Sciences, Mahabouddha, Kathmandu, Nepal.

Email: gcanita222@gmail.com

Phone No: 00977-9841413222

SKIN PRICK TEST REACTIVITY TO COMMON AEROALLERGENS AMONG PATIENTS OF ALLERGIC RHINITIS

ABSTRACT

Aims and Objectives: This study aims to investigate the pattern of skin prick test reactivity to various aeroallergens among patients presenting with allergic rhinitis symptoms.

Methods: A cross-sectional study was conducted among 145 patients in the Department of ENT-HNS of a tertiary centre from December 2021 to January 2023. It included patients above six years of age diagnosed with allergic rhinitis based on the ARIA guidelines (2019). Exclusion criteria included chronic rhinosinusitis, nasal polyposis, tumours of the nose or sinuses, pregnancy, drug-induced rhinitis, and patients on antihistamines, steroids, or antileukotrienes within 7 days before the study.

Results: The skin prick test reactivity to aeroallergens was assessed in 145 patients aged 11 to 70 years (mean age: 31.98 years). Eye symptoms occurred in 59%, skin symptoms in 31%, and airway symptoms in 41% of the patients with allergic rhinitis. Frequent allergens were *D. pteronyssinus*, *D. farinae*, *Blomia*, wheat dust, and rice grain dust. Among all the patients, 8.96% had no positive skin test reactions.

Conclusion: Eye, skin and airway symptoms are the common symptoms in patients with allergic rhinitis. Majority of patients have polysensitization, house dust mites being the most common allergen.

Keywords: Allergic rhinitis, dust mites, skin prick test

INTRODUCTION

Allergy is defined as a hypersensitivity reaction initiated by specific immunologic mechanisms. Allergic rhinitis (AR) includes a combination of two or more symptoms, namely, watery rhinorrhoea, nasal obstruction, itching, and sneezing. Allergic rhinitis occurs when these symptoms result from immunoglobulin E (IgE) mediated inflammation following exposure to allergens.¹

The common inhalant allergens causing AR are house dust mites, pollens, fungi, and insects. Sensitization to aeroallergens is the most important factor causing symptoms in allergic rhinitis.²

Many studies have shown that the distribution and pattern of aeroallergens are significantly different from one country to another.³ The skin prick test (SPT) is considered the gold standard test for the diagnosis of AR. SPT helps in the identification of the sensitizing aeroallergen and aids in the management of the disease, the mainstay of which is avoidance and immunotherapy.⁴ The aim of this study is to investigate the pattern of skin prick test reactivity to various aeroallergens among patients presenting with symptoms of allergic rhinitis.

METHODS

A cross-sectional study was conducted in the Department

of ENT-HNS, Bir Hospital, National Academy of Medical Sciences, Kathmandu from December 2021 to January 2023. The patients above six years of age diagnosed with allergic rhinitis according to Allergic Rhinitis and its Impact on Asthma (ARIA) 2019 guidelines. Patients with chronic rhinosinusitis, nasal polyposis, benign or malignant tumours of the nose and paranasal sinuses, pregnancy, drug-induced rhinitis were excluded from the study. Allergens identified to be common in this part of the continent were used for SPT.

In patients under medications for allergic rhinitis, SPT was conducted 7 days after discontinuation of the medications. Patients were explained about the procedure and possible complications in detail and informed consent were taken. The volar arm was cleaned with alcohol, and allergens were marked 3 cm apart, 5 cm above the wrist and below the elbow. A drop of allergen was placed on the skin, and a 23-gauge needle was inserted at an angle of 45° to prick the skin to the depth of 0.5 mm. The needle was lifted slightly so that there was tenting of the skin to allow entry of allergen beneath the stratum corneum epidermis. The needle was taken down to its original position of prick and gently withdrawn outside without causing bleeding. Glycerinated buffered saline and Histamine Dichloride were used as a negative and positive control respectively. Reactions were measured after 15-20 minutes, with wheals >3 mm along

with a positive histamine reaction (≥ 3 mm) and a negative saline control (< 3 mm) were considered positive. A positive response to at least one of the allergens was accepted as the presence of sensitization. The data were collected in the proforma. There were six major groups of aeroallergens namely house dust mites, dusts, insects, epithelia, pollens and fungi. The aeroallergens were coded and tabulated. Data analysis was done using IBM Statistical Package for Social Sciences version 20.0.

RESULTS

This study reported on skin prick test reactivity to aeroallergens among 145 patients with allergic rhinitis. There were 58 males and 87 females of age ranging from 11 to 70 years with the mean age of 31.98 years. Other symptoms like eye symptoms, skin symptoms, and airway symptoms were present in 59%, 31%, and 41% of the total cases respectively (Fig. 1). In our study, the most common allergens were D-pteronyssinus, D.farinae, Blomia, Wheat dust, Grain dust (Rice) (Table 1). Approximately 8.96% of patients did not exhibit positive sensitivity reactions on skin prick testing.

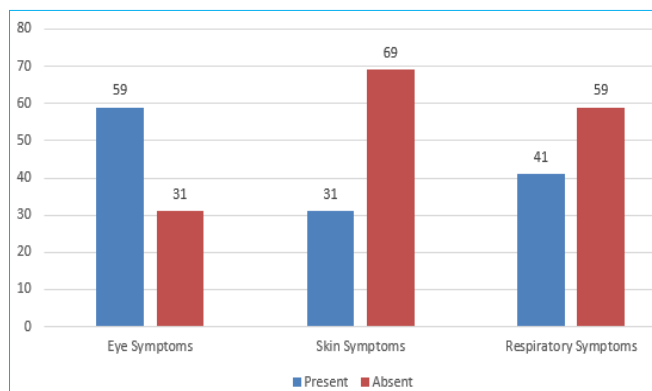


Figure 1: Allergic Rhinitis and associated symptoms (in percentage).

Table 1. Common aeroallergens from each group

Allergen code	Allergens	Number	Percent
	MITE		
M2	D-pteronyssinus	66	46%
M1	D.farinae	62	43%
M3	Blomia	61	42%
	DUST		
D1	Wheat dust (threshing)	26	18%
D6	Grain dust (Rice)	24	17%
D7.	Grain dust (Wheat)	15	10%
D2	Cotton dust	12	8%
D3	House dust	12	8%
	INSECT		
I	Cockroach	20	14%

Allergen code	Allergens	Number	Percent
	EPITHELIA		
E1	Dog epithelia	15	10%
E4	Buffalo dander	14	10%
E6	Pigeon dropping	8	6%
E7	Chicken feather	7	5%
E5	Cat epithelia	7	5%
	POLLEN		
P2	Parthenium hysterophorus	13	9%
P4	Xanthium strumarium	12	8%
P3	Chenopodium album	11	8%
P5	Brassica nigra	9	6%
P1	Cynodon dactylon	9	6%
	FUNGI		
F1	Aspergillus fumigatus	13	9%
F2	Aspergillus niger	8	6%
F6	Alternaria alternate	7	5%
F7	Candida albicans	6	4%

DISCUSSION

Skin prick testing (SPT) is a reliable, cost-effective, and rapid diagnostic tool for identifying IgE-mediated allergies, offering immediate results and guiding targeted management of allergic diseases.⁵ The sensitivity and specificity of SPT are 80-97% and 70-95% respectively, when combined with a positive history its positive predictive value reaches 97-99%.⁴ Approximately, 8.96% of patients were clinically diagnosed with allergic rhinitis but did not exhibit reactions on SPT. They were probably sensitized to other allergens which were not included in our battery of tests.

The most common allergens identified in our study were house dust mites namely Dermatophagoides pteronyssinus, Dermatophagoides farinae and Blomia tropicalis followed by wheat dust, grain dust (rice) and cockroach. In a study done in Nepal, the common aeroallergen in cases of allergic rhinitis were D. farinae (71.42%) followed by D. pteronyssinus (65.47%) and Blomia species (64.28%).⁶ Our results are similar as our test panels were similar and were derived from the same laboratory. A similar study done by Pokharel et al., 103 out of 170 (60.6%) patients yielded positive responses on SPT. The most prevalent aeroallergens were Lepidoglyphus 86 (50.60%), Dermatophagoides pteronyssinus 85 (50%), Dermatophagoides farinae 82 (48.20%), Thyrophagus 50 (29.40%), Blomia 46

(27.10%), Acarus 43 (25.30%), cat dander 26 (15.30%), dog dander 24 (14.10%), cow and buffalo dander 20 (11.8%), ragweed 20 (11.8%), grass pollen 18 (10.60%) and mugwort 17 (10%).⁷ This study was done with a commercially available kit including *Lepidoglyphus*, a storage mite which was not included in our panel of allergens.

In a study done in India by Shreyas et al. the most common aeroallergen were dust mites (42%) followed by dust (22%), grass (13%), trees (9%), insects (6%), fungi (5%) and others (3%). Amongst dust mites, *D. farinae*(46%) followed by *D. pteronyssinus*(34%) and *Blomia*(20%) were the most common ones.⁸ This finding is almost similar to the results of studies done in Nepal.

In our study, we observed polysensitization in 88.28% (128/145) of participants which could be attributed to various environmental and genetic factors. Polysensitization was seen in 84.52% of the patients in a study done by Bhattachan et al.⁶, in 74.3% of patients in a study done by Ciprandi G et al.⁹ and in 74.5% of patients in a study done by Moscato G et al.¹⁰

House dust mites are arguably the masters of allergenicity. Atopic reactivity to these is one of the most common causes of allergy worldwide.¹¹ Mites are among the most diverse groups of arthropods and they can be found in almost all habitats.¹² House dust mites are a primary source of indoor allergies, commonly associated with asthma and various allergic reactions. These mites thrive in frequently inhabited spaces, accumulating in carpets, couches, mattresses, bed linens, clothing, and windowsills. Their widespread presence in homes globally makes them a significant contributor to indoor allergic conditions. Of these, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae* and *Euroglyphus maynei* are the most frequently found house dust mite species. *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* mites are responsible for more than 90% of house dust mites allergies worldwide.¹³ Among the pollens, the most common allergens were *Parthenium hysterophorus* (9%), *Xanthium strumarium* (8%) and *Chenopodium album* (8%) which are weeds commonly found in our region. Many people engaged in farming for household or agriculture purposes are exposed to their pollens.

Animal danders were also common in our study. The most common epithelium aeroallergens were dog epithelia (15%), buffalo danders (14%) and pigeon droppings (8%). Many families own dogs and cats as pets and some people are indirectly exposed to street dogs and cats as well. Pet allergies might be the most prevalent perennial allergen in the US. Increasing symptom of allergic rhinitis is consistent with this trend of increasing pet allergies.¹⁴ In households outside Kathmandu, the exposure to the domesticated animals like cows, buffaloes, goats, chickens and pigeons

contributes to the allergy to their epithelia and dander.

In our study almost 13.8% of patients are allergic to cockroaches which are found in almost all rural and urban households. In a study in China, 25.7% were SPT positive to cockroaches, out of which 88% were also SPT positive to *Dermatophagoides pteronyssinus* and an IgE cross-inhibition study confirmed that *Dermatophagoides pteronyssinus* sensitization could cause false positive SPT reactions against cockroaches.¹⁵ Hence, cross-reactivity could be the reason for the high SPT positive results against cockroaches.

Many studies show that a person with one atopic condition such as allergic rhinitis is at higher risk of developing another atopic conditions like allergic conjunctivitis, atopic asthma, atopic dermatitis or food allergies. Out of total, 59% of the patients had eye symptoms in our study which was similar to the findings of 52% of ocular symptoms in a study by Klossek JM et al.¹⁶ A meta-analysis showed an association between allergic rhinitis and allergic dermatitis.¹⁷ In our study, 31% of patients of allergic rhinitis had skin symptoms as well. Various studies have shown that around 20 to 40% of patients with allergic rhinitis suffer from asthma.¹⁷ In our study as well, 41% had symptoms of asthma or chronic cough. The limitations of our study was small sample size and availability of the limited number of allergens. Moreover, the positive skin prick test result doesn't always depict the actual allergen the patient is allergic to due to cross sensitivity.

CONCLUSION

Most allergic rhinitis patients in the study sample suffered from polysensitization. This could be due to the cross reactivity among many aeroallergens. Skin prick tests in the patients with symptoms of allergic rhinitis showed that most of the patients were reactive to house dust mites (*D. pteronyssinus*, *D. farinae*, *B. tropicalis*) followed by wheat dust, rice dust and cockroach.

Conflict of Interest: None.

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