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ALLERGEN SENSITIZATION PATTERNS IN PATIENTS WITH ALLERGIC RHINITIS FROM SINDHUDURG DISTRICT, MAHARASHTRA: A PROSPECTIVE STUDY

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ABSTRACT

Background: Allergic rhinitis (AR) is a common IgE-mediated disorder caused by sensitization to environmental allergens. Identifying region-specific allergens is crucial for accurate diagnosis and individualized management. **Aim:** To determine the predominant allergens associated with AR in patients from the Sindhudurg district of Maharashtra, India. **Materials and Methods:** This prospective study was conducted at the Allergy and Immunology Clinic, Kudal, between May 2022 and August 2025. Patients with a history and clinical findings suggestive of AR were enrolled. Following counselling, skin prick testing (SPT) was performed using standardized allergen extracts. A reaction was considered positive if the wheal diameter measured ≥3 mm larger than the negative control. **Results:** A total of 169 patients (77 males, 92 females), predominantly aged 4–40 years, underwent testing. Overall, 96.4% demonstrated sensitization to at least one allergen. Dust mites were the most common sensitizers (72%), followed by cockroach (22%), pollens (14%), fungi (9%), food allergens (1%), and animal dander (1%). **Conclusion:** This study highlights regional variations in allergen sensitization among AR patients. In Sindhudurg district, dust mites emerged as the predominant allergen, likely reflecting the coastal region's humid climate that favors their proliferation. These findings underscore the need for region-specific allergen profiling to guide targeted management strategies, including allergen-specific immunotherapy.

KEYWORDS

INTRODUCTION

The term allergy was first introduced by Clemens von Pirquet in 1906 to describe altered immune responses. A pivotal advancement in the field came with the discovery of immunoglobulin E (IgE) by Kimishige and Teruko Ishizaka, which provided the foundation for understanding IgE-mediated hypersensitivity disorders.

Allergic rhinitis (AR) is among the most common allergic diseases globally, affecting an estimated 500 million people. According to the Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update, AR is defined as a symptomatic nasal condition triggered by IgE-mediated inflammation following allergen exposure. The clinical presentation typically includes sneezing, rhinorrhoea, nasal pruritus, congestion, and postnasal drip, all of which can significantly disrupt sleep, reduce work productivity, and diminish quality of life.

Diagnosis relies on a combination of clinical history, physical examination, and confirmatory tests, most commonly the skin prick test (SPT) and allergen-specific IgE assays. Major environmental allergens include house dust mites, pollens, moulds, insect debris, animal dander, and certain food allergens. Identifying the causative allergens is crucial for developing effective avoidance strategies and implementing allergen-specific immunotherapy.

Because allergen distribution is strongly influenced by geography and climate, region-specific data are essential. The Sindhudurg district, situated along the Konkan coast of Maharashtra, is characterized by high humidity and dense vegetation—factors that may shape local allergen profiles. The present study was designed to determine the predominant allergens associated with AR in this population.

MATERIALS AND METHODS

Study Design and Setting

This prospective study was conducted at the Allergy and Immunology Clinic, Kudal, Sindhudurg district, Maharashtra, from May 2022 to August 2025.

Inclusion and Exclusion Criteria

Patients with clinical features consistent with AR were included. Exclusion criteria were a history of anaphylaxis, severe dermatographism, pregnancy, and active dermatological disorders.

Patient Preparation

Participants discontinued antihistamines at least three days and oral sympathomimetics at least 12 hours prior to SPT. Written informed consent was obtained following counselling about AR and the testing procedure.

Skin Prick Test Procedure

SPT was performed on the volar forearm using standardized allergen extracts. Histamine acid phosphate (1 mg/ml) and saline served as positive and negative controls, respectively. Controls were applied first, and wheal diameters were measured at 8 minutes. A valid test required a histamine wheal ≥3 mm larger than the saline control.

Allergen drops were placed 2 cm apart, and the skin was pricked with a 1 mm sterile lancet. Wheal and flare responses were recorded at 15 minutes. A wheal ≥3 mm larger than the negative control was considered positive. Positive reactions were correlated with clinical history to minimize misinterpretation due to cross-reactivity.

Allergen Panel

A total of 197 standardized extracts were tested across seven categories:

1. **Dust Mites-** Dermatophagoides pteronyssinus, D. farinae, Blomia sp.
2. **Pollens-** e.g., Adhatoda vasica, Acacia arabica, Ageratum conyzoides, Albizzia lebbeck, Amaranthus spp., Parthenium hysterophorus, Cynodon dactylon, Zea mays.
3. **Fungi-** Alternaria tenuis, Aspergillus spp., Cladosporium herbarum, Candida albicans, Fusarium solani, Mucor mucedo, etc.
4. **Insects-** Cockroach, mosquito, honey bee, grasshopper, moth, rice weevil, yellow wasp.
5. **Animal Dander-** Dog, cat, cow, buffalo, human.
6. **Fabrics/Feathers-** Jute, kapok cotton, wool, silk, chicken feathers, pigeon feathers.
7. **Wood Dust-** Mixed wood dust, shisham, teak.

A complete allergen list is provided in the supplementary table.

RESULTS

A total of 169 patients (77 males, 92 females) were included, with most aged 4–40 years. Positive sensitization was identified in 163 patients (96.4%).

Sensitization Frequencies

- **Dust Mites:** 72% (Dermatophagoides pteronyssinus most common)
- **Cockroach:** 22%
- **Pollens:** 14% (notably Ageratum conyzoides, Prosopis juliflora, Amaranthus spinosus, Cynodon dactylon, Artemisia vulgaris)
- **Fungi:** 9% (mainly Aspergillus and Alternaria species)
- **Food Allergens:** 1% (hen's egg)
- **Animal Dander:** 1% (cat and dog epithelia)

DISCUSSION

Sensitization Patterns

High SPT positivity (96.4%) observed in this study is comparable to previous Indian reports (Jain et al. – 95%; Shyna et al. – 70% in children <15 years). Male predominance was also consistent with earlier studies.

Dust Mites

Dust mites were the most frequent sensitizers, with Dermatophagoides pteronyssinus predominating, followed by D. farinae and Blomia sp. These findings are consistent with Arbat et al. and Gill et al. The high humidity of coastal Sindhudurg likely promotes mite growth.

Pollens

Major pollen sensitizers included Ageratum conyzoides, Prosopis juliflora, Amaranthus spinosus, Cynodon dactylon, and Artemisia vulgaris. Previous Indian studies also reported strong reactivity to grasses and weeds, particularly Cynodon dactylon and Parthenium hysterophorus.

Insects

Cockroach sensitization (22%) aligns with findings by Kumar et al. and Dey & Chakraborty, highlighting its importance as an indoor allergen in humid regions.

Fungi

Fungal sensitization (9%) was lower than dust mites and pollens but comparable with reports from Kerala and Central India. Aspergillus and Alternaria species were the most frequent triggers.

Food and Animal Dander

Food allergens were uncommon (1%), limited to hen's egg. Animal dander sensitivity was rare (1%), lower than reports from other regions, possibly reflecting differences in domestic animal exposure.

Comparative Perspective

Overall, dust mites and pollens are the dominant allergens in AR patients, while insects, fungi, food, and animal dander contribute variably depending on geography and lifestyle.

Supplementary Table of Allergens Used in the Study:

Category	Allergen Name
Dust Mites	Dermatophagoides pteronyssinus, Dermatophagoides farinae, Blomia sp.
Pollens	Adhatoda vasica, Acacia arabica, Ageratum conyzoides, Ailanthus excelsa, Albizzia lebbeck, Amaranthus hybridus, Amaranthus spinosus, Argemone mexicana, Artemisia scoparia, Asphodelus tenuifolius, Azadirachta indica, Brassica campestris, Broussonetia papyrifera, Cannabis sativa, Carica papaya, Cassia fistula, Cassia occidentalis, Cassia siamea, Cenchrus ciliaris, Chenopodium album, Chenopodium murale, Clerodendrum phlomidis, Cocos nucifera, Crataeva nurvala, Cynodon dactylon, Cyperus rotundus, Dodonea viscosa, Ehretia laevis, Eucalyptus tereticornis, Gynandropsis gynandra, Holoptelea integrifolia, Imperata cylindrica, Ipomoea fistulosa, Kigelia pinnata, Lawsonia inermis, Maerua arenaria, Melia azedarach, Morus alba, Parthenium hysterophorus, Pennisetum typhoides, Prosopis juliflora, Putranjiva roxburghii, Poa annua, Ricinus communis, Rumex dentatus, Salvadora persica, Sorghum vulgare, Suaeda fruticosa, Typha angustata, Xanthium strumarium, Zea mays
Fungi / Moulds	Alternaria tenuis, Aspergillus flavus, Aspergillus fumigatus, Aspergillus niger, Aspergillus tamarii, Aspergillus versicolor, Candida albicans, Cladosporium herbarum, Curvularia lunata, Fusarium solani, Helminthosporium sp., Mucor mucedo
Insects	Cockroach, Ant, Butterfly, Cricket, Dragonfly, Grasshopper, Honey bee, House fly, Jassids, Locust, Mosquitoes, Moth, Rice weevil, Yellow wasp
Animal Dander	Dog, Cat, Cow, Buffalo, Human
Fabrics / Feathers	Jute, Kapok cotton, Sheep wool, Wool mix, Raw silk, Chicken feathers, Pigeon feathers
Wood Dust	Mixed wood dust, Shisham (Dalbergia sissoo), Teak (Tectona grandis)

CONCLUSION

This study demonstrates that dust mites are the predominant allergens among AR patients in Sindhudurg district, Maharashtra, likely due to the region's humid climate. Identification of local allergen sensitization profiles is critical for effective prevention, patient counselling, and implementation of allergen-specific immunotherapy.

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