

Common Allergens Prevalent in and Around Ambala, Haryana: An Intradermal Study among Patients with Asthma and Allergic Rhinitis and Atopic Dermatitis

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Abstract

Objective: Identification of allergens by intradermal test in patients with asthma, allergic rhinitis, and eczema. **Materials and Methods:** Intradermal test was performed in 100 patients of Ambala over an 8-year period to identify the common allergens. A total of 197 allergens including 50 types of pollen, 19 fungi, 17 insects, 14 types of dust, 6 animal dander, 7 types of fabric and feather and 82 types of foods, dust mite, and parthenium were tested. **Results:** In this study, the major allergens were pollen (51%) followed by foods (28.9%), insects (26.9%), fungus (12.6%), dusts (6.7%). Among pollen allergens, *Brassica campestris* (8%) was a major allergen followed by *Ageratum conyzoides* (7%) and *Artemisia scoparia* (6%) *Cannabis sativa*, *Cynodon dactylon* and *Maerua arenaria* (5%). Among the fungal group, *Alternaria tenuis*, *Aspergillus flavus*, *Aspergillus fumigates*, *Candida albicans*, *Penicillium* sp., *Rhizopus nigricans* (3%), *Fusarium solani* (2%) were found. In the insect group, mosquito (7%), ant (6%), grasshopper (5%), locust (male), moth, and house fly (4%) were the major allergens. Among the dust allergens, grain dust rice (3%), straw dust, house dust, and grain dust bajra (2%) were found. Among the food allergens, prawn (5%), almonds, Baker's yeast, Bengal gram (3%) and mushroom, mango ripe, rajma, cinnamon, chocolate, beans fresh, and areca nut (2%) were found. **Conclusion:** It can be said that the knowledge may help to create a mapping of allergens in this area and help to treat patients by immunotherapy or avoidance strategy.

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KEY WORDS: Allergens, asthma, atopic dermatitis, nasobronchial allergy, intradermal test

What was known?

- Allergens are one of the many factors which can cause and trigger nasobronchial allergy, atopic dermatitis and bronchial asthma.
- Skin intradermal tests can help identify allergens in cases of asthma, allergic rhinitis and eczema.

Introduction

Worldwide, eczema affects 3%–20.5% of the population and allergic rhinitis affects between 10% and 30% of the population and sensitization (IgE antibodies) to a foreign protein in the environment is present in up to 40% of the population.^[1] The rise in the prevalence of allergic diseases has continued in the industrialized world for more than 50 years. Both outdoor and indoor aeroallergens sensitize and exacerbate allergic asthma.^[2] In 1921, Kern noted that a patient with asthma had a positive prick-puncture skin test to extracts obtained from her mattress.^[3] The patient's asthma improved after she enclosed the mattress in heavy packing paper and thoroughly cleaned the room. In 1925, Storm van Leeuwen successfully treated individuals with asthma by

moving them to high altitudes or enclosing them in an allergen-proof chamber.^[4]

In India alone, approximately 20% of the population suffer from allergic rhinitis, 6% from dermatitis, and 15% from bronchial asthma.^[5] The prevalence of atopic dermatitis (AD) has increased in the past two to three decades possibly due to change in indoor and outdoor environment. Allergens are one of the many factors which can cause and trigger nasobronchial allergy, AD, and bronchial asthma. There appears to be a strong association between bioparticulate matters in the

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atmosphere and their effect on human health. The bioparticulates mostly responsible for allergic symptoms are pollens, fungal spores, pest debris, household dust mite, animal danders, chemical compounds, and foodstuffs.^[6-9]

Aeroallergens have been found to have an important role in allergic disorders. The present study was conducted to find the different types of allergens responsible for allergy in the area around Ambala, Haryana, and the surrounding areas.

Materials and Methods

A total of 100 patients attending the outpatient department of Respiratory Medicine Department of Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana, Ambala, Haryana, from 2010 to 2017 were included in this study. An institutional ethics committee clearance was taken. An informed consent from each patient was obtained before their participation in the study. The patients taken were confirmed cases of allergic rhinitis, AD, and bronchial asthma.^[10,11] All the selected subjects were told to stop systemic steroid or other immunosuppressives at least for three days and antihistaminic at least for 7 days prior to the intradermal test.

Intradermal injection of 197 allergen extracts was given to all 100 patients. The allergen extract included 50 types of pollen, 19 fungi, 17 insects, 14 types of dusts, 6 types of animal dander, 7 types of fabric and feathers, 82 types of foods, dust mite, and parthenium. Intradermal injection has overall higher sensitivity and is more reproducible than skin prick test for testing with low potency extracts.^[12] The intradermal test requires about 1000-fold less concentrated extract than those used for skin prick test to achieve a similar response.^[13]

In this study, 197 allergens and positive control (histamine buffer) and negative control (saline buffer) concluded a total of 199 intradermal injections given to a patient [Figure 1]. All the allergens were given on the back

with 4 cm distance between them. Injections were given using a 26 gauge needle up to 0.5 mm depth beneath the skin. The results were interpreted by wheal produced in relation to the negative control. Because of the high incidence of one plus reaction in nonallergic individuals, this group was excluded from the study, and only high positives were considered and analyzed [Figures 1 and 2]. The skin reactions were read after 15–30 min and were graded according to the criteria already published.^[14] Care was taken not to do allergy testing in patients with eczema during an episode of exacerbation.

Results

In this study, the major allergens were pollens (51%) followed by foods (28.9%), insects (26.9%), fungus (12.6%), and dusts (6.7%). Among the various allergens tested, the dust mite allergy was found in 4% of cases, unlike western studies where dust mite was the most prevalent. Among pollen allergens, *Brassica campestris* (8%) was found as major allergen followed by *Ageratum conyzoides* (7%) and *Artemisia scoparia* (6%) *Cannabis sativa*, *Cynodon dactylon*, and *Maerua arenaria* (5%) [Table 1]. Among the fungal group, *Alternaria tenuis*, *Aspergillus flavus*, *Aspergillus fumigates*, *Candida albicans*, *Penicillium sp.*, and *Rhizopus nigricans* (3%) were the major allergens followed by *Fusarium solani* (2%) [Table 2]. In the insect group, mosquito (7%), ant (6%), grasshopper (5%), locust (male), moth, and house fly (4%) were the major allergens [Table 3]. Among the dust allergens, grain dust rice (3%), straw dust, house dust, and grain dust bajra (2%) were found [Table 4] to be the major agents responsible for allergic reactions. Among fabrics and feathers wool mix was found in 2% of cases [Table 6]. Among food allergens [Table 7], prawn (5%) was the major allergen. Other food allergens were almonds, baker's yeast, Bengal gram (3%) and mushroom, mango ripe, rajma, cinnamon, chocolate, beans fresh, and areca nut (2%).



Figure 1: Skin intradermal allergy testing



Figure 2: Large size and pseudopodia suggestive of 3+ reaction at the top right corner in skin intradermal test

Table 1: Results of intradermal test with pollen allergen

Allergen extract	Total number of patients tested	Marked positive reaction (2+/3+)	Percentage
Adhatoda vasica	100	2	2
Ageratum conyzoides	100	7	7
Ailanthus excels	100	2	2
Albizzia lebbeck	100	3	3
Amaranthus hybridus	100	3	3
Amaranthus spinosus	100	2	2
Argemone Mexicana	100	3	3
Artemisia scoparia	100	6	6
Asphodelus tenuifolius	100	2	2
Azadirachta indica	100	2	2
Brassica campestris	100	8	8
Broussonetia papyrifera	100	3	3
Cannabis sativa	100	5	5
Carica papaya	100	1	1
Cassia fistula	100	1	1
Cassia occidentalis	100	2	2
Cassia siamea	100	1	1
Cenchrus ciliaris	100	0	
Chenopodium album	100	0	
Chenopodium murale	100	1	1
Clerodendrum phlomidis	100	3	3
Cocos nucifera	100	0	
Crataeva nurvala	100	3	3
Cyanodon dactylon	100	5	5
Cyperus rotundum	100	0	
Dodonea viscosa	100	1	1
Ehretia laevis	100	2	2
Eucalyptus tereticornis	100	2	2
Gynandropsis gynandra	100	4	4
Holoptelea integrifolia	100	1	1
Imperata cylindrica	100	1	1
Ipomoea fistulosa	100	0	
Kigelia pinnata	100	0	
Lawsonia inermis	100	0	
Maerua arenaria	100	5	5
Melia azedarach	100	2	2
Morus alba	100	1	1
Parthenium hysterophorus	100	3	3
Pennisetum typhoides	100	1	1
Prosopis juliflora	100	2	2
Putranjiva roxburghii	100	3	3
Ranunculus scleratus	100	2	2
Ricinus communis	100	2	2
Rumex dentatus	100	2	2
Salvadora persica	100	1	1
Sorghum vulgare	100	0	
Suaeda fruticosa	100	1	1
Typha angusta	100	0	
Xanthium strumarium	100	1	1
Zea mays	100	0	

Table 2: Results of intradermal test with fungal allergens

Allergen extract	Total number of patients tested	Marked positive reaction (2+/3+)	Percentage
Acrothecium sp.	100	0	
Alternaria tenuis	100	3	3
Aspergillus flavus	100	3	3
Aspergillus fumigates	100	3	3
Aspergillus niger	100	1	1
Aspergillus tamari	100	1	1
Aspergillus versicolor	100	0	
Candida albicans	100	3	3
Cladosporium herbarum	100	1	1
Curvularia lunata	100	0	
Fusarium solani	100	2	2
Helminthosporum sp.	100	0	
Mucor mucedo	100	0	
Neurospora sitophila	100	0	
Nigrospora oryzae	100	1	1
Penicillium sp.	100	3	3
Phoma betae	100	0	
Rhizopus nigricans	100	3	3
Trichoderma sp.	100	1	1

Table 3: results of intradermal test with insect allergen extract

Allergen extract	Total number of patients	Marked positive reaction (2+/3+)	Percentage
Ant	100	6	6
Bumble bee	100	2	2
Butterfly	100	3	3
Cantheroid beetle	100	4	4
Cockroach (female)	100	5	5
Cockroach (male)	100	1	1
Cricket	100	1	1
Dragon fly	100	3	3
Grass hopper	100	5	5
Honey bee	100	2	2
House fly	100	4	4
Jassids	100	1	1
Locust (female)	100	2	2
Locust (male)	100	4	4
Mosquito	100	7	7
Moth	100	4	4
Rice weevil	100	0	

Discussion

Aeroallergens are an important cause of allergic respiratory disease worldwide. In this study, the major allergens were pollen (51%) followed by food (28.9%), insect (26.9%), fungus (12.6%), and dust (6.7%).

Table 4: Results of intradermal test with dust allergens

Allergen extract	Total number of patients	Marked positive reaction (2+/3+)	Percentage
Cotton mill dust	100	1	1
Flax fibre dust	100	0	
Grain dust bajra	100	2	2
Grain dust jowar	100	1	1
Grain dust Rice	100	3	3
Grain dust mix	100	0	
Grain dust wheat	100	0	
Hay dust	100	1	1
House dust	100	2	2
Paper dust	100	0	
Straw dust	100	2	2
Thrashing dust bajra	100	1	1
Thrashing dust wheat	100	0	
Mouldy hay	100	0	

Table 5: Results of intradermal test with dander allergens

Allergen extract	Total number of patients	Marked positive reaction (2+/3+)	Percentage
Buffalo dander	100	1	1
Cat dander	100	0	
Cow dander	100	0	0
Dog dander	100	0	
Horse dander	100	0	
Human dander	100	0	

Table 6: Results of intradermal test with fabric and feathers allergen

Allergen extract	Total number of patient	Marked positive reaction (2+/3+)	Percentage
Jute	100	0	
Kapok cotton	100	0	
Silk (raw)	100	0	
Sheep	100	0	
Wool mix	100	2	2
Chicken feather	100	0	
Pigeon feather	100	0	

Shivpuri^[8] found *Curvularia*, *Alternaria*, *A. fumigates*, *Phoma*, *Neurospora*, *Aspergillus tamarii*, *Helminthosporium*, *Aspergillus niger*, *R. nigricans*, *Trichoderma*, and *Cladosporium*, to be the most common allergens in patients with nasobronchial allergy. Among the dust allergens, grain dust rice (3%), straw dust, house dust, and grain dust bajra (2%) were found to

Table 7: Results of intradermal test with food allergen extract

Allergen extract	Total number of patients	Marked positive reaction (2+/3+)	Percentage
Almonds	100	3	3
Apple	100	0	
Areca nut	100	2	2
Arvi	100	0	
Bajra	100	0	
Baker's yeast	100	3	3
Banana ripe	100	1	1
Beans fresh	100	2	2
Bengal gram	100	3	3
Black pepper	100	1	1
Cabbage	100	1	1
Cardamom large	100	1	1
Cardamom small	100	1	1
Cashew nut	100	0	
Cheeku	100	0	
Chocolate	100	2	2
Cinnamon	100	2	2
Clove (long)	100	0	
Coconut	100	1	1
Coriander	100	0	
Coffee beans	100	0	
Cumin (jeera)	100	1	1
Dal arhar	100	2	2
Dal masoor	100	0	
Dal moong	100	1	1
Dal moth	100	0	
Dal urad	100	0	
Lobia	100	0	
Rajma	100	2	2
Raungi	100	1	1
Kabuli chana	100	0	
Drum stick	100	0	
Garlic	100	0	
Citrus (lemon)	100	1	1
Cucurbis	100	0	
Dhania leaves	100	0	
Ginger	100	0	
Ground nut	100	0	
Gum acacia	100	0	
Jowar	100	0	
Katha	100	1	1
Lady finger	100	0	
Licorice	100	0	
Mango ripe	100	2	2
Mango unripe	100	0	
Milk buffalo	100	1	1
Mushroom	100	2	2

Contd...

Table 7: Contd...

Allergen extract	Total number of patients	Marked positive reaction (2+/3+)	Percentage
Mustard	100	0	
Mustard leaves	100	0	
Onion	100	0	
Orange	100	1	1
Papaya ripe	100	0	
Peas	100	0	
Pista	100	1	1
Potato	100	0	
Radish	100	0	
Rice	100	0	
Saunf	100	1	1
Sonth	100	0	
Soyabean flour	100	1	1
Tamarind	100	0	0
Tea	100	1	1
Tomato	100	0	
Turmeric	100	0	
Walnut	100	1	1
Wheat	100	0	
Chicken	100	0	
Fish	100	0	
Mutton	100	0	
Prawn	100	5	5
Egg	100	1	1
Parthenium leaves	100	3	3
Tobacco	100	0	
Deodar wood	100	0	
Plymix wood	100	0	
Saal wood	100	0	
Shisham wood	100	0	
Teak wood	100	1	1
Yellow wasp	100	3	3
Cobweb	100	0	
Epicoccum perpurascens	100	0	
Strawberry	100	0	
Acacia arabica	100	2	2

be the major agents responsible for allergic reactions. Acharya^[15] found house dust followed by wheat dust, cotton dust, and paper dust to be common among patients with nasobronchial allergy. Among fabrics and feathers wool mix was found in 2% of cases [Tabel 5]. Among food allergens [Table 7], prawn (5%) was the major allergen even though Ambala is nowhere near the sea. Other food allergens were almond, baker's yeast, Bengal gram (3%) and mushroom, mango ripe, rajma, cinnamon, chocolate, beans fresh, and areca nut (2%). However, 82 antigens were negative among all the cases. Total positive reactions were 255 comprised by a total of

115 antigens. Since non-AD is characterized by negative skin prick test, they were not a part of the present study.^[6]

The variation in the prevalence of aeroallergen reactivities in a different region is due to different geo-climatic condition and adaptation of specific microbiological flora and fauna in a specific climate. The variation of skin reactivity may also be attributed to change in the specific pattern of vegetation over a period as a result of the changes in geo-climatic condition. One of the management protocols can be the avoidance of common aeroallergens prevalent in that part of the world although it is not so easy. Allergen-specific immunotherapy is a viable option for these patients.^[16] It can be used in combination with conventional therapy to maximize the outcome and in authors' experience has proved effective in many treatment-resistant cases.

Conclusion

The present study was undertaken to find out the important allergens responsible for allergy in and around Ambala and Yamunanagar having various industries as metal and plywood industry. The difference in the markedly positive intradermal test results among various other studies may be attributed to the difference in the flora of the various geographical regions and to the change in flora over time and climatic conditions. The information from the study may be useful to clinicians managing patients suffering from allergies and help in building the prevalent allergenic antigens in this part of India. The identification of most prevalent and also the full spectrum of aeroallergens responsible for respiratory allergies has a very important role in the management of these conditions. The study may help in selecting the most specific and most cost-effective panel of aeroallergen antigens for the intradermal test as the appropriate diagnostic test, and hence will help in finding the best formulation of allergen-specific immunotherapy as an effective treatment.

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Nil.

Conflicts of interest

There are no conflicts of interest.

What is new?

- The antigens prevalent in this part of India are mapped which will help in selecting the most cost effective panel for skin allergy testing in various parts of India.
- Incorporation of low cost immunotherapy will be possible to patients of asthma, allergic rhinitis and eczema.

References

1. Pawankar R, Canonica GW, Holgate ST, Lockey RF. White Book on Allergy 2011-2012. Executive Summary. Wisconsin: World Allergy Organisation; 2011.
2. Patel B, Lockey RF, Kaliner MA, Aljubran SA, Bush RK. Aeroallergens. Available From: link for AQ7: <https://emedicine>.

- medscape.com/article/137911-overview. [Last accessed on 2018 Apr 25].
3. Kern RA. Dust sensitization in bronchial asthma. *Med Clin North Am* 1921;5:751.
4. Storm van Leeuwen W. Allergic Diseases: Diagnosis and Treatment of Bronchial Asthma, Hay Fever and Other Allergic Diseases. Philadelphia Pa; J.B. Lippincott; 1925.
5. Shivpuri DN. Clinically important pollen, fungal and insect allergen in nasobronchial allergy in India. *Aspects Allergy Appl Immunol* 1980;13:19-23.
6. Simons FE. Allergic rhinobronchitis: The asthma-allergic rhinitis link. *J Allergy Clin Immunol* 1999;104:534-40.
7. Rożalski M, Rudnicka L, Samochocki Z. Atopic and non-atopic eczema. *Acta Dermatovenerol Croat* 2016;24:110-5.
8. Kang B, Jones J, Johnson J, Kang IJ. Analysis of indoor environment and atopic allergy in urban populations with bronchial asthma. *Ann Allergy* 1989;62:30-4.
9. Lacey J, Crook B. Fungal and actinomycete spores as pollutants of the workplace and occupational allergens. *Ann Occup Hyg* 1988;32:515-33.
10. Bousquet J, Van Cauwenberge P, Khaltaev N, Aria Workshop Group, World Health Organization. Allergic rhinitis and its impact on asthma. *J Allergy Clin Immunol* 2001;108:S147-334.
11. Lung function testing: Selection of reference values and interpretative strategies. American thoracic society. *Am Rev Respir Dis* 1991;144:1202-18.
12. Dreborg S, Frew A. EACCI subcommittee on skin tests. *Allergy* 1993;48 Suppl 14:48-82.
13. Nelson HS, Oppenheimer J, Buchmeier A, Kordash TR, Freshwater LL. An assessment of the role of intradermal skin testing in the diagnosis of clinically relevant allergy to timothy grass. *J Allergy Clin Immunol* 1996;97:1193-201.
14. Shivpuri DN. Comparative evaluation of the sensitivity of common methods of diagnostic antigen tests in patients of respiratory allergy. *Indian J Chest Dis* 1962;3:102-7.
15. Acharya PJ. Skin test response to some inhalant allergens in patients of nasobronchial allergy from Andhra Pradesh. *Aspects Allergy Appl Immunol* 1980;8:34-6.
16. Handa S, Jain N, Narang T. Cost of care of atopic dermatitis in India. *Indian J Dermatol* 2015;60:213.