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Identification of common allergens for united airway disease by skin prick test

Vikas Deep Mishra¹, Tariq Mahmood², Jai Krisna Mishra³,

¹ Department of TB and Chest Diseases, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India

² Department of TB and Chest Diseases, MLN Medical College, Allahabad, Uttar Pradesh, India

³ Department of TB and Respiratory Diseases, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Correspondence Address:

Vikas Deep Mishra

Department of TB and Chest Diseases, Heritage Institute of Medical Science, Bhadwar, Varanasi - 211 311, Uttar Pradesh
India

Abstract

Objective: Identification of common allergens by skin prick test in patients of united airway disease. **Materials and Methods:** Skin prick test was performed in 60 patients of United Airway Disease to identify the common allergens. A total of 62 allergens consisting of 36 types of pollen, 5 fungi, 4 insects, 8 type of dusts, 4 dander, 3 fabrics, Dust mite and *Parthenium* leaves were tested. **Result:** Most common allergens were Dust mite (60%) followed by *Parthenium* leaves (45%), insects (18.75%), pollen (14.81%), dust allergens (8.51%), fabrics (8.33%), fungi (5.66%), dander (5%). Most common insect allergens were cockroach (female) (30%), cockroach (male) (23.33%). Common pollens were *Ricinus communis* (28.33%), *Amaranthus spinosus* (28.33%), *Parthenium hysterophorus* (26.66%), *Eucalyptus tereticornis* (26.66%) and *Cynodon dactylon* (25%). Common dust allergens were house dust (21.66%), paper dust (11.66%) and cotton mill dust (10%). Among fabrics kapok cotton (13.33%) showed maximum positivity. Among fungi *Aspergillus fumigatus* (10%) followed by *A. niger* (6.66%) were most common. In animal dander group common ones were cat dander followed by dog dander. **Conclusion:** In conclusion it can be said that the knowledge drawn by above study will help to treat patients by immunotherapy or avoidance strategy.

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Full Text

Introduction

Worldwide, allergic rhinitis affects between 10% and 30% of the population, [1] and sensitization (IgE antibodies) to foreign protein in the environment is present in up to 40% of the population. [1] The rise in prevalence of allergic disease has continued in the industrialized world for more than 50 years. [1] In India, the prevalence of asthma in children below 9

years of age was found to be 0.8% in 1966, whereas now it has been found to be in the range of 5.6% to 23.4% in different parts of the country, [2] thus showing a rising trend. In recent years, there have been more and more studies indicating a strong relationship between allergic rhinitis and bronchial asthma. [3],[4] In one study, up to 80% of asthmatics were found to have allergic rhinitis and likewise up to 40% of allergic rhinitis patients were found to have bronchial asthma, thus leading to the concept of united airway disease. [5]

There appears to be a strong association between bioparticulate matters in the atmosphere and their effect on human health. The study of airborne microorganisms, pollen, spores, and seeds, especially as agents of infection, is known as aerobiology. The bioparticulates mostly responsible for allergic symptoms are pollens, fungal spores, pest debris, household dust mite, animals dander, chemical compounds, and foodstuffs. [6],[7],[8] Airborne biopollutants pose an important problem worldwide due to their allergic properties.

Aeroallergens play an important role in the pathogenesis of respiratory disorder, viz., allergic rhinitis and asthma. Pollens and other aeroallergens are variable in different ecozones, and it is important to identify them for diagnosis and immunotherapy. Few previously done studies have identified aeroallergens and other bioparticles responsible for respiratory allergies in different parts of Uttar Pradesh. [9],[10] The present study was undertaken to find out the aeroallergens in and around Allahabad city.

Materials and Methods

A total of sixty patients attending the outpatient department of TB and Chest Department, SRN Hospital, Allahabad, during August 2010 to July 2011 were included in the study. Of the sixty patients, 35 had as bronchial asthma and 25 were diagnosed as allergic rhinitis. The patients were diagnosed as either allergic rhinitis according to the ARIA guidelines [11] or bronchial asthma according to the GINA guidelines. [12]

Peak expiratory flow rate and spirometry of all the patients were done. Skin prick test with 62 allergens extract was done of all the sixty patients. The allergen extract included 36 types of pollen, five fungi, four insects, eight types of dust, four animal dander, three fabrics, and two miscellaneous groups.

Sixty-two allergens, together with a positive control (glycerol: histamine acid phosphate [1:100]) and a negative control (glycerol buffer), made up of a total of 64 pricks to be given to the patients. Keeping a distance of approximately 2 cm between two allergens, 32 allergens (in three rows) were given in the left forearm, and likewise, 32 pricks were given in the right forearm, in a single setting. A drop of allergen (concentration 1:10) was put on the ventral aspect of the forearm, and then a 26-gauge hypodermic needle was passed through it to 0.5 mm beneath the skin and slightly lifted to allow some allergen extract to enter the stratum corneum of the skin. The skin reaction manifested as a wheal was measured after 15 min and labeled according to the criteria of Agarwal et al. 2003. Skin reaction 2+ and above was considered as strongly positive and the allergens for the above study were bought from Alcit India Pvt Ltd., New Delhi, India.

Discussion

Aeroallergens are an important cause of allergic respiratory disease worldwide. In the present study, dust mite (60%) followed by Parthenium leaves (45%) were found to be the most common allergens. After these, the various groups of allergens responsible for respiratory allergy were as follows insects (18.75%), pollens (14.81%), dust allergens (8.51%), fabrics (8.33%), fungi (5.66%), and finally, animal dander (5%). Agrawal et al. [13] in their study conducted at the same center a few years ago also reported a maximum number of positivity by dust mite followed by Parthenium leaves; however, unlike the present study, after these, the maximum positivity was shown by pollen group of allergens.

In the present study, the major pollen allergens [Table 1] were *Ricinus communis* (28.33%), and *Amaranthus spinosus* (28.33%), followed by *Parthenium hysterophorus* (26.66%), *Eucalyptus tereticornis* (26.66%), *Cynodon dactylon* (25%), *Argemone mexicana* (23.33%), *Ailanthus excelsa* (21.66%), *Brassica campestris* (20%), *Adhatoda vasica* (20%), *Putranjiva roxburghii* (20%), and *Holoptelea integrifolia* (18%). In comparison to the study done by Agrawal et al., [13] *R. communis*, *A. spinosus*, and *A. mexicana* were found to be the dominant allergens. In comparison to the study conducted by Prasad et al. [14] in Lucknow, certain new allergens such as *Ranunculus sceleratus*, *Artemisia scoparia*, *Cannabis sativa*, *Lawsonia inermis*, *Ipomoea fistulosa*, *Maerua arenaria*, *Suaeda fruticosa*, *Albizia lebbeck*, *Broussonetia papyrifera*, *Cocos nucifera*, and *Kigelia pinnata* were found in the present study. In the study conducted by Shivpuri, [7] the major

pollens were *Holoptelea*, *Sorghum vulgare*, *Pennisetum*, *Artemisia*, *R. communis*, *Morus alba*, *Cassia*, *A. mexicana*, *C. dactylon*, *Carica*, *Cannabis*, *Xanthium strumarium*, *Amaranthus*, *Imperata*, and *Putranjiva*. {Table 1}

Among the fungi group [Table 2], the most common allergens were *Aspergillus fumigatus* (10%) followed by *Aspergillus niger* (6.66%) and *Candida albicans* (5%). Agrawal et al. [13] reported *Candida albicans* to be more allergenic than *A. niger*. Prasad et al. [14] did not found *Candida* to be allergenic. Shivpuri [7] found *Curvularia*, *Alternaria*, *A. fumigates*, *Phoma*, *Neurospora*, *Aspergillus tamarii*, *Helminthosporium*, *A. niger*, *Rhizopus nigricans*, *Trichoderma*, and *Cladosporium* to be the most common allergens in patients of nasobronchial allergy. Insects were also found to be the major sensitizers in a good number of patients. Cockroach (female) (30%) followed by cockroach (male) (23.33%) and moth (15%) [Table 3]. The findings of the present study are similar to that of Agrawal et al., [13] Gaur et al. [15] found allergy to moth, mosquito, locust (male), locust (female), dragonfly, grasshopper, jassids, housefly, cockroach, and honeybee to be common in patients of nasobronchial allergy. Among the various dust allergens, house dust (21.66%) was the major sensitizer, to be followed by paper dust (11.66%), cotton mill dust (10%), hay dust (8.33%), and grain dust wheat (8.33%) [Table 4]. Earlier, Holopainen et al. [16] reported the sensitivity of house dust to be 44% in their study. Acharya [17] found house dust followed by wheat dust, cotton dust, and paper dust to be common among patients of nasobronchial allergy. Only 5% of patients showed allergy to various animal dander extracts [Table 5]. The most common was cat dander (8.33%). In the fabric allergens section, Kapok cotton (13.33%) was found to show a maximum number of positive reaction, followed by silk raw (8.33%) and sheep wool (3.33%) [Table 6]. Similar results were seen by Agrawal et al. [13] and Prasad et al. [18] Dust mite (60%) followed by *Parthenium* leaves (45%) were found to be the most common allergens [Table 7]. {Table 2}{Table 3}{Table 4}{Table 5}{Table 6}{Table 7}

Conclusion

The present study was undertaken to find out the important allergens responsible for respiratory allergy and in turn for united airway disease. The difference in markedly positive skin prick test result among various other studies may be attributed to difference in flora of the various geographical regions and to the change in flora over time and climatic conditions. It is to be remembered that such studies carried out over time to time will help in determining the major prevalent allergens of any area and thus could be helpful in treatment and immunotherapy of concerned patients.

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Conflicts of interest

There are no conflicts of interest.

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Table 1: Results of skin prick test with pollen allergen extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
<i>Cynodon dactylon</i>	60	15	25
<i>Sorghum vulgare</i>	60	9	15
<i>Pennisetum typhoides</i>	60	7	11.66
<i>Zea mays</i>	60	4	6.66
<i>Gynandropsis gynandra</i>	60	6	10
<i>Brassica campestris</i>	60	12	20
<i>Ranunculus sceleratus</i>	60	9	15
<i>Rumex dentatus</i>	60	5	8.33
<i>Ricinus communis</i>	60	17	28.33
<i>Artemisia scoparia</i>	60	9	15
<i>Argemone mexicana</i>	60	14	23.33
<i>Cannabis sativa</i>	60	5	8.33
<i>Chenopodium album</i>	60	8	13.33
<i>Lawsonia inermis</i>	60	4	6.66
<i>Cyperus rotundus</i>	60	9	15
<i>Adhatoda vasica</i>	60	12	20
<i>Ageratum conyzoides</i>	60	8	13.33
<i>Xanthium strumarium</i>	60	9	15
<i>Dodonaea viscosa</i>	60	4	6.66
<i>Amaranthus spinosus</i>	60	17	28.33
<i>Parthenium hysterophorus</i>	60	16	26.66
<i>Ipomoea fistulosa</i>	60	2	3.33
<i>Maerua arenaria</i>	60	9	15
<i>Suaeda fruticosa</i>	60	8	13.33
<i>Chenopodium murale</i>	60	8	13.33
<i>Putranjiva roxburghii</i>	60	12	20
<i>Albizia lebbek</i>	60	11	18.33
<i>Ailanthus excelsa</i>	60	13	21.66
<i>Eucalyptus tereticornis</i>	60	16	26.66
<i>Broussonetia papyrifera</i>	60	3	5
<i>Holoptelea integrifolia</i>	60	18	18
<i>Morus alba</i>	60	4	6.66
<i>Prosopis juliflora</i>	60	8	13.33
<i>Azadirachta indica</i>	60	5	8.33
<i>Cocos nucifera</i>	60	2	3.33
<i>Kigelia pinnata</i>	60	2	3.33
Total	2160	320	14.81

Table 2: Result of skin prick test with fungal allergens extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
<i>Aspergillus fumigatus</i>	60	6	10
<i>Aspergillus niger</i>	60	4	6.66
<i>Aspergillus versicolor</i>	60	2	3.33
<i>Aspergillus flavus</i>	60	2	3.33
<i>Candida albicans</i>	60	3	5
Total	300	17	5.66

Table 3: Result of skin prick test with insect allergens extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
Cockroach (female)	60	18	30
Cockroach (male)	60	14	23.33
Moth	60	9	15
Rice weevil	60	4	6.66
Total	240	45	18.75

Table 4: Results of skin prick test with dust allergens extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
House dust	60	13	21.66
Paper dust	60	7	18.66
Cotton mill dust	60	6	10
Grain dust wheat	60	5	8.33
Grain dust bajra	60	1	1.66
Grain dust rice	60	2	3.33
Hay dust	60	5	8.33
Straw dust	60	2	3.33
Total	480	41	8.51

Table 5: Results of skin prick test with dander extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
Cat dander	60	5	8.33
Dog dander	60	4	6.66
Cow dander	60	2	3.33
Human dander	60	1	1.66
Total	240	12	5

Table 6: Results of skin prick test with fabrics allergens extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Marked positive reaction (2+ -4+)
Kapok cotton	60	8	13.33
Silk raw	60	5	8.33
Sheep wool	60	2	3.33
Total	180	15	8.33

Table 7: Results of skin prick test with miscellaneous allergens extract

Allergen extract	Total number of patients tested	Marked positive reaction (2+ -4+)	Percentage
Dust mite (<i>Dermatophagoides farinae</i>)	60	36	60
<i>Parthenium</i> leaves	60	27	45