



Skin Prick Test in Educating Population of Rural Part of Eastern India and Promoting Health in Allergic Rhinitis: An Epidemiological Study

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Abstract Skin prick testing (SPT) is one of the most extensively used screening and diagnostic tool in contemporary allergy practice. It plays a vital role in diagnosis of type 1 hypersensitivity reaction in patients with rhinoconjunctivitis, asthma, urticaria, anaphylaxis, atopic eczema and suspected food and drug allergy. The present study was undertaken to evaluate the pattern of allergenicity of aeroallergens and mites in the rural part of Eastern India using SPT. A total of 50 subjects (25 males and 25 females) were selected for the present study. Complete history and clinical symptoms were recorded according to ARIA guidelines. All the patients were subjected to SPT using 35 allergens. Positive sensitization was recorded in terms of frequency and measured in terms of maximum wheal diameter. The most common allergens observed were Gynandropsis gynandra (positive sensitization in 33 cases

with wheal of 4.18 mm diameter) followed by Dermatophagoides farinae (25 cases, 6.12 mm diameter), Ageratum conyzoides (19 cases, 3.36 mm diameter), Cannabis sativa (17 cases, 3.52 mm diameter) and Cassia occidentalis (17 cases, 3.58 mm diameter). When the sensitivity was being compared between the most common allergens, statistical significance was obtained for Ageratum conyzoides and Cannabis sativa with Dermatophagoides farina (p value-0.0001). SPT is a reliable, minimally invasive procedure with immediate results useful in detection and promoting health of patients suffering from allergic rhinitis.

Keywords Allergy · Hypersensitivity · Pollen

Introduction

Allergy is a hypersensitivity disorder of the immune system of the human body. Allergic reactions occur when a person's immune system reacts abnormally to normally harmless substances, present in the environment [1]. Allergic rhinitis (AR) is a recurrent or chronic allergen specific, IgE-mediated hypersensitivity disorder affecting the nasal lining characterized by nasal congestion, rhinorrhea, sneezing, nasal itchiness, and/or postnasal drip [2]. The burden of allergic diseases in India has been on an uprising inclination in terms of prevalence as well as severity. The global prevalence of allergic rhinitis is between 10 and 30% for adults and as high as 40% for children. Symptoms of allergic rhinitis usually develop before age of 20 years and peak at 20–40 years, before gradually declining [3].

Skin prick test (SPT) is considered as the gold standard in the diagnosis of suspected cases of IgE-mediated allergy.

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It was extensively researched by Helmtraud Ebruster in 1959 as a primary diagnostic tool to detect type I hypersensitivity reactions [4]. Generally accepted indications include allergic rhinitis, asthma, atopic dermatitis, suspected food allergies, latex allergy and specific IgE mediated conditions. It provides information about the presence of specific IgE to protein and peptide antigens (allergens). Identification of common aeroallergens in an area is necessary, in order to educate the patient on what allergens to avoid and also help find the best formulation of allergen immunotherapy for effective AR treatment [2].

Considering the above background, the present study was undertaken to evaluate the pattern of allergenicity of aero-allergens and mites in the rural part of Eastern India using SPT.

Materials and Methods

The present study was initiated after procuring approval for the protocol by the Institutional Ethical Committee. A total of 50 subjects (25 males and 25 females) were selected from the outpatient department of ENT, ICARE institute of Medical Sciences and Research, Haldia, West Bengal. Complete history and clinical symptoms were recorded according to ARIA guidelines.

According to ARIA guidelines, allergic rhinitis is defined if two or more symptoms of rhinorrhea, nasal itching, nasal blockage or sneezing is present in a patient for at least one hour per day for 4 days or more a week and also for 4 or more weeks a year [4]. Based on duration, symptoms are categorized as intermittent (< 4 days/week or < 4 weeks/year) or persistent (> 4 days/week or > 4 weeks/year). Severity grading is either mild/

moderate/severe based on the absence or presence of sleep disturbance and impairment in daily activities, school and work respectively.

All the patients were explained the test procedure and informed consent taken. SPT was performed using 35 allergens. Preparation of the area of skin (the back upper arm, forearm) to be tested was done by cleaning the site with 70% alcohol swab and allowing it to dry. With the help of skin marking pen, the sites were numbered in a chronological order starting with negative saline control and ending with positive histamine control. A minimum distance of 2 cm was maintained between two contiguous test sites. All the 35 allergens were then placed on the marked sites observing extra precaution in matching the exact order and numbering as on the proforma specially designed for the study. The test site was swiftly pricked with the skin testing needle through the drop of antigen making sure the skin is pressed slightly and the needle drawn backwards. The results were noted after a period of 15 min.

Positive sensitization was recorded in terms of frequency measured at the maximum wheal diameter in millimeters with the help of skin testing reaction gauge. All the data obtained was subjected to statistical analysis using STATA 14 software and significance was considered at p value < 0.01.

Results

The present study was conducted in 50 subjects (25 males and 25 females) with a mean age of 32.9 years. Complete history and clinical symptoms were recorded according to ARIA guidelines [Table 1]. Allergic rhinitis was classified

Table 1 Questionnaire based on ARIA guidelines

Questionnaire	Yes	No
Do you have any of the following symptoms for at least one hour on most days (or on most days during the season if your symptoms are seasonal)?		
Watery runny nose	30	20
Sneezing (especially violent and in bouts)	33	17
Nasal itching	21	29
Conjunctivitis (red, itchy eyes)	31	19
How long do your symptoms last?		
Fewer than 4 days per week or fewer than 4 consecutive weeks	25	23 didn't report with proper history
More than 4 days per week and more than 4 consecutive weeks	2	
How are your symptoms of Allergic Rhinitis affecting you?		
Disturb my sleep	23	27
Restrict my daily activities (sport, leisure, etc.)	21	29
Restrict my participation in school or work	27	23
Are troublesome to me	28	22

Table 2 Distribution of allergens in terms of frequency

Allergen	Frequency (no. of cases)
<i>Gynandropsis gynandra</i>	33
<i>Dermatophagoides farinae</i>	25
<i>Ageratum conyzoides</i>	19
<i>Cannabis sativa</i>	17
<i>Cassia occidentalis</i>	17
<i>Prosopis juliflora</i>	16
<i>Suaeda fruticosa</i>	15
<i>Brassica campestris</i>	14
<i>Accasia arabica</i>	13
<i>Ailanthus excelsa</i>	13
<i>Albizia lebbek</i>	13
<i>Holoptelea integrifolia</i>	13
<i>Imperata cylindrica</i>	13
<i>Melia azedarach</i>	13
<i>Adhatoda vasica</i>	12
<i>Morush alba</i>	12
<i>Dermatophagoides pteronyssinus</i>	11
<i>Artemisia scoparia</i>	11
<i>Eucalyptus tereticornis</i>	11
<i>Salvadora persica</i>	11
<i>Carica papaya</i>	10
<i>Cassia siamea</i>	10
<i>Cyperus rotundus</i>	10
<i>Law sonia enermis</i>	10
<i>Argemone mexicana</i>	9
<i>Azadirachta indica</i>	9
<i>Chenopodium album</i>	9
<i>Putranjiva roxburghii</i>	9
<i>Rumex dentatus</i>	9
<i>Amaranthus spinosus</i>	8
<i>Cocos nucifera</i>	6
<i>Ricinus communis</i>	6
<i>Xanthium strumarium</i>	6
<i>Cynodon dactylon</i>	5
<i>Typha angustata</i>	5

as mild intermittent (16 cases), mild persistent (1 case), moderate-severe intermittent (31 cases) and moderate-severe persistent (2 cases).

Among 35 allergens, the most predominantly found allergens were gynandropsis gynandra (35 cases) followed by Dermatophagoides farinae (25 cases), ageratum conyzoides (19 cases), cannabis sativa (17 cases) and cassia occidentalis (17 cases). The order of positive sensitization was Dermatophagoides farinae (6.12 mm) followed by Dermatophagoides pteronyssinus (5.72 mm), salvadora persica (4.63 mm), cynodon dactylon (4.40 mm) and gynandropsis gynandra (4.18 mm) [Table 2].

Sensitization was being compared between gynandropsis gynandra and the most common allergens using *t*-test. Sensitization between ageratum conyzoides and gynandropsis gynandra and cannabis sativa was found to be 4.23 mm and 4.17 mm respectively and statistically significant at *p* value < 0.01.

Discussion

The Indian subcontinent shows regional disparities in vegetation type leading to diverse seasonal and annual composition of airborne pollen and the patterns of their distribution with divers impact on human health [5]. Studies done by Mandal et al. and Moitra et al. in eastern part of India have suggested predominance of aeroallergens in rural and urban parts of West Bengal [6, 7]. Similar results were obtained in the present study.

Aeroallergens are an important cause of allergic respiratory diseases worldwide. They are usually classified as indoor (principally mites, pets, insects or from plant origin, e.g., ficus), outdoor (pollens and molds) or occupational agents. Classically, outdoor allergens comprise a greater risk for seasonal rhinitis than indoor allergens and are a greater risk for asthma and perennial rhinitis. Henceforth, identification of allergens is the initial step, and the treating physician should be aware of geographical distribution and prevalence of aeroallergen in a particular area [1, 8].

SPT can be used to provoke an immediate hypersensitivity response in the skin when the point of the device is used to prick/puncture the stratum corneum, resulting in exposure of the epidermis to an allergen (extract) solution. When relevant allergens are introduced into the skin, specific IgE bound to the surface receptors on mast cells are cross-linked, mast cells degranulate and histamine and other mediators are released. This produces a wheal and flare response which can be quantitated. Many different allergens can be tested simultaneously because the resultant reaction to a specific allergen is localized to the immediate area of the SPT [9].

The most predominantly found allergens were pollen allergens i.e., gynandropsis gynandra (35 cases) and Dermatophagoides farinae (25 cases) in the present study. Similarly, Sharma et al. had observed majority of pollen allergens as a causative factor in AR [1]. In contrary, house dust mites were present predominantly in studies conducted by Ibekwe and Ibekwe and Mishra et al. [2, 8]. Larger proportion of positive sensitization was observed in house dust mites (Dermatophagoides farina-6.12 mm and Dermatophagoides pteronyssinus-5.72 mm) in the present study.

The chief advantage of SPT is that the test can be interpreted within 15 min after the reagent is applied to the

skin and it gives a visual indication of the sensitivity which can be used in order to impact the patient's behavior. SPT can also be utilized to test less common allergens, such as certain medications, fresh fruits and vegetables where no specific IgE antibody measurements are available [10].

Conclusion

Meteorological parameters play a significant role in dissemination and retention of pollen in the air. The present data obtained from the rural part of Eastern India, along with immuno-biochemical tests and statistical interpretation suggested that local people suffer from allergies associated with the occurrence of respective dominant local allergenic pollen. Detailed information on indigenous pollen is of vital importance for the clinical practitioners in diagnosis and management of AR patients.

Compliance with Ethical Standards

Conflict of interest The authors declare that there is no conflict of interest.

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