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EVALUATION OF SKIN PRICK TEST FOR COMMON AERO ALLERGENS IN PATIENTS WITH BRONCHIAL ASTHMA

Medicine

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ABSTRACT

Background and Objective: Aeroallergens play a significant role in the aetiology of asthma and other allergic respiratory disorders. Evaluation of skin prick test for common aeroallergens in bronchial asthma patients and identification of the function of different inhalant allergens in bronchial asthma patients were the goals of the study. **Methods:** A prospective observational study was conducted on the data acquired from patients with bronchial asthma who had pre-performed spirometry and were attending the Chest OPD of a tertiary hospital. **Results:** The mean age of the study group was 39.7 years. The skin prick test was positive to atleast one aeroallergen in 82.2%. The intensity of the SPT reaction was greatest for fungi and house dust mites in patients with bronchial asthma. **Conclusion:** The skin prick test has excellent sensitivity and specificity for detecting allergen-specific IgE, and in some instances is more sensitive than in-vitro testing for specific IgE in serum.

KEYWORDS

Bronchial Asthma, Aeroallergens, Skin prick test

INTRODUCTION

The global burden of respiratory allergic diseases, particularly asthma, is enormous, with more than 300 million people suffering from the disease, with India accounting for roughly one-tenth of those affected.[1,2] Aeroallergens play a significant role in the aetiology of allergic respiratory disorders, including asthma and allergic rhinitis.[2,4] Therefore , knowledge of locally prevalent aeroallergens is critical for the diagnosis and treatment of allergic individuals. Skin allergy testing (SPT) is an effective approach for confirming hypersensitivity to a specific allergen.[4,5] SPT detects allergen-specific IgE on a patient's mast cells and has been shown to be more sensitive and specific than the radioallergosorbent test (RAST).[6,7] A positive reaction means that mast cells in other target organs (e.g., the eyes, nose, lungs, and gastrointestinal tract) will react to the allergen as well.[8] The study's objective was to identify the role of different inhalant allergens in patients with bronchial asthma attending the Chest Outpatient Department of a tertiary care hospital using a skin prick test with allergen extracts supplied by Credisol India Limited.

METHODS

A prospective observational study was conducted on the data collected from patients diagnosed as bronchial asthma with pre-performed spirometry as per GINA guidelines and patients having symptoms suggestive of atopy. Patients with severe generalized skin disease or an acute skin infection, previous history of anaphylactic shock, coronary artery disease, acute exacerbation of bronchial asthma, pregnant women and children of age less than 6 years were excluded from the study. A total of 45 patients fulfilling inclusion criteria were screened and skin prick test was conducted with 70 common aero allergens. Prior to performing tests with allergen extracts, cutaneous response to 50% glycerinated buffer saline and histamine (10mg/ml) was tested on each patient as negative and positive controls, respectively to ensure that the patient was suitable for the test. A small drop of test extract was placed on the test site (skin of the volar surface of forearm) and the skin is pricked through (about 1 mm) with a skin prick test lancet at 60^0 angle. The skin tests results were read after 20 minutes by measuring significant wheal and erythema at the test site. All data was collected in structured proforma and was analyzed using Statistical Package for Social Sciences (SPSS ver. 21.0, IBM Corporation, USA) for MS Windows. The data on categorical variables is shown as n (% of cases) and the data on continuous variables is presented as Mean and Standard deviation (SD). The statistical significance of distribution of prevalence of positivity of skin prick test across several categorical variables was tested using Chi-Square test of Fisher's exact probability test. The p-values less than 0.05 were considered to be statistically significant. All the hypotheses were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference). Prior approval was taken from the ethics committee. Informed consent was taken from the study participants and confidentiality was maintained.

RESULTS

A total of 45 cases were included in this study with a male to female sex ratio of 0.87:1. The mean age of the study group was 39.7 years. The skin prick test was positive to atleast one aeroallergen in 37 (82.2%) of the subjects, while it was negative in 8 (17.8%) of the subjects. (Figure 1)

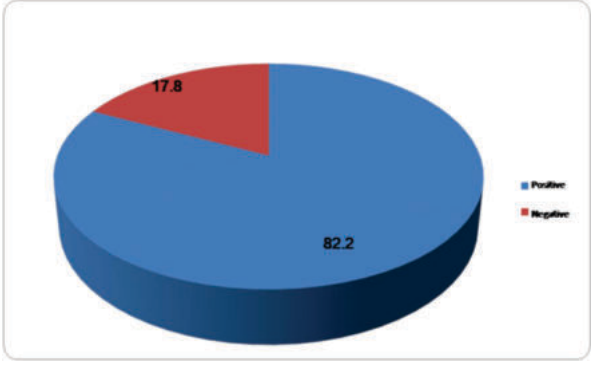

Figure 1:- Distribution Of Overall Prevalence Of Positivity Of Skin Prick Test Among The Cases Studied

Prevalence of positivity of skin test did not differ significantly among different categories in gender, age groups or place of residence. (Figure 2)

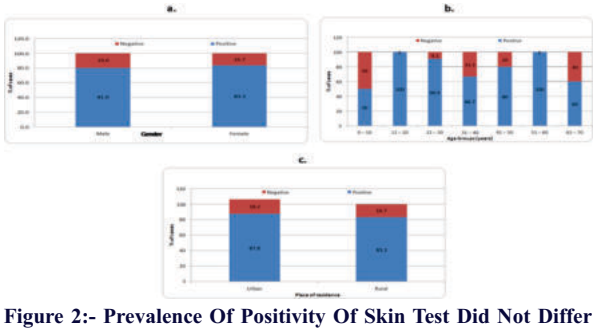

Figure 2:- Prevalence Of Positivity Of Skin Test Did Not Differ Significantly Among Different Categories In A. Gender, B. Age Groups C. Place Of Residence

Among different aeroallergen groups, fungi was the most common offending aeroallergen in 36 (80%) in the SPT-positive reactors among bronchial asthma patients, followed by dust mites 29 (64.4%), pollen 9 (20%), dusts 2 (4.4%), and epithelia 1 (2.2%). Among individual allergens the most common offending allergen was Candida albicans in 18 (40.0%) of SPT positive patients followed by Aspergillus flavus 16(35.6%), Mite D pteronyssinus 14 (31.1%),Mite D farinae 13(28.9) and Ricinus communis 7(15.6%). Candida albicans 18 (40%) was the

most common allergen to which study participants had a positive skin prick test for fungi, followed by Aspergillus flavus 16 (35.6%) and Aspergillus fumigatus 3 (6.7%). Aspergillus niger 1 (2.2%) and Aspergillus tamari 1 (2.2%) were the least frequent. Aspergillus versicolor, Fusarium solanii, Trichoderma sp., Curvularia lunata, Rhizopus nigricans, and Penicillium sp. were not detected by the SPT. (Table 1)

Among allergens in pollen, Ricinus communis 7 (15.6%) was the most prevalent allergen in SPT-positive individuals, followed by Xanthium Strumarium 1 (2.2%) and Holoptelea Intergrifola 1 (2.2%). (Table 2)

Table 1:- Distribution Of Prevalence Of Various Fungal Allergen Positivity On Skin Prick Test Among The Cases Studied.

Fungal Allergen	N	%
Candida albicans	18	40.0
Aspergillus – Flavus	16	35.6
Aspergillus – Fumigatus	3	6.7
Aspergillus – Niger	1	2.2
Aspergillus tamari	1	2.2
Aspergillus – Solanii	0	0.0
Rhizopus Nigricans	0	0.0
Curvularia Lunata	0	0.0
Penicillium S.P.	0	0.0
Cladosporium herbarum	0	0.0
Alternaria alternata	0	0.0
Tricoderma SP	0	0.0
Phoma Tropicalis	0	0.0
Helminthosporium SP	0	0.0
Aspergillus Versocolor	0	0.0

Table 2:- Distribution Of Prevalence Of Pollen Allergen Positivity On Skin Prick Test Among The Cases Studied.

Pollen Allergen	N	%
Ricinus Communis	7	15.6
Xanthium Strumarium	1	2.2
Holoptelea Intergrifolia	1	2.2
Cynodon dactylon	0	0.0
Cyperus rotundus	0	0.0
Parthenium hysterophorus	0	0.0
Ischarmum Indicum	0	0.0
Amaranthus Spinosus	0	0.0
Argermone Mexicana	0	0.0
Chenopodium album	0	0.0
Brassica nigra	0	0.0
Ageratum conyzoides	0	0.0
Cocos nucifera	0	0.0
Peltophorum pterocarpum	0	0.0
Eucalyptus SPP	0	0.0
Cassia Siamea	0	0.0
Zea Mays	0	0.0
Typha angustata	0	0.0
Acacia Arabica	0	0.0
Prosopis Juliflora	0	0.0
Chenopodium murale	0	0.0
Carica Papaya	0	0.0
Putranjiva Roxburghii	0	0.0
Ailanthus Excelsa	0	0.0
Casuarina Equisetifolia	0	0.0
Ipomoea SP	0	0.0
Cenchrus Barbatus	0	0.0
Azadirachta Indica	0	0.0
Mangifera Indica	0	0.0
Samania Saman	0	0.0
Pithocellibium	0	0.0

In total, 29 (64.44%) of the SPT-positive responders were allergic to house dust mite, followed by house dust (2.2%), and silk dust (2.2%). (Table 3) Mite D pteronyssinus indicated positivity in 14 cases (31.1%), followed by Mite D farina in 13 cases (28.2%). Only canine epithelia 1 (2.2%) exhibited a positive SPT response among animal dander. (Figure 3) The intensity of the SPT reaction was greatest for fungi and house dust mites in patients with bronchial asthma.

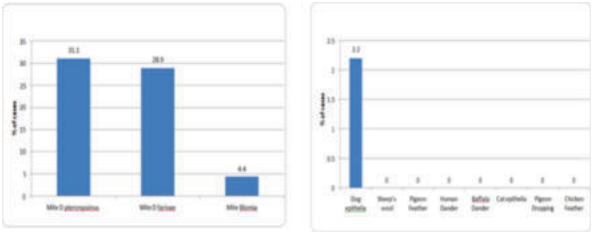

Figure 3:- Distribution Of A. Prevalence Of Dust Mites Allergen Positivity And B. Prevalence Of Epithelia Allergen Positivity On Skin Prick Test Among The Cases Studied

Table 3:- Distribution Of Prevalence Of Dust Allergen Positivity On Skin Prick Test Among The Cases Studied

Dust Allergen	N	%
House dust	1	2.2
Silk dust	1	2.2
Wheat dust (Threshina)	0	0.0
Cotton dust	0	0.0
Paper dust	0	0.0
Hay dust	0	0.0
Saw dust (wood dust)	0	0.0
Polished dust	0	0.0
Grain dust (rice)	0	0.0
Grain dust (Wheat)	0	0.0
Spiderweb dust	0	0.0

DISCUSSION

Aeroallergens are frequently associated with bronchial asthma. The identification of allergen triggers plays a crucial role in alleviating the patient's distress and enhancing their quality of life. The skin prick test is a highly effective method for identifying sensitization to specific aeroallergens. In our study, we compared the skin prick test results of 45 bronchial asthma patients with 70 common aeroallergen extracts. As allergen avoidance therapy is the cornerstone of asthma treatment, knowledge of the allergens to which a region's study population is commonly sensitised could aid medical practitioners in narrowing the panel of allergens evaluated in daily practice, resulting in greater specificity and cost-effectiveness.

In our study, the skin prick test was positive to at least one aeroallergen in 37 (82.2%) of the subjects and it was negative in the remaining 8 (17.8%). Kumar R et al.[9] in their study found that 28.69% patients had negative reaction to SPT, whereas positive reactions to SPT were found in71.31% patients. Chogtu B et al.[10] in their study found that out of 48 patients, 5 (10.4%) gave negative SPT to all the allergens tested while 43 (89.6%) patients gave positive skin prick test response to at least one allergen. Another study by Kumar R et al.[11] found that only 6 (0.65%) patients had no reaction at all from SPT, whereas 912 (99.35%) patients had a positive SPT response to at least one allergen. The variation in positivity to SPT response in different studies could be due the variation in patient population, difference in the quality of allergen extracts, criteria used for interpretation of skin prick test response and variation in the types of aeroallergens prevalent in different places. Among fungi, Candida albicans 18 (40%) was the most common allergen to which the study patients had a positive skin prick test. The SPT was negative for Aspergillus versicolor, Fusarium solanii, Trichoderma sp., Curvularia lunata, Penicillium sp., Cladosporium herbarum, Rhizopus nigricans, and Alternaria alternate. In contrast to our findings, Kumar R et al.[11],Sharma R. K et al.[12], and Prasad R et al.[13] discovered that Aspergillus fumigatus was the most prevalent fungus while Candida was the least prevalent. In our study, Ricinus communis pollen (15.6%) was the most prevalent allergen among SPT-positive responders. However, different studies have documented varying pollen variety sensitivities.[10,11,14] Regional disparities in vegetation type, the seasonal and annual composition of airborne pollen, and the patterns of their distribution may account for variations in pollen sensitivity. In contrast to rice grain dust[10] and wheat dust[11], the most prevalent dust allergen identified in our study was house dust mite in 29 (64.44%) of the SPT-positive patients. In our study, only dog epithelia 1 (2.2%) demonstrated a positive SPT response. Contrary to our study, Sharma R. K et al.[12] discovered that, among dander (3.40%), cat 4 (44.44%) was the most prevalent dander, followed by cow 3 (33.33%). This discrepancy between studies may be a result of the different geographical distribution and prevalence of aeroallergen in a particular region.

Our findings emphasize that appropriate preventive strategies may reduce the cost and morbidity of therapeutic actions. This study will aid in the selection of the panel of most prevalent aeroallergens for skin prick testing (SPT), as well as the identification of the best allergen species for immunotherapy in this area. Hence it could be concluded, when correctly implemented, the skin prick test has excellent sensitivity and specificity for detecting allergen-specific IgE, and in some instances is more sensitive than in-vitro testing for specific IgE in serum.

There are a few limitations to the study, such as the fact that the skin prick test positivity to distinct aeroallergens in studies reported from various locations in India varies widely. It could have been due to variation in patient population, difference in the quality of allergen extracts, criteria used to interpret skin prick test response, variation in the types of aeroallergens prevalent in different places, different geo climate of different places allowing different varieties of flora and fauna, resulting in different prevalence of different aeroallergens in different places. This study is also limited by its small sample size, which may or may not be representative of the community and general population.

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Conflict of Interest: None declared

Data Availability Statement: Supporting data related to the study will be provided on request to corresponding author.

Human/Animal Ethics Approval Declaration: Institutional ethical committee clearance was obtained and informed consent was taken from the study participants. Confidentiality of the participants was maintained.

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