

## Original Research Article

# The study of correlation between clinical history of allergic rhinitis and result of skin prick test in allergic rhinitis

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### ABSTRACT

**Background:** Allergic rhinitis is a recurrent or chronic allergen specific type I hypersensitivity disorder. Skin prick testing is an essential test procedure to confirm sensitization in immunoglobulin E mediated allergic diseases presenting with allergic rhinitis.

**Methods:** The present study was a hospital based cross sectional comparative study. Tests were applied to volar aspect of forearm, at least 2-3 cm from the wrist. 56 allergens were tested on patient's body as the allergist watches for signs of an allergic skin reaction. The negative (-), positive (+), (+++) and (++++) results were assessed.

**Results:** Out of 100 study subjects, most of the study subjects were from age group 31-40 years of age (46%) followed by 41-50 (30%). Very few i.e. 3% were less than 19 years of age. Out of total majority were male (57%) and 43% were female. Most of the females were from age group 31-40 i.e. 26%. Sensitivity of the skin prick test was 89.01% and specificity was 100%.

**Conclusions:** Skin prick test is a very sensitive test to diagnose allergens. Sneezing was the most common symptom and dust was the most common aero-allergen found.

**Keywords:** Allergic rhinitis, Skin prick test, Histamine, Atopy

### INTRODUCTION

The word "allergy" was first used by Clemens von Pirquet in 1906.

Allergies are a number of conditions caused by hypersensitivity of the immune system to something in the environment. These diseases include hay fever, food allergies, atopic dermatitis, allergic asthma, and anaphylaxis. The underlying mechanism involves immunoglobulin E antibodies (IgE), part of the body's immune system, binding to an allergen (in environment) and then to a receptor on mast cells or basophils where it induces the release of inflammatory chemoreceptors such as histamine. Diagnosis is typically based on a person's medical history.

Skin prick testing is an essential test procedure to confirm sensitization in IgE mediated allergic diseases. The recommended method of skin prick testing includes the proper use of specific allergen extracts, positive and negative controls, interpretation of tests after 15 to 20 minutes of application, with a positive result defined as a wheal.

According to ARIA guidelines, allergic rhinitis is defined if two or more symptoms of rhinorrhea, nasal itching, nasal blockage, or sneezing are 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.<sup>1</sup>

While allergy is pre-diagnosed through patient history and examination, in vivo skin tests or in vitro serological

tests are used in definitive diagnosis. Amongst all intradermal allergy tests, skin prick test (SPT) is the one that is most commonly used.<sup>2</sup> In the SPT, the response of the skin to the IgE-associated allergen is assessed. In vivo tests are more reactive and less expensive compared to in vitro tests. Therefore, SPT is the most preferred one to identify the allergen. In patients with allergic rhinitis, identifying the allergens causing the symptoms as well as the environmental presence of allergens form the most important step in the treatment of the disease.

Objectives of the study were allergen if known by patient, to find out whether it is the only allergen causing all the symptoms in that patient, efficacy of SPTs to detect allergen causing related symptoms in the patient, to find out advantages and disadvantages of SPT, correlation between history of allergy and result of SPT.

## METHODS

The present study was a hospital based Cross sectional comparative study carried out in Department of ENT of Mahatma Gandhi Mission Medical College, Aurangabad which is a tertiary health care teaching hospital during 25 October 2017 to 15 October 2019. Simple random sampling method was used for inclusion of study samples. Patients coming to OPD/IPD with history of allergies and obeying inclusion and exclusion criteria was randomly selected for the study until investigator achieved the desired sample size. Face to face interview was carried out in local language (Marathi or Hindi). At the time of visit, the patients were informed about the study and its purpose. Data was collected using pre-designed, pre-tested, semi-structured questionnaire. Thorough clinical examination of each subject was carried out by maintaining the privacy after the consent of each patient. Patients were appropriately screened for allergies, and where possible, discontinued on medications that interfere with test results accentuate systemic allergic reactions. Before any allergy testing, all the necessary information about details of past allergic reactions experienced, family history of specific allergies, past illnesses, lifestyle and work habits, food and eating habits were taken.

### Inclusion criteria

All patients with alleged history of allergy, age was 18 to 50 years, both sexes, chronic history of allergy not relieved or just temporarily relieved by symptomatic treatment were included.

### Exclusion criteria

Patient with skin lesions (leprosy, eczema, dermatographism), patient with any major medical disease such as diabetes mellitus, hypertension or Ischemic heart disease, patients on antihistaminics and steroids, patients with hypersensitivity reactions, immunocompromised patients were excluded.

Tests were applied to volar aspect of forearm, at least 2 to 3 cm from the wrist. The distance between 2 SPTs (>2 cm) was critical to avoid false positive results. Metal lancets or needles were the tools of choice for the test to allow small amount of allergen to be introduced in skin. Histamine and normal saline was used as positive and negative controls respectively. 56 allergens was tested on patient's body as the allergist watches for signs of an allergic skin reaction. The negative (-), positive (+), (+++) and (++++) results were assessed and analyzed.



**Figure 1: Performing SPT on volar aspect of forearm of patient.**

According to Ibeque et al in their study the prevalence of allergies was..%.<sup>3,16</sup> Considering 95% confidence level and 10% allowable error, the sample size was 100 by following formula:

$$N = \frac{Z^2 \times p \times q}{e^2}$$

In above equation, N=sample size, Z=1.96, p=prevalence of allergic rhinitis, q=100-p, e=allowable error which was considered here as 10% of total prevalence of allergic rhinitis.

$$= (1.96)^2 \times 81 \times 19 / (64)^2$$

$$= 93.4$$

5% population added to above as non response or incomplete answers.

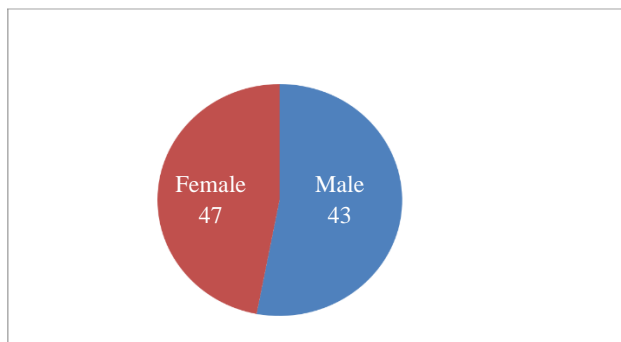
$$93 + 6.5 = 100$$

Thus, sample size = 99.5 ≈ 100.

The collected data was numerically coded and entered in Microsoft Excel 2007, and analysed by using SPSS version 20.0 statistical software by maintaining anonymity and privacy of respondents. The analyzed data was presented in the form of text, tables and graphs.

## RESULTS

Out of 100 study subjects, most of the study subjects were from age group 31 to 40 years of age (46%) followed by 41 to 50 (30%). Very few i.e. 3% were less than 19 years of age. Out of total majority were male (57%) and 43% were female. Most of the females were from age group 31 to 40 i.e. 26%.



**Figure 1: Sex distribution.**

There were no patients from class V that is lower class; this means either these people are unaware of their symptoms or they don't have enough facility to visit and take treatment for their sufferings. Size and type of family mattered in a way that overcrowding and not maintaining hygiene might aggravate allergic symptoms in few patients.

70% subjects were belonging to a joint family; followed by 19% subjects having nuclear family and rest had three generation family.

**Table 1: Socioeconomic status of study subjects.**

Socioeconomic class	Male	Female	Total
	N (%)	N (%)	N (%)
Class I	7	5	12
Class II	32	10	42
Class III	12	21	33
Class IV	6	7	13
Class V	0	0	0
<b>Total</b>	<b>57</b>	<b>43</b>	<b>100</b>

Among 57 males, 49 patients had allergy and 8 patients did not have allergy. In 43 tested females, 32 females had allergy and 11 did not have allergy. Hence total 81% subjects had allergy and 19% did not have allergy.

$$\text{Sensitivity} = 81/91 \times 100 = 89.01\%$$

$$\text{Specificity} = 9/9 \times 100 = 100\%$$

In 81 allergic patients, SPT was positive.

In 10 patients, the test results were negative but they were allergic to something might be to some allergen outside

the allergy kit. And in 9 patients, SPT was negative and they were not allergic to anything.

**Table 2: Distribution of the study subjects according to presence of allergy.**

Allergy	Male	Female	Total
	N (%)	N (%)	N (%)
Present	49	32	81
Absent	8	11	19
<b>Total</b>	<b>57</b>	<b>43</b>	<b>100</b>

**Table 3: Sensitivity and specificity of SPT for the identification of allergic agent.**

	Allergy present	Allergy absent	Total
Test positive	81	0	81
Test negative	10	9	19
<b>Total</b>	<b>91</b>	<b>9</b>	<b>100</b>

Out of 100, 13% males and 29% females were Hindu; 25% males and 12% females were Muslim; 7% males were Buddhist, 2% males were Sikh; and 10% males and 2% females were of other religion. Amongst study subjects, 50% were educated till 4th std; 20% people studied till middle school; 23% subjects studied till secondary or higher secondary; 4% subjects were graduated and only 3% were post-graduated.

**Table 4: Distribution of study subjects according to present complaints.**

Presenting complaints	Male (%)	Female (%)	Total* (%)
Itching	1	2	1.44
Pruritus	3	5	3.84
Running nose	38	19	27.4
Frequent sneezing	22	18	19.23
Breathlessness	16	6	10.57
Cold	13	16	13.94
Headache	7	18	12.01
Fever	1	2	1.44
Cough	3	4	3.36
Sore throat	10	4	6.73

Out of 100 patients, 38 had running nose which was the most common symptom found; followed by sneezing in 22 patients; 16% had breathlessness and 13% had cold. Itching was the least common symptom found. Subjects were found to have multiple overlapping symptoms as in one subject had more than one presenting symptom (according to ARIA guidelines); hence the total percentage exceeds 100%.

During allergy testing by SPT, 56 allergens were tested and amongst 39 patients' results were positive out of 100 patients. House dust was the most common allergen

found. Followed by congress grass and egg, 7% each. 6% patients were positive for mite.

**Table 5: Distribution of study subjects according to allergy detected by SPT.**

Type of allergen	Male (%)	Female (%)	Total (%)
House dust	20	19	39
Wheat dust	2	2	4
Egg	5	2	7
Prawns	1	3	4
Rice	1	2	3
banana	3	-	3
Lemon	1	2	3
Ginger	3	1	4
Fish	2	-	2
Cheese	1	-	1
Mutton	1	-	1
Congress grass	6	1	7
Mite	4	2	6
Aspergillus	2	-	2
Animal dander	3	2	5
Others	4	5	9

## DISCUSSION

Aetiology of allergic rhinitis is complex, involving cells, mediators, cytokines, chemokines neuropeptides and adhesion molecules which illustrate specific symptoms of allergic rhinitis and the nonspecific hyper-reactivity.<sup>4</sup> It has four phases: sensitization, subsequent reaction to allergen, late phase reaction and systemic activation

According to ARIA guidelines, allergic rhinitis is defined if two or more symptoms of rhinorrhea, nasal itching, nasal blockage, or sneezing are 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. Kianifar et al studied over 41 students having food allergies, the result suggested that SPT was more sensitive than fecal or serum RAST; and fecal RAST was two times more sensitive than serum RAST.<sup>5</sup> Cho et al studied Correlation between skin-prick testing, individual specific IgE tests, and a multiallergen IgE assay for allergy detection. If skin testing is conducted correctly, it is useful to confirm the diagnosis of specific allergy.<sup>6</sup>

According to Keleş et al, the most common symptoms of seasonal and perennial allergic rhinitis were sneezing and nasal obstruction, respectively.<sup>7</sup> Ornek et al reported the 'Sneezing' as the most common symptom (82%).<sup>8</sup> We also found out more proportion of sneezers-runners than blockers; This was supporting the finding of Lee et al and Tatar et al investigated the correlations between the severity of symptoms in allergic rhinitis and the results of SPT.<sup>6,9</sup>

Rasool et al reported that SPT was positive in 86.4% of patients with allergic asthma, 68.5% of patients with allergic rhinitis and 1.6% of patient with urticaria, respectively. In this study the SPT was positive in 89.01% of the patients.<sup>10</sup>

## CONCLUSION

In conclusion, our results explore clinical profile of allergic rhinitis patients and presence of allergies in them. The most common aero-allergens found were House dust and pollens. Most common food allergens were eggs and prawns. The most common symptom was sneezing after that it was nasal blockage. Most of the patients narrated the appropriate history and it was correlated with result of SPT. SPT is a very sensitive test to diagnose allergen in patients having atopy. SPT requires knowledge and skill for the interpretation of result and application to the clinical problem of the patient.

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