

# Aero Allergen Profile By Skin Prick Test Among Adult Bronchial Asthma Patients In A Tertiary Care Hospital, South India

Dr. Meenakshi. N<sup>1</sup>, Dr. Gayathri. B<sup>2</sup>, Dr. Aruna Shanmuganathan<sup>3</sup>, Dr. Nisha Ganga<sup>4</sup>, D. Ragulan<sup>5</sup>, Dr. Muthukumar<sup>6</sup>

**Abstract BACK GROUND :** Bronchial Asthma is a heterogeneous disease, characterized by chronic airway inflammation. Prevalence of asthma in India is 2-12% in adults, with a national burden of about 18 million asthmatics. Atopy is a strong risk factor for the development of asthma. Allergens such as pollens, fungus can trigger airway narrowing and airway inflammation and can trigger nasobronchial allergy. Atopy has been characterized by the production of specific IgE in response to common environmental allergens. Skin Prick Test (SPT) is the most effective, reliable, rapid and gold standard method to diagnose IgE mediated Type 1 Allergic reactions like asthma, urticaria, food allergy. Confirmation of sensitization to a specific allergen through SPT enables specific allergen avoidance and need for allergen immunotherapy. Hence this study is undertaken to study the aero allergen profile among adult asthma patients.

**Materials AND METHODS :** A hospital based cross sectional study was conducted in Department of Respiratory Medicine, Chettinad Hospital & Research Institute for which about 78 subjects were included. Subjects with normal and raised eosinophil counts were included in our study. Institutional Human Ethical Committee approval and informed consent were obtained. All Subjects were evaluated with Skin Prick Test. Results were analysed using SPSS version 23. Categorical outcomes were compared between study groups using Chi square test / Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used).

**Results :** Mean Age Distribution = 37.6 ± 12.5 in years (male = 46, female = 32). Commonest allergens were Dust Mite (30.11%), Aspergillus Fumigatus (27.42%), Bermuda Grass (15.59%). SPT showed positive correlation with allergen exposure history.

**Conclusion :** Dust mite, Aspergillus Fumigatus, Bermuda Grass were identified as most common allergens by SPT among bronchial asthma patients. Hence avoidance of allergens in those with allergen exposure is recommended in optimal management of bronchial asthma.

**Key Words :** Aero allergen, Bronchial asthma, Exposure history, Skin Prick Test.

## 1 INTRODUCTION

Asthma is a chronic respiratory disorder of the airways characterized by bronchial hyper-responsiveness, respiratory symptoms, structural re-modelling and reversible disease<sup>1</sup>. It is a chronic inflammatory disease of the airways that affects people of all ages which imposes a substantial burden on patients, their families, and the community. Asthma is one of the common and an important cause for long term non-communicable diseases (NCDs) and also cause a substantial disability and death worldwide<sup>1</sup>. Asthma is a heterogeneous disease, characterized by chronic airway inflammation<sup>2</sup>. A variety of inflammatory cells and mediators regulates the prolonged airway inflammation and that is the central mechanism in the pathogenesis of asthma<sup>3</sup>. Prevalence of asthma in India is 2-12% in adults, with a national burden of about 18 million asthmatics<sup>4</sup>. Asthma is one of the common and an important cause for long term non-communicable diseases (NCDs) and also cause a substantial disability and death worldwide<sup>1</sup>.

A recent Indian Study on Epidemiology of Asthma, Respiratory Symptoms and Chronic Bronchitis (INSEARCH) has been done with 85,105 men and 84,470 women from 12 urban and 11 rural sites in India estimated the prevalence of asthma in India was found to be 2.05% among those aged >15 years<sup>4</sup>. According to Global Asthma network 2018, asthma is ranked as the 16th leading cause of years lived with disability and 28th leading causes of burden of disease, as measured by disability adjusted life years (DALYs)<sup>1</sup>. Atopy is a strong risk factor for the development of asthma. Allergens such as pollens, fungal spores, pest debris, household dust mite, animal's dander can trigger airway narrowing and airway inflammation and can trigger nasobronchial allergy<sup>5</sup>. Atopy has been characterized by the production of specific IgE in response to common environmental allergens<sup>6</sup>. Patients with atopic disease include allergic asthma, allergic rhinitis, atopic dermatitis and urticaria, which showed elevated IgE level. Skin prick test (SPT) is the most effective diagnostic test to detect IgE mediated type I allergic reactions like allergic rhinitis, atopic asthma, acute urticarial, food allergy etc<sup>7</sup>. Skin testing was found to be the most effective measure of atopy<sup>8</sup>. Skin tests is a practicable and reproducible investigation, semi quantitative measure of sensitization when performed correctly, it will give quicker and cheaper results than any other technique, in the diagnosis of respiratory allergic diseases and will reflect the sensitization status of airways mucosae<sup>7</sup>. Skin prick test (SPT) is used to investigate a patient in a safe and efficient way to find out whether the patient is sensitized to allergens

- Professor and HOD<sup>1</sup>, Postgraduate<sup>2</sup>, Professor<sup>3</sup>, Senior resident<sup>4</sup>, Associate professor<sup>5,6</sup>
- Department of Respiratory Medicine, Chettinad Hospital & Research Institute (Kelambakkam, Kancheepuram District, Tamil Nadu, India)
- drbgayathri@gmail.com<sup>1</sup>, paddy\_2020@yahoo.com<sup>2</sup>, draruna.shanmuganathan@gmail.com<sup>3</sup>, nisha.prejit@gmail.com<sup>4</sup>, ragul007@hotmail.com<sup>5</sup>, mkumar72@gmail.com<sup>6</sup>
- CORRESPONDING AUTHOR: Dr. Gayathri. B, Final year, Post Graduate, Plot No-21, super foundation

and also for devising immunotherapy as the therapeutic modality<sup>7</sup>. Though studies correlating between skin prick test reactivity with serum Ig are available, limited studies on correlation of bronchial asthma with history of allergen exposure and skin prick test are present. Hence the present study is undertaken to correlate specific allergens with allergen exposure.

**1. MATERIALS AND METHODOLOGY**

A Total of 78 adult participants with the age group of 18 to 80 years were enrolled for this study who were diagnosed as Bronchial Asthma based on GINA Guidelines. Subjects with normal and raised eosinophil counts were included in our study. Written consent form was collected from the participants after explaining the protocol. Patients with skin lesions (active eczema/treated with topical steroids), BA with acute exacerbations, active infection/PTB, patients on chronic systemic steroid therapy/immune suppressants, patients on medications known to cause peripheral eosinophilia, pregnant patients, HIV patients and smokers were excluded in our study. All the individuals underwent thorough evaluation of medical history and a detailed physical examination. All the parameters and clinical details were recorded in a well prepared proforma. All the patients were evaluated using SPT (using Allergo SPT Kit from Merck) were done. Data analyzed using SPSS 23 version and correlation done using Chi square test.

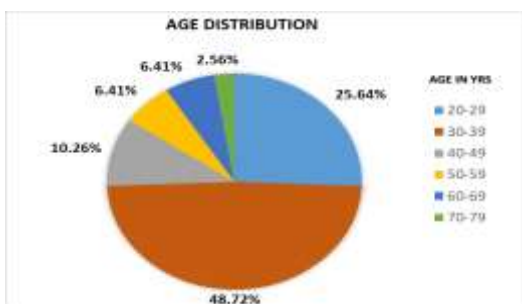
**2. RESULTS**

A Total of 78 patients with Bronchial Asthma with normal and raised eosinophil counts who attended the OPD of Department of Respiratory Medicine in Kanchipuram district were included in our study. Those patients are subjected to detailed clinical history and examination, Absolute eosinophil counts and Skin Prick test.

**AGE DISTRIBUTION IN STUDY POPULATION**

*Table 1: Age distribution*

Age in years	Number (N)	(N) Percentage %
20-29	20	25.60%
30-39	38	48.70%
40-49	8	10.30%
50-59	5	6.40%
60-69	5	6.40%
70-79	2	2.60%
Total	78	100.00%



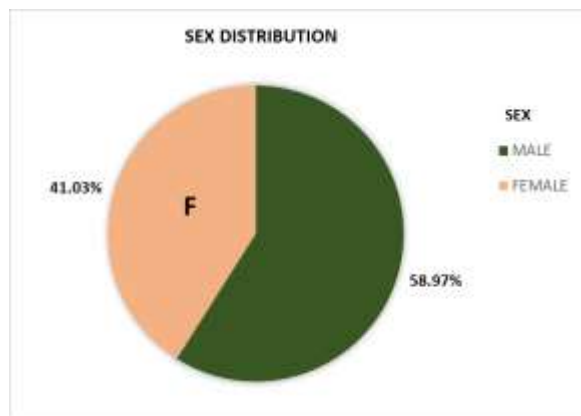
*Figure 1: Age distribution*

Among 78 participants, Majority of the subjects belong to the age group between 30-39 years, with the mean age of 37.6± 12.5 in years.

*Table 2: Gender distribution*

Gender	Frequency	Percentage
Female	32	41.03%
Male	46	58.97%
Total	78	100.00%

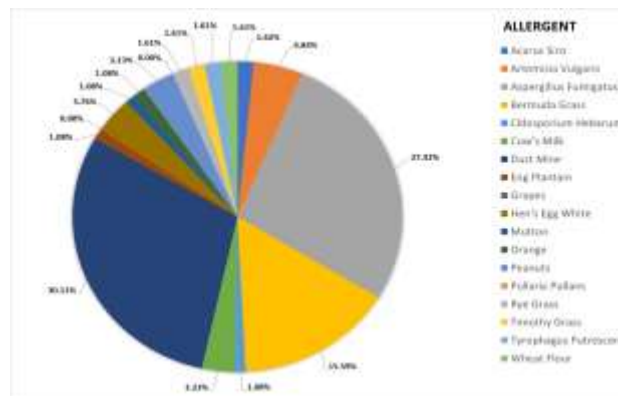
Among the 78 cases studied, there is a slight male predominance of 58.97 %



*Figure 2: Gender distribution*

Total subjects enrolled = 78  
 Subjects with normal eosinophil counts =39  
 Subjects with raised eosinophil counts =39

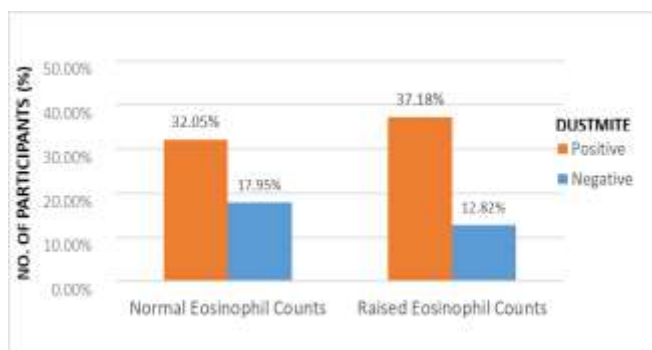
**PREVALENCE OF COMMON ALLERGENS IN THE STUDY POPULATION**



*Figure 3: Prevalence of common allergens in the study population*

Out of 78 subjects studied, the most common aero allergens were found to be Dust Mite, Aspergillus and Bermuda grass.

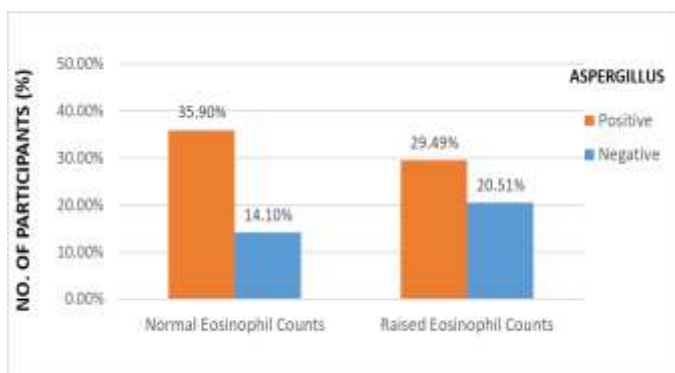
**PREVALENCE OF DUSTMITE ALLERGEN IN NORMAL AND RAISED EOSINOPHIL COUNTS SUBJECTS**



**Figure 4:** Distribution of Dust mite allergen among patients with normal and raised eosinophil counts

32.05 % of subjects with normal eosinophil counts and 37.18% of subjects with raised Eosinophil counts had dust mite allergy.

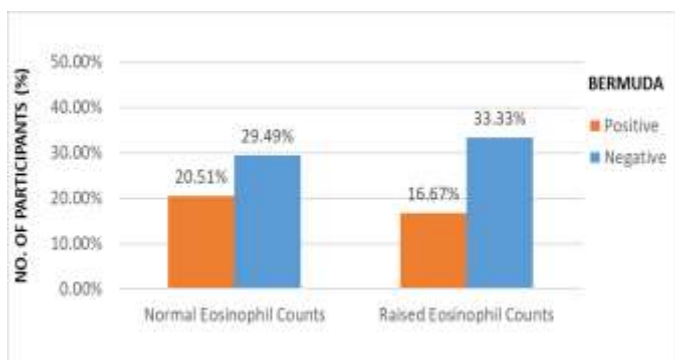
**PREVALENCE OF ASPERGILLUS ALLERGEN IN NORMAL AND RAISED EOSINOPHIL COUNTS SUBJECTS**



**Figure 5:** Distribution of Aspergillus allergen among patients with normal and raised eosinophil counts

35.90 % of subjects with normal eosinophil counts and 29.49 % of subjects with raised eosinophil counts had Aspergillus allergy.

**PREVALENCE OF BERMUDA GRASS ALLERGEN IN NORMAL AND RAISED EOSINOPHIL COUNTS SUBJECTS**



**Figure 6:** Distribution of Bermuda allergen among patients with normal and raised eosinophil counts

20.51 % of subjects with normal eosinophil counts and 16.67 % of subjects with raised eosinophil counts had Bermuda allergy.

**CORRELATION OF HISTORY OF EXPOSURE WITH SPECIFIC ALLERGENS BY SPT**

S. No	Allergens	History of Exposure		Chi Square	P Value
		Yes	No		
1	<b>Dust mite</b>			7.02	0.008
	Yes	54 (69.23%)	0 (0.00%)		
	No	21 (26.92%)	3 (3.85%)		
2	<b>Aspergillus</b>			19.217	0.000
	Yes	51 (65.38%)	0 (0.00%)		
	No	18 (23.08%)	9 (11.54%)		
3	<b>Bermuda</b>			27.321	0.000
	Yes	29 (37.18%)	0 (0.00%)		
	No	20 (25.64%)	29 (37.18%)		

(p value < 0.05 is significant)

History of exposure had a positive correlation with dust mite allergen, Aspergillus fumigatus and Bermuda allergen and it was statistically significant.

**3. DISCUSSION**

A total of 78 Bronchial Asthma subjects belonging to the age group of 18 to 80 years were included in our study with the mean age 37.6± 12.5 years. There was a slight male predominance, among the study population i.e. 59%. Two groups with normal and raised eosinophil counts of 39 subjects in each arm respectively were included in our study. Among the subjects with raised Eosinophil counts, majority of the people belongs to the age group between 30-39 years (48.72%), with the mean age of 35.076±12.329 years. Among the subjects with normal eosinophil counts, majority of the people belongs to the age group between 30-39 years (43.59 %), with mean age of 40.179±12.242 years. There was a slight male predominance in both the groups. A study done by Jagadeeshwar.k et.al among bronchial asthma patients with eosinophilia observed that males were found to be the predominant population<sup>9</sup> and in a study done by Garg et.al also observed that males were found to be predominant among bronchial asthma patients<sup>10</sup>. Skin Prick Test(SPT) was done using standardized allergens to identify the most common allergens in our study. Most common allergen identified were dust mite allergy (30.11%) followed by aspergillus allergy (27.42%) followed by bermuda allergy (15.59%). Hence dust mite was found to be the most common allergen in the study population. Mishra et.al observed that dust mite (60%) followed by parthenium leaves (45%) were found to be the most common allergens<sup>5</sup> in bronchial asthma patients with eosinophilia. Rasool, Roohi et.al in a study observed that dust mite is the second most common allergen among bronchial asthma patients and allergic rhinitis patients<sup>7</sup>. Aggarwal D et al. in the study among bronchial asthma patients with eosinophilia found out that most common aero allergen was found to be Dust mite<sup>11</sup>.

Bharti chogtu et.al done a study among bronchial asthma patients observed that rice grain dust, followed by house dust mite and house dust were identified as the common dust allergens<sup>12</sup>. When clinical history exposure to allergen was correlated with SPT results, our study showed the following results. History of exposure had a positive correlation with dust mite allergen, aspergillus fumigatus allergen and with bermuda allergen and it is statistically significant. According to Droste JHJ, Kerkhof M et.al in his study found that skin test reactivity to house dust mite was the most prevalent in their study population<sup>13</sup> it is found to have concordance with our study. According to Hendrick, D J et.al a study on an analysis of skin prick test reactions in 656 asthmatic patients found that overall 77% of the skin test positive patients gave positive histories of allergy and the most common allergen was found to be dustmite<sup>14</sup>. Since allergen exposure history had a positive correlation with the specific allergens in my study, life style modification like avoidance of allergens is advisable in the optimal management of bronchial asthma.

#### 4. CONCLUSION

The most common allergens identified by SPT in bronchial asthma subjects were dust mite, aspergillus and bermuda allergen. Allergen exposure history correlated significantly with dust mite, aspergillus and bermuda allergen allergens. Hence avoidance of the allergens in those subjects with exposure history and allergen immunotherapy wherever indicated is recommended in the optimal management of Bronchial asthma.

#### 5. REFERENCES

- [1] World Health Organization. Global Asthma Network the Global Asthma Report [Internet]. 2018. Available from: [www.globalasthmanetwork.org](http://www.globalasthmanetwork.org)
- [2] Jain V, Mishra M, Singh A. Clinical profile of bronchial asthma patients reporting at respiratory medicine outpatient department of teaching hospital. *Indian J Allergy, Asthma Immunol.* 2015;29(1):3.
- [3] Biology H. Spirometric Evaluation of Pulmonary Function Tests in Bronchial Asthma Patients. *Journal of Exercise Science and Physiotherapy*, Vol. 6, No. 2: 106-111, 2010
- [4] Koul PA, Patel D. Indian guidelines for asthma: Adherence is the key. *Lung India. lungindia Indian*2015;32(7): S1–2.
- [5] Mishra VD, Mahmood T, Mishra JK. Identification of common allergens for united airway disease by skin prick test. *Indian Journal of Allergy, Asthma and Immunology* 2016; Jul-Dec 2016 • Volume 30 • Issue 2
- [6] Pearce N, Pekkanen J, Beasley R. How much asthma is really attributable to atopy? *Thorax.* 1999;54(3):268–72.
- [7] Rasool R Shera IA, Nissar S, Shah ZA, Nayak N, Siddiqi MA. Role of Skin Prick Test in Allergic Disorders: A Prospective Study in Kashmiri Population in Light of Review. *Indian Journal of Dermatology* 2013; 58(1)
- [8] Khadadah M et.al. The association of skin test reactivity, total serum IgE levels, and peripheral blood eosinophilia with asthma in Kuwait *J Allergy clin immunol* volume 97, number 4
- [9] Ec K. A study on serum IgE levels, peripheral eosinophils and individual symptoms in patients with noninfective rhinitis and asthma and related conditions. *International Journal of Pharmacy and Pharmaceutical Sciences* ISSN- 0975-1491.Vol 4, Issue 1, 2012
- [10] Garg AK, Purohit S. A study of clinical profile and factors associated with bronchial asthma at tertiary health care centre. *MedPulse International Journal of Medicine*, Print ISSN: 2550-7583, Volume 4, Issue 3, December 2017
- [11] 11. Divya Aggarwal, Abhilash S.\*, Sunil Kapur, Divya Gupta et.al Study of causal aeroallergens in allergic rhinitis 2019 Jul;5(4):916-921
- [12] Chogtu B Magaji N, Magazine R, Acharya PR. Pattern of Allergen Sensitivity among Patients with Bronchial Asthma and / or Allergic Rhinosinusitis in a Tertiary Care Centre of Southern India. *Journal of Clinical and Diagnostic Research.* 2017 Aug, Vol-11(8)
- [13] Droste JHJ, Kerkhof M, Monchy JGR De, Schouten JP, Riicken B, Group E. Association of skin test reactivity, specific IgE, total IgE, and eosinophils with nasal symptoms in a community-based population study. 1996;922–32. *J Allergy clin immunol* volume 97, number 4
- [14] Hendrick DJ, Davies RJ, Souza MFD, Pepys J. An analysis of skin prick test reactions in 656 asthmatic patients. *Thorax* (1975), 30, 2.