

## Sensitization to Pollen Antigens in 1420 Patients of Jalandhar and Neighbouring Area in Punjab

VP Jerath<sup>1</sup>, Megha Sood<sup>2</sup>, Prashant Jerath<sup>3</sup>, Aditya Jerath<sup>4</sup>

<sup>1</sup>Dr. Jerath's Skin and VD Clinic and Allergy Centre, Jalandhar;

<sup>2</sup>Department of Pharmacology, Punjab Institute of Medical Sciences, Jalandhar.

<sup>3</sup>Mohan Dai Oswal Cancer Treatment and Research Foundation, Ludhiana, and

<sup>4</sup>Department of Ophthalmology, Government Medical College and Hospital, Patiala, Punjab

### Abstract

In the present study, 1420 patients of respiratory allergy, including 30 patients of ocular allergy were tested intradermally to find out offending pollen allergens. *Amaranthus spinosus* elicited marked positive skin reaction in maximum 207 patients (14.57%), followed by *Suaeda fruticosa* in 140 (9.85%), *Ricinus communis* in 119 (8.38%), *Cynodon dactylon* in 118 (8.30%), *Parthenium hysterophorus* in 116 (8.16%), *Prosopis juliflora* in 95 (6.69%) and *Xanthium strumarium* in 76 (5.35%). Sensitization was observed in the range of 1-2% with antigens like *Adhatoda vasica*, *Ageratum conyzoides*, *Argemone mexicana*, *Artemisia scoparia*, *Asphodelus tenuifolius*, *Brassica campestris*, *Cannabis sativa*, *Cassia occidentalis*, *Cassia siamea*, *Chenopodium album*, *Kigelia pinnata*, *Pennisetum typhoides* and *Sorghum vulgare*. Other pollen antigens, namely, *Albizia lebbek*, *Azadirachta indica*, *Imperata cylindrica*, *Lawsonia inermis*, *Putranjiva roxburghii* and *Zea mays* showed positive reactions in < 1% of respiratory allergy patients tested.

**Key words:** Pollen antigens, skin tests, Allergy patients, Punjab, India

### INTRODUCTION

Acro-allergens play a key role in the pathogenesis of allergy, particularly rhinitis, asthma and ocular allergic diseases. The main triggering factors

(allergens) are from pollens, fungi, animal dander, house dust mites and domestic pets. Among the aero-allergens, pollens have been studied maximally and constitute an important source of pollinosis.

Respiratory allergy afflicts almost all types of populations of the world as is evident from the data across the globe<sup>1-4</sup>. Epidemiological studies suggest the prevalence of respiratory allergic diseases from 15% to 30%, but these vary from country to

*Address for correspondence:* VP Jerath, Dr. Jerath's Skin and VD Clinic and Allergy Centre, 180, Street Number 4, Central Town, Jalandhar City Punjab. IJAAI, 2010, XXIV (2) 69-73.

country<sup>5</sup>. Recent surveys in India reveal 20% population having rhinitis and 15% develop bronchial asthma<sup>6</sup> which appears on the increase as compared to an earlier study from Delhi, 1964<sup>7</sup>.

Knowledge about the prevalence of allergens in an area is very important as it helps in proper diagnosis and effective management of the disease. The present study was aimed to find out pollen allergens by intradermal tests (ID) in patients of respiratory allergy from Jalandhar and neighbouring area in Punjab. The pollen antigens were selected based on aerobiological and clinical studies at various places in northern region of the country<sup>8</sup>, including Amritsar<sup>9</sup>.

#### MATERIAL AND METHODS

Here we present the data of positive reactions to pollens on 1420 patients aged 14 to 57 years of respiratory allergy with or without ocular allergy collected over a period of 28 years from 1982 to 2010. This is a retrospective study, which included 925 patients suffering from nasal allergy, 465 from bronchial allergy and 30 patients from ocular allergy. Of the total cases, 56% were males and 44% were females. The duration of illness varied from 1-30 years.

The allergy tests were conducted on patients who were not on antihistamines for 72 hours and steroids for 48 hours. Children lesser than 14 years were not included because a good percentage of them may get automatic remission beyond this age.

**Skin testing:** Intradermal injection of pollen antigens (1:500 dilution) were administered on the volar surface of the forearm. Each patient was injected intradermally with 0.01ml of 1: 500 (w/v) antigenic extracts and negative control i.e. phosphate buffered saline and a positive control with 100µg/ml of histamine di-phosphate. The skin reactions were read after 20 minutes and graded according to the criteria published earlier<sup>10</sup>. The results were interpreted by the size of wheal produced in relation to the negative control.

#### RESULTS

The results of skin reactivity to various pollen antigens are given in Table 1.

Out of 1420 patients tested intradermally, *Amaranthus spinosus* showed marked positive reactions in 207 patients (14.57 %) topping the list followed by *Suaeda fruticosa* 140 (9.85%), *Ricinus communis* 119 (8.38%), *Cynodon dactylon* 118 (8.30%), *Parthenium hysterophorus* 114 (8.16%), *Cenchrus ciliaris* 111 (7.81%) *Prosopis juliflora* 95 (6.69%), and *Xanthium strumarium* 76 (5.35%). Antigenic extract of pollens namely *Argemone mexicana*, *Artemisia scoparia*, *Brassica campestris*, *Cannabis sativa*, *Cassia siamea*, and *Pennisetum typhoides* showed marked positive reactions in  $\geq 2\%$  of the patients tested. The pollen antigens such as *Adhatoda vasica*, *Ageratum conyzoides*, *Asphodelus tenuifolius*, *Cassia occidentalis*, *Kigelia pinnata*, *Chenopodium album* and *Sorghum vulgare* elicited marked positive reactions in  $\geq 1\%$  of cases.

Most of the pollen antigens yielded 2 plus reactions, however the antigens exhibiting 3 plus reactions were *Amaranthus spinosus*, *Cynodon dactylon* and *Parthenium hysterophorus*.

#### DISCUSSION

The work on pollen allergy was initiated in 1950's by Shivpuri in Delhi. Subsequently Kasliwal and colleagues reported important pollen allergens of Jaipur<sup>11</sup>. Shivpuri and Prakash<sup>12</sup> observed *Prosopis juliflora* as a major cause of pollinosis with 12% patients showing marked positive reactions. Later Shivpuri and his colleagues<sup>13</sup> reported the pollens namely *Ageratum conyzoides*, *Ailanthus excelsa*, *Amaranthus hybridus*, *Anogeissus pendula*, *Artemisia scoparia*, *Cassia siamea*, *Cenchrus ciliaris*, *Chenopodium album*, *Cynodon dactylon*, *Ipomoea fistulosa*, *Paspalum distichum* and *Poa annua* responsible for IgE mediated allergy. Under "All India coordinated project on Aerobiology" survey of air borne pollens and spores was carried out at Amritsar (Dept. of Botany, Guru Nanak Deo university, Amritsar) in the year 1980-81. The pollen

Table 1. Sensitization to pollen antigens in 1420 patients of respiratory allergy

| Pollens/<br>antigen             | Total number of patients tested (n): 1420 |         |       |      |                                                  |           |
|---------------------------------|-------------------------------------------|---------|-------|------|--------------------------------------------------|-----------|
|                                 | Neg %                                     | ± to 1+ | 2+%   | 3+%  | Patients with<br>marked positive<br>reaction no. | 2+ to 3+% |
| <b>GRASSES</b>                  |                                           |         |       |      |                                                  |           |
| <i>Cynodon dactylon</i>         | 91.51                                     | -       | 5.70  | 2.60 | 118                                              | 8.30      |
| <i>Cenchrus ciliaris</i>        | 92.00                                     | -       | 7.81  | -    | 111                                              | 7.81      |
| <i>Pennisetum typhoides</i>     | 97.34                                     | -       | 2.60  | -    | 32                                               | 2.60      |
| <i>Sorghum vulgare</i>          | 98.42                                     | -       | 1.54  | -    | 22                                               | 1.54      |
| <i>Imperata cylindrica</i>      | 99.21                                     | -       | 0.77  | -    | 11                                               | 0.77      |
| <i>Zea Mays</i>                 | 99.43                                     | -       | 0.56  | -    | 8                                                | 0.56      |
| <b>HERBS/ SHRUBS</b>            |                                           |         |       |      |                                                  |           |
| <i>Amaranthus spinosus</i>      | 85.08                                     | -       | 11.76 | 2.81 | 207                                              | 14.57     |
| <i>Suaeda fruticosa</i>         | 89.10                                     | -       | 9.85  | -    | 140                                              | 9.85      |
| <i>Ricinus communis</i>         | 91.43                                     | -       | 8.38  | -    | 119                                              | 8.38      |
| <i>Parthenium hysterophorus</i> | 91.64                                     | -       | 6.76  | 1.40 | 116                                              | 8.16      |
| <i>Xanthium strumarium</i>      | 94.63                                     | -       | 5.35  | -    | 76                                               | 5.35      |
| <i>Cannabis sativa</i>          | 97.19                                     | -       | 2.74  | -    | 92                                               | 2.74      |
| <i>Artemisia scoparia</i>       | 97.27                                     | -       | 2.67  | -    | 38                                               | 2.67      |
| <i>Brassica campestris</i>      | 97.27                                     | -       | 2.67  | -    | 38                                               | 2.67      |
| <i>Argemone mexicana</i>        | 97.34                                     | -       | 2.60  | -    | 37                                               | 2.60      |
| <i>Asphodelus tenuifolius</i>   | 98.13                                     | -       | 1.83  | -    | 26                                               | 1.83      |
| <i>Ageratum conyzoides</i>      | 98.49                                     | -       | 1.47  | -    | 21                                               | 1.47      |
| <i>Chenopodium album</i>        | 98.53                                     | -       | 1.40  | -    | 20                                               | 1.40      |
| <i>Adhatoda vasica</i>          | 98.56                                     | -       | 1.40  | -    | 20                                               | 1.40      |
| <i>Cassia occidentalis</i>      | 98.64                                     | -       | 1.33  | -    | 19                                               | 1.33      |
| <i>Lawsonia inermis</i>         | 99.57                                     | -       | 0.49  | -    | 6                                                | 0.49      |
| <b>TREES</b>                    |                                           |         |       |      |                                                  |           |
| <i>Prosopis juliflora</i>       | 93.16                                     | -       | 6.69  | -    | 95                                               | 6.69      |
| <i>Cassia siamea</i>            | 97.70                                     | -       | 2.25  | -    | 32                                               | 2.25      |
| <i>Kigelia pinnata</i>          | 98.92                                     | -       | 1.05  | -    | 15                                               | 1.05      |
| <i>Putranjiva roxburghii</i>    | 99.40                                     | -       | 0.63  | -    | 9                                                | 0.63      |
| <i>Albizia lebbek</i>           | 99.50                                     | -       | 0.49  | -    | 7                                                | 0.49      |
| <i>Azadirachta indica</i>       | 99.50                                     | -       | 0.49  | -    | 7                                                | 0.49      |

types recorded from the atmosphere were *Artemisia scoparia*, *Albizia lebbek*, *Ageratum conyzoides*, *Amaranthus spinosus*, *Brassica campestris*, *Cannabis sativa*, *Chenopodium album*, *Eucalyptus teritecornis*, *Holoptelea integrifolia*, *Imperata cylindrica*, *Morus alba*, *Mangifera indica*, *Parthenium hysterophorus*, *Pennisetum typhoides*, *Ricinus communis* and *Sorghum vulgare*<sup>8,9</sup>. The pollen antigens selected for ID testing in the present study were based on surveys at Amritsar and northern region of the country.

Acharya<sup>14</sup> from Guntur (Andhra Pradesh) reported marked positive skin reactions in the range of 19-10% (in descending order) to pollen antigens namely *Cassia occidentalis*, *Ageratum conyzoides*, *Cassia siamea*, *Eucalyptus teritecornis*, *Salvadora persica*, *Lawsonia inermis*, *Ricinus communis*, *Adhatoda vasica*, *Kigelia pinnata*, *Amaranthus spinosus*, *Melia azedarach*, *Artemisia scoparia*, *Suaeda fruticosa*, *Ehretia aspera*, *Dodonea viscosa* and *Zea mays*. However, in the present study, only few pollen antigens such as *Amaranthus spinosus* (14.57%), *Suaeda fruticosa* (9.85%), *Ricinus communis* (8.38%), and *Cynodon dactylon* (8.30%) demonstrated marked positive skin reactions in higher number of patients. This may be due to difference in sensitivity towards allergens in two different populations tested.

Agnihotri et al<sup>15</sup> found *Amaranthus spinosus* to be most common allergen in Lucknow region followed by *Cynodon dactylon*, *Holoptelea integrifolia*, *Prosopis juliflora*, *Azadirachta indica* and *Chenopodium murale* based on skin testing. Prasad et al<sup>16</sup> identified pollen types namely, *Ageratum conyzoides*, *Ailanthus excelsa*, *Amaranthus spinosus*, *Argemone mexicana*, *Adhatoda vasica*, *Brassica campestris*, *Cassia siamea*, *Cenchrus ciliaris*, *Cannabis sativa*, *Chenopodium album*, *Cynodon dactylon*, *Gyanandropis gynandra*, *Holoptelea integrifolia*, *Imperata cylindrica*, *Melia azedarach*, *Morus alba*, *Parthenium hysterophorus*, *Prosopis juliflora*, *Putranjiva roxburghii*, *Ricinus communis*, and *Sorghum vulgare*, as important sensitizers by intradermal testing on patients of

respiratory allergy. Most of the pollen allergens giving marked positive reaction in our study are similar to pollen types recorded in studies at Lucknow.

In Delhi, several surveys have been conducted by Singh and Shivpuri<sup>17</sup>, Singh and Babu<sup>18</sup> and Malik et al<sup>19</sup> and the dominant pollens recorded are from grasses, *Cheno/ Amaranthus spp.*, *Ailanthus excelsa*, *Ricinus communis*, *Morus alba*, *Xanthium strumarium*, *Cannabis sativa*, *Artemisia scoparia* and *Holoptelea integrifolia*. Shivpuri<sup>20</sup> in a study of 300 patients at Delhi took 3+ and 4+ reactions only into consideration among the pollens and described *Holoptelea integrifolia*, *Ipomea fistulosa*, *Prosopis juliflora*, *Sorghum vulgare*, *Pennisetum typhoides*, *Artemisia scoparia*, *Ricinus communis* and *Morus alba* as important allergens. In the present study, only three pollen antigens namely *Amaranthus spinosus*, *Parthenium hysterophorus* and *Cynodon dactylon* showed 3+ and none of the pollen types elicited 4+ reaction on ID testing.

In conclusion, the present study identified *A. spinosus*, *S. fruticosa*, *R. communis*, *C. dactylon*, *P. hysterophorus*, *C. ciliaris* and *P. juliflora* as important triggers of allergic disorders in Punjab. More studies are required to validate this data by specific IgE estimation against offending allergens.

#### ACKNOWLEDGEMENTS

We are thankful to Dr. SV Gangal, former Director, Centre for Biochemical Technology, Delhi for his valuable and erudite guidance and help. Thanks are also due to Dr. Vikram Mahajan, Professor, Department of Dermatology and Venereology, Dr. RP Government Medical College, Kangra (Tanda), HP State.

#### REFERENCES

1. Pekkanen J, Remes ST, Husman T, Lindberg M, Kajosaari M, Koivikko A, Soininen L. Prevalence of asthma symptoms in video and written questionnaires among children in four regions of Finland. *Eur. Respir J.* 1997; **10**(8): 1787-1794.
2. Woolcock AJ, Bastiampillai SA, Marks GB, Keena VA. The burden of asthma in Australia. *Med J Aust.* 2001; **175**(3): 141-145.

3. Anthracopoulos M, Kartza A, Liolios E, Triga M, Triantou K, Priftis K. Prevalence of asthma among school children in Patras, Greece: three surveys over 20 years. *Thorax* 2001; **56**(7): 569-571.
4. Chhabra SK, Gupta CK, Chhabra P, Rajpal S. Prevalence of bronchial asthma in school children in Delhi. *J Asthma* 1998; **35**(3): 291-296.
5. Anonymous: All India Coordinated Project on Aeroallergens and Human Health. Report. Ministry of Environment and Forests, New Delhi 2000.
6. Prasad R, Verma SK, Dua R, Kant S et al. A study of skin sensitivity to various allergens by skin prick test in patients of nasobronchial allergy. *Lung India* 2009; **26**(3): 70-73.
7. Vishwanathan R. Definition, incidence, etiology and natural history of asthma. *Indian J Chest Dis* 1964; **6**: 108-124.
8. Singh BP, Nair PKK, Gangal SV, Joshi AP. Incidence of airborne pollen grains and fungi in different regions of India. *Proc. Nat. Conf Environ Biopollution* 1981; **1**: 125-134.
9. Nair PKK, Joshi AP, Gangal SV. Airborne pollen, spores and other plant materials of India- A Survey. CSIR Centre for Biochemicals, Delhi and National Botanical Research Institute, Lucknow publication. 1986: p. 1-221.
10. Shivpuri DN. Comparative evaluation of the sensitivity of common methods of diagnostic antigen tests in patients of respiratory allergy. *Indian J. Chest Dis* 1962; **3**: 102-107.
11. Kasliwal RM, Solomon SK. Correlation of respiratory allergy cases with atmosphere pollen concentrations and meteorological factors. *J Ass Physics India* 1985; **6**: 180-195.
12. Shivpuri DN, Prakash D. A study in allergy to *Prosopis juliflora* (Kabuli keekar). *Ann. Allergy* 1967; **25**: 643-648.
13. Shivpuri DN, Singh AB, Babu CR. New allergenic pollens of Delhi state, India and their clinical significance. *Ann. Allergy* 1979; **42**: 49-52.
14. Acharya PJ. Skin test response to some inhalant allergens in patients of nasobronchial allergy from Andhra Pradesh. *Aspects Allergy Applied Immunology* 1980; **13**: 14-18.
15. Agnihotri MS, Singh AB. Observation on pollinosis in Lucknow with special reference to offending factors. *Aspects Allergy Applied Immunol* 1971; **51**: 135-141.
16. Prasad R, Kumar R, Verma SK, Pandey US. A study of skin sensitivity to various allergens by intradermal test in patients of bronchial asthma. *Indian J Allergy Asthma Immunol* 2001; **15**(1): 17-21.
17. Singh K, Shivpuri DN. Studies on yet unknown allergenic pollen of Delhi state metropolitan, botanical aspects. *Ind J Med Res* 1971; **59**: 1392-1410.
18. Singh AB, Babu CR. Pollen types in atmosphere of Delhi. *Phytomorphology* 1980; **30**: 180-189.
18. Malik P, Singh AB, Babu CR, Gangal SV. Atmospheric concentration of pollen grains at human height. *Grana* 1991; **30**: 129-136.
20. Shivpuri DN. Clinically important pollen, fungal and insect allergens for nasobronchial allergy patients in India. *Aspects Allergy Applied Immunology* 1980; **13**: 19-23.