

Full Length Research Paper

Prevalence of aero-allergenic pollen at Kupwara-India

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Kashmir valley has been witnessing an increase in allergy related disorders usually due to aeroallergens present in the environment, mostly during spring and autumn seasons. The present study was aimed at finding total and specific IgE responses in serum samples of 257 patients reporting to various health centers across the valley with symptoms of seasonal allergy. Samples were first screened for the total immunoglobulin E (IgE) levels by a sandwich enzyme linked immunosorbent assay (ELISA) method. All the samples showed presence of high levels of total IgE (650 to 1200 IU/ml). Specific IgE levels were determined using grass and tree mix antigens by a two step capture ELISA method. After recording the concentration of the total and specific IgE levels of 257 serum samples, 175 samples out of the 257 were reactive for the allergens used in the present study. Specific IgE ranged from 1.1 to 75.0 IU/ml representing moderate to high specific IgE levels. 82 samples not reactive to the allergens used earlier, but had high total IgE levels probably due to the other allergens which are further being evaluated. 22 patients having severe symptoms of allergic rhinitis complaints were tested clinically by skin prick test method for different allergens like pollen (18 types), insect (1 type), dust (5 types), fungi (5 types) and epithelia (2 types). The skin test reactions were interpreted and graded at 15 to 20 min.

Key words: Kashmir Himalaya, aero-allergenic, pollen, immunoglobulin E (IgE), skin prick test.

INTRODUCTION

Pollen constitute a major source of atmospheric pollution causing a number of allergic disorders like rhinitis, conjunctivitis, dermatitis, bronchial asthma, etc. among the people living around the world. Prevalence of the pollen in the atmosphere and their monitoring in relation to meteorology, constitute the basis concept of aeropalynology. Under this concept, an effort has been made to carry out the survey of airborne pollen in a climatic condition of district Kupwara situated in the Northern region of Kashmir. Hence, the present study was taken to monitor the pollen grains daily in the atmosphere of district Kupwara of Jammu and Kashmir state as Kashmir valley has been witnessing an increase in allergy related disorders mostly due to aeroallergens present in the atmosphere mostly during spring and autumn seasons. Air monitoring of the district was carried out in May 2008 to April 2009 with vertical cylindrical rods

installed at three different locations in the study site. The data compiled revealed that there are 32 pollen types in the atmosphere of the area out of which 23 are already known allergic in the world. Keeping in view the prevalence of unknown allergic pollen, an apprehension was concealed that there may be some allergic disorders among the population of the area, and this assumption was confirmed from the government hospitals working in the area where a number of patients that attended have been diagnosed of various allergic disease. The authors have collected the blood samples from these patients in order to evaluate the concentration of total IgE and specific IgE levels in such patients. These samples were carried out at the Department of Immunology, Sheri Kashmir Institute of Medical Science (SKIMS) Soura Srinagar. Two bio allergens namely *Poa pratensis* and *Cynodon dactylon* were tested against specific IgE by sandwich ELISA method in 150 patients. All the patients selected were between the age group of 12 to 55 years. All the samples showed the presence of high levels of total IgE and specific IgE.

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Table 1. Pollen types found in atmosphere of Kupwara in spring season (April to June).

Serial number	Name of genus/species	Site A	Site B	Site C
1	<i>Abies pindrow</i>	4.83	5.35	4.95
2	<i>Brassica</i> species	1.2	1.87	1.35
3	<i>Buxus</i> species	1.35	1.53	1.4
4	<i>Cedrus deodara</i>	3.85	5.25	2.15
5	<i>Chenopodium album</i>	1.35	1.87	1.51
6	<i>Cupressus</i> species	0.1	0.87	0.9
7	<i>Geranium</i> species	2.35	3.67	2.76
8	<i>Morus</i> species	9.85	11.25	13.76
9	<i>Picea smithiana</i>	5.35	4.25	4.7
10	<i>Pinus</i> species	7.85	9.25	4.23
11	<i>Pinus roxburghii</i>	3.25	4.23	2.53
12	<i>Pinus halepensis</i>	2.35	3.45	2.15
13	<i>Platanus orientalis</i>	5.73	4.37	3.15
14	<i>Plantago lanceolata</i>	6.2	6.87	4.15
15	<i>Polygonum</i> species	2.23	1.87	1.37
16	<i>Poa</i> (6 types)	15.43	19.63	12.35
17	<i>Populus</i> species	4.73	6.52	7.15
18	<i>Primula</i> species	2.73	2.85	1.1
19	<i>Punica granatum</i>	0.73	0.85	0.05
20	<i>Pnmus</i> species	1.13	2.1	1.76
21	<i>Rumex acetosa</i>	7.35	8.71	6.35
22	<i>Robinia pseudoacacia</i>	6.73	7.01	2.25
23	<i>Ranunculus</i> species	2.74	4.35	2.34
24	<i>Salix</i> species	5.14	6.85	7.42
25	<i>Salix</i> species	1.25	2.35	3.45
26	<i>Stellaria media</i>	2.11	1.05	1.53
27	<i>Taxus</i> species	1.02	0.05	0.15
28	<i>Thymus</i> species	0.67	1.35	2.05
29	<i>Ulmus</i> species	0.56	0.01	0
30	Unidentified species	9.73	12.37	10.15

MATERIALS AND METHODS

Vertical cylinder rod (VCR) samplers for day to day monitoring were used for the study at three different sites like Iqbal Market (Site A), Bohipora (Site B) and Kulangam (Site C). These samplers were installed on the roof of buildings at a height of 10 m above the ground level. The trapping surface is 18 × 18 mm vaseline coated cellophane wound glass rod clubbed vertically under a protective shield. After 24 h, the exposed traps were thoroughly scanned under the compound microscope and pollen grains were identified by comparing the standard source slides prepared directly from the source plants.

Percentage for trapped pollen grains was calculated using formulae:

$$\text{Age for pollen grains (\%)} = \frac{\text{Number of particular grains}}{\text{Total number of trapped pollen grains}} \times 100$$

While making calculations, a correlation factor was used to obtain uniformity.

$$\text{Corrected month count} = \frac{\text{Number of days in a month}}{\text{Actual number days} \times \text{Actual count}} \times 100$$

(Alka et al., 1993; Chanda and Sarkar, 1972; Gupta et al., 1984; Munshi, 1994; Shivpuri and Dua, 1963; Suman et al., 2005; Shivpuri and Kartar, 1971; Sridhara et al., 1992; Laemmli, 1970; Andersen and Heron, 1993; Wayne, 2000; Anon, 1993; Thakur, 1989; Singh and Dahiya, 2002).

RESULTS

Air of research sites were monitored from May 2008 to April 2009, and revealed a total of 32 pollen types. The identified pollen type belongs to 22 families (Gymnosperms and Angiosperms). The air borne pollen has been grouped into herbs, shrubs and trees.

The monthly incidence of each pollen types is present in tubular form. It is clear from Tables 1 to 5 that the pollen

Table 2. Pollen types found in atmosphere of Kupwara in summer season (July to September).

Serial number	Name of genus/species	Site A	Site B	Site C
1	<i>Abies pindrow</i>	1.24	2.15	1.35
2	<i>Brassica</i> species	0.42	0.15	0.71
3	<i>Cedrus deodara</i>	12.13	15.35	6.35
4	<i>Chenopodium album</i>	0.34	0	0.6
5	<i>Cupressus</i> species	0.25	0	0.45
6	<i>Cupressus sempervirens</i>	0	0.52	0.68
7	<i>Geranium</i> species	0.58	0.95	0.15
8	<i>Morus</i> species	5.05	5.66	7.99
9	<i>Picea smithiana</i>	0.95	3.58	0
10	<i>Pinus</i> species	6.35	8.52	3.65
11	<i>Pinus roxburghii</i>	1.35	2.35	0
12	<i>Platanus orientalis</i>	2.05	2.35	1.05
13	<i>Plantago lanceolata</i>	9.61	13.86	12.35
14	<i>Polygohum</i> species	0.91	0.73	0.45
15	<i>Poa</i> (6 types)	13.05	54.35	27.15
16	<i>Populus</i> species	0.19	0.29	1.35
17	<i>Rumex acetosa</i>	9.3	12.69	7.67
18	<i>Robinia pseudoacacia</i>	1.05	0.4	0
19	<i>Ranunculus</i> species	1.47	2.53	1.35
20	<i>Salix</i> species	1.25	1.75	2.15
21	<i>Stellaria media</i>	0.31	0.48	0.1
22	<i>Thymus</i> species	1.35	1.76	0.14
23	<i>Ulmus</i> species	0.03	0.63	0.15
24	Unidentified species	14.48	7.45	4.68

incidence at three different sites varies significantly. Pollen concentration remains higher at site B (Bohipora) than that of site A (Iqbal Market) and site C (Kulangam). However all the trapped pollen grains showed marked seasonal variation as shown in Table 1 (spring season), Table 2 (summer season), Table 3 (autumn season) and Table 4 (winter season).

Percentage of allergic pollen from these different sites

Out of 32 pollen types trapped and studied, 23 types are already known to be allergic and cause various allergenic disorders. The main allergenic disorders caused by these allergic pollen types are allergic rhinitis allergic dermatitis, bronchial asthma and conjunctivitis. Allergic pollen types reported from the atmosphere of Kupwara are presented in Table 5.

IgE response in allergic individuals

Many scientific discoveries proved that human allergic diseases resulted from the formation of anti bodies belonging to an immunoglobulin isotype termed IgE.

Patients suffering from various types of allergies like allergic rhinitis conjunctivitis, dermatitis and brochial asthma were selected for the study. Each patient was clinically evaluated and careful history of allergic conditions was recorded. Blood samples from suspected patients were collected after proper evaluation of each patient by Venipuncture and were transferred to the Department of Immunology and molecular medicine SKIMS. Serum was separated and divided into two aliquots and were stored at -20°C until further processed.

Total IgE response

All the samples showed the presence of high levels total IgE equivalent to 650 to 1200 IU/ml.

Specific IgE response

Two bio allergens, namely *C. dactylon* and *P. pretance* were tested against specific IgE in 150 patients, 126 serum samples showed presence of IgE levels against different grass and tree pollen at varying concentrations ranging from 1.1 to 75.0 IU/ml. Out of all the grass and tree pollen, most of the samples were reactive for mixed

Table 3. Pollen types found in atmosphere of Kupwara in autumn season (October to December).

Serial number	Name of genus/species	Site A	Site B	Site C
1	<i>Abies pindrow</i>	0.85	0.96	0.3
2	<i>Brassica</i> species	0	0.73	0.15
3	<i>Cedrus deodara</i>	2.75	4.45	1.53
4	<i>Chenopodium album</i>	0.75	0.98	0
5	<i>Cupressus</i> species	2.85	3.15	1.35
6	<i>Cupressus sempervirens</i>	0.32	1.22	1.2
7	<i>Geranium</i> species	0.48	3.31	1.2
8	<i>Morus</i> species	4.86	5.38	4.47
9	<i>Platanus orientalis</i>	0.16	0.24	0.15
10	<i>Plantago lanceolata</i>	10.92	16.09	7.05
11	<i>Polygonum</i> species	0	0.63	0.3
12	<i>Poa</i> (6 types)	29.05	48.12	35.15
13	<i>Rumex acetosa</i>	12.53	14.02	13.29
14	<i>Robinia pseudoacacia</i>	1.25	0	0.81
15	<i>Stellaria media</i>	0.24	0.48	0.15
16	Unidentified species	16.91	13.48	16.12

Table 4. Pollen types found in atmosphere of Kupwara in winter season (January to March).

Serial number	Name of genus/species	Site A	Site B	Site C
1	<i>Abies pindrow</i>	0.5	0.91	0
2	<i>Brassica</i> species	0.13	0.91	0.35
3	<i>Buxus</i> species	0.61	0.86	0.76
4	<i>Cedrus deodara</i>	0.25	0.36	0.52
5	<i>Cupressus sempervirens</i>	3.15	7.81	12.92
6	<i>Cupressus</i> species	5.1	8.63	6.45
7	<i>Geranium</i> species	0	0.36	0.15
8	<i>Morus</i> species	12.22	13.16	14.45
9	<i>Picea smithiana</i>	0.13	0.36	0.15
10	<i>Pinus</i> species	1.25	1.65	0.64
11	<i>Pinus roxburghii</i>	1.23	1.25	0.05
12	<i>Pinus halepensis</i>	0	0.36	0.15
13	<i>Plantago lanceolata</i>	6.15	10.41	5.35
14	<i>Poa</i> (6 types)	32.15	34.13	12.15
15	<i>Populus</i> species	0.61	0.72	0.86
16	<i>Pinus</i> species	0.72	0.91	0.25
17	<i>Rumex acetosa</i>	7.81	12.38	6.25
18	<i>Robinia pseudoacacia</i>	5.61	8.57	0.08
19	<i>Salix</i> species	0.13	1.45	1.12
20	Unidentified species	2.35	5.29	0.37

antigens especially for *C. dactylon* (27 patients) and *P. pretance* (69 patients) of which 16 male and 11 female patients showed positive reactions for *C. dactylon* and 47 male and 22 female patients showed positive reactions for *P. pretance*. 34 serum samples did not show any specific reactions to pollen specific antigens used in the study. These samples probably had specific IgE levels

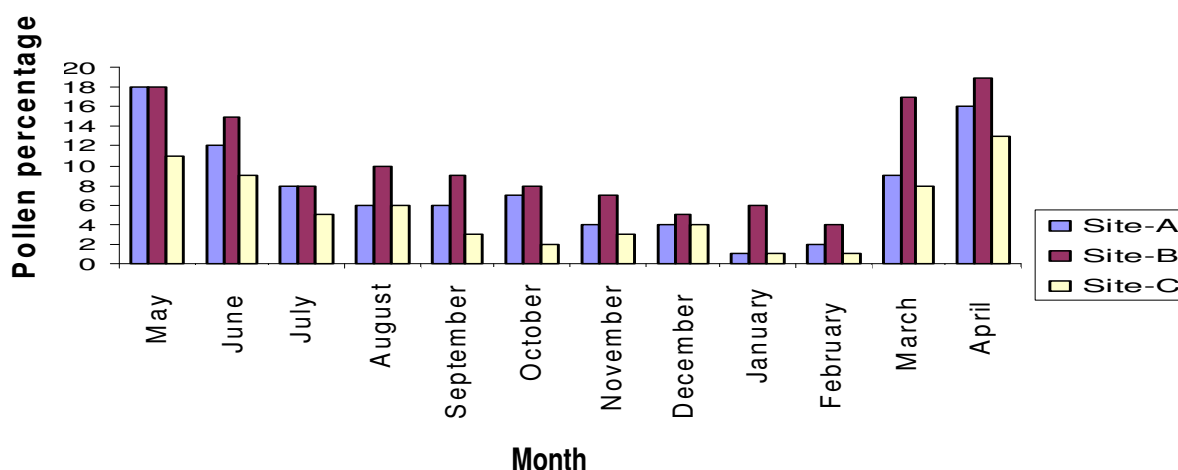
against other pollens diluted but not used in the current study.

DISCUSSION

The prevalence and distribution of air borne pollen varies

Table 5. Percentage of allergic pollen.

Serial number	Pollen types	Site A	Site B	Site C
1	<i>Plantago lanceolata</i>	0.27	0.67	0.42
2	<i>Morus</i> species	7.95	6.84	4.24
3	<i>Rumex acetosa</i>	10.81	9.05	8.44
4	<i>Salix</i> species	2.35	1.28	1.55
5	<i>Ulmus</i> species	1.87	0.35	1.2
6	<i>Pinus</i> 3 types	5.34	6.43	4.75
7	<i>Chenopodium album</i>	0.54	1.42	0.35
8	<i>Cedrus deodara</i>	3.48	6.32	2.73
9	<i>Brassica</i> species	0.51	0.73	0.39
10	<i>Cupressus</i> (2 types)	3.08	7.15	2.25
11	<i>Poa</i> (6 types)	23.05	38.65	32.1
12	<i>Prunus</i> species	1.53	2.7	1.73

**Figure 1.** Total monthly pollen count in the atmosphere of cite A (Igal Market), cite B (Bohlpura) and cite C (Kulangam).

with weather condition, vegetation type and flowering period (Munshi, 2000). Plantaginaceae, Poaceae, Moraceae, Polygonaceae, Papilionaceae Cupressaceae, Plantanceae, etc., and Poaceae were found to be the most abundant, because many of these taxa are widespread in the surrounding areas.

In the present study the lowest pollen count was registered in winter, because rain washes out suspended pollen and low temperature may probably decrease pollen count. The studies on air borne pollen attain unique importance in recent years, because it provides first hand information to the physicians and medical practitioners for identifying various allergic disorders among the people living in that area (Agashe, 1994).

During the research study, an effort has been made for the first time to check total IgE and specific IgE levels in the serum of allergic individuals who complain of various allergic symptoms diagnosed by the local physicians.

The pollen concentration remains higher from March to September. During spring season, all the flowering plants of Kashmir valley are in full bloom due to which the higher concentration of pollen is in the air. During winter season, concentration of pollen remains very low as plants do not flower during winter (minimum temperature 0.8°C to 4.6°C and maximum 5.9°C to 15.5°C). The pollen concentration also shows decrease during autumn, while highest pollen counts was found during April to May and lowest in January to February (Figure 1).

Conclusion

It has been assessed after compiling the data that pollen count appears to be fluctuated, which may be due to weather parameters and flowing period. The survey revealed 32 pollen types, which belongs to families

Brassicacia, Buxaceae, Caryophyllaceae, Cupressaceae, Chenopodiaceae, Geraniaceae, Lamiaceae, Moraceae, Pinaceae, Plantanaceae, Primulaceae, Plantaginacea, Polygonaceae, Papilionaceae, Punicaceae, Poaceae, Ranunculaceae, Rosaceae, Salicaceae, Taxaceae and Ulmaceae. 32 identified pollen types include 23 known allergic pollen types. The data compiled by the study may be helpful to physicians of the area.

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