

Palm Pollen Grain Sensitivity in Kerala

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Abstract

Respiratory ailments such as bronchial asthma and allergic rhinitis are relevant health problems among human beings. These manifestations are known to be caused by the inhalation of various allergic substances including pollen grains. Among the airborne pollen grains, members of Arecaceae hold a vital role due to its dominance in the aerial distribution. Present study is aimed at the allergy evaluation using pollen extracts of Arecaceae members, among 500 patients attending the Respiratory Allergy and Immunology Clinic, Medical College, Thiruvananthapuram. In order to have a better understanding of the allergic manifestations, a detailed analysis of the possible parameters that can influence hypersensitive reactions was carried out.

Keywords: Arecaceae, Intradermal Skin Test, Ig E

Introduction

Arecaceae (Palmaceae or Palmae) is one of the largest taxonomic group among monocotyledons which includes about 2500 species under 217 genera (Chakraborty et al., 1998). In India, the family is represented by about 24 genera and 225 species. Members of the group are distributed mainly in tropical and sub tropical regions of the world which extends in the temperate regions also. The family is unique with a large compound spadix that possesses large number of unisexual flowers and huge amount of pollen grains. Of the large amount of pollen grains released into the atmosphere, few of them are utilized for sexual reproduction while the remaining is present in the atmosphere. These pollen grains interact with the mucos membranes and develop hypersensitive reactions among human beings.

Nasobronchial diseases in human beings like bronchial asthma and allergic rhinitis are known to be caused due to the inhalation of various allergic substances including the pollen grains. Though most of the grains are capable of eliciting allergic reactions, intensity of the reaction varies with various factors influencing it. Majority of palm pollen grains are usually light, abundant in distribution and wind dispersed and such features enhance the chance of eliciting hypersensitive reactions. Aerobiological studies conducted in different regions of India showed an increased aerial incidence of pollen grains of Arecaceae (Ravindran et al., 1986, 1988; Nair et al, 1986 and Prakashkumar, 1992). Similarly the survey conducted by Department of Respiratory Medicine, Medical College, Thiruvananthapuram during late eighties and early nineties revealed the predominance of Arecaceae pollen in the atmosphere of Kerala (Gopi et al,

1992; Ravindran et al, 1991 and Prakashkumar et al, 1988,1993). Since in Kerala there is abundance in palm species with a good aerial pollen deposition, the possibility of eliciting hypersensitive reactions among people is also high. Hence a study in this direction on evaluating the aerial incidence of four common tropical pollen belonging to Arecaceae and its allergic potentiality among the allergic patients in the state was planned. It is expected that the results could help in understanding and managing the allergic manifestations due to these pollen grains.

Materials and Methods

The pollen grains of four aerially dominant members belonging to the family Arecaceae are selected. This include pollen grains of *Areca catechu*, *Cocos nucifera*, *Oreodoxa regia* and *Phoenix dactylifera*.

Collection of Pollen Grains and Antigen Extraction

The pollen were collected in bulk, air dried and sieved to remove the debris. Purity of pollen grains was checked and samples with more than 95 % purity were used for the study. Antigenic extraction of these pollen grains were made in Phosphate Buffered Saline (Sheldon et al.,1967).

Allergy Evaluation (Chai et al)

Allergy evaluation was done based on the procedure of Chai et al. (1975). Skin testing was done among a group of 500 patients who were registered with the Respiratory Allergy and Immunology Clinic, Medical College, Thiruvananthapuram. The patient selection was made according to the inclusion exclusion criteria. Patients between a range of 10 and 49 years and with a history of respiratory allergy were selected for the study. Patients suffering with chronic asthma for 10 years or above, patients on daily steroids and those with other complicating diseases were excluded.

Intradermal Skin Test (ID)

The antigenic extract of 1:500 dilution was used for skin

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testing. Phosphate buffered saline (PBS) and histamine phosphate (100 µg/ml) were used as the negative and positive controls respectively. Intradermal skin testing was performed on the volar aspect of the fore arm by injecting 0.02 ml of the antigen using 1.0 ml tuberculin syringe. The degree of reactivity was calculated by measuring the wheel size after 20 minutes and interpreted based on Chai et al (1975).

Results and Discussion

Study on hypersensitivity reactions due to pollen grains is one of the major areas of research around the world. Intensity of hypersensitivity reactions can be determined by various diagnostic tools, among which intradermal skin testing is considered to be the most relevant and accepted procedure.

Incidence of skin test reactions in the present study showed a wide range of results. With regard to total positivity (1+ to 4+), antigen of *Oreodoxa regia* showed highest reactivity of 53.8% followed by *Cocos nucifera* (40%), and *Areca catechu* (27.2%). Considering significant positive reactions (2+ to 4+), *Oreodoxa regia* pollen showed the highest percentage (11.4%) followed by *Cocos nucifera* (6.8%) and *Phoenix dactylifera* (6.6%).

Individual analysis of the positive reactivity showed that *Oreodoxa regia* antigen registered the highest frequency of 1+ skin test reactions (42.4%), while least reactivity of 24.6% was recorded with *Areca* antigen. For 2+ reaction, *Oreodoxa regia* showed the highest response (8.6%), followed by *Cocos* (4.8%) and *Phoenix* (4.0%). For 3+ reactions, highest frequency of 2.4% and 2.0% were shown by *Oreodoxa* and *Phoenix* antigens respectively. When 4+ reactivity was compared, similar reactivity of 0.4% was shown by *Oreodoxa* and *Cocos* antigens, followed by *Phoenix* (0.2%) pollen antigen.

Hypersensitive reactions vary according to individuals and can be influenced by different environmental as well as physiological conditions. Hence a detailed analysis of positive reactions with different parameters that could influence allergic conditions such as age, sex, locality, clinical history and family history of the patients were made.

Age and Reactivity.

In the present study, almost comparable reactivity was observed among all age groups. This suggest that the age of the patient is not significant in pollen allergy. Similar trend of reactivity was observed previously by Kuhr et al (1990) and Prakashkumar et al (1998). Tsang et al (2000), after a series of investigations stated that it is other external factors

rather than age that influence hypersensitive reactions among humans.

Sex and Reactivity

In the present study, for all the three antigens except *Cocos nucifera*, the male patients were more reactive. Similar trend of reactivity was observed by Friedhoff et al. (1981). A possible explanation for this trend was that the high incidence of skin test reactivity among males is due to their frequent exposure to the allergen (Szalai, 1972 and Border et al., 1974).

Clinical History and Reactivity

Patients registered for skin testing were grouped under three categories based on the clinical history such as those with Rhinitis, Asthma and Rhinitis and Asthma. Patients with a clinical history of asthma reacted more significantly to all the pollen types except for *Phoenix dactylifera* whereas the *Phoenix dactylifera* reacted more among the Rhinitis cum Asthmatic group. Similar observation was made by Anuradha et al. in 2006. Tsai et al. (2003) identified a specific Ig E in the serum of asthmatic patients which is more reactive and specific than the normal Ig E. This may be reason for the high incidence of pollen reactivity among asthmatic patients.

Family History and Reactivity

Present findings showed high skin test reactivity among patients with a positive family history of allergy. In all the antigen types, patients with a positive family history of allergy were more reactive than those without. Similar type of observations were made by Haus et al (1988), Niu et al (2009) and Schroeder et al (2009). Haus et al. (1988) noticed an elevated level of Ig E concentration in new borns with a family history of allergy. He concluded this as a reason for high incidence of skin test reactivity among patients with a positive family history of allergy. This explanation can be applied in the present findings as well.

Locality and Reactivity

In the present study, pollen types which were abundantly airborne in certain localities were found to be allergic among patients from that areas. Aerobiological studies conducted previously in the state of Kerala showed that there is a major distribution of pollen grains of *Oreodoxa regia* in the Coastalbelt atmosphere and during present study patients from this locality was more allergic to this pollen type (Prakashkumar et al., 1988, 1989).

Maximum skin test positivities for *Areca catechu* anti-

Table 1. Criteria to read Intradermal Test

Control (mm)	±	1+	2+	3+	4+ & above
2	3 – 4	5 – 7	8 – 10	11 – 14	Above 14
3	4 – 5	6 – 8	9 – 11	12 – 45	Above 15
4	5 – 6	7 – 9	10 – 12	13 – 16	Above 16
5	6 – 7	8 – 10	11 – 13	14 – 17	Above 17
6	7 – 8	9 – 11	12 – 14	15 – 18	Above 18
7	8 – 9	10 – 12	13 – 15	16 – 19	Above 19

Table 2. Clinical study – Intradermal Skin Testing

Name of Antigen	Total Patients	1+		2+		3+		4+ and above		Total Positivity		Total Significant Positivity	
		N	%	N	%	N	%	N	%	N	%	N	%
<i>Areca catechu</i>	500	123	24.6	10	2.0	3	0.6	-	-	136	27.2	13	2.6
<i>Cocos nucifera</i>	500	166	33.2	24	4.8	8	1.6	2	0.4	200	40	34	6.8
<i>Oreodoxa regia</i>	500	212	42.4	43	8.6	12	2.4	2	0.4	269	53.8	57	11.4
<i>Phoenix dactylifera</i>	500	155	31.0	20	4.0	10	2.0	1	0.2	186	37.2	33	6.6

Table 3. Different parameters that influence hypersensitive reactions

Name of Antigen	Sex	Age	Clinical history	Family history	Locality	Locality of respective pollen
<i>Areca catechu</i>	Males	30-39	Asthma	Positive	Midlands, Coastalbelt	Midlands, Coastalbelt
<i>Cocos nucifera</i>	Equal	20-29, 40-49	Asthma	Positive	Highlands, Midlands, Coastalbelt	Highlands, Midlands, Coastalbelt
<i>Oreodoxa regia</i>	Males	10-19, 40-49	Asthma	Positive	Coastalbelt	Coastalbelt
<i>Phoenix dactylifera</i>	Males	10-19	Asthma cum Rhinitis	Positive	Coastalbelt, Midlands	Coastalbelt, Midlands

gen was reported among those registered from the midlands and coastbelt, as this plant shows major distribution in these geographical localities. Similar trend was observed in other two pollen antigens also. These results indicate that the distribution of particular pollen types in a given area has a significant influence on the allergic reactions among the people inhabiting such regions.

Conclusion

The present study has proved that the pollen grains of Arecaceae which are aerielly dominant in the atmosphere of Kerala state were potent allergens to the human beings. It is also understood that various factors such as patient sex, clinical history, family history and locality of patient had a high influence on eliciting hypersensitive reactions among human beings.

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