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Prevalence of Allergy to Some Inhalants among Rhinitis Patients in Malaysia

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SUMMARY **This study was conducted to determine the seasonal prevalence of allergies to house dust, *D. pteronyssinus, D. farinae,* cat fur, dog hair, mixed moulds, mixed grass pollens and American cockroach. A total of 314 patients with clinically suspected allergic rhinitis was examined by prick test using commercial preparations of the above allergens. Total serum IgE of the patients was determined by a Sandwich ELISA. Ninety-six percent of the patients tested positive to more than one allergen. Most were positive to a combination of 4 allergens. More than 70% of the patients were positive to house dust, *D. pteronyssinus, D. farinae* and cat fur. Analysis indicates that for an individual who tests positive for house dust, there is a very high risk of the person being allergic to the dust mites and cat fur too. Most of the allergens had 2 peak period of high positive PT rates; mixed moulds and mixed grass pollens had 3 peaks. There was significant positive correlation between the monthly positive PT rates against mixed moulds and mixed grass pollens with maximum daily mean temperature and mean temperature at 14.00 hours.**

In recent years, the term allergy has become synonymous with Type 1 hypersensitivity.[1] These reactions are characterized by the specific activation of IgE-sensitized mast cells by allergens resulting in the release of pharmacological mediators of inflammation. Of great concern are allergies which affect the respiratory system and cause typical clinical features such as asthma and perennial rhinitis.

The prevalence of inhalant allergies in Malaysia is not well documented. The few reports available concentrated mainly on house dust and house dust mite allergens.[2,3,4,5] There is a variety of other aeroallergens that can be of importance such as pollens and fungal spores. Information on the seasonal prevalence of allergies to such aeroallergens will aid diagnosis leading to better management of the problem.

The objectives of the study were thus to determine the seasonal prevalence of allergies to some selected inhalants among rhinitis patients, and to correlate the prevalence with some meteorological parameters.

MATERIALS AND METHODS

Cases

A total of 314 clinically suspected allergic rhinitis patients from the Department of Otorhinolaryngology, Kuala Lumpur Hospital, was included in the study. Patients aged 6 years or less were excluded because of lack of suitable resuscitation equipment in case of anaphylactic reactions. Written consent was obtained from all participants. Personal data and case histories of all participants were recorded on standard forms. All patients were instructed to refrain from consuming antihistamines or steroid medications for at least 24 hours before undergoing prick testing

There were more female than male patients. Most patients were in the 21-40 years age group (Table 1). Malays and Indians comprised the majority of patients.

Prick test

Prick test (PT) solutions were purchased from Bencard, UK. The

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Table 1. Sex, age and ethnic group distribution of rhinitis patients

		Number	Percent of total (n=316)
Sex	Male	149	47.2
	Female	163	51.6
Age	7-20 yr	64	20.2
	21-30 yr	102	32.2
	31-40 yr	91	28.8
	41-50 yr	39	12.3
	51-60 yr	12	3.8
	> 60 yr	6	1.9
Ethnic group	Malay	135	42.7
	Indian	100	31.6
	Chinese	62	19.6
	Others	17	5.4

N.B.: Particulars of two patients were not available

following allergens were used : House dust, *Dermatophagoides pteronyssinus, D. farinae,* cat fur, dog hair, mixed grass pollens, mixed moulds and American cockroach (*Periplaneta sp.*). Histamine dihydrochloride (1 mg/ml) and allergen diluent (50% glycerine, 6% sodium chloride, 0.5% phenol) were used as positive and negative controls, respectively. The components of the mixed grass pollens extract are : Bent, Brome, Cocksfoot, Dogstail, Oat-Grass, Fescue, Foxtail, Meadow, Rye-Grass, Timothy, Vernal, and Yorkshire Fog. The mixed moulds extract contains the following: *Altenaria alternata, Aspergillus amstelodami, Asp. niger, Asp. terreus, Cladosporium cladosporioides, Neurospora sitophila, Mucor mucedo, Mucor spinosus, Rhizopus nigricans, Penicillium brevicompactum, Pen. expansum,* and *Pen. notatum.* All patients were tested with the house dust, *D. pteronyssinus, D. farinae,* cat fur, mixed grass pollens and mixed moulds allergens. The cockroach allergen was obtained later and was tested on only 156 patients. The dog hair allergen was used only on non-Muslims who numbered 177.

The prick test was conducted as follows. A small drop of each of the test solutions and controls was placed on the forearm of each patient. The drops were separated from each other by at least 2 cm. Sterile lancets were used to make superficial pricks through the drops of solutions. A new lancet was used for each solution. After 15 minutes, the largest diameter of each wheal produced, was measured. Reactions with wheals larger than the diluent control were considered positive. Positive reactions were graded 1+, 2+, 3+ and 4+ according to the manufacturer's guidelines.

Table 2. Frequency of positive prick test in rhinitis patients

Number of allergens	Number of patients positive
0	33
1	13
2	21
3	34
4	122
5	42
6	50

Total IgE

Two hundred and fifty one patients consented to provide 5 ml of venous blood each. Serum was obtained and total IgE determined by a sandwich enzyme-linked immunosorbent assay. In the assay, human IgE is captured by rabbit anti-human IgE (Dakopatts, Denmark). The antibody-IgE complex is then detected by peroxidase conjugated rabbit anti-human IgE (Dakopatts, Denmark). The total IgE was expressed in IU/ml using a standard which had been calibrated against a "Second International Reference Preparation, 1980" obtained from the National Institute for Biological Standards and Control, UK.

Meteorological data

Data for the Kuala Lumpur area were obtained from the Meteorological Department of Malaysia. The data includes monthly maximum and minimum temperatures, monthly mean temperature at 08.00 and 14.00 hours, monthly mean relative humidity at 08.00 and 14.00 hours, and monthly total rainfall.

RESULTS

Frequency of positive PT

If the results for dog hair and cockroach are excluded because they were not tested on all patients, it was observed that only 4% of the patients were allergic to a single allergen (Table 2). Most patients (39%) were allergic to a combination of 4 allergens and 16% were positive to all the allergens tested.

Prevalence rates

More than 70% of the patients tested were positive to *D. pteronyssinus, D. farinae,* house dust and cat fur (Table 3). Approximately less than 40% were positive to the other 4 allergens.

Pearson Chi-square analysis indicated that there was significant association between test results for house dust and the other allergens ($p < 0.0006$). Using Odds Ratio, the

Table 3. Prick test results of rhinitis patients

Allergen	Number of patients						% +ve
	n	-ve	1+	2+	3+	4+	
D. pteronyssinus	314	57	31	81	53	92	82
D. farinae	314	57	23	92	62	80	82
House dust	314	61	20	102	73	58	81
Cat fur	314	84	23	94	68	45	73
Dog hair	177	104	19	43	8	3	41
Mixed moulds	314	231	43	35	5	0	26
Mixed grass pollens	314	239	34	34	6	1	24
Cockroach	156	123	11	17	5	0	21

n = total number of patients

relative risks were determined of being positive to other allergen when a patient is positive to house dust (Table 4). It is apparent that for an individual who is allergic to house dust, there is a very high risk of the person being allergic to the dust mites and cat fur too.

Table 4. Association of house dust allergen prick test results with results of others

Allergen	Pearson Chi-square probability	Relative risk estimate
D. farinae	< 0.00001	20.3
D. pteronyssinus	< 0.00001	26.4
Cat fur	< 0.00001	22.3
Dog hair	0.00001	10.4
Mixed moulds	0.00002	9.1
Mixed grass pollens	0.00009	7.8
Cockroach	0.00053	9.3

Table 5. Average monthly positive prick test rates

Allergen	Average	S.D.
D. farinae	81.2	15.3
D. pteronyssinus	81.1	17.0
House dust	78.3	16.9
Cat fur	68.5	20.3
Dog hair	37.5	29.4
Mixed moulds	24.6	20.2
Cockroach	22.3	18.8
Mixed grass pollens	19.8	18.4

Total IgE

The total IgE of the 251 patients tested ranged from 48 - 74, 995 IU/ml with a median of 284 IU/ml. The values were not normally distributed.

Monthly PT positive rates

The highest average monthly rates were against *D. pteronyssinus* and *D. farinae*. That was followed closely with that for house dust. The lowest rate was that for grass pollen.

Examination of the monthly distribution of positive PT rates (Figs. 1 and 2) revealed that most of the allergens appeared to have 2 peaks. The first peak for *D. pteronyssinus* appeared between March and April, whereas the second, occurred around July or August. *D. farinae* and house dust had similar distributions as that of *D. pteronyssinus*.

Cat fur and dog hair first peaked in March or April. Their second peak was more variable, occurring between July to September

For most of the study period, mixed moulds and grass pollens appeared to have 3 peaks. The first peak occurred in January and the second peak in either April or May. The third peak was in September or October. There was no positive results to these two allergens towards the last three months of the study period, ie from July to September 1993.

There were two peaks for the cockroach allergen. The first peak occurred in March or April and the second in October. It must be noted that testing with cockroach allergen only commenced in September 1992.

Correlation of positive PT rates with meteorological data

Linear correlation of meteorological data with positive prick test results was examined at a 99% significant level. It was found that there was a significant correlation between positive rates for mixed moulds with mean maximum temperature ($r = 0.59$, $p = 0.004$) and mean temperature at 14.00 hours ($r = 0.70$, $p < 0.001$) (Fig. 3). Similarly there was a significant correlation between rates of grass pollen with the mean maximum temperature ($r = 0.54$, $p = 0.008$) and mean temperature at 14.00 hours ($r = 0.64$, $p = 0.002$) (Fig. 4). There was no other significant correlation.

DISCUSSION

It appears that allergy to multiple allergens is common among rhinitis patients in Malaysia. That will complicate management and necessitates that a panel of allergens be used for diagnosis. In Malaysia, such a panel

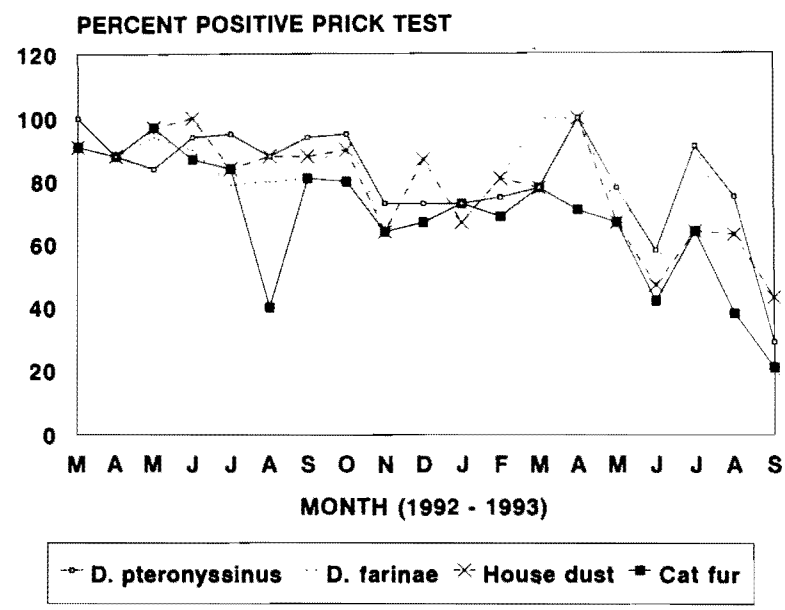

Fig. 1 Seasonal distribution of positive prick test rates for some inhalants.

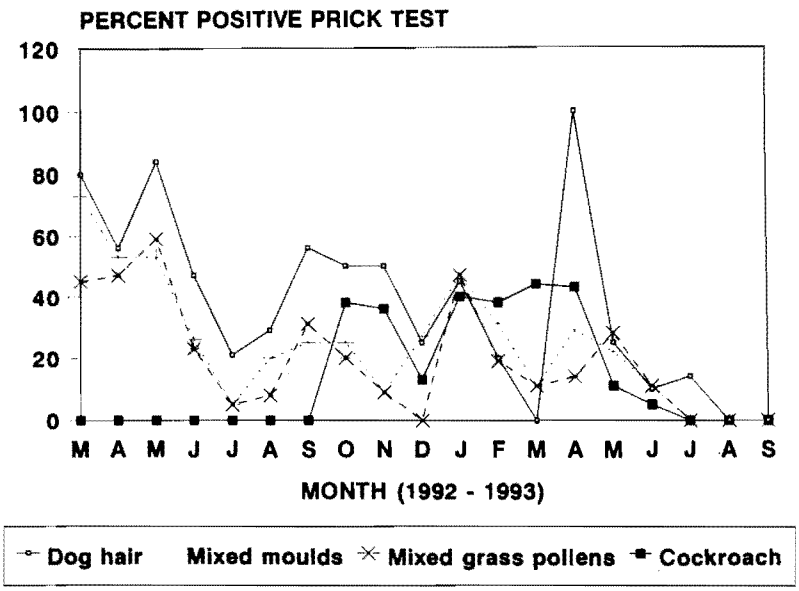

Fig. 2 Seasonal distribution of positive prick test rates for some inhalants.

for allergic rhinitis should include the following allergens: house dust, *D. pteronyssinus, D. farinae,* and cat fur; allergies to these allergens have been demonstrated in this study to be more prevalent. This is not unique to Malaysia as these allergens are of similar importance in other countries.[7]

House dust is a complex mixture which is very difficult to define. The significant association between test results of house dust and the other allergens is perhaps indicative that indeterminate quantities of these other allergens are present in the house dust. Of these other allergens, the house dust mites and cat fur may be the more important components as indicated by the relative high risks determined in this study in relation to house dust allergy. The major cat allergen *Fel d I* is present on very small particles in house dust which becomes air-borne readily. Thus a sensitive person can develop severe reactions by breathing in these air-borne particles without coming in direct contact with the animal.[8]

Effective and efficient house dust reduction procedures may reduce exposure not just to house dust allergens but to house dust mites and cat fur allergens as well. Most studies on the effect of reducing house dust mite allergen exposure on symptoms of allergic rhinitis have reported benefits.[9,10]

The wide range of total IgE obtained from the patients studied showed that when total IgE is low, it should not be assumed that allergies are not the underlying disease. The level of total IgE may be related to the number of allergens each patient is susceptible to as well to the level of specific IgE. However, due to the limited number of allergens tested in this study, such a correlation was not done as the findings shall be suspect. A significant correlation has been reported between total serum IgE and specific IgE to *D. pteronyssinus* and *D. farinae.*[11]

Due to various constraints, the study could not be completed for at least 2 years to obtain a more representative seasonal distribution pattern of positive

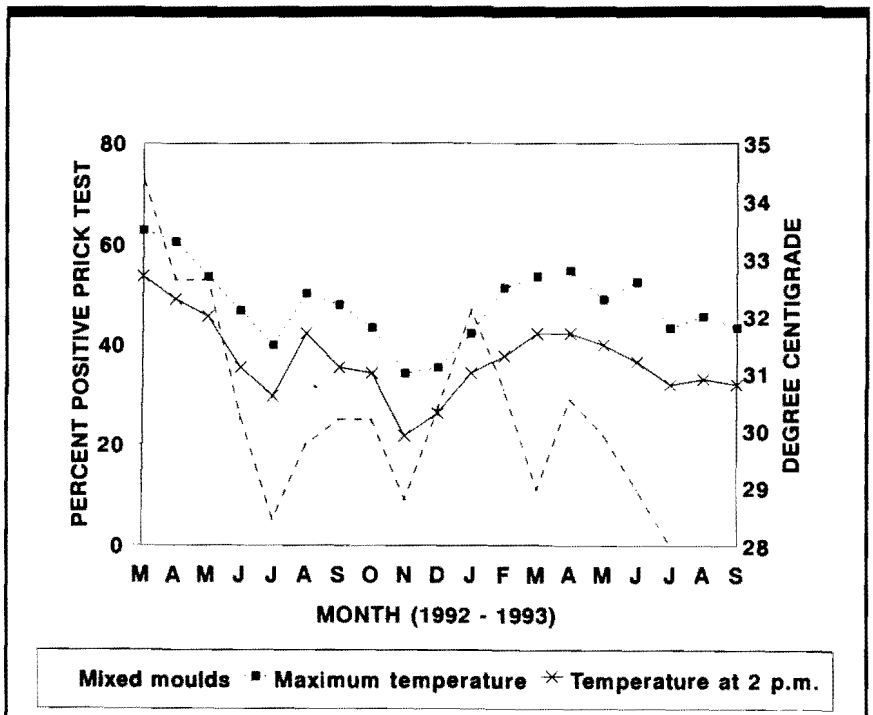

Fig. 3 Distribution of positive prick test rates against mixed moulds and mean daily temperatures.

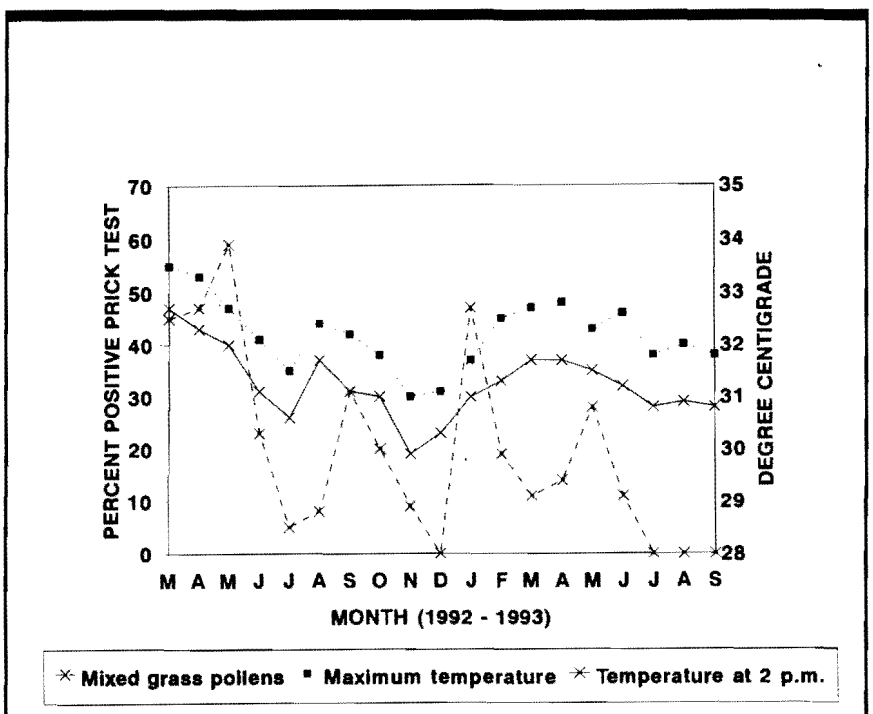

Fig. 4 Distribution of positive prick test rates against mixed grass pollens and mean daily temperatures.

PT results to the various allergens. From the data that are available, it is evident that there are peak periods for high positive reactions to all the allergens tested. Other studies may be necessary to determine whether the distribution patterns are related to the seasonal densities of the particular allergens. Local data on the seasonal distribution of allergens is not available. However, various researchers have indicated that in the temperate countries, there are distinct seasonal fluctuations of allergens of *D. pteronyssinus* and *D. farinae*.[12,13]

The climate in the tropics can basically be divided into wet and dry seasons. Daily temperatures are usually higher during the dry periods and these are also the periods of flowering. Thus it is no surprise that positive PT rates to mixed grass pollens have a positive correlation with day temperatures. The same is perhaps true for the mixed moulds. As the moulds and grass pollens allergens used in this study is a mixture of different species, the distribution pattern observed may be a cumulative effect of the different species. Further studies with individual grasses and moulds found locally shall present a more accurate picture and are being pursued.

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