Original Article

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Sensitisation to common allergens in children with allergic rhinitis

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ABSTRACT

Introduction: Allergic rhinitis is common in otorhinolaryngology practice. According to 'Allergy Rhinitis and its Impact on Asthma (ARIA), Clinical and Experimental Allergy Reviews' guidelines, the management of allergic rhinitis includes allergen avoidance. Therefore, it is important to know the allergens to which the patient is sensitised. This study was carried out to determine the prevalence of sensitisation to common allergens among children with allergic rhinitis seen in a tertiary referral centre in Malaysia. **Materials and Methods**: All children aged five to 12 years who had been referred to Otorhinolaryngology clinic Universiti Kebangsaan Malaysia Medical Center (UKMMC) from 2005 to 2010 with symptoms consistent with allergic rhinitis and had a skin prick test (SPT) were included in the study. The common allergens that had been used in the SPT were aeroallergens, food allergens and contact allergens. The database of SPT results was collected and reviewed. **Results:** A total number of 580 children were included in this study with 69.3% showing positive SPT. From the positive SPT results, a total of 1,515 sensitisations were observed with 60.9% sensitised to aeroallergens, 38.6% sensitised to food allergens and 0.6% sensitised to contact allergens. Among the aeroallergens, the house dust mite accounted for more than half of the sensitisations: *Dermatophagoides pteronyssinus* (27.9%), *Dermatophagoides farinae* (26.4%), *Blomia tropicalis* (26.0%). The most common food allergen sensitisation was seafood – crab (18.5%), prawn (18.0%) and squid (8.7%). Each of the other food allergens tested accounted for less than five percent of the positive SPT result. The contact allergen tested in this study was latex. **Conclusion:** This data represents a common allergen sensitisation in children with rhinitis symptoms residing in urban areas with house dust mites being the most common allergen sensitised in these children.

Keywords: Allergic rhinitis, children, common allergen, skin prick test

INTRODUCTION

Allergic rhinitis is a common disease affecting five to 50% of the global population, and its prevalence rates are inversely correlated with the standard of living. [1] It is one of the most commonly encountered conditions in Otorhinolargyngology practice. The peak incidence of allergic rhinitis occurs in childhood and adolescence. [2] Although not a life threatening condition, it has a great impact on the quality of life, especially when it affects children. According to the 'Allergy Rhinitis and its Impact

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on Asthma (ARIA), Clinical and Experimental Allergy Reviews' guidelines, allergen avoidance is an aspect in the management of allergic rhinitis. [1] Therefore, it is important to know the type of allergens to which a patient is sensitised. Skin prick test (SPT) is one of the commonly used methods of testing sensitisation towards certain allergens.

SPT is a valuable tool in screening for predisposition to immediate hypersensitivity reactions. [3] It is a widely used method of studying sensitisation and is quick, pedagogic, and inexpensive. [4] The size of the wheal in SPT can be influenced by many factors. [3] Therefore, a negative SPT result does not exclude allergy especially in children with clinical symptoms. In such cases, more sensitive and specific tests such as serum IgE levels can be performed. However, a study by Hill *et al*. showed that SPT appeared to be more sensitive than serum lgE antibody testing in the diagnosis of food allergy. [5] This study assessed the prevalence of positive SPT to common allergens among children with allergic rhinitis seen in a tertiary referral centre in Malaysia.

MATERIALS AND METHODS

Study Population

All children aged five to 12 years with symptoms consistent with allergic rhinitis referred to the Otorhinolaryngology clinics in Universiti Kebangsaan Malaysia Medical Centre (UKMMC) (2005 to 2010) and had SPT were included in this study.

Skin Prick Test (SPT)

SPT was performed on the volar surface of the forearm by a qualified nurse or doctor. The skin was punctured with a disposable lancet through a droplet of each allergen placed on the skin. The results were read after 15 minutes. The size of the wheals were outlined with a felt tip pen and transferred to the record sheet by adhesive transparent tape. A positive reaction was considered if the wheal had a diameter of 3mm or more. Examples of SPT are shown in Figure 1. The allergen extracts that were used in this study were from ALK Abello (Soluprick SQ, Denmark). A total of 39 allergens were used. In addition to this, a positive control using histamine and two negative controls using normal saline and sterile water were used in this study.

Data collection and analysis

The database of the SPT results was reviewed from January 2005 to May 2010 were collated. The allergens were categorised into three groups – aeroallergen, food allergen and contact allergen. Each allergen was compared using percentage in its own group.

Definition

Sensitisation was defined as at least one positive SPT reaction to the allergens tested.

RESULTS

A total of 580 children with allergic rhinitis underwent SPT. Altogether, 402 (69.3%) children had positive tests and these consisted of 60.9% (n=922) positive for aeroallergen, 38.6% (n=584) for food allergen and 0.59% (n=9) for contact allergen (latex) (Figure 2).

Altogether, there were 1,515 positive tests. Single and multiple sensitisations were observed in 207 and 195 respectively (Figure 2). Among the patients with multiple sensitisations, the mean number of sensitisations per patient was 6.7.

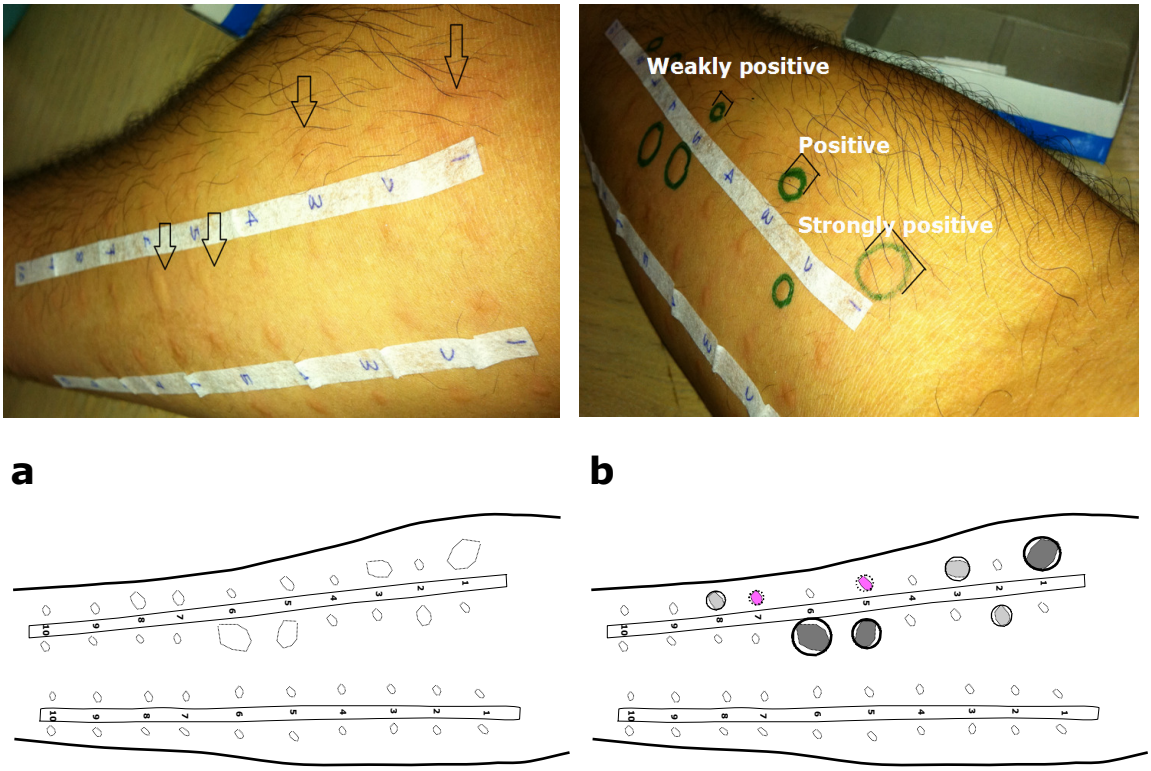

Fig 1: a) Skin Prick Test on the volar aspect of the forearm with control on the lower and allergens on the top side showing various reactions and some visibly positive before marking and measurements, b) after marking showing various type of positivity (dark grey: strongly positive, light grey positive and pink weakly positive).

Among the aeroallergens tested, house dust mite (Figure 3) accounted for more than half, highest with *Dermatophagoides pteronyssinus* (27.9%, n=257), followed by *Dermatophagoides farinae* (26.4%, *n*=243), *Blomia tropicalis* (26.0%, *n*=240). Other aeroallergens tested were cockroach (9.3%, *n*=86), grass (5.4%, *n*=50), cat fur (3.6%, *n*=33) and moulds (1.4%, *n*=13).

Among the 24 food allergens tested, seafood was the most common food allergens that had positive reaction. These consisted of crab 18.5% (*n*=108), followed by prawn, 18.0% (*n*=105) and squid, 8.7% (*n*=51). Other tested food allergens accounted for less than five percent positive SPT result with food allergens (Table 1).

Latex was the only contact allergen tested in this study. Altogether, nine patients had sensitisations to latex allergen (0.6%).

DISCUSSION

We showed that when SPT with common allergens were performed in children referred with symptoms of allergic rhinitis, more than half of the children had positive reaction. Most had multiple sensitisations towards the allergens tested. In this study, 3mm weal size was used as the lowest positive value based on the European Academy of Allergology and Clinical Immunology (EAACI) Subcommittee on Allergen Standardisation and Skin Test in

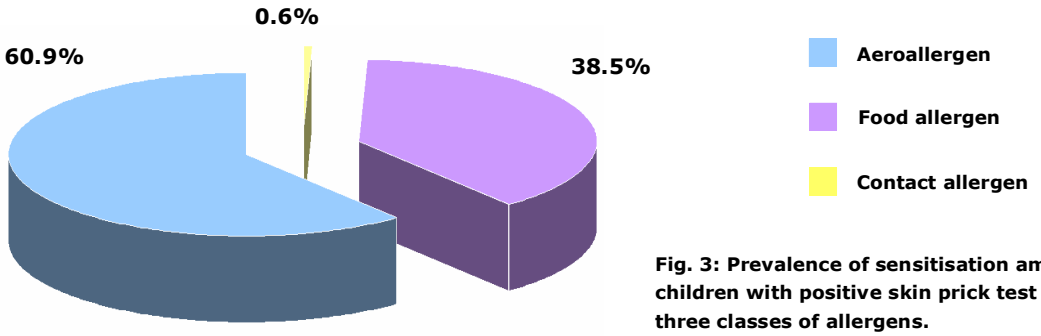

Fig. 3: Prevalence of sensitisation among children with positive skin prick test to the three classes of allergens.

1993. [6] The weal size of a positive test is dependent on several factors that include subject's sensitivity to the allergen, the quality and quantity of allergen in the preparation used, and the possible low responses to low molecular weight irritants such as glycerol, phenol and the impurities in the allergen preparation. [3] In order to avoid over estimation or over-diagnosis, we always compare the SPT results with the symptoms that patients have and re-evaluate after treatment that include measure to avoid allergens.

Although the prevalence of sensitisation is variable from one country to another, most of the recent studies have shown that aeroallergen sensitisation is more common than food allergen sensitisation. [3, 7] In this study, the aeroallergen sensitisation accounted for more than two third (60.9%) of the total sensitisation to the common allergens tested. Kulig *et al*. in 1999 followed a prospective birth cohort of 216 children from the age of one to six, described the natural course of sensitisation of food allergens and showed a decrease in annual incidence rates of sensitisation to food allergens. Sensitisation to food allergens declined from 10% at one year to 3% at six years. At the same time, incidence of sensitisation to aeroallergens increased from 1.5% at one year to 8% at six years. [8] Unfortunately, we did not

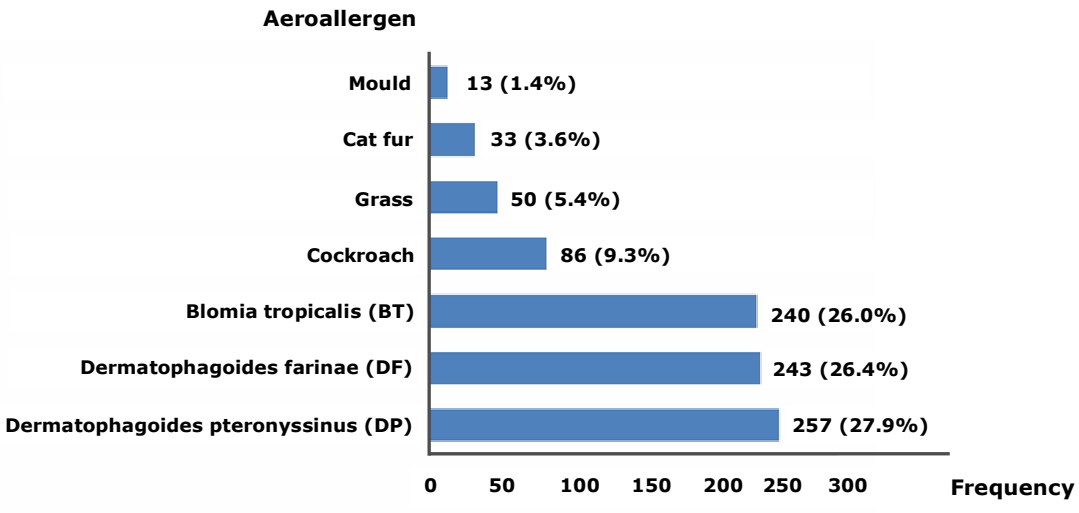

Fig. 3: Positive for aeroallergens.

follow-up the children yearly for the SPT. Despite older age at testing in our patients, it is possible that if annual SPT were done, similar findings may be observed given that the rate of aeroallergens sensitisation is much higher than food allergen sensitisations

There are many species of house dust mites according to geographical distribution and is influenced by temperature and humidity of the country. *Dermatophagoides pteromyssinus* (DP), *Dematophagoides farinae* (DP) and *Blomia tropicalis* (BT) are the most common house dust mite species in Southeast Asia and are the important sensitising allergens among Singaporean and Malaysian. [9, 10] In our study, house dust mites accounted for more than 60% of the sensitisation of the aeroallergens tested. The components of house dust mites that cause allergy reaction is the feacal material that contains potent digestive enzymes that highly allergenic. More that 95% of allergen cause by house dust mites contains in their faecal material. [11] Other than that, mites exoskeleton also can cause allergy reaction. Studies carried out in Singapore and Malaysia using enzyme-linked immunosorbent assay to detect specific IgE showed that *Blomia tropicalis* was the most common aeroallergen. [9] On the contrary, our study showed that *Dermatophagoides pteromyssinus* (27.9%) was the most common aeroallergen among children with rhinitis symptoms followed by *Dermatophagoides farinae* (26.4%) and *Blomia tropicalis* (26.0%). This is consistent with another study conducted in Malaysia that also showed that *Dermatophagoides pteromyssinus* and

Table 1: Positive test for food allergens.

Aeroallergen	**n**	**Overall positive**	**Proportion in aeroallergen**
	(922)	**100%**	**(60.9%)**
Crab	108	18.5	7.1
Prawn	105	18.0	6.9
Squid	51	8.7	3.4
Dhal	28	4.8	1.9
Soy	26	4.5	1.7
Chicken	24	4.1	1.6
Cockle	23	3.9	1.5
Red bean	23	3.9	1.5
Green bean	22	3.8	1.5
Wheat	20	3.4	1.3
Fish (mixed)	19	3.3	1.3
Milk	18	3.1	1.2
Fish Tengiri	16	2.7	1.1
Fish Kembung	15	2.6	1.0
Mutton	15	2.6	1.0
Egg white	14	2.4	0.9
Rice	12	2.1	0.8
Fish Bilis	11	1.9	0.7
Tomato	11	1.9	0.7
Barley	8	1.4	0.5
Egg yolk	8	1.4	0.5
Peanut	3	0.5	0.2
Orange	2	0.3	0.1
Banana	2	0.3	0.1
Total	584	100	38.6

Dermatophagoides farinae were the common aeroallergens. [10] However in this study *Blomia tropicalis* was not tested. Many other studies from other part of the world have also reported that house dust mite is the most common aeroallergen in allergic patients. [7, 12-14] However, some these studies did not report on the types of house dust mites tested.

The prevalence of food allergy sensitisations among the children in our study is much less compared to aeroallergens. It accounted for 38.6% of the total positive test. Although there are many food allergens tested, the majority of children with rhinitis had sensitisation towards seafood. Importantly, seafood allergy can be potentially severe and it is often noted in adults. [15-17] The most common seafood allergy in our study was crab (18.5%), followed by prawn (18.0%) and squid (8.7%). The prevalence of food allergy is likely to be different from one geographical region to another. Meta-analysis on the prevalence of food allergy by Rona *et al*. concluded that there is marked heterogeneity in the prevalence of food allergy. [18] One of the studies on the frequency of food allergies in Australia and Southeast Asia has recently shown that egg, cow's milk and peanut were the most common food allergens in Australia, but there were divergent results from different regions of Southeast Asia. [19] In our study, egg allergy accounted for 3.4% (egg white plus egg yolk) compared to milk (3.1%) and peanuts (0.5%). It is unclear whether the differences in reactivity to foods are due to genetic or cultural factors, but the findings raise the possibility that genetic susceptibility to food allergy may operate at the T-cell level modulated by the major histocompatibility complex. [19] The difference in the prevalence of food allergy in children in the different parts of the world can also be due to the common food varieties found in that particular country. Therefore, allergy testing is important to determine the food allergen sensitisation in the subject population.

In conclusion, our study showed that sensitisation to aeroallergen and food allergens were common among children with allergic rhinitis referred to our centre. Among aeroallergen, sensitisation to house dust mites were common. Sensitisation to seafood was also common. Therefore, parents should be informed to avoid of such allergens as part of the management of their children allergic rhinitis. Further studies are required to assess whether our findings can be generalised to other centres and regions of the countries including the rural areas.

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