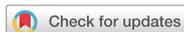


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Skin prick test reactivity to aeroallergens in adult allergy clinic in Thailand: a 12-year retrospective study

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ABSTRACT

Background: The global prevalence of allergic rhinitis, asthma, and atopic dermatitis has risen significantly over the last 2 decades. Allergic sensitization to aeroallergen is a major risk factor in developing the allergic disease. The prevalence of aeroallergen sensitization varies in different regions and countries.

Objective: To determine the prevalence of common aeroallergen sensitization and the atopic status among adult patients.

Methods: A cross-sectional, retrospective study. The data were collected from medical records and database of the result of skin prick test of patients who had the allergic symptoms or chronic urticaria in adult allergy clinic, Ramathibodi hospital from January 2004 to December 2015.

Results: A total of 1,516 of patients (female, 1,118 [73.7%]) were enrolled. The mean ages of participants were 41.34 (standard deviation, ± 16.5) years. Fifty-eight percent (58%) of patients were diagnosed with allergic rhinitis, 19.7%, 3.2%, and 9.2% with asthma, atopic dermatitis, and chronic urticaria respectively. In the chronic urticaria group, 57.4% underwent the positive skin prick test to common aeroallergens. Mites were responsible for the most common inhaled allergen sensitization in this study as 50.1% of *Dermatophagoides pteronyssinus*, 32% of *Dermatophagoides farinae*, and 31.5% of house dust. Cockroach was the second most common aeroallergen sensitization as 32.3% followed by grass pollen, Bermuda (21.1%) and timothy (13.6%). The animal dander, cat and dog, occupied 12.9 and 10% respectively.

Conclusion: Mites were the most common cause of aeroallergen sensitization in all patients followed by cockroach, grass pollen, and animal dander. However, Bermuda sensitization has increased significantly in the last 6 years.

Keywords: Allergens; Prevalence; Skin test; Rhinitis; Urticaria; Asthma

INTRODUCTION

The global prevalence of allergic rhinitis, asthma and atopic dermatitis has risen significantly over the last 2 decades [1-6]. From the previous study in Asia-Pacific, there was increased in the prevalence of allergic rhinitis from 37.9% to 50.6% and asthma from 12.2% to 14.5% [4].

Allergic disease is a health problem affecting the quality of life in the aspect of sleep, school, work, and social life [7]. The etiology of allergic diseases are complex resulting from genetics [8-10] and interacting environment factors [11-14]. Allergic sensitization to aeroallergens is a major risk factor for developing the allergic disease [15-17]. The previous study in western countries demonstrated 15%–20% of preschool children sensitized to inhalant allergens by the age of 7 years were significantly increased risk of being asthma [18].

The prevalence of aeroallergen sensitization varies in different regions and countries. In Sweden, cat was the most common aeroallergen sensitization [19] while Japanese cedar pollen was taken into account in Japan [20].

The purpose of this study was to illustrate the prevalence of the common aeroallergen sensitization by skin prick test and atopic status of patients who have been visited to adult allergy clinic at Ramathibodi hospital, Thailand from January 2004 to December 2015.

MATERIALS AND METHODS

The study was approved by the ethic committee of Ramathobodi Hospital, Mahidol university. The permission number is ID-10-59-52. There is no conflict of interests.

A cross-sectional retrospective study recruited 1,516 patients who had allergic symptoms or urticaria and had done skin prick test to the common aeroallergens in the adult allergy clinic, Ramathibodi hospital over 12-year periods between January 2004 and December 2015.

We reviewed the medical records and database of result of the skin prick test in all participants and the diagnosis of allergic diseases were confirmed by allergist, pulmonologist, and otolaryngologist. Demographic data including sex, age, atopic diseases, and the result of skin prick test to common aeroallergens were collected. The skin prick test was conducted using a standard commercial extract panel (Alk-Abello, Lincoln Diagnostics, Dallas, Tx, USA), included 17 aeroallergens (*Dermatophagoïdes pteronyssinus*, *Dermatophagoïdes farinae*, house dusts, cockroach, Bermuda, timothy, Johnson grass, acacia, careless weed, cat, dog, *Alternaria*, *Trichophyton*, *Candida*, *Aspergillus*, moldmix, mixed feather). The positive result of skin prick test was declared if wheal is ≥ 3 mm in diameter. Histamine and normal saline were applied as positive and negative control. All testing was performed by 2 investigators.

Descriptive statistics were applied to describe demographic data and the result of skin prick tests. IBM SPSS ver. 18.0 (IBM Co., Armonk, NY, USA) were used with license usage of Mahidol university.

RESULTS

Study population

A total of 1,516 patients were enrolled in this study. Seventy-three point seven percent (73.7%) are female patients and the mean aged was 41.34 ± 16.5 years. Allergic rhinitis is the most common allergic disease (58%), followed by asthma (19.7%), atopic dermatitis (3.2%), and allergic conjunctivitis (3.2%). Chronic urticaria was documented in 9.2%. 4.1% of the participants had history of nonsteroidal anti-inflammatory drugs allergy (**Table 1**).

Table 1. Demographic data of 1,516 patients in adult allergy clinic from 2004 to 2015 in a tertiary care hospital, Thailand

Variable	Value
Female sex	1,118 (73.7)
Age (yr)	41.34 ± 16.50
Underlying disease	
Allergic rhinitis	879/1,516 (58)
Asthma	299/1,516 (19.7)
Chronic urticaria	140/1,516 (9.2)
Atopic dermatitis	49/1,516 (3.2)
Allergic conjunctivitis	49/1,515 (3.2)
Chronic rhinosinusitis	44/1,513 (2.9)
History of NSAIDs allergy	62/1,516 (4.1)

Values are presented as mean ± standard deviation.
NSAID, nonsteroidal anti-inflammatory drug.

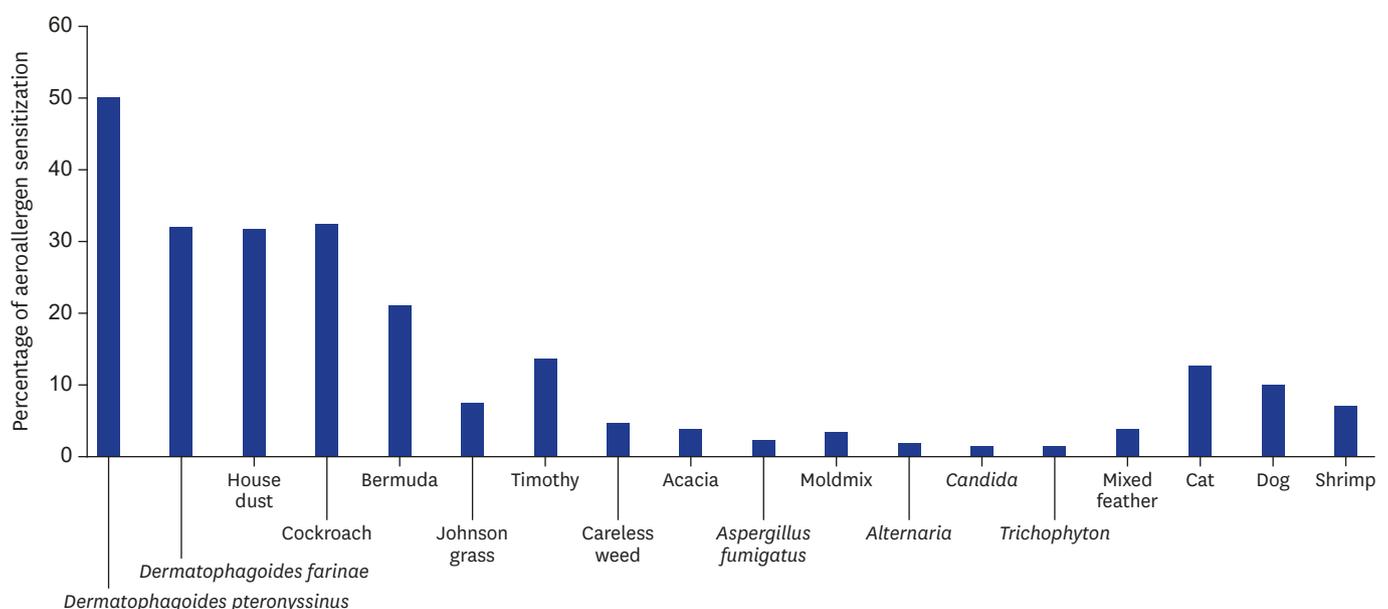
Prevalence of common aeroallergens sensitization

The most frequent aeroallergen sensitization that resulted in positive skin prick test was mites (*D. pteronyssinus*, 50.1%; *D. farina*, 32%) followed by house dust 31.5%, cockroach 32.3%, grass pollen (Bermuda, 21.1%; timothy, 13.6%) and animal dander (cat, 12.9%; dog, 10%) (Fig. 1). In 57.4% of patients with chronic urticaria demonstrated positive skin prick test to common aeroallergens.

Allergic diseases and common aeroallergen sensitization

In asthma patients, 75.9% sensitized mites followed by cockroach (33.9%), Bermuda (18.9%), timothy (16%), cat (12.2%), and dog (7.5%). Fungal sensitization was reported in asthmatic patients as 5.3% of *Trichophyton*, 3.8% of moldmix, 2.4% of candida, 2.2% of alternaria, and 1.7% of *Aspergillus fumigatus*. Only *Trichophyton* had statistical significance ($p = 0.017$) correlated with asthma.

In participants who had chronic rhinitis symptoms, 58% of these group sensitized to common aeroallergens. Mites were responsible for the most common aeroallergen

**Fig. 1.** Prevalence of common aeroallergen sensitization in a tertiary care hospital, Thailand.

sensitization (71%) in allergic rhinitis patients followed by 31.3% of cockroach, 21.6% of Bermuda, 13.5% of timothy, 12.8% of cat, and 10.3% of dog. *D. farinae* is the significant aeroallergens that correlated with allergic rhinitis ($p = 0.03$).

Sixty-nine point four percent (69.4%) of atopic dermatitis patients sensitized mites followed by 25% of Bermuda, 20.8% of cat, 18.8% of cockroach, 17% of timothy, and 14.6% of dog. In chronic urticaria patients, 67.9% sensitized mites followed by cockroach (25.2%), Bermuda (20.1%), cat (12.2%), timothy (11.5%), Johnson grass (10.1%), and dog (8.6%).

The comorbidities of allergic diseases were illustrated in this study, 54.2% (162 of 299) of asthma patients was diagnosed allergic rhinitis, while 18.4% (162 of 879) of allergic rhinitis patients was diagnosed asthma.

Changing trends of common aeroallergen sensitization

The prevalence of aeroallergen sensitization was plotted in line graphs as Fig. 2. Mites and cockroach were occupied as the most common and the second most common aeroallergen

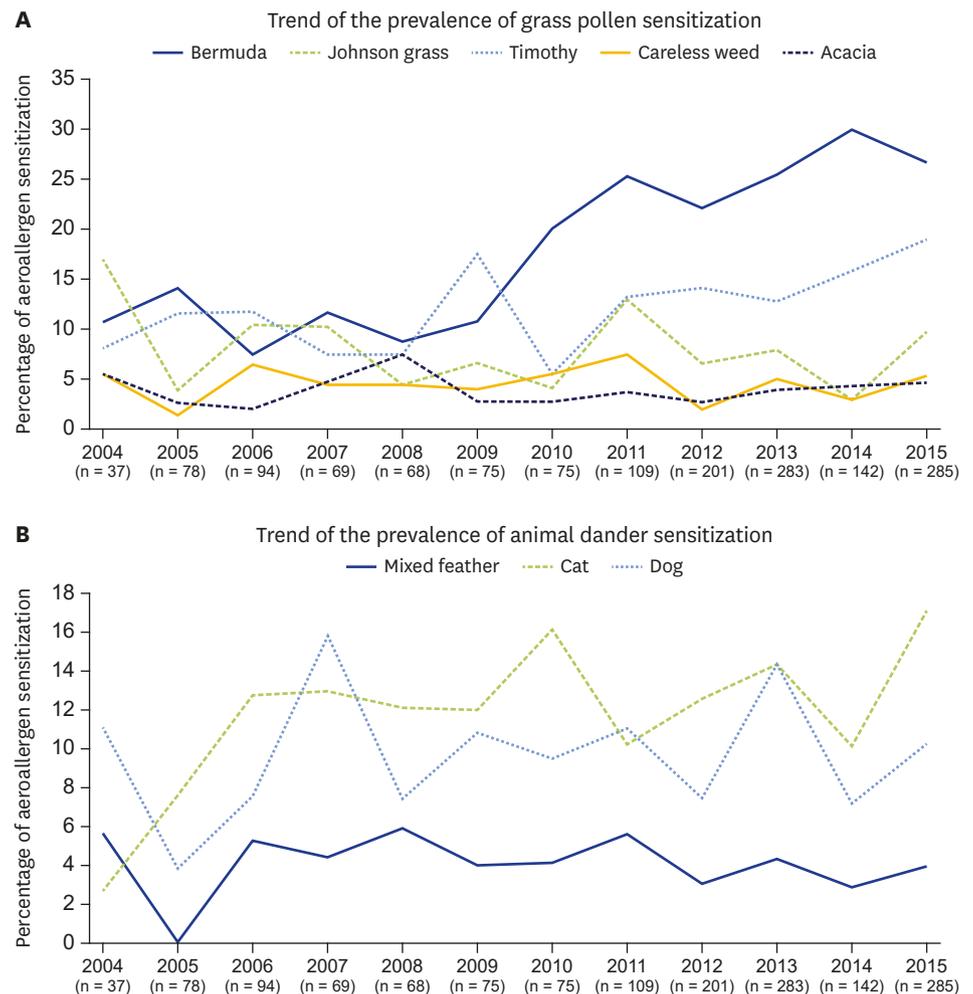


Fig. 2. Changing trend of the prevalence of common aeroallergen sensitization over a 12-year period in a tertiary care hospital, Thailand. (A) Trend of the prevalence of grass pollen sensitization. (B) Trend of the prevalence of animal dander sensitization. (C) Trend of the prevalence of mites, house dust and cockroach sensitization. (D) Trend of the prevalence of fungal sensitization. (continued to the next page)

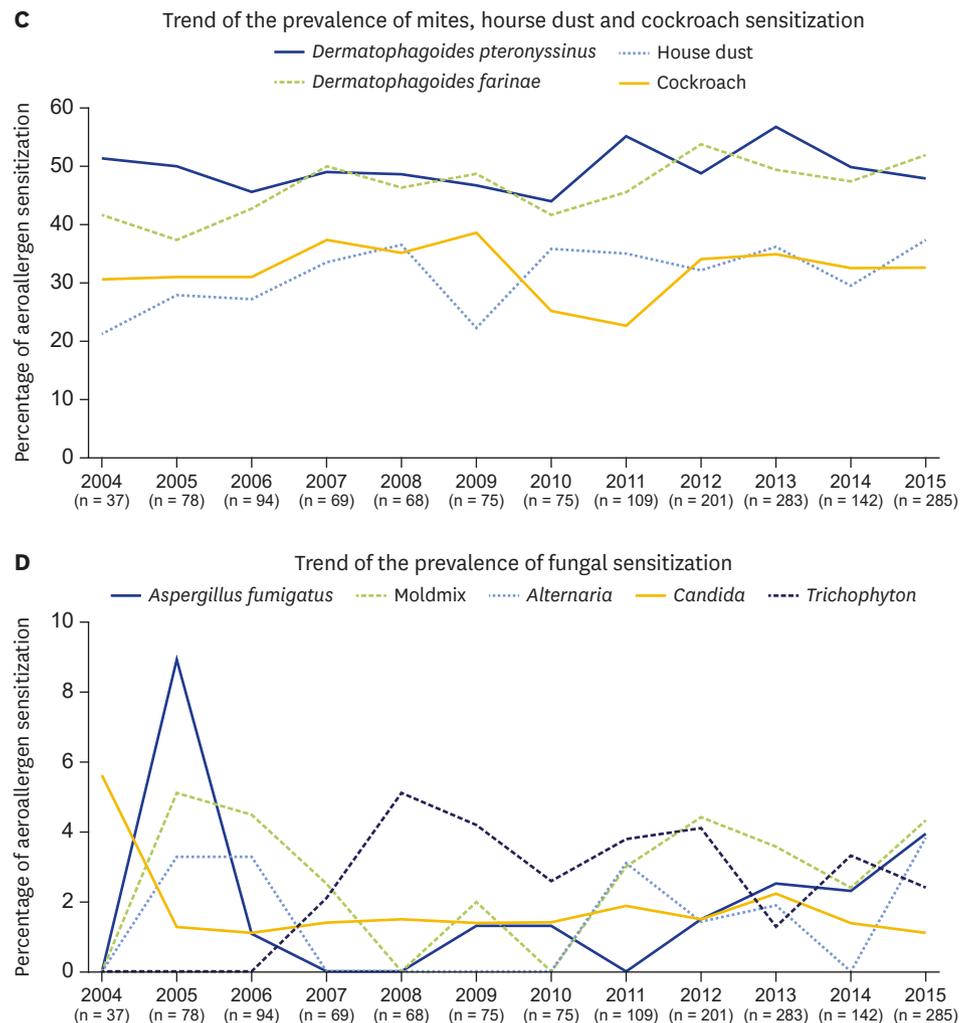


Fig. 2. (Continued) Changing trend of the prevalence of common aeroallergen sensitization over a 12-year period in a tertiary care hospital, Thailand. (A) Trend of the prevalence of grass pollen sensitization. (B) Trend of the prevalence of animal dander sensitization. (C) Trend of the prevalence of mites, house dust and cockroach sensitization. (D) Trend of the prevalence of fungal sensitization.

sensitization, however, those trends remained stable for all over the periods. In contrary to grass pollen, there was a significant increase in the prevalence of Bermuda sensitization from positive skin prick test in the last 6 years from 10.8% in 2009 to 26.7% in 2015. Similarly, timothy sensitization was increased significantly from 5.4% in 2010 to 18.9% in 2015. The prevalence of cat sensitization was gradually increased from 2.8% in 2008 to 17.1% in 2015.

DISCUSSION

Mites were the highest percentage of common aeroallergen sensitization (*D. pteronyssinus*, 50.1%; *D. farinae*, 32%) followed by house dust 31.5%, cockroach 32.3%, grass pollen (Bermuda, 21.1%; timothy, 13.6%) and animal dander (cat, 12.9%; dog, 10%). Similarly to the previous study of common causative allergens in allergic rhinitis patients that revealed house dust mite is the most common allergens in our country [4].

Mites allergen sensitization associated with the risk of asthma in children and adults as described by several studies [15, 21-24]. Arshad et al. [15] studied in 1,456 children and reported 50% of participants who sensitized to mite had asthma. The previous study in 384 adult patients found 175 of patients (45.6%) who sensitized to house dust mites had asthma [24]. In this study demonstrated 20.9% (227 of 1,088) of patients who sensitized to mite had asthma. However, the statistical significance of mite sensitization was not shown in asthmatic patients ($p = 0.075$) compare with nonasthmatic patients.

The comorbidities of allergic diseases were depicted in this study. Fifty-four point two percent (54.2%) of asthma patients had allergic rhinitis, while 18.4% of allergic rhinitis patients had asthma. This result was similar to the previous report that found 55%–75% of asthmatic patients had allergic rhinitis while 13.9%–25% of allergic rhinitis patients had asthma [25].

In this study illustrated that 67.9% of patients with chronic urticaria had positive skin prick test to common aeroallergens. The various previous studies reported the positive skin prick test to aeroallergens and food allergens in patient with chronic urticaria about 27.4%–64% [26-28].

Kulthanan et al. [29] reported 47.7% of chronic urticaria patients had positive skin prick test which classifies as 30% to food allergens, 41% to aeroallergens, and 22.7% to both food and aeroallergens.

In 42.9% (60 of 140 patients) of chronic urticaria patients had only urticaria without other atopic diseases which in these group sensitized to aeroallergens in 70% (40 of 60 patients). This result demonstrated the higher percentage of positive skin test to common aeroallergens in chronic urticaria patients than the previous reports. Caliskaner et al. [27] illustrated the significant association between mite sensitization in patients who had chronic urticaria without other atopic diseases. However, the statistic significant correlation between common aeroallergens and chronic urticaria was not documented in our study.

Despite the fact that mites are the major indoor allergen, the prevalence of mites sensitization in each year remained steady over the 12-year period. While the prevalence of Bermuda sensitization was increased significantly in the last 6 years. Furthermore, there was gradual increase in the prevalence of cat sensitization over the time. The possible reasons are due to more cat ownership in the societies [30].

In conclusion, mites were the most common aeroallergen sensitization in Thailand followed by cockroach, grass pollen, and animal dander. However, the prevalence of Bermuda sensitization is increased significantly in the last 6 years. The prevalence of sensitization to aeroallergens was common in chronic urticaria patients.

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