ORIGINAL ARTICLE

Skin Prick Test Reactivity to Aeroallergens in Yala Hospital

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Background: Diagnosis of allergic rhinitis relies on a comprehensive approach, including patient history and physical examination. Additionally, a skin prick test can aid in guiding patients towards effective allergen avoidance strategies and treatment plans.

Objective: To identify the most common aeroallergen sensitizations among allergic rhinitis patients in Yala Hospital and to compare patient characteristics, such as symptom severity or frequency between the skin prick test-positive and negative groups.

Materials and Methods: The present study was a retrospective analytic study. The data were collected from medical records of all chronic rhinitis patients who underwent skin prick test at Yala Hospital between April 1, 2023 and October 31, 2024. Unpaired t-test, chi-square test, and odds ratio were used, with a significance level of 5% (p of less than 0.05).

Results: One hundred forty-four chronic rhinitis patients underwent skin prick test. Mean ages was 25±16.6 years. Ninety-one patients (63.2%) had positive test and fifty-three patients (36.8%) had negative test. House dust mites were the most aeroallergens sensitized, *Dermatophagoides pteronyssinus* 93.4% and *Dermatophagoides farinae* 84.6%, followed by cockroach 33%, cat hair 17.6%, dog hair 1.1%, and *Cladosporidium* 1.1%. There was no careless weed and para-grass sensitization. There was an association between the frequency of symptom and the result of skin prick test (p<0.001). Patients with persistent symptoms were 6.72 times more likely to exhibit a positive skin prick test compared to those with intermittent symptoms. No significant association was observed between the severity of symptoms and the results of the skin prick test (p=0.145).

Conclusion: The present study found house dust mites to be the most prevalent aeroallergen sensitization among allergic rhinitis patients at Yala Hospital. Patients presenting with persistent symptoms were significantly more likely to exhibit a positive skin prick test compared to those with intermittent symptoms. Consequently, for patients with chronic rhinitis who experience intermittent symptoms, a skin prick test may not be necessary to save healthcare costs. However, for patients with chronic rhinitis and persistent symptoms who have not responded to treatment, a skin prick test is recommended. This is because the likelihood of a positive skin prick test is higher in this group, allowing for targeted allergen avoidance strategies and potential allergen immunotherapy.

Keywords: Skin prick test; Allergic rhinitis; Aerollergens

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Rhinitis is diagnosed by the presence of 1 or more of the following symptoms, nasal congestion, rhinorrhea, sneezing, or itching[1]. Rhinitis can be classified by the pathogenesis into allergic and non-allergic rhinitis (NAR). Allergic rhinitis (AR) is an inflammatory disorder of the nasal mucosa triggered by the inhalation of allergens. Upon allergen exposure, individuals with AR release an immunoglobulin E (IgE), mediated immune response, leading to the release of inflammatory mediators and characteristic symptoms such as nasal congestion, rhinorrhea, sneezing, and itching[2]. Serum specific IgE or skin testing are allergy testing used to confirm diagnosis of AR. The prevalence of AR ranged from 10% to 30% of adults and up to 40% of children[3].

In clinical practice, especially in primary care or in the hospitals without rhinologists, the diagnosis of AR is often made solely by history taking. The skin prick test (SPT), recommended by Thai Allergic Rhinitis Practice Guideline 2022[2], plays a crucial role in confirming AR and identifying specific aeroallergens that trigger symptoms and should be done by medical personnel supervised by a rhinologist or allergy doctor.

The SPT demonstrates good diagnostic accuracy, with sensitivity and specificity exceeding 80%[4]. The SPT offers a safe and well-tolerated testing method suitable for a wide range of patients, from young children to the elderly, due to its ease of administration.

Variations in aeroallergens sensitization across Thailand's diverse geographic regions remain

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understudied. Identifying the specific allergens responsible for rhinitis symptoms empowers patients to avoid allergens exposure, potentially leading to significant symptom reduction. House dust mites (HDM), for example, have been identified in previous studies as a common cause of AR in Thailand[5-7]. In Southern Thailand, the study conducted by Sangchan et al. revealed that HDM and cockroach were the most prevalent sensitized aeroallergen among children in Songkhla Province[8]. Therefore, the primary objective of the present study was to identify the most common aeroallergen sensitizations among AR patients, including children and adults in Yala, which is the southernmost province in Thailand and has a tropical climate.

The subjects with SPT positive were defined as AR and the subjects with SPT negative were defined as NAR[4]. Katel et al. found no significant relationship between AR severity and the type of aeroallergen, but there was an association between AR severity and type of sensitization such as mono- or poly-sensitization[7]. Furthermore, Pothirat & Chaiwong found that the AR subjects had lower age and long duration of disease compared to the NAR subjects[5]. Therefore, the secondary objective of this study was to identify additional differences between AR and NAR subjects, particularly in the severity and frequency of their symptoms.

Materials and Methods

The study was approved by the Ethic Committee of Yala Hospital, number 20/2567. There is no conflict of interests.

The present study was a retrospective analytical study. Data were extracted from the medical records of all chronic rhinitis patients who underwent skin prick testing at Yala Hospital between April 1, 2023 and October 31, 2024. The inclusion criteria were 1) patients age 6 to 60 years old, 2) patients were diagnosed as chronic rhinitis by history taking and physical findings, and 3) patients consented to perform SPT. Exclusion criteria were: 1) patients who had contraindications for testing including pregnancy, uncontrolled asthma, severe eczema, skin dermatographism, and severe underlying disease, 2) patients who did not stop antihistamine, anti-depressant drugs, or 30 mg of oral prednisone seven days prior to testing, and 3) patients who did not stop applying topical steroid at forearm three weeks prior to testing.

The sample size estimation was calculated by the Cochran's formula for unknown population. The present study required a sample size of 138 patients to provide 95% confidence level with p=10% of global prevalence AR(1) (z=1.96, e=0.05, p=0.1).

Demographic data such as gender, age, comorbidities, and frequency and severity of symptoms were recorded. The frequency and severity of AR were classified by the World Health Organization (WHO)[9]. The frequency of symptom has been divided by intermittent, which is less than days per week or less than four consecutive weeks per year and persistent, which is more than four days per week and more than four consecutive weeks per year. The severity of symptoms has been classified as mild for symptoms that did not interfere with quality of life such as impairment of daily activities, work or school performance, and moderate to severe for symptoms that interfered with quality of life. Patients were divided into four age groups as 6 to 12 years for child, 13 to 20 years for adolescent, 21 to 35 years for young adult, and 36 to 60 years for middle-aged adult.

SPT was performed using eight aeroallergens extract (*Dermatophagoides pteronyssinus* (DP), *Dermatophagoides farina* (DF), American cockroach, cat hair, dog hair, careless weed, para-grass, *Cladosporidium*), positive control, which is histamine, and negative control, which is 50% glycerinated phenol saline. Eight aeroallergens, along with a positive and negative control, were applied to the patient's forearm. A 25-gauge needle then gently pricked the skin surface to introduce the allergens, avoiding penetration that would cause bleeding. Following the SPT, wheal and flare diameters were measured at 15 to 20 minutes to determine test results. A wheal diameter of 3 mm or larger compared to the negative control was interpreted as a positive SPT[10].

Statistical analysis was performed using SPSS Statistics, version 17.0 (SPSS Inc., Chicago, IL, USA). Descriptive data were reported in the form as numbers and percentage. Continuous data were reported using the mean and standard deviation. Unpaired t-test, chi-square test, and odds ratio were used to test an association between categorical variables. A p-value less than 0.05 was considered significant.

Results

One hundred forty-four patients with chronic rhinitis underwent SPT. The mean age of the participants was 25±16.6 years. Demographic data such as gender, the frequency of symptom, the severity of symptom, and the airway comorbidities are shown in Table 1.

Table 1. Demographic data of 144 chronic rhinitis patients performed SPT in Yala Hospital

Variables	Total; n (%)
Sex	
Male	55 (38.2)
Female	89 (61.8)
Age groups	
6 to 12 years (child)	57 (39.6)
13 to 20 years (adolescent)	16 (11.1)
21 to 35 years (young adult)	27 (18.8)
36 to 60 years (middle aged adult)	44 (30.6)
Classified by the frequency of symptom	
Intermittent	41 (28.5)
Persistent	103 (71.5)
Classified by the severity of symptom	
Mild	62 (43.1)
Moderate to severe	82 (56.9)
Airway comorbidities	
Asthma	24 (16.7)
Chronic rhinosinusitis (CRS)	20 (13.9)

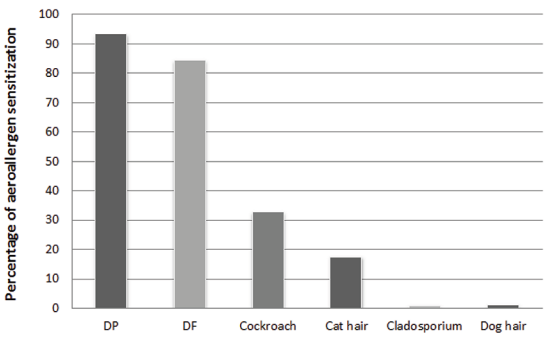

Figure 1. Percentage of aeroallergen sensitization by skin prick test in Yala Hospital.

There were 91 patients (63.2%) had positive SPT and 53 patients (36.8%) had negative SPT. The HDM had the highest number of positive results, DP 93.4% and DF 84.6%, followed by American cockroach 33.0%, cat hair 17.6%, dog hair 1.1%, and *Cladosporidium* 1.1%. There was no careless weed and para-grass sensitization, as shown in Figure 1.

From Table 2, the mean age of the SPT-positive group was 21.9±15.8 years, while the SPT-negative group had a mean age of 30.2±16.9 years (p=0.004). A significant association between age and SPT positivity was observed (p=0.022). Children with chronic rhinitis were more likely to be SPT-positive, while middle-aged adults were more likely to be SPT-negative.

From Table 3, a statistically significant association was observed between symptom persistence and positive SPT results (p<0.001). Patients with persistent symptoms were 6.72 times more likely to exhibit a positive SPT compared to those with intermittent symptoms. In the SPT positive group, 78 patients (85.7%) had persistent symptoms and 13 patients (14.3%) had intermittent symptom, while in the SPT negative group, 25 patients (47.2%) had persistent symptom and 28 patients (52.8%) had intermittent symptom. No significant association was observed between the severity of symptoms and the results of the SPT (p=0.145).

Table 2. Patient's characteristics of skin prick test positive and negative group

	SPT positive (n=91)	SPT negative (n=53)	p-value
Age (year); mean±SD	21.9±15.8	30.2±16.9	0.004*
Age group; n (%)			
6 to 12 years (child)	42 (46.1)	15 (28.3)	0.022*
13 to 20 years (adolescent)	12 (13.2)	4 (7.5)	
21 to 35 years (young adult)	17 (18.7)	10 (18.9)	
36 to 60 years (middle-aged adult)	20 (22.0)	24 (45.3)	
Airway comorbidities; n (%)			
Asthma	18 (19.8)	6 (11.3)	0.189
CRS	7 (7.7)	13 (24.5)	0.005*

SPT=skin prick test; CRS=chronic rhinosinusitis; SD=standard deviation
* p<0.05, statistical significance

Table 3. The frequency and severity of symptom of skin prick test positive and negative group

	SPT; n (%)		Odd ratio (95% CI)	p-value
	Positive (n=91)	Negative (n=53)		
Frequency of symptom				
Persistent	78 (85.7)	25 (47.2)	6.72 (3.02 to 14.91)	<0.001*
Intermittent	13 (14.3)	28 (52.8)		
Severity of symptom				
Moderate to severe	56 (61.5)	26 (49.1)	1.66 (0.83 to 3.29)	0.145
Mild	35 (38.5)	27 (50.9)		

SPT=skin prick test; CI=confidence interval
* p<0.05, statistical significance

Discussion

The authors demonstrated an age-related association with rhinitis subtype. The mean age of the SPT-positive group was 21.9±15.8 years, while the SPT-negative group had a mean age of 30.2±16.9 years (p=0.004). Younger patients, especially in children with chronic rhinitis, were more likely to exhibit AR, or SPT-positive, whereas older patients

especially in middle-aged adult were more likely to present with NAR, or SPT-negative. These findings were consistent with Zhu et al.'s study[11], which reported a significantly higher mean age in NAR patients of 31.8±16.7 years compared to AR patients at 26.3±14.8 years (p=0.0001). However, Kalpaklioglu & Kavut's[12] study did not identify a significant age difference between AR and NAR patients.

Furthermore, the present study revealed that chronic rhinitis patients with chronic rhinosinusitis (CRS) were SPT-negative, aligning with Vichyanond et al.'s[13] findings that snoring and sinusitis were predominant symptoms in NAR patients.

The present study found that HDM were the highest percentage of common aeroallergen sensitization with DP at 93.4% and DF at 84.6%, followed by cockroach at 33%. The present study is similar to the previous study in Thailand that revealed HDM is the most common aeroallergen sensitization in Thailand[5-8,14,15]. The present study findings also indicate that geographic variations within Thailand do not significantly impact the types of aeroallergens to which individuals are sensitized. Whether residing in the northern[5], central[7,14], or southern[8,15] regions, both children[8,15] and adults exhibited comparable patterns of aeroallergen sensitization.

Additionally, the authors found a statistically significant association ($p<0.001$) between symptom persistence and the likelihood of positive SPT results or AR diagnosis. Patients with persistent symptoms were found to be 6.72 times more likely to yield a positive SPT or be diagnosed with AR than those with intermittent symptoms. However, there was no statistical association between the severity of symptom and the result of SPT (p=0.145). The present study result was supported by the previous study by Bachert et al.[16] that reported that the AR patient has more persistent symptoms than the NAR patient. These findings of the present study may be applied to patients presenting with infrequent episodes of chronic rhinitis. In settings without access to skin prick testing, it is crucial to consider a broad differential diagnosis, including NAR, infectious rhinitis, and sinusitis, before concluding that AR is the primary cause. However, the present study findings were different from the study of Ibekwe et al.[17] in a 2016 Nigerian study, which did not observe a significant association between SPT results and either symptom frequency or severity. The present study findings also differed from those of Kalpaklioglu & Kavut's study[12] and Mølgaard et al.[18] who reported that NAR have more persistent but equally severe symptoms compared to subjects with AR. Due to the inconsistencies observed in studies, additional research is warranted to explore the relationship between symptom severity and frequency in both AR and NAR patient populations.

There were limitations in the present study. Firstly, this study's used only eight commercial allergens. This might have underestimated the overall prevalence of AR. As a result, direct comparisons with other studies may be limited. Secondly, accurately classifying the severity and frequency of symptoms can be challenging, as it often depends on patient recall. When patients have undergone prior treatments, their recollection of symptoms may be biased or distorted. This can lead to inaccurate reporting and hinder the reliability of symptom-based assessments.

Conclusion

The study at Yala Hospital identified HDM as the most prevalent aeroallergen sensitization among patients with AR. Additionally, patients presenting with persistent symptoms were significantly more likely to exhibit a positive SPT compared to those with intermittent symptoms. Consequently, for patients with chronic rhinitis who experience intermittent symptoms, SPT may not be necessary to save healthcare costs. However, for patients with chronic rhinitis and persistent symptoms who have not responded to treatment, a SPT is recommended. This is because the likelihood of a positive SPT is higher in this group, allowing for targeted allergen avoidance strategies and potential allergen immunotherapy.

What is already known on this topic?

HDM, for example, have been identified in previous studies as a common cause of allergic rhinitis in Thailand. However, variations in sensitization to aeroallergens across Thailand's diverse geographic regions remain understudied. This research gap necessitates further investigation to understand the specific allergen profiles within different regions.

What does this study add?

A positive SPT is a well-established diagnostic tool for AR. This study demonstrated a significant correlation between a positive SPT and a higher frequency of AR symptoms. The presence of symptoms resembling AR does not necessarily equate to a diagnosis of AR, particularly if the frequency of

these symptoms was low. Overlapping symptoms can occur with NAR, infectious rhinitis, or sinusitis.

Conflicts of interest

The author declares no conflict of interest.

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