

Characteristics of Atopic Dermatitis Patients who Underwent Skin Prick Test

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ABSTRACT

Background: Skin prick test (SPT) is indicated in type I hypersensitivity reactions (rapid type), among which is Atopic Dermatitis (AD). However, the results of SPT for the tested allergens are not always accompanied by history of known allergens in AD patients. **Purpose:** To identify the characteristics of AD patients who underwent SPT. **Methods:** This was a descriptive retrospective study to determine the demographics, allergy history, SPT results, and positive and negative clinical relevance in AD patients treated at Allergy Immunology Division of Dermatology and Venereology Outpatient Clinic Dr. Soetomo General Academic Hospital Surabaya-Indonesia from January 2017 to December 2019. **Results:** A total of 284 AD patients were included. The adult age group (20-59 years) predominated the AD patient's visit every year with 58 patients (60.42%), 47 patients (46.08%), and 65 patients (75.58%) in 2017, 2018, and 2019, respectively. Only 60 AD patients underwent SPT, where most patients were allergic to dust with 30 patients (50.0%). House dust mite (HDM) allergen had the highest percentage of positive SPT result with 41 patients (63.3%). The greatest clinical relevance was found in cat fur allergen, where all patients (100.0%) had clinical relevance to their SPT result. **Conclusion:** This study shows that most AD patients were in adult age group and had a history of dust allergy. The highest percentage of positive SPT result was found in HDM allergen and the greatest clinical relevance was found in cat fur allergen.

Keywords: allergen, atopic dermatitis, clinical relevance, skin prick test, human and medicine.

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BACKGROUND

Atopic dermatitis (AD) is a chronic, often recurrent, inflammatory skin disease and also multifactorial disease involving the interaction between host (impaired skin barrier function), agent (microbial or viral), and environment (allergen exposure). Exposure to allergens, which often causes AD, might come from vegetable and animal protein sources.¹ Skin prick test (SPT) is indicated in type I hypersensitivity reactions (rapid type), among which is AD. This examination could identify an individual's sensitivity to various allergens.² However, the results of SPT for the tested allergens are not always accompanied by history of known allergens in AD patients.

This study was a descriptive retrospective study that aimed to determine the characteristics of AD patients who underwent SPT. This study could provide information regarding the characteristics of AD patients who underwent SPT to better support AD diagnosis and management in the future.

METHODS

This study was a descriptive retrospective study to determine the demographics, allergy history, SPT results, and positive and negative clinical relevance in AD patients treated at Allergy Immunology Division of the Dermatology and Venereology Outpatient Clinic of Dr. Soetomo General Academic Hospital Surabaya, Indonesia from January 2017 to December 2019. The sampling technique used was total population technique, by collecting secondary data from AD patient's medical record. The inclusion criteria were all patients recorded in the medical record with diagnosis of AD based on Hanifin and Rajka criteria and underwent SPT procedures. The data and results obtained were then entered into a data collection sheet for analysis using the Statistical Package for Social Science (SPSS) version 17. This study has received ethical approval from the Hospital Ethics Committee of Dr. Soetomo General Academic Hospital Surabaya (Ref.No: 0059/LOE/301.4.2/VII/2020).

RESULTS

There were total of 284 AD patients with 96, 102, and 86 patients in 2017, 2018, 2019, respectively. The adult age group (20-59 years) predominated AD

patient's visits every year with 58 patients (60.42%), 47 patients (46.08%), and 65 patients (75.58%) in 2017, 2018, and 2019, respectively. Table 1 outlines AD patient demographics by age group.

Table 1 The age group of atopic dermatitis patients

Age Group	Visit Year					
	2017		2018		2019	
	n	Percentage (%)	n	Percentage (%)	n	Percentage (%)
Children (<10 years)	0	0.00	2	1.96	4	4.65
Adolescent (10-19 years)	28	29.17	45	44.12	7	8.14
Adult (20-59 years)	58	60.42	47	46.08	65	75.58
Elderly (≥60 years)	10	10.42	8	7.84	10	11.63
Total	96	100.00	102	100.00	86	100.00

Table 2 History of allergy distribution on atopic dermatitis patients

Allergen	(n)	Percentage (%)
Dust	30	50.0
Broiler chicken	9	15.0
Shrimp	15	25.0
Cow's milk	1	1.7
Egg	14	23.3
Kapok	0	0.0
Beef	1	1.7
Milk fish	0	0.0
Sea fish	10	16.7
Crab	0	0.0
Peanut	3	5.0
Chocolate	0	0.0
Rice	0	0.0
Wheat flour	0	0.0
Potato	0	0.0
Banana	0	0.0
Papaya	1	1.7
Pineapple	0	0.0
Orange	0	0.0
Organic chicken	0	0.0
Chicken skin	0	0.0
Dog's fur	0	0.0
Cat's fur	0	0.0

^aOne patient might have more than one history of allergen.

Among all AD patients who visited the Allergy Immunology Division of the Dermatology and Venerology Department Outpatient Clinic of Dr.

Soetomo General Academic Hospital within 2017-2019, there were 60 patients who underwent SPT. Prior to SPT, history of the patient's allergy was obtained.

Table 3 Skin prick test results on all allergens of atopic dermatitis patients

Allergen Type	Positive SPT	Positive SPT	Negative SPT	Negative SPT
	Result	Result Percentage (%)	Result	Result Percentage (%)
HDM	41/60	63.3	19/60	36,7
Broiler chicken	8/60	13.3	52/60	86,7
Shrimp	5/60	8.3	55/60	91,7
Cow's milk	3/60	5.0	57/60	95,0
White egg	2/45	4.4	43/45	95,6
Kapok	3/15	20.0	12/15	80,0
Beef	1/15	6.7	14/15	93,7
Milk fish	4/15	26.7	11/15	73,3
Tuna	0/15	0.0	15/15	100,0
Pindang fish	3/15	20.0	12/15	80,0
Crab	5/15	33.3	10/15	66,7
Peanut	1/15	6.7	14/15	93,3
Chocolate	3/15	20.0	12/15	80,0
Rice	4/15	26.7	11/15	73,3
Wheat flour	4/15	26.7	11/15	73,3
Potato	3/15	20.0	12/15	80,0
Banana	4/15	26.7	11/15	73,3
Papaya	1/15	6.7	14/15	93,3
Pineapple	2/15	13.3	13/15	86,7
Orange	2/15	13.3	13/15	86,7
Organic chicken	4/15	26.7	11/15	73,3
Chicken's skin	2/15	13.3	13/15	86,7
Dog's fur	4/9	44.4	5/9	55,6
Cat's fur	0/4	0.0	4/4	100,0

SPT = Skin Prick Test; HDM = House Dust Mite

Table 4 Clinical relevance between allergy history and skin prick test result of atopic dermatitis patients

Allergen Type	Clinical Relevance	
	Yes	No
HDM	37 (61.7%)	23 (38.3%)
Broiler chicken	47 (78.3%)	13 (31.7%)
Shrimp	44 (73.3%)	16 (26.7%)
Cow's milk	38 (84.4%)	7 (15.6%)
White egg	56 (93.3%)	4 (6.7%)
Kapok	12 (80.0%)	3 (20.0%)
Beef	5 (55.6%)	4 (44.4%)
Milk fish	4 (100.0%)	0 (0.0%)
Tuna	14 (93.3%)	1 (6.7%)
Pindang fish	14 (93.3%)	1 (6.7%)
Crab	8 (53.3%)	7 (46.7%)
Peanut	7 (46.7%)	8 (53.3%)
Chocolate	10 (66.7%)	5 (33.3%)
Rice	12 (80.0%)	3 (20.0%)
Wheat flour	14 (93.3%)	1 (6.7%)
Potato	11 (73.3%)	4 (26.7%)
Banana	11 (73.3%)	4 (26.7%)
Papaya	12 (80.0%)	3 (20.0%)
Pineapple	12 (80.0%)	3 (20.0%)
Orange	14 (93.3%)	1 (6.7%)
Organic chicken	13 (86.7%)	2 (13.3%)
Chicken's skin	13 (86.7%)	2 (13.3%)
Dog's fur	11 (73.3%)	4 (26.7%)
Cat's fur	13 (86.7%)	2 (13.3%)

HDM = House Dust Mite

Table 2 outlines allergy distribution on AD patients. Of all 60 patients, most patients were allergic to dust, with 30 patients (50.0%). Table 3 showed SPT results on all allergens of AD patients. Among all patients who underwent SPT, house dust mite (HDM) allergen had the highest percentage of positive SPT results, with 41 patients (63.3%). House dust mite, broiler chicken, shrimp, and cow's milk allergen were tested on all patients (60 patients), egg white allergen was tested on 45 patients, dog's fur allergen was tested on 9 patients, cat's fur allergen was tested on 4 patients, and the remaining allergens were tested on 15 patients.

Table 4 describes the clinical relevance between allergy history and SPT results in AD patients. The greatest clinical relevance was found in cat's fur allergen, where all patients (100.0%) had clinical relevance to their SPT results.

DISCUSSION

The adult (20-59 years) and adolescent (10-19 years) age group were the largest age groups who visited the outpatient clinic in 2017-2019. These results were similar to a retrospective study of AD patient's profile at Dermatology and Venereology Outpatient Clinic of Prof. Dr. R. D. Kandou Hospital, Manado conducted by Febriansyah *et al.* Among 461 AD patients, 269 patients (58.35%) belonged to the >12 years age group.³ A retrospective study by Ratnaningtyas and Hutomo at Allergy Immunology Division of the Dermatology and Venereology Outpatient Clinic of Dr. Soetomo General Academic Hospital Surabaya-Indonesia reported that among 272 new AD patients, the largest age group was 15-24 years (33.3%).⁴

In this study, the highest prevalence of allergy history was dust allergy (50.0%). This result was consistent with a study by Wistiani and Notoatmojo who studied the correlation between allergen exposure to allergic diseases in children at Dr. Kariadi General Hospital, Semarang. From 44 children with allergy, 18 patients (34.1%) were diagnosed with AD and most patients (53.8%) had dust allergy.⁵ Another study by Ludfi *et al* involving samples from junior high school students in Surabaya, Indonesia evaluated the factors that might affect allergic diseases in children. Using multivariate logistic regression test, they concluded that birth order ($p=0.005$) and HDM exposure ($p=0.018$) affected clinical manifestations of children with AD.⁶ Aeroallergens or inhaled allergens can be divided into two types, indoor and outdoor allergens. Indonesia is a tropical country, where household allergens such as HDM are more common.⁷

Among the 284 AD patients who visited our outpatient clinic, only 60 patients underwent SPT. This

could be caused by the patient's condition at the time of visit who might have absolute or relative contraindications to SPT. Absolute contraindications for SPT include diffuse dermatological conditions (examination should be performed on healthy and normal skin), severe dermographism, uncooperative patients, and patients who could not stop their antihistamine or other drug use that might affect SPT results. Relative contraindications for SPT include unstable/severe persistent asthma, pregnancy (because of the mild risk of anaphylaxis with hypotension and uterine contractions), infants less than two years of age, and patients taking beta blockers and angiotensin-converting enzyme (ACE) inhibitors.⁸

The allergen with the highest positive SPT result was HDM allergen (63.3%). This result was in accordance with a study by Zeppa *et al* on AD patients aged 18 years and over at the Dermatology and Venereology Clinic in a hospital in Italy involving 332 AD patients, where they reported that positive SPT results for aeroallergens and food allergens were found in 227 (68,4 %) AD patients.⁹ A retrospective study by Natallya and Barakbah at Dermatology and Venereology Outpatient Clinic of Dr. Soetomo General Academic Hospital, Surabaya from 2007 to 2012 reported that out of 19 AD patients with positive SPT results, most patients showed positive result to HDM allergen with 8 patients (42%).¹⁰ A retrospective descriptive study using medical records and SPT results of patients by Garna *et al* at Allergy Clinic of Immanuel Hospital, Bandung which aimed to determine the profile of allergic patients reported a total of 206 patients with a history of allergies, where most allergic patients who came to the clinic had clinical presentation of dermatitis with 89 patients (43.20%). From all allergic patients, HDM gave the most positive SPT results with 108 patients (52.43%).¹¹

Clinical relevance is determined if there is a match between allergy history and SPT result. In this study, the greatest clinical relevance was found in cat's fur allergen (100.0%), followed by cow's milk, beef, milkfish, and papaya (93.3%). These results were in accordance with a study by Asha'ari *et al* at Allergy Clinic of a hospital in Malaysia which compared the specific IgE test result with SPT result for allergy diagnosis and involved 99 patients with allergy history. They stated that the sensitivity and specificity of SPT for cat's fur were 90.5% and 44.9%, respectively.¹² Another study by Čelakovská *et al* investigated the specificity and sensitivity of SPT, specific IgE test, and Atopy Pacht Test (APT) in 301 AD patients aged over 14 years with food allergies at Dermatology Department of a hospital in Czech Republic. They found that the specificity and sensitivity of SPT for

cow's milk were 97.9% and 33.3%, respectively.¹³ A meta-analysis examining the accuracy of SPT, specific IgE test, and APT in food allergy patients involving 24 studies with 2831 samples reported that SPT had a sensitivity of 88% (76–94%) and a specificity of 68% (56–77%) for cow's milk.¹⁴ A study from Anggraeni *et al* that compared SPT results of new local and imported allergen extracts with specific IgE in 45 AD patients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia reported that cow's milk allergen had a specificity of 88.23%, while its sensitivity only reached 27.27%.¹⁵ Sensitivity was defined as proportion of patients who had a history of a particular disease and reported having a positive test result, meanwhile specificity was defined as proportion of patients who did not have a history of a particular disease and reported having a negative test result.¹² However, only four allergens (HDM, broiler chicken, cow's milk, and shrimp) were tested in all patients in this study. This might explain the very high percentage (100.0%) of clinical relevance for cat's fur allergen.

Based on the results of this study, it can be concluded that most AD patients were in adult age group and had dust allergy history. The highest percentage of positive SPT result was found in HDM allergen. The greatest clinical relevance was found in cat's fur allergen, followed by egg white, beef, milkfish, chocolate, and papaya allergen.

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