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Clinical profile of atopic dermatitis in children: demographics, skin lesions, and treatment approaches

Ordelia Nur Inayah Sunarto [1], Sawitri [2,*], Zahrah Hikmah [3] and Yuri Widia [4]

[1] *Medical Program, Faculty of Medicine, Airlangga University, Surabaya – Indonesia.*
[2] *Département of Dermatology and Venereology, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.*
[3] *Département of Pediatric, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.*
[4] *Département of Dermatology and Venereology, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.*

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Abstract

Background: Atopic dermatitis (AD) has a high prevalence, especially in children (15-20%), with significant increases in industrialized countries. In Indonesia, AD ranks as the most common pediatric skin disease, affecting 23.67% of children. This condition significantly impacts the psychosocial well-being of both patients and their families and is often associated with asthma and allergic rhinitis, particularly in severe cases.

Purpose: This study aims to identify the clinical profile of pediatric AD patients at RSUD Dr. Soetomo Surabaya from 2020 to 2023.

Methods: This observational descriptive study uses secondary patient data with a retrospective design.

Results: Seventy-one samples met the inclusion criteria, with the highest number of visits occurring in 2020. Most patients were from Surabaya. The majority of cases were in the infantile age group, with a predominance of male patients. Itching was the most common primary complaint, and the majority of cases had symptoms lasting less than one month. In infants, erythema was the most common lesion, while in the pediatric group, erosion was most frequent, and in adolescents, erythema was also common. Lesions were most commonly located on the face in infants, while in the childhood and adolescence groups, lesions were primarily found on the lower extremities. A total of 11.26% of patients had a history of asthma, and 2.81% had allergic rhinitis. Recurrence was common, and 33.80% of patients had a family history of atopy. The most commonly used systemic therapy was cetirizine and the most common topical treatment was hypoallergenic emollients.

Keywords: Dermatitis; Atopic Dermatitis; Allergy; Children

1. Introduction

It commonly begins in infancy and early childhood but can persist into adulthood or emerge for the first time later in life. AD is one of the most prevalent skin diseases, with an estimated prevalence of 15-20% in children and 1-3% in adults, and its incidence has tripled in the past few decades in industrialized countries [1]. According to data from the Indonesian Pediatric Dermatology Study Group (KSDAI), AD ranks first among the top 10 pediatric skin diseases,

* Corresponding author: Sawitri

accounting for 611 cases, or 23.67%, in Indonesia [2]. A study conducted at the Dermatology and Venereology Outpatient Clinic at Dr. Soetomo General Hospital in Surabaya in 2019 reported 185 cases of AD, with 86 patients (46%) being in the pediatric age group, ranging from 1 month to 18 years [3]. From the above description, it can be seen that the majority of AD cases occur in children.

Atopic Dermatitis (AD) does not discriminate by age or ethnicity and has a substantial psychosocial impact on both patients and their families. It is one of the leading causes of the global burden of skin diseases [4]. The intense itching experienced by AD patients can disrupt sleep, lead to fatigue, decreased daily performance, and a significant reduction in quality of life, not only for the patient but also for the family and surrounding environment [5].

The clinical presentation of AD varies depending on the patient's age, with distinct differences in the appearance of skin lesions during infancy, childhood, and adulthood. In the context of atopic dermatitis, efflorescence refers to the various types of lesions that manifest on the skin as a result of the disease, often changing with disease progression and treatment. AD is known to present and progress differently at various ages. Understanding how age influences clinical manifestations and efflorescence is crucial for the diagnosis and management of AD.

2. Material and methods

The study conducted is a descriptive observational retrospective study using secondary data, carried out at the Dermatology and Venereology Outpatient Clinic and the Pediatric Health Outpatient Clinic at Dr. Soetomo General Hospital, Surabaya. The sample in this study includes all new pediatric AD patients at the Dermatology and Venereology Outpatient Clinic and the Pediatric Health Science Outpatient Clinic at Dr. Soetomo General Hospital, Surabaya, from 2020 to 2023, who meet the inclusion criteria.

The sampling technique involves using electronic medical records, which will be retrieved and compiled according to the inclusion criteria. The study variables include the number of new cases, domicile, age, gender, main complaints, duration of complaints, recurrence, skin efflorescence, lesion location, treatment, atopic march, and family history of atopy.

The study location is the Dermatology and Venereology Outpatient Clinic and the Pediatric Health Science Outpatient Clinic at Dr. Soetomo General Hospital, Surabaya.

3. Results and discussion

The number of pediatric AD patient visits at the Dermatology and Venereology Outpatient Unit and the Pediatric Health Outpatient Unit of Dr. Soetomo Regional General Hospital, Surabaya, during the period of 2020-2023 was 71 patients. The highest number of visits was recorded in 2020, with 27 patients (38%).

These data were then classified based on the outpatient unit visited by the new pediatric DA patients. It was found that the number of visits to the Dermatology and Venereology Outpatient Unit was 63 patients (88,7%), with the highest number of visits in 2020, totaling 27 patients (38%). Meanwhile, the number of visits to the Pediatric Health Outpatient Unit was 8 patients (11,2%), with the highest number recorded in 2022, amounting to 4 patients (5,6%) (Table 1).

Table 1 Number of visits of pediatric atopic dermatitis patients

Outpatient clinic	**Years**				**Total (%)**
	2020	**2021**	**2022**	**2023**	
Dermatolgy and Venereology Outpatient Clinic	24	12	16	11	63 (88,7)
Pediatric Health Outpatient Unit	3	0	4	1	8 (11,2)
Total	27	12	20	12	71 (100)

Table 2 Residence of pediatric atopic dermatitis patients

Residence	Years				Total (%)
	2020	2021	2022	2023	
Surabaya	23	8	13	11	55 (77,4)
Jombang			2		2 (2,8)
Sidoarjo			2		2 (2,8)
Benowo			1		1 (1,4)
Tulung agung			1		1 (1,4)
Bangkalan			1		1 (1,4)
Mojokerto		1			1 (1,4)
Krian		1			1 (1,4)
Nganjuk		1			1 (1,4)
Lamongan		1			1 (1,4)
Pasuruan	1				1 (1,4)
Banjarmasin				1	1 (1,4)

The distribution of residence for pediatric DA patients at the Dermatology and Venereology Outpatient Unit and the Pediatric Health Outpatient Unit of Dr. Soetomo Regional General Hospital, Surabaya, during the period of 2020-2023 shows that the majority of patients came from Surabaya, totaling 55 patients (77,4%) (Table 2).

Table 3 Anamnesis of pediatric patients with Atopic Dermatitis

Anamnesis	Years				Total (%)
	2020	2021	2022	2023	
Gender					
Female	12	8	9	5	34 (47,8)
Male	15	4	11	7	
Age					
Infantile	13	8	5	7	33 (46,4)
Children	12	4	12	4	32 (45)
Adults	2	0	3	1	6 (8,4)
Main Complaint					
Itch	22	5	18	8	53 (74,6)
Redness patches	22	9	5	5	41 (57,7)
White patches	3	0	0	1	4 (5,6)
Brown patches	0	1	0	1	2 (2,8)
Vesicle	3	0	2	5	10 (14)
Dry skin	7	0	4	2	13 (18,3)
Duration					
<1 Month	20	3	8	5	36 (50,7)

1-12 Month	7	6	10	5	28 (39,4)
>12 Month	0	3	2	2	7 (9,8)
Recurrency					
Recurrence	20	9	19	12	60 (84,5)
No recurrence	0	2	1	1	4 (5,6)
Unknown	6	1	0	0	7 (9,8)
History of atopic					
AD + Asthma	4	1	3	0	8 (11,2)
AD + Rhinitis alergy	2	0	0	0	2 (2,8)
Family history of AD					
Patient with family history	12	5	3	2	24 (33,8)
Patient without family history	3	1	0	0	4 (5,6)
Unknown	12	6	17	10	45 (63,3)

Note: each patient may have more than one main complaint; AD: Atopic Dermatitis

Based on the age classification of DA, The majority of patients are male (52,1%). The majority of patients fall into the infantile category (0-2 years) with a total of 33 patients (46,4%). Itching is the most common complaint (74,6%), with the majority of complaints lasting less than 1 month (50,7%). 60 patients (84,5%) experienced recurrence. It was found that 8 patients (11,2%) had a history of AD with asthma, 2 patients (2,8%) had a history of AD with allergic rhinitis, and 24 patients (33,8%) had a family history of atopy (Table 3).

Table 4 Treatment of Pediatric patients with Atopic Dermatitis

Therapies	**Years**				**Total (%)**
	2020	**2021**	**2022**	**2023**	
Antihistamin					
Cetrizine	13	7	13	7	40 (56,3)
Loratadine	1	0	2	0	3 (4,2)
Oral Antibiotic					
Amoxicillin	2	0	2	0	4 (5,6)
Erythromycin	0		2	2	4 (5,6)
Cloxacillin	0	1	0	0	1 (1,4)
Oral Steroid					
Dexamethasone	0	1	0	0	1 (1,4)
Topical Steroid					
Mometasone Cream	5	5	9	1	20 (28,1)
Hydrocortisone Cream	3	4	3	5	15 (21,1)
Dexosimethasone	0	1	0	0	1 (1,4)
Moisturizer					
Pseudoceramide cream	9	11	9	9	38 (53,5)
Vaselin Album	0	0	5	0	5 (7)

Other Therapies					
PZ Compress	0	0	1	0	1 (1,4)
NaCl Compress	1	1	1	1	4 (5,6)
Natrium Fusidate Cream	2	4	7	5	18 (25,3)
Baby Soap	3	0	3	1	7 (9,8)

Note: Each patient may have more than one treatment

4. Discussion

4.1. Demographic data

The highest number of visits occurred in 2020 (38%). There was a decline in 2021 (16,9%), followed by an increase in 2022 (28,1%), and another decrease in 2023 (16,9%). This trend is similar to the study conducted at RSUD Dr. Soetomo Surabaya from 2019 to 2021 [3]. The decline is suspected to be related to the COVID-19 pandemic, which began in 2019. Many believed that individuals with skin diseases were at a higher risk of contracting COVID-19 compared to the general population leading people to avoid hospital visits during flare-up [6]. Additionally, during the COVID-19 pandemic, hospital visit restrictions were implemented, and elective or non-urgent procedures were postponed to prioritize the management of COVID-19 patients. However, a study found that the COVID-19 pandemic contributed to an increase in atopic dermatitis (AD) exacerbations due to home quarantine and increased stress [7]. Irritant agents such as soap and water, which were used more frequently during the pandemic, also contributed to the exacerbation of AD [7].

Based on the data distribution of new pediatric atopic dermatitis (AD) patients in the Department of Dermatology and Venereology and the Department of Pediatric Health Sciences at RSUD Dr. Soetomo Surabaya during the period 2020-2023, the majority of patients were from Surabaya (77,4%). A study conducted in Shanghai found that the prevalence of AD was higher in urban areas compared to suburban areas [8]. Surabaya is also an urban area, often experiencing higher levels of air pollution, including vehicle smoke, dust, and industrial chemicals. These pollutants can damage the skin barrier and trigger inflammation, which is a key factor in the development of AD.

The phenomenon of hyperhygienic behavior occurs in urban areas with higher education levels. Hyperhygiene can reduce exposure to microorganisms and allergens that actually help the immune system adapt and develop tolerance. A study showed that overly clean environmental exposure contributes to the increased prevalence of allergies and atopic conditions [9].

4.2. Gender

This study shows nearly equal results between males (52,1%) and females (47,8%). This finding is supported by a study that found boys tend to exhibit a higher prevalence of AD than girls. For instance, studies have found that among children younger than four years old, the prevalence was recorded at 8,7% for boys compared to 5,6% for girls. But, after puberty, this pattern reverses, with a higher prevalence observed in females due to hormonal changes that influence immune response and skin barrier function [10]. There is a theory suggesting that the male-to-female ratio in childhood is 1.14:1 [1]. So, there is no significant difference is observed between genders in pediatric AD cases.

4.3. Age

In this study, the highest number of cases was found in the infant age group, with 33 patients (46,7%). Atopic dermatitis (AD) is more common in infants aged 0-12 months. This is believed to be related to the underdeveloped skin barrier function in infants, making them more susceptible to AD [1]. Infants have more sensitive and relatively thinner skin during the first few months of life, including an incomplete and thinner stratum corneum compared to adults. This condition makes infants more vulnerable to allergen exposure. As children grow older, their skin barrier function typically improves, potentially reducing the risk of AD. Furthermore, effective therapy and proper management can reduce the severity and frequency of AD symptoms. The immune system becomes more stable with age, which may also decrease the risk of AD [11].

4.4. Results of the anamnesis

The most common main complaint reported was itching, with 53 patients (74,6%) mentioning it. The results of this study align with a study conducted at RSUD Dr. Soetomo Surabaya from 2019-2021, which found itching to be the most

frequently reported complaint by patients [3]. Itching, red patches, and dry skin are the most common complaints experienced by patients. Research indicates that skin barrier dysfunction can make the skin more permeable to irritants, allergens, and pathogens, triggering an inflammatory response and causing itching [12]. Additionally, dysbiosis or imbalance in the gut microbiota has also been linked to the development of allergies and atopic dermatitis (AD). An imbalanced microbiome composition triggers an excessive immune response, which can increase pruritus [13]. Cold temperatures also contribute to the severity of pruritus. Cold conditions affect blood circulation and nerve sensitivity. Cold temperatures cause blood vessel constriction, reducing blood flow to the skin, which worsens already impaired skin conditions and increases pruritus intensity. Skin nerve sensitivity to cold increases, making the skin more sensitive to stimuli, including itching. Dry air can also increase transepidermal water loss (TEWL), which can worsen pruritus [12].

Based on the data obtained, the majority of patients experienced symptoms for less than one month (50,7%). This finding is consistent with previous research that showed the most common duration of symptoms in AD patients is less than one month [12]. There are three main interconnected aspects in the progression of atopic dermatitis (AD): skin barrier damage, the environment, and the immune system. The duration of symptoms is closely related to these aspects. A symptom duration of <1 month can occur because AD in children is often promptly treated, especially in infants who receive more attention. Parents' knowledge in recognizing symptoms, triggers, treatment, and the appropriate use of moisturizers for AD helps in early identification of the condition before it worsens.

Based on the results of the study, the majority of patients experienced relapses (84,5%). AD is a condition that can persist for a long time, even for a lifetime, and relapses in children are often caused by a variety of interacting factors. One of the main causes of relapses is high serum IgE levels in children with AD. Elevated IgE can cause excessive allergic reactions, including histamine release from mast cells, which can trigger a relapse of AD symptoms [3]. Additionally, children with AD often have immune systems that are highly sensitive to allergens and microbes. An overactive immune system can worsen already irritated skin, increasing the risk of relapse. Failing to eliminate irritants and neglecting other triggering factors are key contributors to AD relapses. A lack of proper skin care, such as moisturizing, can reduce the integrity of the skin barrier, making it more easily exposed to allergens.

This theory is consistent with the results of this study, which show that the majority of patients experienced relapses during the course of their condition. This highlights that, in addition to appropriate treatment, attention to factors influencing relapses, such as IgE levels, immune system sensitivity, elimination of triggers, and skin barrier integrity, is crucial in the management of AD in children. Based on the data obtained, 24 patients (33.80%) had a family history of atopy. The genetic predisposition for AD is well-established, with parental atopy being a strong predictor of the condition in offspring. For instance, maternal and paternal histories of atopy have been linked to increased risks of AD, with odds ratios ranging from 1.57 to 1.90 depending on the parent's condition and the child's age.[14] Both studies support the findings of this research, which show that patients with a family history of atopy are at higher risk of developing AD.

In this study, there were 8 patients (2,8%) with asthma and 2 patients (2,8%) with allergic rhinitis. This is related to the concept of atopic march. A study showed that the disrupted skin barrier in individuals with atopic dermatitis (AD) can become a pathway for allergens and microorganisms, which then induce a systemic Th2 immune response [15]. This response can increase the risk of developing allergic rhinitis and airway hyperreactivity. Atopic march typically occurs in children with a family history of allergies and progresses into several allergic conditions over a certain period of time. Therefore, this study aligns with the theory that AD is linked to the development of asthma and allergic rhinitis.

4.5. Effloresence lesion findings

In the infant group (0-2 years), the most common lesion was erythema, with 13 patients (18,3%). In the pediatric group (2-12 years), the most common lesion was erosion, with 14 patients (19,7%). In the adolescence group (>12 years), the most common lesion was erythema, with 3 patients (4,2%). Skin lesions in patients with atopic dermatitis (AD) can vary based on the patient's age and individual condition. AD in infants is typically more generalized and acute, presenting as erythema, excoriation, vesicles, and serous exudates due to scratching from intense itching [1]. This theory supports the findings of this study, where erythema was the most common lesion in the infant age group (0-2 years). Erythema results from genetic defects in the filaggrin (FLG) gene, leading to epidermal barrier dysfunction and causing immune cells to come into contact with environmental antigens. In atopic dermatitis, the Th2 cell response becomes more dominant than the Th1 response, leading to the release of pro-inflammatory cytokines and chemokines such as IL-4, IL-5, and TNF-alpha, which induce a systemic inflammatory response causing erythema. FLG mutations have a similar impact as ceramide defects and are closely linked to transepidermal water loss (TEWL), which can lead to xerosis. Mutations in FLG result in alterations in the separation phase related to skin barrier dysfunction [16]. It has even been

found that AD patients without FLG-related genetic abnormalities can experience a decline in FLG function later in life, indicating a strong association between FLG and AD [17].

Erosion and hyperpigmentation dominated in the adolescence group (>12 years) based on AD age classification. Hyperpigmentation lesions are associated with the duration of AD. Chronic inflammation can cause changes in skin color, resulting in darker skin or hyperpigmentation. A study highlighted that adolescents often present with acquired pigmentation, notably around the neck area, which is associated with moderate-to-severe eczema. This condition reflects both frictional melanosis and post-inflammatory changes. The psychosocial impact of these changes can be significant, as visible skin alterations may affect self-esteem and social interactions among adolescents [18].

4.6. Location of lesion

In the infant age group, the most common lesion location was the facial area (14%). In the pediatric age group, the most common lesion location was the lower extremities (25,3%), and in the adolescence group (>12 years), the most common lesion location was also the lower extremities (2,8%). The findings of this study are consistent with the theory regarding the location and distribution of lesions based on age in atopic dermatitis (AD). In infants (0-2 years), lesions typically appear on the cheeks and then spread to the forehead, scalp, ears, and neck. In children (2-10 years) and adolescence (>12 years), lesions can be acute or chronic or continue from the infant phase [1]. The areas that dominate in children are the lower extremities, which may be due to the increased susceptibility of these areas to repeated friction, triggering allergic reactions and inflammation. Environmental conditions also play a role in the development of lesions on the lower extremities. In children and adolescence, there is more frequent contact with the floor, leading to greater exposure of the knees and feet to dust, dirt, and other allergens. Additionally, increased physical activity, such as running and playing, can raise skin temperature and humidity, which are factors that trigger the onset of AD.

4.7. Management and therapy

According to the 2018 Indonesian Guidelines for the Diagnosis and Management of Atopic Dermatitis (AD), there are five pillars of AD management: patient and caregiver education and empowerment, avoiding and modifying environmental triggers/lifestyle modifications, strengthening and maintaining optimal skin barrier function, eliminating inflammatory skin disease, and controlling and eliminating the itch-scratch cycle [19].

Education and lifestyle modification is the first pillar to address in managing AD. Education involves addressing all issues related to AD and the importance of proper skin care to optimize skin barrier function. Lifestyle modification includes avoiding various triggers of AD. Irritants, allergens, certain foods, extreme temperatures (hot and cold), and stress are common triggers. Once this pillar is achieved, the next step is to provide pharmacologic therapy.

The pharmacologic therapy for AD in children, as found in this study, is categorized into systemic and topical treatments. This study found that patients often had more than one type of therapy, both systemic and topical. The most commonly used systemic therapy was cetirizine, an antihistamine (55,7%). The most commonly used oral antibiotic was amoxicillin (6,5%). Oral steroids were given to only 2 patients (3,2%), with dexamethasone and dexosimethasone being the most commonly prescribed. These findings are consistent with a previous study conducted at Dr. Soetomo Hospital Surabaya in 2014, which found that the most commonly used systemic therapy was the antihistamine cetirizine in 40 patients (97.5%) [20].

Oral antihistamines are commonly used in AD treatment. Clinical evidence indicates that oral antihistamines are less effective in reducing AD symptoms. However, their antipruritic and sedative effects can help prevent patients from staying awake at night due to itching. Oral antihistamines can also be used for longer periods than topical corticosteroids, helping to reduce flare-ups and optimize treatment. Oral antihistamines are generally safe for use in children, with minimal risk of significant side effects [21].

Other systemic therapies used include oral antibiotics such as amoxicillin, erythromycin, and cloxacillin. Oral antibiotics are not always used in AD treatment for children. They are typically prescribed for secondary bacterial infections. The use of oral antibiotics has not shown a significant effect in reducing the severity of AD symptoms. In some cases, the use of oral antibiotics may lead to antibiotic resistance and cause side effects such as hypersensitivity reactions.

Oral steroids were prescribed to only 2 patients in this study. The 2021 PERDOSKI guidelines state that oral steroids can be given for a short period (up to 1 week) for acute/chronic/severe/extensive AD exacerbations, especially if there is secondary infection or a condition requiring systemic treatment. In this study, the patients who received oral steroids had a history of chronic symptoms lasting 1-12 months. Their lesions were located in multiple regions, and the lesions presented as erosions, pustules, and crusts. Oral steroids are generally not recommended for AD in children unless

prescribed by a specialist. When used, oral steroids can have significant side effects, such as skin thinning, and are typically reserved for severe cases that do not respond to topical treatments [22].

The most commonly used topical therapy was pseudoceramide cream. Pseudoceramide cream is a moisturizer designed to avoid allergic reactions. It is characterized by non-irritating ingredients, no fragrances or dyes, and is quickly absorbed without leaving residue that could become an irritant. The way emollient moisturizers work is by filling the gaps between desquamating corneocytes, resulting in smoother skin. Research has shown that the use of moisturizers plays a crucial role in protecting the skin. Moisturizers help maintain the skin barrier, preventing penetration by triggers and reducing inflammatory responses. The 2021 PERDOSKI guidelines highlight that managing AD includes not only avoiding irritants and allergens but also strengthening and optimizing the skin barrier function.

A study showed that most AD patients improve with appropriate management. It is important to understand that AD can only be controlled, not fully cured. About 90% of AD patients will experience improvement by the time they reach puberty, with one-third of them developing allergic rhinitis and another third developing asthma [23].

5. Conclusion

The profile of pediatric atopic dermatitis patients obtained through this study aligns with previous research and theory.

Compliance with ethical standards

Disclosure of conflict of interest

All the authors have no conflicts of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

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