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Description of Hanifin-Rajka Criteria and Skin Hydration in Adult Patients with Mild-Moderate Atopic Dermatitis at Tertiary Hospital

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ABSTRACT

Background: Atopic dermatitis (AD) is a chronic inflammatory skin disorder that typically manifests in childhood and has a diverse etiology. In the United States, the prevalence of AD among adults was 4.9%, while in Japan it was 2.1%. The majority of people with AD have dry skin. Hanifin-Rajka criteria were the first to be established and are frequently used as diagnostic standards in research**. Purpose:** The purpose of this study is to determine the Hanifin-Rajka criteria and skin hydration in adult patients with mild-moderate atopic dermatitis at Dr. Soetomo General Academic Hospital, Surabaya March-May 2022. **Methods:** This cross-sectional descriptive study included adult patients with mild to moderate AD according to Hanifin-Rajka aged 18-64 years who visited the Dermatology and Venereology Outpatient Dr. Soetomo General Academic Hospital Surabaya between March and May 2022. Skin hydration was measured using a corneometer on the volar side of the left forearm in the skin area. **Result:** Based on the major criteria, all participants had pruritus, typical morphology and distribution, and chronic or chronically recurrent dermatitis. As for the minor criteria, more varied results were obtained, one of which was xerosis, which was experienced by all participants. The skin hydration shows that the mean value for skin hydration was 39.8 ± 12.1. The lowest skin hydration was 21.4 and the highest was 87.4, both found in subjects with mild AD. **Conclusion:** Most patients with mild to moderate atopic dermatitis had three of the four main criteria on Hanifin-Rajka, and half of the participants had insufficiently hydrated skin.

Keywords*:* atopic dermatitis, diagnosis, skin hydration, human and health.

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BACKGROUND

Atopic dermatitis (AD) is a chronic inflammatory skin condition that typically manifests in childhood and has a varied history. The disease's signature symptom is itch, which can be unyielding and cause sleep disturbances, as well as excoriated, infection-prone skin. Patients with AD frequently also have atopic comorbidities, such as allergic rhinitis and asthma, and their quality of life is significantly reduced.[1] Up to 2.4% of the world's population is affected. The prevalence varies considerably between countries. For instance, the prevalence of AD among adults in the United States was 4.9%, and in Japan it was 2.1%. In some countries, the frequency of AD among children might reach 20%.[2] In this 3-year period, 327 new patients were treated at the Dermatology and Venereology Outpatient Unit at Dr. Soetomo General Academic Hospital in Surabaya, Indonesia.[3]

There are numerous diagnostic standards that can be used to determine AD. Hanifin-Rajka criteria are the most significant and widely used. Hanifin and Rajka

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proposed a set of criteria that are referred to as "Hanifin and Rajka's diagnostic criteria for AD" in order to enable accurate AD diagnosis.[4] The Hanifin-Rajka criteria (HRC) were the first to be created and are frequently used as diagnostic standards in research. They had been applied since the 1980s to standardize the diagnosis. Dermatologists experimentally defined the HRC items for use in hospital settings based on "clinical experience" and expert consensus.[5] There were 4 major criteria and 23 minor criteria, of which 3 major criteria and 3 minor criteria must be met to establish the diagnosis of atopic dermatitis.[6]

The majority of people with AD have dry skin, including unaffected areas. This arises as a result of the compromised skin barrier associated with AD, which allows allergens to penetrate the skin more easily, resulting in increased irritation and inflammation.[7] Clinical signs of a compromised epidermal barrier include inflammation, dry skin, and scaling, which are the defining characteristics of AD. The stratum corneum (SC) serves primarily as the skin barrier. Inadequate SC hydration and pH of the skin's surface lead to barrier damage and AD.[8] The use of moisturizers by AD patients is very important to improve skin hydration.[9] The purpose of this study is to determine the Hanifin-Rajka criteria and skin hydration in adult patients with mild-moderate atopic dermatitis at Dr. Soetomo General Academic Hospital, Surabaya, March-May 2022.

METHODS

This cross-sectional descriptive study included adult patients with mild-to-moderate DA aged 18-64 years who visited the Dermatology and Venereology Outpatient Clinic at Dr. Soetomo General Academic Hospital Surabaya between March and May 2022. The Hanifin-Rajka criteria were used to reach a diagnosis, and a corneometer CM825 from the Courage Khazaka was used to investigate the level of skin moisture. Measurements were taken on the volar side of the left forearm in the skin area. Data on diagnostic criteria in accordance with Hanafin-Rajka criteria, as well as results of skin hydration measurements, were recorded and calculated. This research was approved by the ethics committee of the Dr. Soetomo General Academic Hospital in Surabaya, Indonesia, with register number 0356/KEPK/I/2022.

RESULT

Participants in this study included 32 patients, consisting of 17 females and 15 males, who suffered from mild-moderate atopic dermatitis. Thirty participants admitted to having a history of allergies, with 62.5% having rhinitis allergies, 18.7% having asthma, and 12.5% having both. There was a history of allergies in the families of 14 (43.7%) of the participants.

Table 1. Major criteria found in the research subject

Major criteria	Total	Percentage
Pruritus		
Yes	32	100%
No	0	0%
Typical morphology and distribution		
Yes	32	100%
No	0	0%
Chronic or chronically-relapsing dermatitis		
Yes	32	100%
No	0	0%
Personal or family history of atopy		
Yes	31	96.8%
No	1	3.1%

The diagnosis for AD was reached using the Hanifin-Rajka criteria. For the major criteria, Table 1 shows that all of the participants had pruritus, typical morphology and distribution, and chronic or chronically relapsing dermatitis. Only one participant had no personal or family history of atopy.

The minor criteria were based on history, as shown in Table 2. Xerosis was experienced by all of the participants. As many as 27 (84.3%) participants had a tendency toward cutaneous infection and nipple eczema, followed by courses influenced by environmental or emotional factors (78.1%) and itching when sweating (71.8%). A tendency toward non-specific hand or foot dermatitis and white dermographism or delayed blanch was experienced by 27 (65.6%) participants, while orbital darkening and ichthyosis/palmar hyperlinearity/keratosis pilaris were found in 21 (62.5%) participants. Dennie-Morgan infraorbital folds were found in 19 (59.3%) participants, followed by early age of onset (53.1%), cheilitis (46.7%), anterior neck folds (40.6%), food intolerance (28.1%), perifollicular accentuation (25%), and recurrent conjunctivitis (59.3%). As few as 3.1% of participants had intolerance to wool and lipid solvents, elevated serum IgE, and immediate (type I) skin test reactivity. In patients who never tested serum IgE, this point was not relevant. None of the

participants had keratoconus, anterior subscapular cataracts, pityriasis alba, facial pallor, or facial erythema.

Table 2. Minor criteria found in the research subject

Minor Criteria	Present	Percentae
Xerosis	32	100%
Ichthyosis/palmar hyperlinearity/keratosis pilaris	20	62.5%
Immediate (type I) skin test reactivity	1	3.1%
Elevated serum IgE	1	3.1%
Early age of onset	17	53.1
Tendency toward cutaneous infection	27	84.3%
Tendency toward non-specific hand or foot dermatitis	21	65.6%
Nipple eczema	27	84.3%
Cheillitis	15	46.8
Recurrent conjunctivitis	7	21.8%
Dennie-Morgan infraorbital fold	19	59.3%
Orbital Darkening	20	62.5%
Anterior neck folds	13	40.6%
Itch when sweating	23	71.8%
Intolerance to wool and lipid solvents	1	3.1%
Perifollicular accentuation	8	25%
Food intolerance (total)	9	28.1%
Food intolerance (detail)		
Shrimp	2	62.5%
Fermented Shrimp	1	3.1%
Cow's Milk	4	12.5%
Shrimp &Cow's milk	1	3.1%
Peanut	1	3.1%
Course influenced by environmental/emotional factors	25	78.1%
White dermographism/delayed branch	21	65.6%

Table 3. Results of skin hydration

	Skin Hydration (a.u.)	
Mean ± SD	39.8 ± 12.1	
Minimum	21.4	
Maximum	87.4	
Maximum	87.4	
Classification of skin hydration (n)		
Very Dry	4	12.5 %
Dry	13	40.6 %
Sufficiently hydrated	15	46.8 %

Based on history taking, it was discovered that 4 participants were allergic to cow's milk, 2 participants were allergic to shrimp, 1 participant was allergic to both, 1 participant was allergic to peanuts, and 1 participant was allergic to fermented shrimp paste.

The skin hydration examination was conducted using a corneometer. Table 2 shows that the mean value for skin hydration was 39.8 ± 12.1. The lowest skin hydration was 21.4 and the highest was 87.4, both found in subjects with mild AD. Results from the corneometer's instruction manual were interpreted to indicate that up to 15 (46.8%) individuals had sufficient hydration, followed by 13 (40.6%) people with dry skin and 4 (12.5%) participants with very dry skin.

DISCUSSION

According to existing data, it is estimated that approximately 23.67% of the population in Indonesia exhibits a certain condition referred to as AD.[10] The Dermatology and Venereology Outpatient Clinic at Dr. Soetomo General Academic Hospital Surabaya documented a group of 185 patients diagnosed with AD.

AD is characterized by the presence of itching with multifactorial etiological and pathological trigger factors. It is known that AD is a condition with trigger factors in the form of internal factors such as heredity, skin characteristics, stress, immunological disorders, or external factors in the form of irritants, allergens, food, microorganisms, and weather. The diagnosis of AD is established by history and clinical manifestations. There are various diagnostic criteria for AD, among which the most frequently used are the Hanifin-Rajka major and minor criteria.[11]

AD is an eczema disease with chronic intense itching and is recurring following a lifetime of healing. Recurrence or worsening of the condition usually occurs at the early onset of life due to the high activity of children, who are susceptible to exposure to triggering factors in the surrounding environment.[12] Intense itching, especially at night, is one of Hanifin-Rajka's major criteria. All respondents experienced itching accompanied by morphology and distribution according to age, recurrence, and family history of atopy (96.8%). Similar to the literature, our study was dominated by patients with early onset at initial diagnosis. Seventy percent of atopic patients have a family history of one or more of the main atopic characteristics.[11] A study conducted by McKenzie et al. in Singapore found that 69.3% of cases had a personal history of atopy such as allergic rhinitis (34.5%), asthma (9.5%), and allergic rhinitis and asthma (25.5%).[13] Silverberg et al. found that 55% of AD patients had a personal history of atopic allergic rhinitis, asthma, and food allergies.[14] A number of population-based surveys show that the risk of a child having atopy is greater when the mother has atopy than the father.[12] Similar to our study, 62.5% of respondents had allergic rhinitis, 18.7% had asthma, and 12.5% had both, with 43.7% having a family history of allergies.

The pathogenesis of barrier dysfunction in AD patients is demonstrated by mutations in the filaggrin (FLG) gene. The skin barrier consists of the cornified envelope, a cross-linked, flexible, insoluble structure composed of corneocytes, lipids, involucrin, loricrin, and filaggrin. Skin with AD has a characteristic dry, flaky appearance. Dry skin is typically associated with decreased Natural Moisturizing Factor (NMF) levels, which are necessary for the SC to maintain the correct degree of moisture. Since an important amount of the NMF components is made up of filaggrin's metabolic byproducts, it has been hypothesized that filaggrin may indirectly affect the activity of certain of these enzymes. The existence of FLG-null mutations or a decrease in filaggrin levels will therefore cause a decrease in SC-NMF levels. Reduced NMF levels have been shown to exist in AD patients.[15] Several conditions are regarded as minor criteria in the Hanifin-Rajka criteria for establishing a diagnosis of AD. Our study showed that the average patient experienced dryness of the skin (53.1%) as measured using a corneometer, with clinical manifestations in the form of xerosis (100%). Precipitating factors are an important thing that can be managed because they are related to relapse, which directly affects the patient's quality of life. Complaints of severe itching can disturb sleep and cause stress for patients and other family members. Itching accompanied by red spots results in scratching, which causes erosion and excoriation and eventually forms lichenification. Dry skin is also another skin disorder that can be a problem for AD patients.[15] Respondents were dominated by environmental/emotional triggers, sweat, a small portion of food, and cotton. Similar studies show that sweat, physical activity, emotions, food, and house mites trigger AD recurrence. It is important to recognize the precipitating factors in AD to prevent relapse and improve the quality of life.[16]

In our study, 84% of AD patients had nipple eczema. Findings in India revealed that this sign is the most common clinical manifestation of AD in the breast, especially in adolescent-adult women with AD. Even though it is not specific and several studies reveal that nipple eczema cannot be used as the basis for diagnosing AD, Hanifin-Rajka still includes it as a minor criteria.[4] However, clinical nipple eczema that is often associated with AD is bilateral nipple eczema that occurs with a trigger in a patient with a history of atopy himself or his family. Even though unilateral nipple eczema is present, it is more associated with other differential diagnoses such as irritant contact dermatitis, skin infections, and Paget's disease.[17,18] It is known that the nipple has a similar outer layer to the skin, a stratified squamous epithelium.[19] In AD, barrier disruption, immunological derangement, lipid disruption, and loss of epithelial integrity cause loss of skin function as a physical barrier.[20] Exposure to allergens such as clothing (wool), bacteria from unsterile breast pumps, and blisters resulting from incorrect attachment of a breastfeeding baby to bacteria can trigger itching and nipple eczema.[18,21] Interestingly, there are several case reports of AD patients with stress triggers. First, adolescents have nipple eczema, with triggers of stress due to the nipple eczema that they experience, making the nipple eczema itchy and widespread.[22] Second, mothers are anxious and worried about postpartum breastfeeding.[21] Similar to conditions on the skin, hydration (emollient) on the nipples is recommended to be given with a little modification, especially for nursing mothers. Breast milk can be applied as a natural moisturizer for AD mothers who are breastfeeding. Baby attachment is also another important factor.[18,21]

Sweating plays an important role in maintaining temperature homeostasis in humans. However, under certain circumstances, sweat can cause itching. Respondents with AD suffer from itching when exposed to heat or psychological stresses, which are

also known as perspiration stimuli. Recently, some mechanisms of sweat-induced itching have been revealed. For instance, attenuated sweating ability is observed in subjects with AD, causing heat retention, skin dryness, and a high susceptibility to itching. Furthermore, the decreased tight junction of the sweat gland in AD leads to sweat leakage in the dermis, which could be designated as a "sweat endocrine response" and may be the cause of tingling an itching during sweating. Additionally, metabolomic analysis of sweat from patients with AD revealed that glucose concentration in sweat increases according to disease severity. Sweat with an elevated glucose concentration retards the recovery of the damaged skin barrier and may promote itching. This will only worsen the patient's quality of life. In fact, in this study, as many as 71.8% of patients complained of itching when sweating. A moisturizer is needed to help coat the damaged epidermis so that the itching-scratching cycle repeats.[23,24] This study also revealed that all respondents experienced itching as a major characteristic of AD. Repeated scratching will also damage the physical barrier, which will increase the tendency toward cutaneous infection.[15,25,26] In our study, patients also tended to experience a tendency toward cutaneous infection. There are many influences of low skin hydration on AD, causing a decrease in the patient's quality of life, both from a functionally and aesthetically. Comprehensive management is required in terms of prevention and therapy. Psychosocial assistance in reducing stress triggers also contributes to preventing AD relapse.[27]

The breakdown of filaggrin proteins depends on environmental humidity. Human skin that is exposed to low Relative Humidity (RH) appears to be more susceptible to mechanical stress than skin with high RH. In general, the decrease in epidermal barrier function is caused by cold temperatures. The number of skin mast cells increases, keratinocytes release proinflammatory cytokines and cortisol, and the skin becomes more sensitive to allergens and irritants.[24] In this study, the dominant respondent (78.1%) had a course influenced by environmental/emotional factors. However, Parthasarathy et al. reported that a history of winter exacerbations was seen in 8% of cases, whereas summer exacerbations were not seen in any.[4]

CONCLUSION

Most patients with mild to moderate atopic dermatitis had three of the four main criteria on Hanifin-Rajka, and half of the participants had insufficiently hydrated skin.

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