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Characteristics, Clinical, and Trichoscopic Features in Pediatric Patients with Alopecia Areata: A Single-Center Observational Study at the Dermatology Clinic of Dr. M. Djamil General Hospital Padang

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ABSTRACT

Background: Alopecia areata (AA) is an autoimmune disease that causes patchy hair loss. In children, AA can have a significant psychological impact. This study aims to identify the characteristics, clinical and trichoscopic features of AA pediatric patients at the dermatology clinic of Dr. M. Djamil General Hospital Padang. **Methods:** This cross-sectional analytical observational study involved pediatric patients (<18 years) with a diagnosis of AA who came to the dermatology clinic of Dr. M. Djamil General Hospital Padang between January 2020 to December 2023. Demographic data, disease history, clinical features, and trichoscopy examination results were collected and analyzed descriptively. **Results:** A total of 125 pediatric AA patients met the inclusion criteria. The majority of patients were female (62.4%) with a mean age of 10.5 years. The most common form of AA is patchy (80%), followed by alopecia totalis/universalis (12%) and ophiasis (8%). A history of atopy was found in 35.2% of patients. The most frequently found trichoscopic features were yellow dots (78.4%), black dots (64%), and broken hairs (56%). **Conclusion:** This study provides a comprehensive description of the characteristics, clinical and trichoscopic characteristics of AA pediatric patients at Dr. M. Djamil General Hospital Padang. These findings may provide a basis for the development of better management strategies for AA in children.

1. Introduction

Alopecia areata (AA) is a chronic autoimmune disease characterized by scarless hair loss, which can occur in all age groups and genders. This disease not only has an impact on physical aspects but can also have a significant psychological impact, especially in children. The prevalence of AA in children is estimated at 2% of all AA cases, and this figure may be higher in certain populations. The pathogenesis of AA involves an autoimmune response directed at hair follicles, causing disruption of the hair growth cycle and resulting in hair loss. Although the exact mechanisms are not completely understood, research has identified several factors that contribute to the development of

AA. Genetic factors play an important role in susceptibility to AA. Genome association studies show a relationship between AA and genes related to the immune system, such as the human leukocyte antigen (HLA) gene. Individuals with a family history of AA have a higher risk of developing this disease. Apart from genetic factors, environmental factors are also thought to play a role in the development of AA. A history of atopy, that is, a tendency to develop allergic reactions, has been identified as a significant risk factor for AA in children. Other autoimmune diseases, such as vitiligo and autoimmune thyroid disease, are also more common in AA patients. Psychological stress is another environmental factor that is thought to

trigger or worsen AA. Several studies report an association between significant stressful events and the onset or exacerbation of AA. The mechanisms underlying this association are unclear but are thought to involve activation of the hypothalamic-pituitary-adrenal (HPA) axis and increased production of stress hormones, which may influence immune system function.^{1,2}

The diagnosis of AA in children is based on the clinical picture and supporting examinations. The typical clinical picture is round or oval hair loss, with a smooth, non-inflamed skin surface. Lesions can be single or multiple and can involve the entire scalp (alopecia totalis) or even the entire body (alopecia universalis). Trichoscopy examination is a non-invasive method that is very useful in diagnosing AA. Trichoscopy allows visualization of the structure of the hair and scalp in more detail, so it can help identify the typical trichoscopic features of AA, such as yellow dots, black dots, broken hairs, and exclamation mark hairs. Management of AA in children aims to control inflammation, stimulate hair growth, and provide psychological support. Topical therapies, such as corticosteroids and minoxidil, are often used as first-line therapy. In cases that are more severe or unresponsive to topical therapy, systemic therapy, such as oral corticosteroids or immunomodulators, may be considered. Psychological support is an important aspect of the management of AA in children. Counseling and behavioral therapy can help children overcome the psychological impacts of hair loss, such as anxiety, depression, and disturbed self-image.^{3,4}

Research on AA in children in Indonesia is still limited. Most of the existing research was conducted in Western countries, so the available data may not fully reflect the characteristics and course of the disease in the Indonesian population. Genetic, environmental, and cultural differences can influence clinical manifestations and response to therapy in AA patients in Indonesia. Therefore, this study aims to identify the characteristics, clinical and trichoscopic features of AA pediatric patients at the dermatology clinic of Dr. M. Djamil General Hospital Padang. It is

hoped that this information will contribute to increasing understanding of AA among children in Indonesia and assist in the development of management strategies that are more effective and appropriate to the local context.

2. Methods

This research used a cross-sectional analytical observational study design (cross-sectional). This design was chosen because it is suitable for identifying characteristics, and clinical and trichoscopic features in pediatric patients with alopecia areata (AA) in one observation period. Cross-sectional research allows simultaneous data collection regarding the variables studied so that it can provide a comprehensive picture of the patient's condition at the time the research was conducted. This research was carried out at the dermatology clinic of Dr. M. Djamil General Hospital Padang, West Sumatera, Indonesia. Dr. M. Djamil General Hospital Padang was chosen as the research site because it is the highest referral hospital in the West Sumatra region and has a fairly large number of pediatric patients with AA. The data collection period lasts for 4 years, namely from January 2020 to December 2023.

The study population was all pediatric patients under 18 years of age who were diagnosed with AA and sought treatment at the dermatology clinic of Dr. M. Djamil General Hospital Padang during the research period. The inclusion criteria established in this study are as follows: Pediatric patients under 18 years of age and the diagnosis of AA is made based on anamnesis, physical examination, and relevant supporting examinations (trichoscopy). Meanwhile, the exclusion criteria set are as follows: Patients with other skin diseases that can cause hair loss, such as tinea capitis, androgenetic alopecia, and traumatic alopecia areata as well as patients with a history of AA treatment that is not well documented. Sampling was carried out using non-probability sampling using the consecutive sampling method. All pediatric patients who met the inclusion criteria and came for treatment to the dermatology clinic of Dr. M. Djamil General

Hospital Padang will be included in this research during the research period until the specified sample size is reached. The sample size was calculated with a confidence level of 95% and a relative precision of 10%. Based on these calculations, the minimum sample size required is 125 patients.

The variables examined in this study are as follows: Independent variables: Age, gender, ethnicity, history of atopy, and history of other autoimmune diseases. Dependent variables: AA form (patchy, alopecia totalis/universalis, ophiasis), extent of AA lesions, disease onset, trichoscopic appearance (yellow dots, black dots, broken hairs, exclamation mark hairs). Operational Definition: Alopecia areata (AA): An autoimmune disease characterized by scarless hair loss, can occur in all age groups, and involves an autoimmune response directed at hair follicles; Child: Individuals under 18 years of age; Atopy: A genetic tendency to develop allergic reactions, such as asthma, allergic rhinitis, and atopic dermatitis; Autoimmune diseases: A group of diseases that occur when the body's immune system attacks the body's own cells; Trichoscopy: A non-invasive examination method that uses a special instrument (dermatoscope) to magnify the scalp and hair, allowing visualization of the hair and scalp structure in more detail; Yellow dots: Yellow dots on the scalp visible on trichoscopic examination, are a typical sign of AA; Black dots: Black dots on the scalp seen on trichoscopic examination, may indicate AA disease activity; Broken hairs: Broken hairs visible on trichoscopy examination, are a sign of active hair loss in AA; Exclamation mark hairs: Hairs in the form of exclamation marks that are visible on trichoscopy examination, are a sign of hair that is narrowing at the proximal part and widening at the distal part.

Data is collected in several ways, namely: 1. Interview: Structured interviews are carried out to collect patient demographic data (age, gender, ethnicity) as well as disease history (history of atopy, history of other autoimmune diseases). 2. Physical Examination: Physical examination is performed to assess the clinical features of AA, including the form

of AA (patchy, alopecia totalis/universalis, ophiasis), the extent of AA lesions, and the onset of the disease. 3. Trichoscopy examination: Trichoscopy examination is carried out using a dermatoscope with a magnification of 20-40 times to identify the typical trichoscopic features of AA, such as yellow dots, black dots, broken hairs, and exclamation mark hairs. 4. Medical Record Recording: Relevant data from the patient's medical record, such as the results of laboratory tests and other supporting examinations, is recorded to complete the research data. The collected data will be analyzed descriptively using frequency distributions and percentages for categorical variables, as well as averages and standard deviations for numerical variables. Bivariate analysis will be carried out to see the relationship between independent and dependent variables using the chi-square test or Fisher's exact test. This research has received approval from the Health Research Ethics Committee of Dr. M. Djamil General Hospital Padang. Informed consent will be obtained from the patient's parent or guardian prior to data collection. The confidentiality of patient data will be properly maintained.

3. Results

Table 1 provides an interesting description of the characteristics of pediatric patients with alopecia areata (AA) at Dr. M. Djamil General Hospital Padang. Of the 125 patients observed, the majority were women, with a proportion reaching 62.4%. These findings are in line with previous research showing that AA occurs more often in girls than boys. Some theories suggest that hormonal differences and immune responses between women and men may be a predisposing factor. The mean age of pediatric patients diagnosed with AA was 10.5 years, with a standard deviation of 3.2 years. This indicates that AA can appear at various ages in children, although the most common age range is between 7 and 14 years. Interestingly, most of the patients (72%) came from the Minangkabau tribe, which is the majority tribe in West Sumatera. Although there are no studies that

specifically link ethnicity to AA risk, these findings open up opportunities for further research into potential genetic or environmental factors that may play a role. A history of atopy, i.e. a genetic predisposition to develop allergic reactions, was found in 35.2% of patients. This figure is quite significant and strengthens the hypothesis that AA is part of the atopic disease spectrum. Dysregulation of the immune

system and increased production of proinflammatory cytokines are thought to be the mechanisms underlying the relationship between atopy and AA. In addition, 12% of patients had a history of other autoimmune diseases. These findings support the concept that AA is an autoimmune disease and that individuals with one autoimmune disease have a higher risk of developing other autoimmune diseases.

Table 1. Characteristics of respondents.

Characteristics	Number of patients	Percentage (%)
Gender		
Female	78	62.4
Male	47	37.6
Mean age (SD)	10.5 (3.2)	
Ethnicity		
Minangkabau	90	72.0
Other	35	28.0
History of atopy	44	35.2
History of other autoimmune diseases	15	12.0

Figure 1 illustrates the distribution of alopecia areata (AA) types in pediatric patients. The most common type of AA is patchy AA, which accounts for 80% of cases. Patchy AA is characterized by the presence of one or more round or oval bald patches on the scalp. Other types of AA observed are alopecia totalis/universalis (12%), where all the hair on the scalp falls out, and ophiasis (8%), where hair falls out on the sides and back of the head.

Figure 1 also shows the distribution of AA disease onset in pediatric patients. Most patients (76%) experienced acute onset, meaning hair loss occurred within 6 months of diagnosis. Meanwhile, 24% of patients experienced a more gradual onset, where hair loss occurred slowly over a longer period of time. Overall, figure 1 provides a clear visual picture of the characteristics of AA in pediatric patients at Dr. M. Djamil General Hospital Padang.

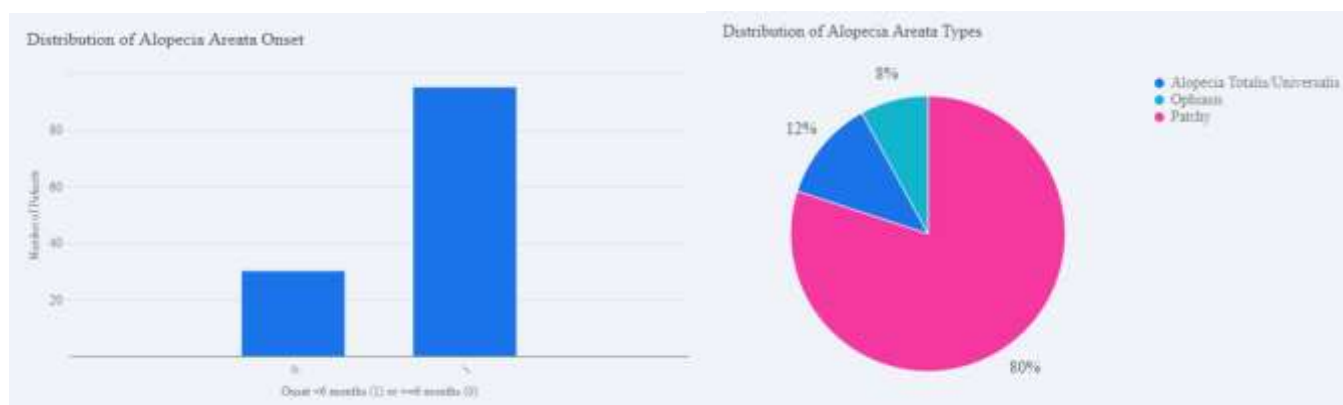


Figure 1. Clinical picture and onset of AA.

Table 2 provides interesting insights regarding the trichoscopic appearance in pediatric patients with alopecia areata (AA) at Dr. M. Djamil General Hospital Padang. Trichoscopy, as a powerful non-invasive diagnostic tool, reveals interesting patterns in the manifestation of AA in children. Yellow dots, which is a typical sign of AA, were found in 78.4% of patients. This high prevalence emphasizes the importance of yellow dots as a primary indicator in the diagnosis of AA in children. The presence of yellow dots indicates inflammatory activity around the affected hair follicles, leading to hair loss. Black dots, which also indicate disease activity, were found in 64% of patients. Black dots represent melanin pigment trapped in miniaturized hair follicles, indicating a pigmentation disorder associated with an inflammatory process. Broken hairs, indicating active hair loss, were found in 56% of patients. These findings highlight the

ongoing nature of hair loss in AA and emphasize the need for therapeutic intervention to prevent further hair loss. Exclamation mark hairs, which are characteristic exclamation mark-shaped hairs, are found in 40% of patients. Although not specific to AA, exclamation mark hairs are frequently associated with this condition and may provide valuable prognostic information. Overall, the distribution of these trichoscopic images provides valuable visual evidence regarding the pathogenesis of AA in children. The presence of yellow dots, black dots, broken hairs, and exclamation mark hairs indicates an active inflammatory process targeting hair follicles, leading to hair loss. These findings not only strengthen our understanding of AA in children but also highlight the importance of trichoscopy as a valuable diagnostic and prognostic tool in the management of this condition.

Table 2. Frequency distribution of trichoscopic features in pediatric alopecia areata patients.

Trichoscopic features	Number of patients	Percentage (%)
Yellow dots	98	78.4
Black dots	80	64.0
Broken hairs	70	56.0
Exclamation mark hairs	50	40.0

4. Discussion

This study provides a comprehensive description of the demographic, clinical, and trichoscopic characteristics of pediatric patients with alopecia areata (AA) at the dermatology clinic of Dr. M. Djamil General Hospital Padang. The results of this study provide an important contribution to our understanding of AA in the pediatric population in Indonesia, as well as opening up opportunities for further research and the development of better management strategies. The majority of pediatric patients with AA in this study were female (62.4%), with a mean age of 10.5 years. This finding is in line with previous studies which reported that AA occurs more often in women than men, especially in the children and adolescents age group. Several factors

that may play a role in this difference in prevalence include hormonal, genetic and environmental factors.^{5,6}

The findings of this study, which showed that 35.2% of pediatric patients with AA had a history of atopy, provide strong support for the hypothesis that AA is part of the atopic disease spectrum. Atopy is a genetic predisposition to develop allergic reactions, such as asthma, allergic rhinitis, and atopic dermatitis. These diseases, including AA, have a common thread in the form of immune system dysregulation. In individuals with atopy, the immune system tends to overreact to substances that are usually harmless, such as pollen, dust, or certain foods. This overreaction involves the release of various inflammatory mediators, including proinflammatory

cytokines such as interleukin-4 (IL-4), IL-13, and interferon-gamma (IFN- γ). These cytokines play an important role in the regulation of immune responses, but in individuals with atopy, their production is excessive and uncontrolled. This can trigger a chronic inflammatory reaction that damages body tissue, including hair follicles. Studies have shown that levels of IL-4, IL-13, and IFN- γ are increased in skin lesions of patients with AA. These cytokines are thought to play a role in activating immune cells that attack hair follicles, causing inflammation and hair loss. IL-4 and IL-13 play a role in the differentiation of T helper 2 (Th2) cells, which are immune cells that play an important role in allergic responses. Th2 cells produce other cytokines that can amplify inflammatory reactions and damage hair follicles. IFN- γ plays a role in activating cytotoxic T cells and natural killer (NK) cells, which are immune cells that can kill infected or damaged body cells. In AA, these cells are thought to attack healthy hair follicles, causing hair loss.⁷⁻⁹

The finding that 12% of pediatric patients with alopecia areata (AA) in this study also had a history of other autoimmune diseases is an important indication of the complexity of this disease. Alopecia areata, as is known, is an autoimmune disease in which the body's immune system mistakenly attacks healthy hair follicles. However, these findings suggest that AA often does not occur in isolation, but is part of a broader autoimmune syndrome. Autoimmune syndromes are a group of diseases in which the body's immune system attacks the body's own cells and tissues. Some autoimmune diseases that are often associated with AA include: Vitiligo: A skin condition characterized by loss of melanin pigment, resulting in white patches on the skin; Autoimmune thyroid disease: A condition in which the immune system attacks the thyroid gland, which can lead to hyperthyroidism (overactive thyroid) or hypothyroidism (underactive thyroid); Type 1 diabetes mellitus: Chronic condition in which the pancreas does not produce enough insulin, a hormone that regulates blood sugar levels; Systemic lupus erythematosus (SLE): A chronic inflammatory disease that can affect various organs and tissues of the body,

including the skin, joints, kidneys, and brain. The association between AA and other autoimmune diseases may be explained by several mechanisms: Genetic predisposition: Individuals with a family history of autoimmune diseases have a higher risk of developing AA and other autoimmune diseases.¹⁰⁻¹²

Some of the genes associated with AA are also associated with other autoimmune diseases. Immune system dysregulation: AA and other autoimmune diseases are characterized by immune system dysregulation, in which the body's immune system attacks the body's own cells and tissues. The mechanisms underlying this dysregulation are not fully understood but are thought to involve genetic, environmental, and infectious factors. Inflammatory microenvironment: The inflammatory microenvironment that occurs in AA can trigger or exacerbate other autoimmune diseases. Proinflammatory cytokines produced during the autoimmune response to AA can activate other immune cells and trigger autoimmune reactions in other organs or tissues. These findings have important implications in the diagnosis and management of AA in children. Children with AA should be evaluated comprehensively to detect the possibility of other autoimmune diseases. In addition, treatment of AA must take into account the possibility of other autoimmune diseases and the risk of associated complications. Further research is needed to understand more about the relationship between AA and other autoimmune diseases. Genetic research can help identify genes that play a role in predisposition to AA and other autoimmune diseases. Immunological studies can help uncover the mechanisms underlying immune system dysregulation in AA and other autoimmune diseases.¹³⁻¹⁵

This study revealed that patchy alopecia areata (AA) is the most common form found in pediatric patients, with a prevalence reaching 80%. Patchy AA is characterized by the presence of one or more round or oval bald patches on the scalp. These patches can vary in size, ranging from small to larger lesions. Hair loss in patchy AA usually occurs suddenly and can

progress rapidly over several weeks or months. Alopecia totalis and alopecia universalis, which are more severe forms of AA, are found in 12% of pediatric patients. Alopecia totalis involves the loss of all the hair on the scalp, while alopecia universalis causes hair loss all over the body, including the eyebrows, eyelashes, and pubic hair. Both forms of AA can have a significant psychological impact on patients, especially children and adolescents. Ophiasis, which is a rare form of AA, is found in 8% of pediatric patients. Ophiasis is characterized by hair loss on the sides and back of the head, forming a ribbon-like pattern. Ophiasis is often more difficult to treat than other forms of AA and can have a poorer prognosis. The extent of AA lesions in pediatric patients varies greatly, ranging from single lesions to involving the entire scalp. In some patients, AA lesions may be limited to one small area, whereas in others, the lesions may expand and join to form larger bald areas. The extent of AA lesions does not always correlate with the severity of the disease, as some patients with small lesions may experience more severe hair loss than patients with larger lesions.^{16,17}

The majority of pediatric patients (76%) in this study experienced acute onset of AA disease, i.e. hair loss occurred in less than 6 months from diagnosis. The acute onset of AA is often triggered by stress factors, both psychological stress and physical stress. Stress can trigger an autoimmune response that attacks hair follicles, causing sudden hair loss. Several studies have shown an association between psychological stress, such as stressful life events or anxiety disorders, and the onset of AA. Physical stress, such as infection or trauma, may also trigger the onset of AA in genetically susceptible individuals. Meanwhile, the more gradual onset of AA disease may be related to genetic or environmental factors. Several studies have identified certain genes associated with an increased risk of AA. Environmental factors, such as exposure to chemicals or viral infections, may also play a role in the development of AA in genetically predisposed individuals. This study provides valuable insight into the shape, extent of lesions, and disease

onset of AA in pediatric patients. These findings can help doctors and other health professionals understand the course of AA in children and provide more appropriate treatment. Further research is needed to identify factors that influence the shape, extent of lesions, and disease onset of AA in children, as well as to develop more effective prevention and treatment strategies.^{17,18}

Trichoscopic examination of pediatric patients with alopecia areata (AA) at Dr. M. Djamil General Hospital Padang revealed several important findings that provide deeper insight into the pathophysiology and prognosis of this disease. Yellow dots, which are small yellow dots on the scalp, were the most common trichoscopic appearance found in pediatric patients with AA (78.4%). The presence of yellow dots is considered a typical sign of AA and indicates the presence of inflammatory activity around the affected hair follicles. Histologically, yellow dots correspond to the accumulation of sebum and keratin in hair follicles that are undergoing miniaturization. Yellow dots can appear at all stages of AA, both in the early (active) and late (stable) stages. However, the prevalence of yellow dots tends to be higher in the early stages of the disease, when inflammatory activity is higher. Therefore, yellow dots can be considered a marker of AA disease activity and can help physicians in determining prognosis and response to treatment. Black dots, which are small black dots on the scalp, are found in 64% of pediatric patients with AA. Black dots can have two different meanings in the context of AA. First, black dots can indicate AA disease activity, especially if found together with yellow dots and broken hairs. In this case, black dots are considered to be melanin pigment trapped in hair follicles that experience miniaturization due to the inflammatory process. Second, black dots can also be a sign of post-inflammation, especially if found in inactive AA lesions. In this case, black dots are thought to be remnants of melanin pigment left behind after the hair follicles have recovered from inflammation. Therefore, the interpretation of black dots should be carried out carefully, taking into account other clinical and

trichoscopic features.^{16,18}

Broken hairs, which are broken hairs near the surface of the scalp, are found in 56% of pediatric patients with AA. Broken hairs are a sign of active hair loss in AA and can be found at all stages of the disease. However, the prevalence of broken hair tends to be higher in the early stages of the disease, when inflammatory activity is higher. Broken hairs can be caused by several mechanisms, including disruption of the hair growth cycle, structural damage to the hair due to inflammation, and physical trauma due to scratching or manipulation of the hair. The presence of broken hairs indicates that the hair follicles are still active and have the potential to recover if inflammation can be controlled. Exclamation mark hairs, which are characteristic exclamation mark-shaped hairs, are found in 40% of pediatric patients with AA. Exclamation mark hairs are formed due to narrowing of the hair at the proximal part (near the scalp) and widening at the distal part (tip of the hair). This narrowing is caused by disruption of the hair growth cycle and structural damage to the hair due to inflammation. Although not specific to AA, exclamation mark hairs are frequently associated with this condition and may provide valuable prognostic information. The presence of exclamation mark hairs in the early stages of AA may indicate a better prognosis, as it indicates that the hair follicles are still active and have the potential to recover.^{19,20}

The findings of this study have several important clinical implications. First, the high prevalence of AA in girls and the association between AA and atopy and other autoimmune diseases indicate the importance of screening and monitoring children with a history of atopy or other autoimmune diseases to detect AA early. Second, the characteristic trichoscopic appearance of AA can help doctors accurately diagnose AA and monitor disease progression. Trichoscopy is a non-invasive diagnostic tool that is easy to perform and can provide valuable information regarding disease activity and prognosis. Third, these findings may provide a basis for the development of better management strategies for AA in children.

Treatment of AA in children must take into account various factors, including patient age, extent of lesion, disease onset, and trichoscopic appearance. Some therapeutic options that can be considered include topical or intralesional corticosteroids, topical minoxidil, anthralin, topical immunotherapy, and systemic therapy such as oral corticosteroids or methotrexate.

This research has several limitations. First, the cross-sectional research design does not allow for determining cause-and-effect relationships between the variables studied. Second, this study was conducted in one health center, so the results of the study may not be generalizable to the population of children with AA in Indonesia as a whole. Third, this study did not include a control group, so it could not compare the characteristics of pediatric patients with AA with those of children without AA. Further research is needed to overcome these limitations. Prospective cohort studies could be conducted to evaluate risk factors and course of AA in children. Multicenter research can be conducted to assess the prevalence and characteristics of AA in the child population in various regions in Indonesia. In addition, further research is also needed to identify biomarkers that can predict disease progression and response to treatment in children with AA.

5. Conclusion

This study provides a comprehensive description of the demographic, clinical, and trichoscopic characteristics of pediatric patients with AA at the dermatology clinic of Dr. M. Djamil General Hospital Padang. These findings may provide a basis for the development of better management strategies for AA in children, including more targeted and individualized therapeutic approaches. Further research is needed to explore other risk factors and identify biomarkers that may predict disease progression and response to treatment in children with AA.

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