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Unveiling the Hidden Patterns: A Dermoscopic Analysis of Vitiligo Lesions at a Tertiary Care Center in Surakarta, Indonesia

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A B S T R A C T

Background: Vitiligo, a common depigmenting disorder, presents with a variety of clinical manifestations. Dermoscopy, a non-invasive skin imaging technique, has emerged as a valuable tool for evaluating pigmentary disorders. This study aimed to analyze the dermoscopic patterns of vitiligo lesions in a cohort of patients at a tertiary care center in Surakarta, Indonesia, and to correlate these patterns with disease stability. **Methods:** This cross-sectional study included 20 adult patients diagnosed with vitiligo at the Dermatology and Venereology Outpatient Clinic of Dr. Moewardi Regional General Hospital Surakarta in July 2023. A dermoscopic examination was performed on all patients using a polarized light dermoscope. Dermoscopic features were analyzed and categorized based on the BPLeFoSK criteria (Border, Pigment Network, Lesions, Follicular, Koebner). Disease stability was assessed based on clinical and dermoscopic findings. **Results:** The majority of patients were female (75%) and between 21-40 years old (65%). All patients exhibited the characteristic "white glow" under dermoscopy. Other common findings included reduced or absent pigment network (40% each), perifollicular hyperpigmentation (30%), and perilesional hyperpigment (30%). Satellite lesions and micro-Koebner phenomenon, indicative of disease activity, were observed in 10% of patients each. Based on these findings, 80% of patients were classified as having stable vitiligo, while 20% had unstable vitiligo. **Conclusion:** Dermoscopy revealed a spectrum of patterns in vitiligo lesions, with the "white glow" being a universal finding. The majority of patients in this cohort had stable vitiligo. Dermoscopy can aid in assessing disease activity and guiding treatment decisions in vitiligo patients.

1. Introduction

Vitiligo, a chronic autoimmune disorder, affects approximately 0.5-2% of the global population, causing a significant impact on the quality of life for those afflicted. This acquired pigmentary disorder is characterized by the selective destruction of melanocytes, the cells responsible for producing melanin, the pigment that gives skin its color. The destruction of melanocytes leads to the formation of depigmented macules and patches on the skin, causing a profound aesthetic impact and often leading to psychological distress. The pathogenesis of vitiligo is complex and multifactorial, involving a complex interplay of genetic, autoimmune, oxidative stress, and neural factors. Genetic predisposition plays a significant role, with multiple genes associated with an increased risk of developing vitiligo. Autoimmune mechanisms are also implicated, with evidence suggesting that the body's immune system mistakenly attacks and destroys melanocytes. Oxidative stress, an imbalance between the production of reactive oxygen species and the body's ability to detoxify them, is also believed to contribute to melanocyte damage. Additionally, neural factors, such as the release of

neuropeptides, may play a role in the pathogenesis of vitiligo.[1-4]

The unpredictable course of vitiligo and its significant impact on quality of life make it a challenging condition to manage. The disease can progress slowly or rapidly, with periods of stability interspersed with periods of activity. The extent and location of depigmentation can vary widely, affecting any part of the body, including the skin, hair, and mucous membranes. The psychological impact of vitiligo can be substantial, leading to feelings of self-consciousness, embarrassment, and social isolation. Diagnosis of vitiligo is primarily clinical, based on the characteristic appearance of depigmented lesions. However, dermoscopy, a non-invasive technique that magnifies and illuminates the skin, has emerged as a valuable tool for evaluating pigmentary disorders. Dermoscopy allows for the visualization of subtle features not visible to the naked eye, aiding in the diagnosis and assessment of vitiligo.[5-7]

Several studies have investigated the dermoscopic patterns of vitiligo lesions. Common dermoscopic findings in vitiligo include; White glow: A bright white background due to the absence of melanin, allowing visualization of deeper dermal structures; Reduced or absent pigment network: Loss of the normal reticular pattern of pigmentation; Perifollicular hyperpigmentation: Increased pigment around hair follicles; Perilesional hyperpigmentation: Increased pigment at the border of vitiligo lesions; Satellite lesions: Small depigmented macules scattered around the main lesion, indicating disease activity; Micro-Koebner phenomenon: Development of new lesions at sites of trauma, suggesting disease instability. These dermoscopic features can provide insights into disease activity and stability. Stable vitiligo is characterized by well-defined borders, absent or reduced pigment network, and perifollicular and perilesional hyperpigmentation. In contrast, unstable vitiligo often exhibits ill-defined borders, a white glow, satellite lesions, micro-Koebner phenomenon, and a disrupted pigment network.[8-10] In this study, we aimed to analyze the dermoscopic patterns of vitiligo lesions in a cohort of patients at a tertiary care center in Surakarta, Indonesia.

2. Methods

This research employed a cross-sectional design to analyze the dermoscopic patterns of vitiligo lesions in a cohort of patients at a tertiary care center in Surakarta, Indonesia. The study was conducted at the Dermatology and Venereology Outpatient Clinic of Dr. Moewardi Regional General Hospital Surakarta in July 2023. The study population consisted of adult patients (≥18 years old) diagnosed with vitiligo based on clinical examination and ICD-10 code L80. The diagnosis of vitiligo was established by experienced dermatologists based on the characteristic clinical presentation of depigmented macules and patches on the skin. The ICD-10 code L80 was used to ensure that all patients included in the study had a confirmed diagnosis of vitiligo. Patients with segmental vitiligo or other pigmentary disorders were excluded from the study. Segmental vitiligo is a distinct subtype of vitiligo characterized by a unilateral distribution of lesions and a different pathogenesis compared to non-segmental vitiligo. The exclusion of patients with other pigmentary disorders, such as pityriasis alba, tinea versicolor, and post-inflammatory hypopigmentation, was necessary to ensure that the dermoscopic patterns observed were specific to vitiligo.

A dermoscopic examination was performed on all patients using a polarized light dermoscope (DermLite DL3, 3Gen, San Juan Capistrano, CA, USA). Polarized light dermoscopy is a non-invasive imaging technique that uses polarized light to visualize subsurface skin structures. The DermLite DL3 is a handheld dermoscope that provides high-quality magnified images of the skin. The dermoscope was applied directly to the skin, and images were captured using a digital camera (Canon EOS 80D, Canon Inc., Tokyo, Japan) attached to the dermoscope. The use of a digital camera allowed for the documentation and storage of dermoscopic images for further analysis. The Canon EOS 80D is a high-resolution digital camera that captures detailed images of the skin.

Dermoscopic features were analyzed and categorized based on the BPLeFoSK criteria. The BPLeFoSK criteria is a standardized system for describing dermoscopic features of pigmentary lesions. The acronym BPLeFoSK stands for Border, Pigment Network, Lesions, Follicular, Koebner; Border: The border of the lesion is assessed for its definition, regularity, and presence of any specific features, such as notching or scalloping; Pigment Network: The pigment network is evaluated for its presence, pattern, and distribution; Lesions: The morphology and distribution of individual lesions are assessed; Follicular: The presence and pattern of perifollicular pigmentation are noted; Koebner: The presence of the Koebner phenomenon, the development of new lesions at sites of trauma, is assessed.

Disease stability was assessed based on clinical and dermoscopic findings. Clinical assessment included evaluating the size, shape, and distribution of vitiligo lesions, as well as the presence of any new or expanding lesions. Dermoscopic assessment involved analyzing the features described in the BPLeFoSK criteria. Patients were classified as having stable vitiligo if they met the following criteria; Well-defined borders; Absent or reduced pigment network; Perifollicular and perilesional hyperpigmentation; Absence of satellite lesions and micro-Koebner phenomenon. Patients not meeting these criteria were classified as having unstable vitiligo. The classification of vitiligo stability was based on the established criteria for stable and unstable vitiligo, which reflect the underlying disease activity.

Data were analyzed using descriptive statistics. Frequencies and percentages were calculated for categorical variables, such as gender, age group, education level, occupation, and dermoscopic features. Descriptive statistics were used to summarize the demographic and dermoscopic characteristics of the study population.

The study was approved by the Ethics Committee of Dr. Moewardi Regional General Hospital Surakarta. Ethical approval was obtained to ensure that the study was conducted in accordance with ethical principles and guidelines for research involving human subjects. All patients provided written informed consent before participating in the study. Informed consent was obtained to ensure that patients were fully informed about the study's purpose, procedures, risks, and benefits before agreeing to participate.

3. Results

Table 1 provides a breakdown of the demographic characteristics of the 20 vitiligo patients involved in the study. There's a significant skew towards female participants. 75% of the patients were female, with only 25% being male. This aligns with general vitiligo prevalence trends where, while the condition affects both sexes roughly equally, women tend to seek treatment more often. The majority of patients (65%) fell within the 21-40 year age bracket. This suggests that the study population primarily consisted of younger adults. 35% were aged 40 or older, indicating some representation of older age groups, though less prominent. The most common education level was Senior High School, representing 45% of the participants. A combined 40% had either a Diploma or a Bachelor's/Master's degree, suggesting a fair proportion with higher education. 15% had only completed Junior High School. The largest occupational group was students (40%), which is likely related to the prominent 21-40 age group. The remaining participants were fairly evenly distributed across housewives, private employees, entrepreneurs, and civil servants, each representing 15%.

Table 2 presents the key dermoscopic characteristics observed in the vitiligo lesions of the 20 study participants; White glow: This was present in 100% of the patients, confirming its status as a hallmark dermoscopic feature of vitiligo. It results from the complete absence of melanin, allowing deeper skin layers to become visible; Pigment Network: 40% of patients showed a reduced pigment network, indicating some disruption of the normal melanin distribution. Another 40% had a completely absent pigment network, signifying more extensive

melanocyte loss. Reversed pattern was not observed in any patient. While reversed pigment network is associated with vitiligo, its absence here might be due to the small sample size or the specific characteristics of this patient group; Lesion Morphology: These were found in 10% of patients. Their presence suggests disease activity, as they represent new, smaller depigmented spots emerging around the main lesion; Koebner Phenomenon: Also found in 10% of patients, this indicates the development of new lesions at sites of minor skin trauma, further pointing towards disease activity; Pigmentation: Observed in 30% of patients, this refers to increased pigment surrounding hair follicles within the depigmented lesion. Also present in 30%, this describes increased pigmentation at the border of the vitiligo lesion. Both types of hyperpigmentation likely represent a compensatory response to melanocyte loss; Vitiligo Stability: 80% of patients were classified as having stable vitiligo based on the combination of dermoscopic features. This indicates that the majority of patients had lesions that were not actively expanding at the time of the study. The remaining 20% were classified as having unstable vitiligo due to the presence of satellite lesions or micro-Koebner phenomenon.

Table 1. Demographic characteristics of vitiligo patients.

Characteristic	Number (n)	Percentage (%)
Gender		
Male	5	25
Female	15	75
Age (years)		
21-40	13	65
≥40	7	35
Education level		
Junior High School	3	15
Senior High School	9	45
Diploma	4	20
Bachelor's/Master's Degree	4	20
Occupation		
Student	8	40
Housewife	3	15
Private employee	3	15
Entrepreneur	3	15
Civil servant	3	15

Table 2. Dermoscopic characteristics of vitiligo lesions.

Dermoscopic feature	Number of patients (n)	Percentage (%)
White glow	20	100
Pigment network		
Reduced	8	40
Absent	8	40
Reversed	0	0
Lesion morphology		
Satellite lesions	2	10
Koebner phenomenon		
Micro-Koebner phenomenon	2	10
Pigmentation		
Perifollicular hyperpigmentation	6	30
Perilesional hyperpigmentation	6	30
Vitiligo stability		
Stable vitiligo	16	80
* Well-defined borders	16	80
* Pigment network (absent or reduced)	8	40
* Perifollicular hyperpigmentation	6	30
* Perilesional hyperpigmentation	6	30
Unstable vitiligo	4	20
* Satellite lesions	2	10
* Micro-Koebner phenomenon	2	10

Figure 1 provides a visual representation of the various dermoscopic features observed in the vitiligo lesions of the study participants; Reduced Pigment Network (Red Arrows): Images A to F showcase areas where the pigment network is visibly reduced. This indicates a partial loss of the normal reticular pattern of pigmentation due to melanocyte destruction. The remaining pigment network might appear thinner, fragmented, or less defined compared to healthy skin; Absent Pigment Network (Blue Arrows): In images B, G, H, J, and K, the pigment network is completely absent. This signifies a more severe loss of melanocytes, leading to a homogenous white appearance without any visible pigment network; Perifollicular Hyperpigmentation (Yellow Arrows): Images H, I, and J demonstrate perifollicular hyperpigmentation, where there is an increased concentration of pigment around hair follicles within the depigmented lesion. This is thought to be a compensatory mechanism where remaining melanocytes around hair follicles increase melanin production; Perilesional Hyperpigmentation (Green Arrows): Images B, G, and K exhibit perilesional hyperpigmentation, characterized by increased pigmentation at the border of the vitiligo lesion. This also likely represents a compensatory increase in melanin production in the surrounding skin; Micro-Koebner Phenomenon (Purple Arrows): Images J and K highlight the micro-Koebner phenomenon, where new, small depigmented spots appear at sites of minor skin trauma, such as scratches or friction. This indicates active disease and an ongoing inflammatory process; Satellite Lesions (Circles): Images K and L show satellite lesions, which are small depigmented macules scattered around the main vitiligo lesion. These lesions also suggest disease activity and the potential for further spread.

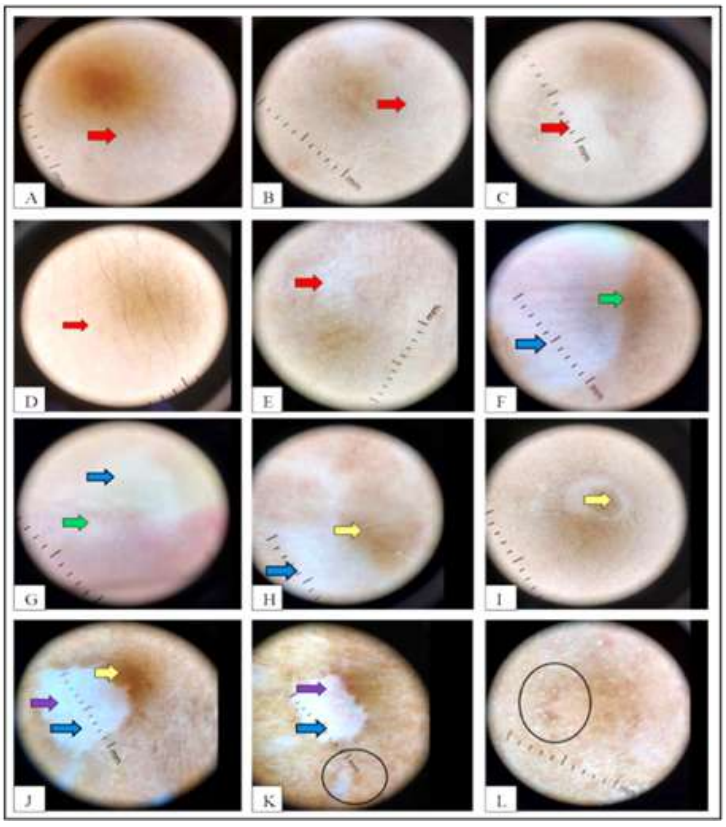

Figure 1. Dermoscopic features in vitiligo patients. (A-F) Reduced pigment network (red arrows). (B, G, H, J, K) Absent pigment network (blue arrows). (H, I, J) Perifollicular hyperpigmentation (yellow arrows). (B, G, K) Perilesional hyperpigmentation (green arrows). (J, K) Micro-Koebner phenomenon (purple arrows). (K, L) Satellite lesions (circles).

Figure 2 focuses specifically on the different pigment network patterns that can be observed in vitiligo lesions using dermoscopy; A. Reduced Pigment Network: This image shows a vitiligo lesion where the pigment network is still present but appears visibly reduced compared to normal skin. The reticular pattern of pigmentation may be thinner, with fewer interconnected lines, or it may appear fragmented and less organized. This pattern suggests a partial loss of melanocytes in the affected area; B. Absent Pigment Network: In this image, the pigment network is completely absent within the vitiligo lesion. The area appears homogeneously white or depigmented, without any visible reticular pattern. This indicates a complete loss of melanocytes in the affected area, leading to the absence of melanin production; C. Reversed Pigment Network: This image illustrates a less common pattern in vitiligo known as reversed pigment network. In this pattern, the pigment network appears darker or more prominent than in the surrounding skin. This is thought to occur due to a compensatory increase in melanin production by melanocytes at the periphery of the lesion; D. Reduced reticular pattern: This image appears to show normal skin with an intact and well-defined pigment network. It likely serves as a reference point for comparison with the other images, highlighting the changes in pigment network patterns associated with vitiligo.

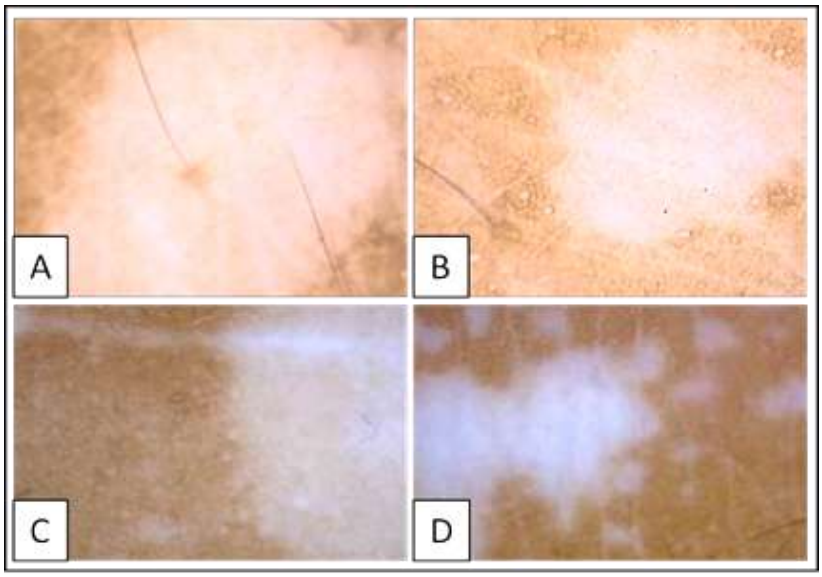

Figure 2. Pigment network patterns in vitiligo: (A) Reduced pigment network; (B) Absent pigment network; (C) Reversed pigment network; (D) Reduced reticular pattern.

Figure 3 provides a closer look at specific dermoscopic features commonly observed in vitiligo, focusing on pigmentation patterns and signs of disease activity; A. Perifollicular Hyperpigmentation: This image demonstrates increased pigmentation surrounding hair follicles within a depigmented vitiligo lesion. The hair follicles appear as darker spots or streaks within the white background of the lesion. This phenomenon is thought to occur due to a compensatory increase in melanin production by melanocytes located around the hair follicles; B. Perilesional Hyperpigmentation: This image shows increased pigmentation at the border of a vitiligo lesion. The edge of the lesion appears darker than the surrounding skin, creating a distinct border. This is also believed to be a compensatory response, where melanocytes at the periphery of the lesion increase melanin production; C. Micro-Koebner Phenomenon: This image highlights the micro-Koebner phenomenon, where new, small depigmented spots

develop at sites of minor skin trauma, such as scratches or friction. This indicates active disease and an ongoing inflammatory process. In this image, the micro-Koebner phenomenon is likely represented by the small, white spots within the larger depigmented area.

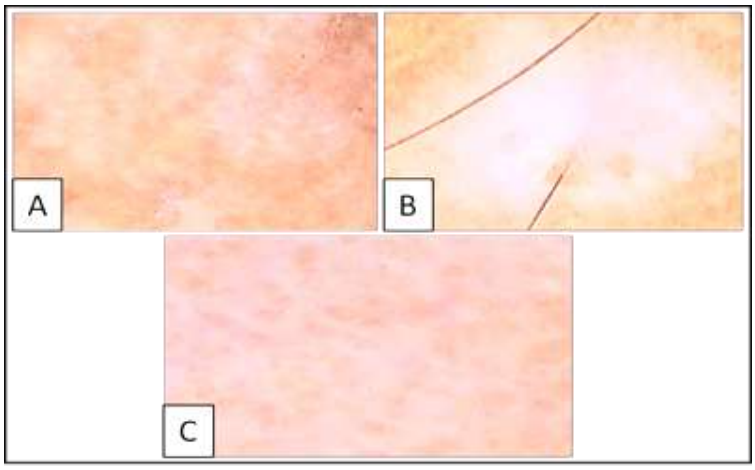

Figure 3. Dermoscopic features in vitiligo. (A) Perifollicular hyperpigmentation; (B) Perilesional hyperpigmentation; (C) Micro-Koebner phenomenon.

4. Discussion

Dermoscopy, a non-invasive skin imaging technique, has revolutionized the evaluation of pigmentary disorders, including vitiligo. By magnifying and illuminating the skin, dermoscopy allows for the visualization of subtle features not visible to the naked eye, providing valuable insights into the underlying pathophysiology of vitiligo and aiding in disease assessment and management. In our study, we observed several major dermoscopic patterns in vitiligo lesions, including pigment network abnormalities and perifollicular/perilesional hyperpigmentation. These patterns reflect the complex interplay of melanocyte destruction, compensatory mechanisms, and disease activity in vitiligo. The most prevalent dermoscopic patterns observed in our study were alterations in the pigment network, specifically a reduced or absent pigment network, each found in 40% of the patients. This finding aligns with the fundamental pathophysiology of vitiligo, which involves the destruction of melanocytes, the cells responsible for producing melanin. The disruption of melanocytes leads to a disruption in the normal melanin distribution, causing a loss of the reticular pattern of pigmentation that characterizes healthy skin. In healthy skin, the pigment network appears as a delicate, interconnected network of brown lines, reflecting the even distribution of melanocytes and melanin. This network is responsible for the skin's overall color and texture and plays a crucial role in protecting the skin from harmful UV radiation. However, in vitiligo, this network can be altered in several ways, reflecting the underlying melanocyte destruction and disease progression. In cases where the melanocyte destruction is partial or less severe, the pigment network may appear reduced. This means that the network is still visible but appears thinner, fragmented, or less defined compared to healthy skin. The lines may be fainter, shorter, and less interconnected, indicating a decrease in the number of functional melanocytes in the area. This pattern suggests that some melanocytes are still present and producing melanin, but their number and function are compromised. In areas with complete or near-complete melanocyte loss, the pigment network may be entirely absent. This results in a homogenous white or depigmented appearance without any visible reticular pattern. The absence of a pigment network

signifies a more severe stage of melanocyte destruction, where the melanocytes have been completely or almost completely destroyed, leading to a complete absence of melanin production in the affected area. These alterations in the pigment network are key dermoscopic features of vitiligo and can provide valuable information about the extent of melanocyte loss and disease progression. The reduced pigment network suggests a less severe stage, where some melanocytes are still present and functional, while the absent pigment network indicates more extensive melanocyte destruction and a more advanced stage of the disease. Another frequent observation in our study was perifollicular and perilesional hyperpigmentation, present in 30% of the patients. This phenomenon is thought to represent a compensatory mechanism in response to melanocyte loss, where the remaining melanocytes increase melanin production to compensate for the loss of pigmentation. Perifollicular hyperpigmentation refers to increased pigmentation surrounding hair follicles within the depigmented lesion. The hair follicles appear as darker spots or streaks within the white background of the lesion. This occurs because melanocytes are often preserved around hair follicles, particularly in the bulge region, which houses melanocyte stem cells. In response to melanocyte loss in the surrounding epidermis, these follicular melanocytes may increase melanin production, leading to a localized increase in pigmentation around the hair follicles. Perilesional hyperpigmentation describes increased pigmentation at the border of the vitiligo lesion. The edge of the lesion appears darker than the surrounding skin, creating a distinct border. This is also believed to be a compensatory response, where melanocytes at the periphery of the lesion increase melanin production to compensate for the loss of melanocytes within the lesion. This hyperpigmentation may be due to the migration of melanocytes from the surrounding skin or to the increased activity of existing melanocytes at the lesion's periphery. The presence of perifollicular and perilesional hyperpigmentation can have important implications for treatment and prognosis. It suggests that there are still functional melanocytes present in the skin, either around hair follicles or at the lesion's periphery. These melanocytes can potentially contribute to repigmentation efforts, either spontaneously or in response to treatment. Therefore, the presence of these hyperpigmentation patterns may indicate a better prognosis for repigmentation, as there are still melanocytes available to produce melanin. The major dermoscopic patterns observed in our study, namely pigment network alterations and perifollicular/perilesional hyperpigmentation, provide valuable insights into the underlying pathophysiology of vitiligo and can aid in disease assessment and management. The pigment network alterations reflect the extent of melanocyte destruction and disease progression. A reduced pigment network suggests a less severe stage, while an absent pigment network indicates more extensive melanocyte loss. This information can help clinicians determine the appropriate treatment approach and monitor disease activity. For example, patients with an absent pigment network may require more aggressive treatment modalities, such as phototherapy or surgical interventions, to promote repigmentation. The presence of perifollicular and perilesional hyperpigmentation suggests a compensatory response to melanocyte loss and may indicate a better prognosis for repigmentation. These findings can be used to guide treatment decisions and provide patients with realistic expectations about the potential for repigmentation. For example, patients with perifollicular hyperpigmentation may be more likely to respond to treatments that stimulate melanocyte stem cells in the hair follicle bulge. In addition to guiding treatment decisions, the major dermoscopic patterns can also help clinicians monitor disease activity and progression. Changes in the pigment network, such as the appearance of new areas with reduced or absent pigment, may indicate disease progression and the need for treatment adjustments. Similarly, the disappearance of perifollicular or perilesional hyperpigmentation may suggest a worsening of the

disease.[11-13]

Vitiligo, an acquired pigmentary disorder characterized by the loss of melanocytes, exhibits a dynamic course with periods of stability interspersed with periods of activity. Understanding the indicators of disease activity is crucial for effective management and treatment, as it allows for timely interventions to control the disease and prevent further progression. Dermoscopy, a non-invasive skin imaging technique, has emerged as a valuable tool for assessing vitiligo activity by visualizing subtle features not visible to the naked eye. In our study, we observed two key dermoscopic features that serve as indicators of active vitiligo satellite lesions and the micro-Koebner phenomenon. Satellite lesions are small, newly depigmented macules or patches that appear around the edges of an existing vitiligo lesion. They represent the outward spread of the depigmentation process, indicating that melanocyte destruction is actively occurring in those areas. The presence of satellite lesions suggests that the vitiligo is not stable and is likely to progress further, leading to an expansion of the depigmented areas. Dermoscopically, satellite lesions appear as small, well-defined, depigmented spots with a characteristic "white glow" due to the absence of melanin. This white glow is a hallmark of vitiligo under dermoscopy and is caused by the lack of melanin pigment, which normally absorbs light. In addition to the white glow, satellite lesions may be surrounded by a subtle halo of perifollicular hyperpigmentation, indicating a compensatory increase in melanin production by the remaining melanocytes around hair follicles. This perifollicular hyperpigmentation is thought to be a response to the loss of melanocytes in the surrounding epidermis, as the melanocytes around hair follicles attempt to compensate for the decreased melanin production. The identification of satellite lesions has important implications for treatment decisions. It suggests that the current treatment regimen, if any, may not be sufficient to control the disease activity. More aggressive treatment approaches, such as phototherapy or surgical interventions, may be necessary to halt the progression of depigmentation and promote repigmentation. Phototherapy involves exposing the affected skin to ultraviolet (UV) light, which can stimulate melanocyte proliferation and repigmentation. Surgical interventions, such as skin grafting or melanocyte transplantation, may be considered in cases of stable vitiligo with limited areas of depigmentation. The Koebner phenomenon, named after the German dermatologist Heinrich Koebner, refers to the development of new skin lesions at sites of injury or trauma. In vitiligo, this phenomenon is often observed as the micro-Koebner phenomenon, where new, small depigmented spots appear at sites of minor skin trauma, such as scratches, friction, or even insect bites. This phenomenon is not unique to vitiligo and can also be observed in other skin conditions, such as psoriasis and lichen planus. The micro-Koebner phenomenon highlights the sensitivity of melanocytes to injury in individuals with vitiligo. Even minor trauma can disrupt the delicate balance of the melanocyte unit, triggering an autoimmune response that leads to further melanocyte destruction and depigmentation. The melanocyte unit is a complex network of cells, including melanocytes, keratinocytes, and Langerhans cells, that work together to maintain skin pigmentation. In vitiligo, this network is disrupted, making melanocytes more vulnerable to injury and triggering an inflammatory response that leads to further melanocyte destruction. Dermoscopically, the micro-Koebner phenomenon appears as small, depigmented spots with a "white glow" that correspond to the sites of previous skin trauma. These spots may be surrounded by a subtle halo of perifollicular hyperpigmentation, similar to satellite lesions. The presence of perifollicular hyperpigmentation suggests that some melanocytes are still present and functional around hair follicles, but their ability to compensate for the melanocyte loss in the surrounding epidermis is limited. The presence of the micro-Koebner phenomenon is another indicator of active vitiligo and suggests that the disease is not well-controlled. It underscores the importance of protecting the skin from injury and

avoiding unnecessary trauma to prevent further disease progression. Patients with active vitiligo should be advised to wear protective clothing, use sunscreen, and avoid activities that may cause skin trauma. The observation of satellite lesions and the micro-Koebner phenomenon in our study underscores the dynamic nature of vitiligo and the importance of recognizing signs of disease activity. Even in patients with predominantly stable lesions, the presence of these activity indicators suggests the potential for disease progression and the need for close monitoring. The identification of disease activity indicators can guide treatment decisions and patient counseling. Patients with active vitiligo may require more aggressive treatment approaches to control the disease and prevent further depigmentation. These approaches may include topical or systemic corticosteroids, calcineurin inhibitors, phototherapy, or surgical interventions. The choice of treatment should be individualized based on the patient's specific needs and preferences, as well as the extent and location of the depigmentation. In addition to medical treatments, patients with active vitiligo should be advised to protect their skin from injury and avoid unnecessary trauma to minimize the risk of new lesion formation. This may involve wearing protective clothing, using sunscreen, and avoiding activities that may cause skin trauma. Regular dermoscopic examinations can help monitor disease activity and identify new or evolving lesions. This allows for timely adjustments to treatment regimens and proactive management of the disease. Dermoscopy can also be used to assess the response to treatment and identify patients who may benefit from more aggressive therapies.[14,15]

Vitiligo, an acquired pigmentary disorder characterized by the loss of skin color, is a dynamic condition with periods of stability interspersed with periods of activity. Accurately classifying the stability of vitiligo is crucial for determining the appropriate treatment strategy and providing patients with realistic expectations about the course of their disease. In our study, we classified vitiligo stability based on the observed dermoscopic features, categorizing 80% of the patients as having stable vitiligo and 20% as having unstable vitiligo. This classification has significant implications for treatment decisions and patient counseling. The classification of vitiligo stability is based on a combination of clinical and dermoscopic features. Clinically, stable vitiligo is characterized by the absence of new or expanding lesions for at least six months to one year. The borders of the lesions are clear and distinct, indicating that the depigmentation process is not actively spreading. The pigment network, which is the normal reticular pattern of pigmentation, is either completely absent or significantly reduced within the lesion. This reflects the loss of melanocytes, the cells responsible for producing melanin. There is increased pigmentation around hair follicles and at the border of the lesion. This is thought to be a compensatory response to melanocyte loss, where the remaining melanocytes increase melanin production. Satellite lesions and the micro-Koebner phenomenon are indicators of active vitiligo, as discussed in section 4.2. Their absence suggests that the disease is not actively progressing. In contrast, unstable vitiligo is characterized by the presence of new or expanding lesions, ill-defined borders, a disrupted pigment network, and the presence of satellite lesions or the micro-Koebner phenomenon. These features indicate ongoing melanocyte destruction and disease progression. The classification of vitiligo stability has significant implications for treatment decisions. Patients with stable vitiligo may respond well to topical or systemic medical therapies aimed at controlling inflammation and promoting repigmentation. Topical corticosteroids are anti-inflammatory medications that can help reduce the autoimmune response and promote repigmentation. They work by suppressing the immune system and reducing inflammation in the skin, which can help to halt the destruction of melanocytes and stimulate repigmentation. Topical corticosteroids are available in various strengths and formulations, and the choice of medication depends

on the severity and location of the vitiligo. Topical calcineurin inhibitors medications suppress the immune system and can help reduce inflammation and promote repigmentation. Calcineurin inhibitors, such as tacrolimus and pimecrolimus, work by inhibiting the activation of T cells, which are immune cells that play a role in the destruction of melanocytes. Topical calcineurin inhibitors are particularly useful for treating vitiligo on sensitive areas of the skin, such as the face and neck. In some cases, systemic corticosteroids may be used for short periods to control active inflammation. However, long-term use of systemic corticosteroids is associated with significant side effects, such as weight gain, osteoporosis, and increased risk of infections. Therefore, systemic corticosteroids are generally reserved for severe cases of vitiligo or for patients who have not responded to other treatments. For patients with unstable vitiligo, more aggressive treatment approaches may be necessary to halt disease progression and promote repigmentation. Phototherapy involves exposing the affected skin to ultraviolet (UV) light, which can stimulate melanocyte proliferation and repigmentation. Different types of phototherapy, such as narrowband UVB and excimer laser, are available. Narrowband UVB is a type of UV light that is specifically targeted to the affected skin, minimizing damage to healthy skin. Excimer laser is a more targeted form of phototherapy that delivers high-intensity UV light to specific areas of depigmentation. Phototherapy is generally well-tolerated, but it can cause side effects such as sunburn and skin aging. In cases of stable vitiligo with limited areas of depigmentation, surgical interventions, such as skin grafting or melanocyte transplantation, may be considered. Skin grafting involves transplanting healthy skin from one area of the body to the depigmented area. Melanocyte transplantation involves culturing melanocytes from a healthy skin sample and transplanting them to the depigmented area. Surgical interventions can be effective in achieving repigmentation, but they are associated with risks such as scarring and infection. The choice of treatment should be individualized based on the patient's specific needs and preferences, as well as the extent and location of the depigmentation. Factors to consider include the patient's age, overall health, the size and location of the vitiligo patches, and the patient's willingness to undergo more aggressive treatments. The classification of vitiligo stability also has important implications for patient counseling and education. Patients with stable vitiligo can be reassured that their disease is not actively progressing and that treatment can help control inflammation and promote repigmentation. However, they should be advised that vitiligo is a chronic condition and that repigmentation may take time and may not be complete. It is important to set realistic expectations and discuss the potential benefits and risks of different treatment options. Patients with unstable vitiligo should be informed that their disease is actively progressing and that more aggressive treatment approaches may be necessary to control the disease and prevent further depigmentation. They should also be advised to protect their skin from injury and avoid unnecessary trauma to minimize the risk of new lesion formation. This may involve wearing protective clothing, using sunscreen, and avoiding activities that may cause skin trauma. It is important to emphasize to all patients that vitiligo is not contagious and does not affect overall health. However, it can have a significant impact on quality of life due to its cosmetic effects. Patients with vitiligo may experience emotional distress, social isolation, and decreased self-esteem. Therefore, it is essential to provide patients with emotional support and connect them with resources and support groups to help them cope with the challenges of living with vitiligo.[16-18]

Our study has several important clinical implications for the diagnosis, management, and treatment of vitiligo. This study further validates the crucial role of dermoscopy in enhancing the diagnostic accuracy of vitiligo. While the clinical presentation of vitiligo, with its characteristic depigmented macules and patches, is often sufficient for diagnosis, dermoscopy provides a valuable adjunct to visualize

subtle features that may not be apparent to the naked eye. Dermoscopy allows for the identification of specific features associated with vitiligo, such as the "white glow," reduced or absent pigment network, perifollicular hyperpigmentation, and perilesional hyperpigmentation. These features can help differentiate vitiligo from other skin conditions that may mimic its clinical presentation, such as pityriasis alba, tinea versicolor, and post-inflammatory hypopigmentation. By improving diagnostic accuracy, dermoscopy can facilitate early diagnosis and timely intervention, which can significantly impact the course of the disease and improve patient outcomes. Our findings highlight the importance of considering disease activity when selecting treatment modalities. The choice of treatment should be tailored to the individual patient's needs, taking into account the presence of activity indicators and the overall stability of the disease. Dermoscopy plays a crucial role in assessing disease activity and stability by visualizing features such as satellite lesions and the micro-Koebner phenomenon, which are indicative of active vitiligo. The presence of these features suggests that the disease is progressing and may require more aggressive treatment approaches to halt further depigmentation and promote repigmentation. Conversely, the absence of activity indicators and the presence of features associated with stable vitiligo, such as well-defined borders and perifollicular/perilesional hyperpigmentation, suggest that the disease is not actively progressing and may respond well to less aggressive therapies. By accurately assessing disease activity and stability, clinicians can make informed decisions about the most appropriate treatment approach for each patient, optimizing the chances of successful repigmentation and minimizing the risk of disease progression. Our study underscores the need for individualized treatment plans based on the specific dermoscopic features of each patient. The presence of perifollicular hyperpigmentation, for example, may suggest a better prognosis for repigmentation, as it indicates the presence of functional melanocytes in the hair follicle bulge. These melanocytes can potentially contribute to repigmentation efforts, either spontaneously or in response to treatment. Conversely, the presence of satellite lesions or micro-Koebner phenomenon may warrant more aggressive treatment to prevent further disease progression. These features suggest that the disease is actively spreading and that more intensive therapies may be necessary to control the disease activity and promote repigmentation. In addition to guiding treatment decisions, dermoscopy can also be used to monitor the response to treatment and identify patients who may benefit from adjustments to their treatment regimen. For example, if a patient with stable vitiligo shows signs of disease activity on dermoscopy, such as the appearance of new satellite lesions, the treatment may need to be intensified to prevent further depigmentation. Dermoscopy can also be a valuable tool for patient education and counseling. By visualizing the specific features of their vitiligo, patients can gain a better understanding of their condition and the rationale behind the chosen treatment approach. For example, patients with stable vitiligo can be reassured that their disease is not actively progressing and that treatment can help control inflammation and promote repigmentation. However, they should be advised that vitiligo is a chronic condition and that repigmentation may take time and may not be complete. Patients with unstable vitiligo should be informed that their disease is actively progressing and that more aggressive treatment approaches may be necessary to control the disease and prevent further depigmentation. They should also be advised to protect their skin from injury and avoid unnecessary trauma to minimize the risk of new lesion formation. By providing patients with a clear understanding of their condition and the treatment options available, clinicians can empower them to actively participate in their care and make informed decisions about their treatment.[19,20]

5. Conclusion

This study has provided valuable insights into the dermoscopic patterns of vitiligo lesions in a cohort of

patients in Indonesia. The "white glow" was a universal finding, confirming its significance as a hallmark of vitiligo. Other common patterns included reduced or absent pigment network and perifollicular/perilesional hyperpigmentation, reflecting the complex interplay of melanocyte destruction and compensatory mechanisms. The majority of patients in this cohort had stable vitiligo, indicating that their lesions were not actively expanding at the time of the study. However, the presence of satellite lesions and micro-Koebner phenomenon in some patients underscored the dynamic nature of vitiligo and the potential for disease progression. This study highlights the value of dermoscopy in the evaluation of vitiligo. By visualizing subtle features not visible to the naked eye, dermoscopy can aid in diagnosis, assessment of disease activity, and guidance of treatment decisions. The findings of this study can help clinicians better understand the dermoscopic patterns of vitiligo and tailor treatment plans to individual patients. Further research with larger sample sizes and longer follow-up periods is needed to confirm these findings and further explore the relationship between dermoscopic patterns and disease progression in vitiligo.

6. References

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