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The correlation between dermoscopic patterns and histopathological features in idiopathic guttate hypomelanosis at a tertiary care center

Abishek Muniraju Reddy[1], Sudha Banti[1] ✉, Sneha Nataraj[1], Rajesh G[1], Srinivas Konappalli[1]

[1]*Department of Dermatology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore, Karnataka, India.*

Abstract

Introduction: Idiopathic guttate hypomelanosis (IGH) is a common leukodermic dermatosis that primarily affects middle-aged and elderly adults. This study evaluates the dermoscopic features of IGH and their correlation with histopathological findings.
Methods: In the present study, 100 patients with IGH were evaluated. Each patient underwent a comprehensive clinical history assessment along with a dermatological and physical examination. Dermoscopic examination was performed, followed by a histopathological examination to confirm the diagnosis.
Results: The mean age of the participants was 64.67 ± 9.59 years, with 53% being male. The most prevalent dermoscopic pattern observed was nebuloid (33.3%), followed by petaloid (26.7%), and both amoeboid and feathery patterns were seen in equal proportions (20% each). The abdomen (33%) and legs (27%) were the most common sites for IGH lesions. Histopathological examination revealed features such as basket weave hyperkeratosis, atrophic epidermis in some lesions, reduced melanin globules or melanocytes, skip lesions, and flattening of rete ridges across all dermoscopic patterns.
Conclusions: IGH is characterized by distinct dermoscopic patterns, including amoeboid, feathery, nebuloid, and petaloid types. When these patterns are interpreted within the clinical context and corroborated with histopathological findings, they aid in the accurate diagnosis of IGH and its differentiation from other hypopigmented and depigmented dermatoses. Dermoscopy can be considered an adjunctive tool to confirm the diagnosis of IGH.

Keywords: idiopathic guttate hypomelanosis, dermoscopy, amoeboid, feathery, nebuloid

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Introduction

Idiopathic guttate hypomelanosis (IGH) was first described by Costa (1) and is also known as disseminated lenticular leukoderma. In 1951, it was referred to as "symmetric progressive leukopathy of the extremities," a term coined by Cummings and Cottel (2). IGH is a common leukodermic dermatosis primarily affecting middle-aged and elderly adults, with a slight female predominance and potential familial aggregation (3). Indian studies on the elderly population report an IGH prevalence ranging from 43% (4) to 76.5% (5). IGH is characterized by numerous small, well-defined, smooth, depigmented white macules. These macules have a lower melanin concentration and a reduced number of melanocytes (6). Skin of the extensor forearms and shins are commonly affected, but other areas of the body, such as the abdomen and chest, can also be involved (7). Occasionally, small black spots may appear within the white macules, which can vary in shape from circular to angular (8).

Skin pigmentation results from the coordinated activities of melanocytes and keratinocytes. Melanin is produced within melanocytes in specialized membrane-bound organelles called melanosomes. These melanosomes, containing melanin, are transferred to adjacent keratinocytes via dendrites. Each melanocyte typically interacts with 36 keratinocytes in the basal and suprabasal layers, a relationship referred to as the epidermal melanin unit (9). Direct cell-to-cell contact between keratinocytes and melanocytes promotes melanocyte proliferation. Any disruption in the epidermal melanin unit, whether in melanin synthesis or its transport to keratinocytes, can result in skin hypopigmentation (8).

The etiology of IGH is complex, with its pathophysiology potentially influenced by multiple factors, including the patient's age and sun exposure. The number of lesions typically increases with age (10). In one study involving 452 individuals, IGH was observed in 20% of patients 20 to 30 years old, but in 80% of those over 70 (2). People of African descent have been shown to develop non-actinic lesions on covered areas (2). Generally, the number of lesions does not exceed a dozen or two. It has been suggested that this condition may result from an age-related somatic mutation in melanocytes (11).

Several studies have shown that epidermal deformity and keratinocyte abnormalities can significantly limit the distribution of melanin pigment, leading to the development of depigmented macules in the skin (3, 12). Although IGH is generally a non-inflammatory skin condition, one study reported a slight infiltration of mononuclear inflammatory cells in the dermis of affected patients (13).

The clinical appearance of IGH is similar to that of other depigmented skin conditions, such as vitiligo, making it challenging to distinguish IGH from other disorders based solely on clinical evaluation. However, histopathological and dermoscopic features can help differentiate IGH from other depigmented lesions, particularly vitiligo. Immunohistochemistry (IHC) for melanin pigment can be used to differentiate IGH from vitiligo by showing reduced melanin pigment in IGH. However, due to the high cost, IHC was not performed in our study.

The IGH macules are typically 2 to 5 mm in diameter, but they can occasionally reach up to 10 mm. The distribution of patches generally appears to be related to sun exposure, except for the

✉ **Corresponding author: sudhamoghali2@gmail.com**

face, which is affected later than the limbs. Once these lesions develop, their size does not increase; however, the number of lesions may rise with age (8).

Histological findings in IGH show atrophic epidermis with flattening of the rete ridges and a basket weave pattern in the stratum corneum. Melanin is significantly reduced or absent in the basal layer, and the number of melanocytes at the dermoepidermal junction is decreased, although not completely absent. A light microscopy and ultrastructural study (7) demonstrated a reduced number of dopa-positive melanocytes with fragmented or absent dendrites, as well as a decreased number of melanosomes.

Dermoscopy is a non-invasive technique that enhances detection by allowing the visualization of distinct patterns specific to individual skin disorders (14). Dermoscopic studies have identified amoeboid, feathery, nebuloid, and petaloid patterns in IGH lesions. Dermoscopy of IGH reveals white structureless patches with irregular borders and shapes. These areas display a "glowing" effect due to the depletion of melanocytes in the epidermis; however, this glow is less uniform than what is typically observed in vitiligo. IGH may also show regions where melanin is preserved, aiding in its differentiation from similar conditions. In contrast, the dermoscopic appearance of vitiligo shows a more consistent radiance than IGH.

This study provides a comprehensive assessment of the dermoscopic patterns and histopathological features of IGH in patients seen at a tertiary care center. By examining these characteristics, the study aims to enhance the understanding of IGH's clinical presentation and differentiation from other depigmented skin disorders.

Methods

This observational cross-sectional study was conducted in the Department of Dermatology at Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore, Karnataka, India, following approval from the institutional ethical committee. Written informed consent was obtained from all 100 patients with IGH lesions, after which they underwent a detailed clinical history, dermatological and systemic examinations, and relevant bedside tests.

Data were recorded using a pre-structured questionnaire, which included demographics, skin type, history of sun exposure, morphology, the distribution, onset, duration, and progression of lesions, and aspects related to photoaging and Wood's lamp examination. A dermoscopic examination was performed using the Dermlite DL5 (3Gen, San Juan Capistrano, CA, USA) with polarized light. A histological study was conducted as necessary. The analysis focused on the correlation between patients' age, the duration of skin lesions, and various dermoscopic patterns of IGH. With the patients' consent, photographs were taken with strict assurance of confidentiality and non-disclosure of their identities.

Statistical analysis

The data were analyzed using SPSS software version 20.0. Descriptive statistics were used, with all qualitative variables presented as frequencies and percentages, and all quantitative variables presented as means and standard deviations.

Results

The study included 100 patients diagnosed with IGH. The mean age of the participants was 64.67 years, with a standard deviation of 9.60 years. The study population consisted of 53 males and 47 females. In terms of occupational backgrounds, 35 participants were farmers, 20 were laborers, 15 were housewives, eight were tailors, eight were teachers, seven were auto rickshaw drivers, and seven were florists. The average sun exposure among the participants was 6.60 hours per day, with a standard deviation of 2.56 hours (Table 1).

Regarding family history, 26 (26%) participants had a family history of IGH and six had a family history of vitiligo. None of the participants reported a family history of trauma, anemia, or thyroid dysfunction. The location and dermoscopic features of IGH were analyzed in detail: 33 (33%) participants had IGH lesions exclusively on the abdomen, 27 (27%) had lesions on both the abdomen and legs, 20 (20%) had lesions solely on both legs, seven had lesions specifically on the left shin, and 13 (13%) had lesions specifically on the right shin.

The dermoscopic examination revealed that the nebuloid pattern (Fig. 1) was the most common, observed in 33 (33%) participants. The petaloid pattern (Fig. 2) was the second most frequent, found in 27 (27%) participants. Both the amoeboid (Fig. 3) and feathery patterns (Fig. 4) were equally prevalent, each seen in 20 (20%) participants. The mean number of IGH lesions per participant was 9.27, with a standard deviation of 4.57 (Table 2).

Table 1 | **Patient characteristics.**

Subject characteristics	Value
Age, years (mean ± *SD*)	64.67 ± 9.60
Sex, *n* (%)	
Male	53 (53)
Female	47 (47)
Occupation, *n* (%)	
Auto rickshaw driver	7 (7)
Farmer	35 (35)
Florist	7 (7)
Housewife	15 (15)
Laborer	20 (20)
Tailor	8 (8)
Teacher	8 (8)
Daily exposure to sun, hours (mean ± *SD*)	6.60 ± 2.56
Family history, *n* (%)	
Idiopathic guttate hypomelanosis	26 (26)
Vitiligo	6 (6)

SD = standard deviation.

Table 2 | **Location and dermoscopic features of idiopathic guttate hypomelanosis.**

Lesion characteristics	Value
Location, *n* (%)	
Abdomen	33 (33)
Abdomen and legs	27 (27)
Both legs	20 (20)
Left shin	7 (7)
Right shin	13 (13)
Dermoscopic features, *n* (%)	
Amoeboid	20 (20)
Feathery	20 (20)
Nebuloid	33 (33)
Petaloid	27 (27)
Number of lesions (mean ± *SD*)	9.27 ± 4.57

SD = standard deviation.

The results indicate a significant association between sun exposure and dermoscopic patterns. The nebuloid pattern has the strongest correlation with outdoor occupations (78.8%, $p < 0.001$), followed by the feathery (70.0%, $p = 0.01$), petaloid (66.7%, $p = 0.03$), and amoeboid (65.0%, $p = 0.02$) patterns. These findings suggest that individuals engaged in outdoor occupations, which typically involve higher sun exposure, are more likely to present with these dermoscopic patterns, particularly the nebuloid pattern.

No significant association was found between sex and dermoscopic patterns because the *p*-values for all patterns were greater than 0.05. This indicates that the distribution of dermoscopic patterns does not differ significantly between males and females.

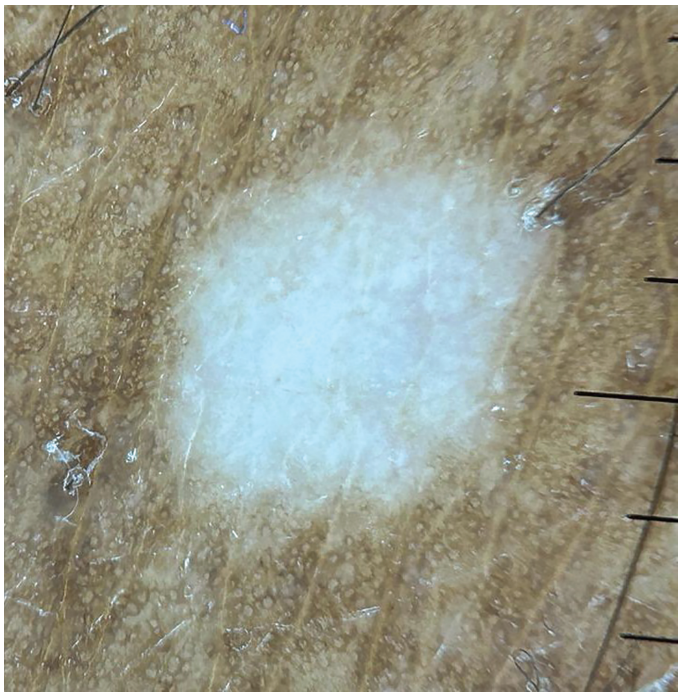

Figure 1 | Dermoscopy showing a nebuloid pattern with an oval cloudy dense white pattern with indistinct margins merging into surrounding skin.

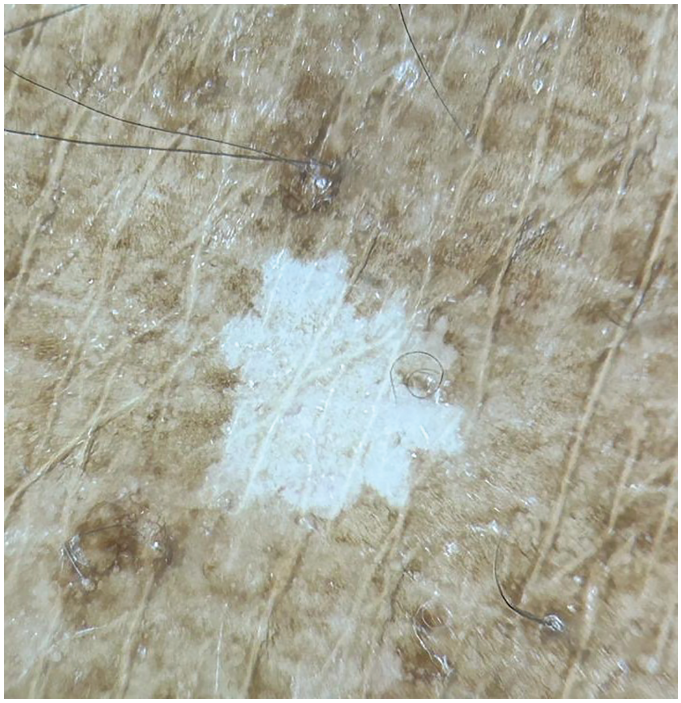

Figure 2 | Dermoscopy showing a petaloid pattern with well-defined petal-like borders with an irregular polycyclic pigmented margin.

Figure 3 | Dermoscopy showing an amoeboid pattern with a well-defined hyperpigmented margin containing a pseudopod extension (arrow).

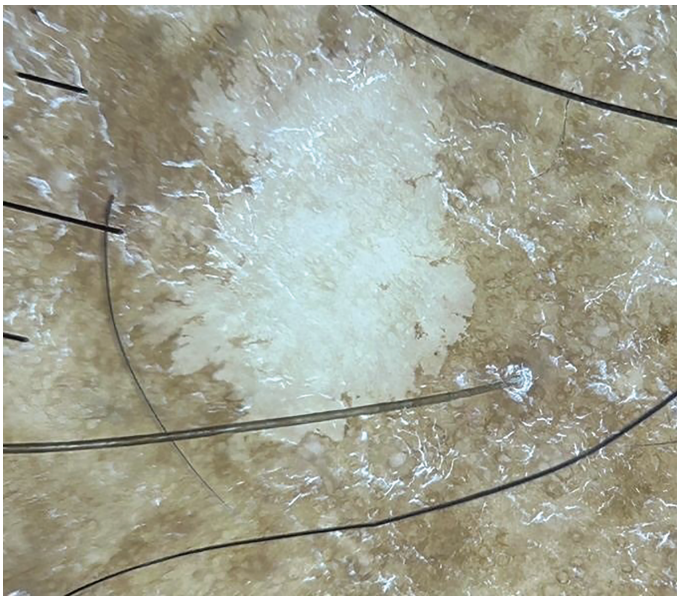

Figure 4 | Dermoscopy showing a feathery pattern with defined and feathery margins and irregular pigmentation.

The results also demonstrate a significant association between age and certain dermoscopic patterns. The nebuloid pattern is most strongly associated with individuals over 60 years old (81.8%, $p < 0.001$), followed by the petaloid (74.1%, $p = 0.01$) and amoeboid (70.0%, $p = 0.04$) patterns. The feathery pattern does not show a significant association with age ($p = 0.65$). These findings suggest that older individuals (over age 60) are more likely to present with the nebuloid, petaloid, and amoeboid patterns.

The study also included visual representations of the various dermoscopic patterns.

Discussion

IGH is generally considered a condition of adulthood and aging, becoming more prevalent as individuals become older. Most peo-

ple develop their first lesion later in life, with a mean age of 64.67 ± 9.59 years observed in this study. Similar findings were reported by Singhal et al. (14), in which the mean age was 57.82 years, and older patients (over age 50) were more commonly affected, suggesting that IGH is a natural aspect of the aging process. In a study by Ankad et al. (15), the average age of patients was 54.50 years, ranging from 24 to 85 years. Babu et al. (10) reported an age range from 36 to 59 years, with an average age of 47 years.

In this study, males were more frequently affected than females, which contrasts with the findings of Singhal et al. (14), who reported a higher prevalence among females, potentially due to greater concern over cosmetic disfigurement. Kim et al. (8) also found a slightly higher frequency in women (40.4% in men vs. 59.6% in women). According to Arguelles-Casals et al. (16), both males and females are equally likely to be affected. Other investigations have also reported a higher frequency of IGH in women than in men (2, 17).

In their study, Kim et al. (8) found that the arm was the most commonly affected region, with 25 out of 47 patients (53.2%) presenting lesions in this area. Of these, 24 patients had lesions on the forearm, whereas one had a lesion on the lower portion of the upper arm. Lesions on the legs were observed in 10 patients (21.3%), all of which were located on the lower part of the leg. Trunk lesions were noted in nine patients (19.1%), and three patients (6.4%) had lesions on their faces. Singhal et al. (14) reported that the distal region of the lower extremities was the most prevalent site of involvement, followed by the distal part of the upper extremities. These findings are consistent with earlier studies by Harish et al. (18) and Kim et al. (8).

Although this study did not reveal a high number of cases with lesions on the face and neck regions, other studies have documented occurrences on these areas. In contrast, this study found that IGH most commonly affected the abdomen (33%), followed by both the abdomen and legs (27%).

IGH lesions are most typically found on sun-exposed skin, particularly the anterior region of the lower limbs. However, even sun-protected areas may also be affected. For example, although the face receives significant sun exposure, only 6% of IGH cases in the study by Shin et al. (9) were located on the face. This suggests that factors other than prolonged solar exposure contribute to IGH because lesions often appear on the anterior tibial surface or the forearm—areas prone to trauma due to their intermittent exposure to sunlight.

Some subjects exhibited more spots on their lower back. Although sunlight is likely responsible for the initial emergence of these lesions, other factors may also contribute to their formation, which could explain the appearance of lesions in areas that are rarely, if ever, exposed to sunlight. The lower central region of the back and the anterior surface of the tibia have less subcutaneous tissue compared to other locations, making them more susceptible to impact trauma (13).

Ferrandiz et al. (19) and Arrunategui et al. (20) identified a familial tendency to develop this condition. Falabella et al. (3) observed a statistically significant prevalence of IGH among the relatives of IGH patients compared to normal controls, indicating familial aggregation among IGH subjects. In addition, Arrunategui et al. (20) found a substantial association between HLA-DQ3 and IGH in a study of 22 Colombian renal transplant patients.

Shin et al. (9) found that only 7% of their patients had family members with IGH lesions, whereas in this study 26.7% of patients reported a family history of IGH.

In this study, the most common dermoscopic feature was the nebuloid pattern (33.3%), followed by the petaloid pattern (26.7%). The amoeboid and feathery patterns were observed in equal proportions (20.0%). These findings differ from those reported by Babu et al. (21), in which the most common dermoscopic pattern was amoeboid (57.2%), characterized by pseudopodia extending into the adjacent skin. In their study, the amoeboid pattern was followed by the feathery (22.7%), petaloid (12.7%), and nebuloid (7.2%) patterns.

Ankad et al. (16) also found that the amoeboid pattern was the most prevalent, with the nebuloid pattern being the least common, similar to this study's findings. In studies by Harish et al. (22) and Ankad et al. (16), the feathery pattern was more commonly observed in younger individuals, whereas the nebuloid pattern was more frequent in older patients. The nebuloid pattern is thought to indicate more recent onset, whereas older IGH lesions tend to present with amoeboid, feathery, or petaloid patterns.

Distinguishing between IGH and other conditions histopathologically can be challenging. IGH is characterized by basket weave hyperkeratosis, atrophic epidermis with loss of rete ridges, and reduced pigmentation in the basal layer (Fig. 5). In this study's histological investigation, all dermoscopic patterns showed basket weave hyperkeratosis, atrophic epidermis, loss of melanin globules or reduced melanocyte numbers, skip lesions, and flattening of the rete ridges in the epidermis. Singhal et al. (15) reported that among 12 patients (6.6%) that underwent skin biopsy, there was evidence of atrophic epidermis with loss of rete ridges and reduced melanin in the basal layer. Some lesions exhibited irregularly distributed melanin granules with focal skip areas that retained melanin. Lesions on sun-exposed areas also demonstrated elastotic changes in the upper dermis.

Kim et al. (8) found that hyperkeratosis was a more common histological finding than epidermal atrophy and flattened rete ridges. Epidermal atrophy was more frequently observed in lesions over non-sun-exposed areas compared to those in sun-exposed regions (6). In the dermis, a mild perivascular lymphocytic infiltrate was present in all dermoscopic patterns. However, the

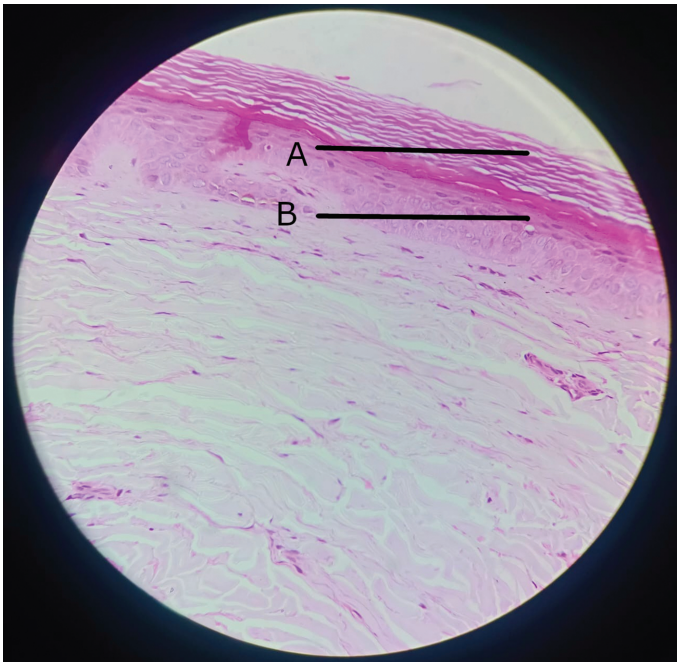

Figure 5 | Histopathology of idiopathic guttate hypomelanosis: A) basket weave hyperkeratosis, B) atrophic epidermis, loss of melanin globules / reduced number of melanocytes and flattening of rete ridges in the epidermis.

amoeboid pattern showed partial loss of rete ridges, whereas the nebuloid pattern displayed complete loss of rete ridges.

Babu et al. (21) noted that the dermis exhibited fibrocollagenous tissue, appendages, and mild perivascular lymphoplasmacytic infiltrate. These histological findings were consistent across all dermoscopic patterns, regardless of their variety (10).

This study explored the associations between dermoscopic patterns in IGH and factors such as sun exposure, sex, and age. As detailed in Table 3, a strong association was found between sun exposure and dermoscopic patterns, with the nebuloid pattern showing the strongest correlation with outdoor occupations (78.8%, $p < 0.001$). Age was also significantly related to certain dermoscopic patterns, particularly the nebuloid pattern, which had a notable association with individuals over 60 years old (81.8%, $p < 0.001$). However, no significant association was observed between sex and dermoscopic patterns. These results indicate that prolonged sun exposure and older age may be significant factors contributing to the development of specific dermoscopic patterns in IGH, whereas sex does not appear to be a major factor. The findings underscore the importance of considering sun exposure and age in the clinical assessment and management of IGH, and they highlight the need for further research to better understand the condition's etiology and progression (20, 23, 24).

Conclusions

This study highlights the specific and characteristic dermoscopic features of IGH. The nebuloid pattern was most commonly observed, followed by the petaloid pattern, with amoeboid and feathery patterns each occurring equally. Histopathological examination revealed common features across all patterns, including basket weave hyperkeratosis, reduced melanocytes, flattening of the rete ridges, and mild perivascular lymphocytic infiltrate, with the amoeboid pattern showing partial loss of rete ridges and the nebuloid pattern exhibiting complete loss. The study also found IGH to be more prevalent in older males, with the abdomen and lower legs being the most frequently affected areas. Familial aggregation was noted in a significant number of cases, suggesting a potential genetic component to the condition.

In conclusion, dermoscopy proves to be a valuable supplementary tool in diagnosing IGH. By correlating characteristic dermoscopic patterns with histopathological findings and clinical history, accurate diagnosis of IGH is facilitated, reducing confusion with other depigmented lesions. Further research is warranted to determine the sensitivity and specificity of dermoscopy for IGH and to evaluate its potential as a non-invasive diagnostic tool.

Table 3 | Variation in dermoscopic patterns based on sun exposure, gender, and age.

Variable		Amoeboid (*n* = 20)	Feathery (*n* = 20)	Nebuloid (*n* = 33)	Petaloid (*n* = 27)
Work	Outdoor, *n* (%)	13 (65.0)	14 (70.0)	26 (78.8)	18 (66.7)
	Indoor, *n* (%)	7 (35.0)	6 (30.0)	7 (21.2)	9 (33.3)
	p-value	0.02	0.01	‹ 0.001	0.03
Sex	Male, *n* (%)	12 (60.0)	9 (45.0)	19 (57.6)	13 (48.1)
	Female, *n* (%)	8 (40.0)	11 (55.0)	14 (42.4)	14 (51.9)
	p-value	0.37	0.65	0.44	0.84
Age	› 60 years, *n* (%)	14 (70.0)	11 (55.0)	27 (81.8)	20 (74.1)
	≤ 60 years, *n* (%)	6 (30.0)	9 (45.0)	6 (18.2)	7 (25.9)
	p-value	0.04	0.65	‹ 0.001	0.01

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