

Clinical and Dermoscopic Evaluation of Melasma: A Study of Patterns, Severity, and Associated Risk Factors

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Abstract: Melasma is a common acquired hyperpigmentary disorder characterised by symmetrical brown macules and patches affecting mainly sun-exposed facial areas. It predominantly occurs in women of reproductive age and is strongly associated with ultraviolet radiation, hormonal influences, pregnancy, oral contraceptive use, and genetic predisposition. Dermoscopy has emerged as an important non-invasive diagnostic tool for evaluating pigment depth, vascular changes, and prognostic features. This study aimed to evaluate the clinical and dermoscopic characteristics of melasma, assess disease severity using the Melasma Area and Severity Index (MASI), and determine the association between dermoscopic findings and major clinical risk factors. This study included 80 patients with clinically diagnosed facial melasma attending the dermatology outpatient clinic. Demographic and clinical data were collected, including age, sex, skin phototype, family history, oral contraceptive use, topical steroid use, sun exposure, and pregnancy-related melasma. Clinical classification was based on facial distribution patterns. Dermoscopic examination was performed using a handheld dermoscope with ×10 magnification. MASI scoring was used to assess severity. The mean age was 34.5 ± 5.2 years, and females represented 95.0% of cases. Malar melasma was the predominant clinical pattern (72.5%). Brown background pigmentation (90.0%), irregular pigment network (87.5%), and brown globules and dots (97.5%) were the most frequent dermoscopic findings. Telangiectasia was present in 77.5% of patients. Sun exposure showed a significant association with telangiectasia (OR = 4.67; 95% CI: 1.28–16.99; p = 0.023). Dermoscopy provides valuable diagnostic and prognostic information in melasma and supports individualised management strategies.

Keywords: Melasma, Dermoscopy, Hyperpigmentation, Telangiectasia, Sun Exposure

Introduction

Melasma is a common acquired disorder of hyperpigmentation characterised by symmetrical light-to-dark brown macules and patches, predominantly affecting sun-exposed areas of the face, particularly the cheeks, forehead, upper lip, nose, and chin [1,2]. It represents one of the most frequent causes of dermatological consultation for pigmentary disorders and is associated with considerable cosmetic concern and psychological distress, particularly among women of reproductive age [1,3]. Although melasma can affect all ethnic groups, it is more prevalent in individuals with Fitzpatrick skin phototypes III–V and among populations residing in regions with intense ultraviolet (UV) radiation exposure, including the Middle East, South Asia, and Latin America [1,4].

The pathogenesis of melasma is complex and multifactorial, involving an interplay between genetic predisposition, ultraviolet radiation, visible light exposure, hormonal influences, pregnancy, oral contraceptive use, thyroid dysfunction, inflammatory processes, and certain cosmetic or pharmacological triggers [2,5]. Solar radiation remains the most significant exacerbating factor, as UV exposure stimulates melanocyte activity and promotes excessive melanin production through increased melanogenesis and altered dermal–epidermal interactions [1,2]. Recent evidence has further demonstrated the role of vascular changes, basement membrane disruption, mast cell activation, oxidative stress, fibroblast senescence, and chronic subclinical inflammation in sustaining persistent pigmentation, indicating that melasma is not merely a melanocytic disorder but a complex photoaging-associated dermatosis [2,6].

Clinically, melasma is commonly classified according to facial distribution into centrofacial, malar, and mandibular patterns, with the centrofacial type being the most prevalent [3]. Histopathologically and by Wood’s lamp examination, lesions may be categorised into epidermal, dermal, or mixed types depending on the depth of melanin deposition, which may influence therapeutic response and prognosis [1,7]. However, Wood’s lamp examination may have limited sensitivity, especially in darker skin types, and histopathological confirmation is not routinely practical in clinical settings [5].

Dermoscopy has emerged as a valuable non-invasive diagnostic tool in the evaluation of pigmentary disorders, allowing enhanced visualisation of pigment distribution, vascular structures, and perifollicular changes beyond what is appreciable by naked-eye examination [8]. In melasma, dermoscopy assists in differentiating epidermal from dermal pigmentation and identifying characteristic findings such as diffuse reticuloglobular brown pigmentation, irregular pigment networks, arcuate structures, telangiectasia, and perifollicular sparing [8,9]. These features may not only improve diagnostic precision but also provide prognostic insight and guide therapeutic decision-making by identifying vascular or mixed components associated with treatment resistance [9,10].

Assessment of disease severity is equally important in clinical practice and research. The Melasma Area and Severity Index (MASI) remains one of the most widely used scoring systems for quantifying melasma severity and monitoring treatment response [7]. Correlating clinical severity with dermoscopic findings may provide a more comprehensive understanding of disease behaviour and improve personalised management strategies.

Despite the growing use of dermoscopy in dermatology practice, studies evaluating the relationship between dermoscopic patterns of melasma, clinical severity, and associated demographic and risk factors remain relatively limited, particularly in regional populations where environmental and hormonal influences may differ significantly. Therefore, this study aims to perform a clinical and dermoscopic evaluation of melasma, with particular emphasis on identifying prevalent dermoscopic patterns, assessing disease severity, and exploring their association with relevant demographic and clinical risk factors.

Materials And Methods

Study design and patients

This clinical cross-sectional observational study was conducted to evaluate the clinical and dermoscopic characteristics of patients diagnosed with melasma and to investigate their association with disease severity and relevant demographic and risk factors. A total of 80 patients with clinically diagnosed melasma were enrolled consecutively during the study period. The diagnosis of melasma was established based on characteristic clinical presentation of symmetrical hyperpigmented macules and patches involving sun-exposed facial areas, supported by dermatological examination.

Inclusion and exclusion criteria

Patients with clinical diagnosis of facial melasma were included in the study. Patients with other facial pigmentary disorders that could interfere with diagnosis, such as post-inflammatory hyperpigmentation, lichen planus pigmentosus, exogenous ochronosis, or drug-induced pigmentation and patients with history of recent facial chemical peeling, laser therapy, or depigmenting procedures within the previous 3 months were excluded from the study.

Data collection

A detailed clinical history was obtained from all participants using a structured questionnaire. Demographic variables included age, sex, occupation, marital status, and Fitzpatrick skin phototype. Clinical variables included duration of melasma, age at onset, family history, history of pregnancy-related melasma,

use of oral contraceptive pills, thyroid disease, cosmetic use, sun exposure, sunscreen use, and history of previous treatment. Clinical examination included documentation of the anatomical distribution pattern of melasma, classified as centrofacial, malar, or mandibular type according to standard clinical classification. The pattern and extent of pigmentation were recorded by consultant dermatologists.

Assessment of disease severity

Melasma severity was assessed using the Melasma Area and Severity Index (MASI), which remains one of the most widely accepted clinical scoring systems for melasma evaluation [2]. MASI scoring was performed by assessing four facial regions: forehead (30%), right malar region (30%), left malar region (30%), and chin (10%). For each area, the extent of involvement (A), darkness (D), and homogeneity (H) were evaluated, and the total MASI score was calculated. Patients were categorised into mild, moderate, and severe melasma according to MASI score ranges used in previous literature.

Dermoscopic examination

Dermoscopy was performed using a handheld dermoscope (DermLite DL4, 3Gen Inc., USA) under standardised lighting conditions with $\times 10$ magnification. Both polarised and non-polarised modes were used where appropriate.

The following dermoscopic features were specifically evaluated:

1. Pigment network pattern
2. Reticuloglobular pigmentation
3. Arcuate and annular structures
4. Perifollicular sparing
5. Telangiectasia
6. Vascular components
7. Brown, grey, or bluish pigmentation
8. Epidermal, dermal, or mixed pigment pattern

Dermoscopic classification was performed according to previously validated criteria described in the literature. Representative dermoscopic images were documented for analysis and comparison.

Statistical analysis

Data were entered and analysed using Statistical Package for the Social Sciences (SPSS) software version 26. Continuous variables were presented as mean \pm standard deviation (SD), while categorical variables were expressed as frequencies and percentages.

Associations between dermoscopic findings and clinical variables were analysed using Chi-square test for categorical variables and one-way ANOVA for continuous variables where appropriate. Correlation between MASI score and dermoscopic features was assessed using Pearson's correlation coefficient depending on data distribution.

A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Written informed consent was obtained from all participants prior to enrolment. Confidentiality of patient data was strictly maintained throughout the study, and all procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval for the study was obtained from the Institutional Research Ethics Committee of [insert institution name] under approval number [insert approval number].

Results

A total of 80 patients with clinically diagnosed melasma were included in this cross-sectional study. The mean age of the study population was 34.5 ± 5.2 years (range: 25–46 years). Females constituted the vast majority of cases (95.0%), while males represented only 5.0%, demonstrating the marked female predominance of melasma in clinical practice.

Fitzpatrick skin phototype III was slightly more common than type IV, accounting for 55.0% and 45.0% of patients, respectively. The most frequent clinical distribution pattern was malar melasma (72.5%), followed by centrofacial (7.5%), mandibular (7.5%), combined malar-centrofacial (7.5%), and malar-mandibular involvement (5.0%).

Regarding disease duration, the majority of patients had melasma for 2–4 years, with 3 years being the most common duration (32.5%). Positive family history was reported in 15.0% of cases. History of oral

contraceptive pill use was present in 27.5%, while topical corticosteroid use was observed in 75.0% of patients. Significant sun exposure was reported by 85.0% of participants, and pregnancy-induced melasma was documented in 50.0% of female patients (Tab. 1).

Table 1. Demographic and clinical characteristics of the study population

Variable	Frequency (n=80)	Percentage (%)
Sex		
Female	76	95.0
Male	4	5.0
Skin type		
Type III	44	55.0
Type IV	36	45.0
Clinical site		
Malar	58	72.5
Centrofacial	6	7.5
Mandibular	6	7.5
Malar + Centrofacial	6	7.5
Malar + Mandibular	4	5.0
Family history		
Yes	12	15.0
No	68	85.0
Drug history (OCP use)		
Yes	22	27.5
No	58	72.5
Topical steroid use		
Yes	60	75.0
No	20	25.0
Sun Exposure		
Yes	68	85.0
No	12	15.0
Pregnancy-induced melasma		
Yes	40	50.0
No	40	50.0

Dermoscopic findings

Brown background pigmentation was the predominant dermoscopic finding, observed in 90.0% of patients, while mixed pigmentation was seen in 7.5% and blue-grey pigmentation in only 2.5%. Irregular pigment network was the most common dermoscopic pattern (87.5%), whereas regular network was identified in only 12.5%.

Brown globules and dots were present in 97.5% of patients, confirming the predominance of epidermal pigmentation patterns. Telangiectasia was detected in 77.5% of cases, indicating a substantial vascular component associated with melasma lesions (Tab. 2).

Table 2. Dermoscopic characteristics of melasma

Variable	Frequency (n=80)	Percentage (%)
Background pigmentation		
Brown	72	90.0
Mixed	6	7.5
Blue-grey	2	2.5
Dermoscopic pattern		
Irregular network	70	87.5
Regular network	10	12.5

Globules and dots		
Brown	78	97.5
Mixed	2	2.5
Telangiectasia		
Present	62	77.5
Absent	18	22.5

Association between clinical factors and telangiectasia

A statistically significant association was observed between sun exposure and the presence of telangiectasia. Patients with significant sun exposure were more likely to demonstrate telangiectatic changes compared with those without significant exposure (OR = 4.67; 95% CI: 1.28–16.99; p = 0.023). Topical corticosteroid use also showed an increased odds ratio for telangiectasia (OR = 3.33; 95% CI: 1.08–10.25), although the association did not reach conventional statistical significance (p = 0.060). No statistically significant associations were observed between telangiectasia and family history, oral contraceptive use, pregnancy-induced melasma, or skin phototype (p < 0.05).

Table 3. Association of telangiectasia with selected risk factors

Variable	Odds Ratio (OR)	95% CI	p-value	Significance
Sun exposure	4.67	1.28–16.99	0.023	Significant
Topical steroid use	3.33	1.08–10.25	0.060	Borderline
Family history	0.52	0.14–1.97	0.452	Not significant
OCP use	0.70	0.22–2.16	0.557	Not significant
Pregnancy-induced melasma	0.75	0.26–2.15	0.790	Not significant
Skin type IV vs III	1.88	0.62–5.63	0.294	Not significant

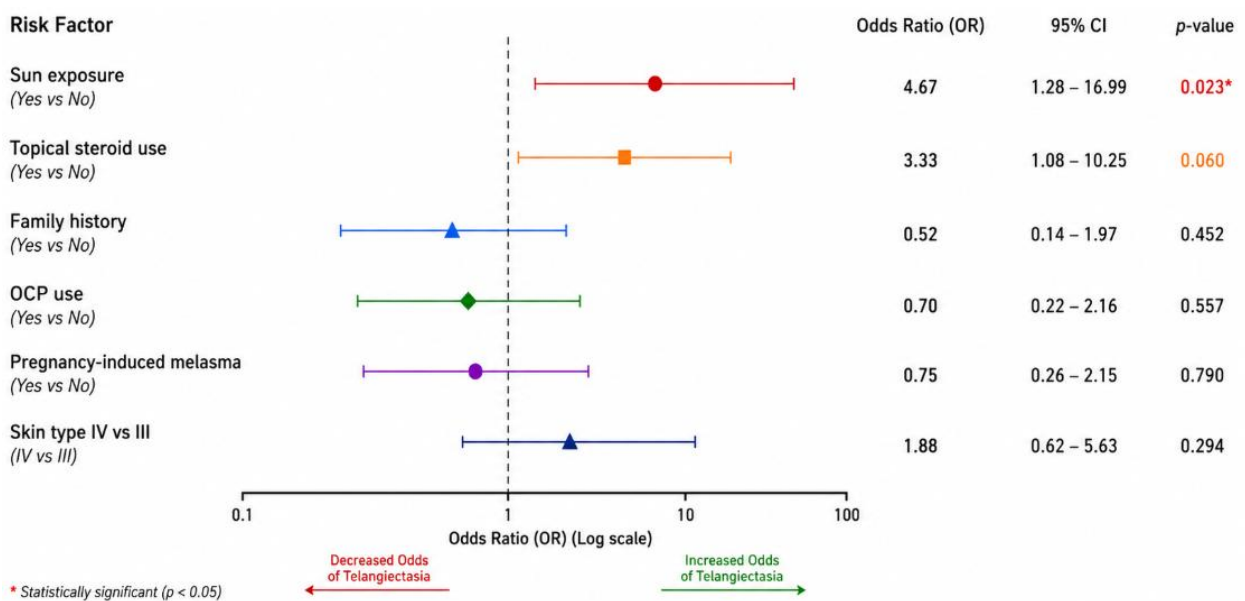


Figure 1. Forest plot demonstrating the association between major clinical risk factors and the presence of telangiectasia in melasma patients.

The forest plot demonstrates that sun exposure was the strongest statistically significant predictor of telangiectatic dermoscopic changes, while topical steroid use showed a clinically relevant but borderline significant association.

Discussion

Melasma remains one of the most challenging acquired pigmentary disorders encountered in dermatological practice because of its chronicity, recurrent nature, and substantial psychosocial burden. The present study provides a comprehensive clinical and dermoscopic evaluation of melasma and demonstrates

significant associations between clinical risk factors and dermoscopic vascular changes, particularly telangiectasia. The findings reinforce the multifactorial pathogenesis of melasma and highlight the diagnostic value of dermoscopy in routine clinical assessment.

In the current study, the mean age of patients was 34.5 ± 5.2 years, with a marked female predominance (95.0%). This observation is consistent with previous studies reporting that melasma predominantly affects women during their reproductive years because of hormonal influences, particularly oestrogen and progesterone, which stimulate melanogenesis and increase melanocyte sensitivity to ultraviolet radiation [11,12]. Handel et al. similarly reported a strong female predominance and peak incidence between the third and fourth decades of life, supporting the demographic pattern observed in our population [1].

Fitzpatrick skin phototype III was slightly more frequent than type IV in this study, which aligns with the known higher prevalence of melasma among individuals with intermediate to darker skin phototypes. Increased melanocytic activity and greater responsiveness to ultraviolet radiation in these skin types may explain this predisposition [4,13]. This finding is particularly relevant in Middle Eastern populations where prolonged sun exposure and environmental factors significantly contribute to disease persistence.

Although classical literature often identifies centrofacial melasma as the most common clinical pattern, the present study demonstrated that malar melasma was the predominant presentation (72.5%). Similar findings have been reported in several regional studies where chronic sun exposure and occupational outdoor activity favour lateral facial involvement [6,14]. This variation may also reflect ethnic, geographical, and lifestyle differences affecting disease distribution.

Sun exposure was reported by 85.0% of participants and emerged as the strongest statistically significant predictor of telangiectasia (OR = 4.67; 95% CI: 1.28–16.99; $p = 0.023$). This finding strongly supports the established role of ultraviolet radiation as the principal aggravating factor in melasma pathogenesis [2,5]. Beyond melanocyte stimulation, chronic UV exposure induces dermal inflammation, vascular proliferation, mast cell activation, and basement membrane disruption, contributing to both pigmentation and vascular dermoscopic changes [2,15]. The strong association between sun exposure and telangiectasia in our study further supports the concept of melasma as a photoaging-associated disorder rather than a purely melanocytic disease.

Topical corticosteroid use was highly prevalent (75.0%) and showed a borderline significant association with telangiectasia (OR = 3.33; 95% CI: 1.08–10.25; $p = 0.060$). Prolonged unsupervised use of topical corticosteroids is known to induce cutaneous atrophy, vascular fragility, and telangiectatic changes, particularly in facial skin [16].

Although statistical significance was not fully achieved, the clinical relevance remains substantial and may reflect the widespread misuse of over-the-counter steroid-containing depigmenting preparations in the region. This observation has important therapeutic implications and underscores the need for patient education and regulation of topical steroid misuse.

Dermoscopically, brown background pigmentation (90.0%), irregular pigment network (87.5%), and brown globules and dots (97.5%) were the most common findings, indicating predominant epidermal pigmentation. These findings are highly consistent with previous dermoscopic studies by Neema and Chatterjee and by Kumar et al., who identified irregular brown reticuloglobular patterns as the characteristic dermoscopic hallmark of epidermal melasma [8,9,17]. The predominance of epidermal pigmentation may have prognostic significance, as epidermal melasma generally demonstrates better response to topical depigmenting therapies than dermal or mixed variants [6].

Telangiectasia was identified in 77.5% of patients, reflecting a substantial vascular component. Recent studies increasingly recognise vascular alterations as central contributors to melasma pathogenesis, with elevated expression of vascular endothelial growth factor (VEGF) and increased dermal vascularity observed histologically [15,18]. The high frequency of telangiectasia in our study further supports this vascular hypothesis and suggests that therapies targeting vascular components, such as tranexamic acid or vascular lasers, may provide additional benefit in selected patients [19].

No statistically significant associations were observed between telangiectasia and oral contraceptive use, pregnancy-induced melasma, family history, or skin phototype. Although hormonal influences are well-established contributors to melasma initiation, they may not directly correlate with vascular dermoscopic changes once the disease is established [12]. Similarly, family history may influence susceptibility rather than

clinical morphology. These findings suggest that environmental exposure, particularly sunlight, may exert a stronger effect on dermoscopic vascular changes than genetic or hormonal factors alone.

The use of MASI scoring alongside dermoscopy provides a more comprehensive framework for melasma assessment. While MASI quantifies disease severity clinically, dermoscopy enhances understanding of pigment depth and vascular involvement, thereby improving treatment planning and prognostic evaluation [7,10]. Integrating both approaches may support more individualised therapeutic strategies and improve long-term disease control.

Nevertheless, several limitations should be acknowledged. The relatively modest sample size and single-centre design may limit generalisability. Histopathological confirmation was not performed because of ethical and practical limitations, and dermoscopic interpretation may retain some degree of observer dependency. Additionally, longitudinal follow-up was not included; therefore, treatment response and prognostic outcomes could not be assessed. Future multicentre prospective studies with larger cohorts are required to further validate these findings.

Conclusions

Melasma in this study predominantly affected women of reproductive age with Fitzpatrick skin types III and IV, with malar distribution representing the most frequent clinical pattern. Dermoscopy revealed a predominance of epidermal pigmentation characterised by brown background pigmentation, irregular pigment network, and brown globules and dots, while telangiectasia was highly prevalent, indicating an important vascular component. Significant sun exposure was the strongest predictor of telangiectatic changes, highlighting the central role of ultraviolet radiation in disease pathogenesis and progression. Dermoscopic evaluation, combined with clinical severity assessment using MASI, provides a valuable non-invasive approach for diagnosis, prognostic stratification, and therapeutic planning in melasma.

Future Directions

Future research should focus on large-scale multicentre prospective studies to validate dermoscopic predictors of disease severity and treatment response across different ethnic and geographical populations. Longitudinal studies assessing the evolution of dermoscopic vascular patterns before and after therapy may further clarify the prognostic significance of telangiectasia in melasma. In addition, comparative studies evaluating vascular-targeted therapies, including tranexamic acid and laser-based interventions, may help optimise management protocols for patients with prominent vascular dermoscopic features. Greater emphasis should also be placed on preventive strategies, particularly strict photoprotection and public awareness regarding inappropriate topical corticosteroid use.

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