Al-Rafidain J Med Sci. 2026;10(2):15-21.
DOI: https://doi.org/10.54133/ajms.v10i2.2820

AJMS

Online ISSN (3219-2789)

Research Article

The Correlation Between Thyroid Status, Family History, and Melasma Severity: A Cross-Sectional Dermatological Analysis

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Received: 30 January 2026; Revised: 21 March 2026; Accepted: 26 March 2026

Abstract

Background: Although family history is well recognized as a major predisposing factor in melasma, the extent to which hereditary background correlates with disease severity or underlying thyroid function abnormalities remains unclear. ***Objective***: To assess the influence of family history on the severity of melasma and to determine if thyroid hormone levels or thyroid autoimmunity vary between women with and without a familial history of melasma. ***Methods***: This cross-sectional study included 50 women diagnosed with facial melasma, who were stratified into two groups: those with a positive family history (n=10) and those without a family history (n=40). All participants underwent clinical evaluation using the modified Melasma Area and Severity Index (mMASI). Laboratory assessment included serum FT3, FT4, TSH, and anti-thyroid peroxidase (anti-TPO) antibodies measured via standardized immunoassays. ***Results***: The mean mMASI scores were slightly lower in patients with a family history compared to those without, although the difference did not reach statistical significance (12.9±1.5 *vs*. 13.5±0.8; *p*=0.10). Thyroid hormone levels (FT3, FT4, TSH) showed no significant differences between groups. However, anti-TPO antibody levels were significantly higher in the non-familial group (26.0± 7.2 *vs*. 20.3±6.0 IU/mL; *p*=0.02), suggesting increased thyroid autoimmunity in patients without hereditary predisposition. ***Conclusions***: Family history did not significantly influence melasma severity or thyroid hormone levels. However, elevated anti-TPO titers among women without a family history indicate a potential autoimmune component in non-hereditary melasma.

Keywords: Anti-TPO; Family history; Melasma; mMASI; Thyroid autoimmunity.

العلاقة بين حالة الغدة الدرقية، وتاريخ العائلة، وشدة الكلف: تحليل جلدي مقطعي

الخلاصة

الخلفية: على الرغم من أن التاريخ العائلي معروف جيدا كعامل رئيسي للإصابة بالكلف، إلا أن مدى ارتباط الخلفية الوراثية بشدة المرض أو اضطرابات في وظائف الغدة الدرقية لا يزال غير واضح. **الهدف**: تقييم تأثير التاريخ العائلي على شدة الميلاسم وتحديد ما إذا كانت مستويات هرمون الغدة الدرقية أو المناعة الذاتية للغدة الدرقية تختلف بين النساء اللاتي لديهن وبدون تاريخ عائلي للسرطان. **الطرائق**: شملت هذه الدراسة المقطعية 50 امرأة تم تشخيصهن بالكلف الوجهي، تم تقسيمهن إلى مجموعتين: اللواتي لديهن تاريخ عائلي إيجابي (n=10) وعدم وجود تاريخ عائلي (n=40). خضع جميع المشاركين لتقييم سريري باستخدام مؤشر معدل لمنطقة الكلف ومقياس شدة المرض(mMASI). شمل التقييم المخبري الأجسام المضادة لبيروكسيداز ومضاد الغدة الدرقية (Anti-TPO) التي تم قياسها عبر اختبارات مناعة موحدة. **النتائج**: كان متوسط درجات mMASI أقل قليلا لدى المرضى الذين لديهم تاريخ عائلي مقارنة بمن لا يملكون تاريخا، رغم أن الفرق لم يصل إلى دلالة إحصائية (12.9±1.5 مقابل 13.5±0.8؛ p=0.10). أظهرت مستويات هرمون الغدة الدرقية (FT3، FT4، TSH) عدم وجود فروق ذات دلالة إحصائية بين المجموعات. ومع ذلك، كانت مستويات الأجسام المضادة المضادة ل TPO أعلى بشكل ملحوظ في المجموعة غير العائلية (26.0± 7.2 مقابل 20.3±6.0 وحدة دولية/مل؛ p=0.02)، مما يشير إلى زيادة المناعة الذاتية للغدة الدرقية لدى المرضى الذين لا يعانون من استعداد وراثي. **الاستنتاجات**: لم يؤثر التاريخ العائلي بشكل كبير على شدة الكلف أو مستويات هرمونات الغدة الدرقية. ومع ذلك، فإن ارتفاع معدلات مضادات TPO بين النساء بدون تاريخ عائلي يشير إلى وجود مكون مناعي ذاتي محتمل في الميلاسم غير الوراثي.

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Article citation: Al-Ansare NJH, Khine TH. The Correlation Between Thyroid Status, Family History, and Melasma Severity: A Cross-Sectional Dermatological Analysis. *Al-Rafidain J Med Sci.* 2026;10(2):15-21. doi: https://doi.org/10.54133/ajms.v10i2.2820

INTRODUCTION

Melasma is a chronic, acquired hyperpigmentation disorder characterized by symmetrical, irregular brown to gray-brown macules and patches, typically appearing on sun-exposed facial areas such as the cheeks, forehead, upper lip, and chin [1]. Its prevalence is highest among women of reproductive age and individuals with darker skin types (Fitzpatrick II–V), though cases in men and other age groups are also reported [2]. Visible discoloration, often recurrent, can lead to substantial psychological distress, reduced quality of life, and a high demand for effective, long-term management [3]. Despite its high prevalence and clinical impact, the etiology and pathogenesis of melasma remain incompletely understood. The conventional paradigm attributes melasma to a multifactorial interplay of ultraviolet (UV) radiation, hormonal influences, genetic predisposition, and skin-environment interactions. Ultraviolet exposure continues to be considered the single most important trigger: UV radiation induces reactive oxygen species (ROS), upregulates melanogenic pathways, and promotes melanocyte activation and melanin synthesis [4]. Hormonal factors play a pivotal role, especially in women. The sudden increase in estrogen and progesterone, such as during pregnancy, use of oral contraceptives, or

hormonal therapy, has been classically associated with the onset or aggravation of melasma. A recent mechanistic study further elaborates this hormonal influence, demonstrating how estrogen and progesterone modulate melanogenesis via upregulation of melanocyte-specific genes, influencing melanin production and skin pigmentation patterns [5]. However, accumulating evidence suggests that melasma is more than just UV- or hormone-driven hyperpigmentation. Recent advances in dermatologic research point to a complex dermal–epidermal interplay involving not only melanocytes but also dermal fibroblasts, vascular changes, basement membrane disruption, mast cell activation, and chronic low-grade inflammation [6]. Studies have also identified aberrant expression of growth factors (e.g., stem cell factor, SCF), increased c-kit signaling, and altered intercellular communication as contributing to persistent pigmentation [3]. Such insights underscore that melasma may comprise several overlapping biological pathways rather than a single uniform disease entity [7]. Genetic predisposition is widely recognized as another key factor. A substantial proportion of melasma patients report a positive family history, suggesting heritable susceptibility to melanocyte hyperreactivity and pigmentary dysregulation under environmental or hormonal triggers. Nevertheless, despite its recognized importance, the role of family history in determining disease severity, clinical course, and associated systemic factors remains poorly defined [7]. In parallel, emerging research has focused on possible systemic associations, including endocrine and immunological factors. Among these, thyroid abnormalities, particularly thyroid autoimmunity, have drawn attention [8]. Given these complexities, an important question arises: Does a positive family history of melasma predict only disease susceptibility, or does it also influence severity, clinical expression, and systemic associations? If familial melasma reflects primarily genetic pigmentary predisposition, one might expect less contribution from systemic or immunologic triggers such as thyroid autoimmunity. Conversely, sporadic (non-familial) cases might rely more heavily on modifiable triggers, UV exposure, hormones, and immune dysregulation, possibly resulting in different disease behavior. To date, few studies have directly compared melasma phenotypes, severity, and endocrine immunologic parameters between familial and non-familial cases. This gap limits our ability to stratify patients for prognosis or personalized therapy and complicates efforts to understand melasma heterogeneity. Therefore, the present study was designed to address this knowledge gap by comparing disease severity (using standardized mMASI scoring) and thyroid profiles (hormone levels and anti-thyroid peroxidase antibody titers) between women with melasma with versus without a family history. Building on the notion that melasma likely results from a multifactorial interplay of genetic, hormonal, environmental, and immunological factors, we hypothesize that non-familial melasma may demonstrate stronger systemic (autoimmune) associations, whereas familial cases may reflect a more genetically determined pigmentary phenotype.

METHODS

Study design and setting

This cross-sectional analytical study was conducted on patients who attended a private outpatient clinic of dermatology, venereology, and sexually transmitted diseases in the Wasit governorate of Iraq in the period from November 2024 to May 2025. The study enrolled a total of 50 female patients diagnosed clinically with facial melasma. All evaluations were performed by a dermatologist with expertise in pigmentary disorders to ensure diagnostic accuracy and uniformity in clinical assessment. Upon recruitment, the participants were categorized into two groups based on their family history. Group A consisted of women who reported a positive family history of melasma in at least one first-degree relative, while Group B included those with no known family history of the condition.

Inclusion criteria

Eligible participants were women aged between 18 and 50 years who had a confirmed diagnosis of melasma for at least six months.

Exclusion criteria

Patients were excluded if they were pregnant or breastfeeding, had other facial pigmentary disorders such as post-inflammatory hyperpigmentation or drug-induced pigmentation, or suffered from photosensitivity disorders. Additional exclusion criteria included previous use of photosensitizing medications, the presence of diagnosed thyroid diseases under treatment, autoimmune disorders other than thyroid autoimmunity, and recent use of systemic corticosteroids, hormonal therapy, immunosuppressive agents, or melasma-targeted treatments such as laser therapy, chemical peels, or topical depigmenting agents within the preceding three months. Patients who had acute dermatologic or systemic conditions that could interfere with pigmentation or laboratory assessment were also excluded.

Data collection

All participants underwent a structured dermatologic interview and examination. Demographic information, including age, occupation, and skin phototype, was recorded. Detailed clinical history was obtained, covering the duration of melasma, its facial distribution pattern, sun exposure habits, sunscreen use, facial cosmetics use, hormonal factors, and gynecologic history. Family history of melasma was carefully recorded to guarantee precise categorization of the study groups. Melasma severity was quantified using the modified Melasma Area and Severity Index (mMASI), a validated scoring system that evaluates

affected facial regions in terms of area, darkness, and homogeneity. The mMASI score ranges from 0 to 24, with higher scores indicating more severe disease involvement [9]. In addition to clinical assessment and as part of routine present history taking and baseline clinical evaluation, blood samples were collected before the initiation of any treatment; early-morning venous blood samples were collected from all participants after an overnight fast. Thyroid function was evaluated by measuring serum levels of free triiodothyronine (FT3), free thyroxine (FT4), and thyroid-stimulating hormone (TSH) using standardized chemiluminescent immunoassays performed in the same laboratory to avoid inter-assay variability. Plain tubes were used for serum collection to measure TSH, FT3, and FT4. Serum levels of TSH, FT3, and FT4 were measured using a Mindray CL-6000i automated chemiluminescence immunoassay analyzer (Mindray Bio-Medical Electronics, Shenzhen, China) with manufacturer-provided reagent kits at a certified local laboratory. Anti-thyroid peroxidase (anti-TPO) antibodies were quantified using a validated automated immunoassay system to assess thyroid autoimmunity. Measurement of anti-TPO antibody levels was carried out using an enzyme-linked immunosorbent assay (ELISA) kit (Human Anti-TPO ELISA Kit, Elabscience Biotechnology Co., Ltd., Wuhan, China). All laboratory tests were performed following standard operating procedures to ensure reliability and precision. According to the laboratory reference ranges, normal values were defined as follows: Free T3: 2.0–4.4 pg/mL, Free T4: 0.8–1.8 ng/dL, TSH: 0.35–5.0 µIU/mL, and antibody concentrations with values above 34 IU/mL are considered positive.

Outcome measurements

The primary outcome of interest in this study was the comparison of melasma severity, assessed by the mMASI score, between women with and without a family history of the disease. Secondary outcomes included the comparison of FT3, FT4, TSH, and anti-TPO antibody levels between the two groups in order to determine whether thyroid function or thyroid autoimmunity differed according to family history status. Any clinically meaningful abnormalities identified in thyroid function or antibody titers were documented for further interpretation.

Ethical considerations

Ethical approval was obtained from the Lincoln University College Ethical Committee, as the authors' affiliated academic institution, in November 2024. A letter granting administrative permission (gatekeeper approval) to conduct the study and access medical records was obtained from the supervising dermatologist at the recruitment site in Wasit, and written informed consent was secured from all participants prior to their enrollment in the study, in accordance with the ethical principles outlined in the Declaration of Helsinki.

Statistical analysis

Data analysis was conducted using IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). The Shapiro–Wilk test was used to evaluate the normality of continuous variables. Normally distributed variables were expressed as mean ± standard deviation, and comparisons between groups were performed using the independent samples t-test. Non-normally distributed variables were presented as median and interquartile range and analyzed using the Mann–Whitney U test. Categorical variables were summarized as frequencies and percentages and compared using either the chi-square test or the Fisher's exact test, depending on cell counts. Effect sizes for continuous variables were reported as mean differences with 95% confidence intervals. Statistical significance was set at a *p*-value less than 0.05 for all analyses.

RESULTS

A total of 50 women with melasma were included in the study. Group A (n= 10) and group B (n = 40) were comparable in terms of age, with no statistically significant difference observed (36.2 ± 7.5 *vs*. 37.4 ± 6.6 years, *p*= 0.7). The mean mMASI score was lower in group A compared with group B (12.9 ± 1.5 *vs*. 13.5 ± 0.8); however, this difference did not reach statistical significance (*p*= 0.10, mean difference = 0.60, 95% CI: −0.12 to 1.30) (Table 1).

Table 1: Demographic and clinical data of the patients

Variable	Group A (n=10)	Group B (n=40)	*p*-value
Age (year)			
Mean±SD	36.2±7.5	37.4±6.6	0.7[a]
Range	22-45	19-45	
Age category			
<20	0(0.0)	1(2.5)	
20 – 30	3(30)	6(15)	0.6[b]
31 – 40	4(40)	17(42.5)	
41 – 50	3(30)	16(40)	
Facial cosmetics			
Yes	10(100)	40(100)	-
No	0(0.0)	0(0.0)	
Site of melasma			
Centro-fascial	10(100)	40(100)	
Malar	10(100)	40(100)	-
Mandibular	10(100)	40(100)	
mMASI, score			
Mean±SD	12.9±1.5	13.5±0.8	0.1[a]
Range	9–14.3	10.8–15.3	

Values are presented as frequency, percentage and mean±SD. [a]Independent t test. [b] Mann-Whitney U test.

In terms of thyroid function, we found no statistically significant difference between the two groups in terms of free T3 levels (3.1 ± 0.3 *vs*. 3.0 ± 0.7 pg/mL, *p*= 0.70) and free T4 levels (1.3 ± 0.2 vs. 1.2 ± 0.3 ng/dL, *p*= 0.80). Also, the median TSH concentrations were comparable between the two groups, which were 3.4 (2.9–3.9) in group A *vs*. 3.8 (2.8–4.2) in group B (*p*= 0.40). Notably, one patient in the negative family history group demonstrated an extreme TSH elevation (71.5 µIU/mL), which did not affect median-based comparisons but is clinically remarkable and likely reflects an isolated thyroid dysfunction rather than a pattern attributable to family history. Unlike the

thyroid hormone levels, we found that the anti-thyroid peroxidase (anti-TPO) antibody levels differed significantly between groups. Patients with a positive family history exhibited lower anti-TPO titers (20.3 ± 6.0 IU/mL) than those without a family history (26.0 ± 7.2 IU/mL) (p= 0.02, mean difference = 5.7, and 95% CI: 0.8–10.2). This finding suggests that patients without a family history of melasma may exhibit higher levels of thyroid autoimmunity causes related to melasma, whereas hereditary cases may be driven more by genetic pigmentary predisposition rather than immune-mediated mechanisms (Table 2).

Table 2: Laboratory data of the patients studied

Variable	Group A (n=10)	Group B (n=40)	p-value
Free T3 pg/ml			
Mean±SD	3.1±0.3	3±0.7	0.7[a]
Range	2.8–4	0.5–4.1	
Free T4 ng/dl			
Mean±SD	1.3±0.2	1.2±0.3	0.8[a]
Range	1–1.6	0.1–1.6	
TSH µIU/ml			
Mean±SD	3.4±2.9	3.8±2.8	0.4[b]
Range	2–4.4	1.1–71.5	
Anti-TPO Ab IU/ml			
Mean±SD	20.3 ± 6	26 ± 7.2	0.02[a]
Range	10 – 29	12 – 45	

Values are presented as mean±SD and range. [a]Independent t-test. [b]Mann-Whitney U test.

These results show that having a family history of melasma did not appear to influence disease severity or thyroid hormone levels. However, patients without a family history had significantly higher anti-TPO antibody levels, which may indicate a different autoimmune pattern in this group. In general, the results point to the possibility that melasma has more than one underlying cause. More research is needed to confirm these findings and figure out how genetic factors and thyroid autoimmunity work together in the disease.

DISCUSSION

Melasma is a chronic, acquired hypermelanosis with a multifactorial etiology involving genetic predisposition, ultraviolet radiation, hormonal influences, and cutaneous inflammation. Family history has long been reported as a key risk factor, with 40–60% of patients noting affected first-degree relatives, suggesting a substantial heritable component to disease susceptibility and pigmentary response patterns [10,11]. However, despite the recognized familial aggregation, the extent to which family history influences melasma severity, clinical behavior, or associated systemic abnormalities remains incompletely characterized [12]. Given these observations, clarifying whether familial melasma behaves differently from sporadic cases is clinically relevant. Familial cases may represent a predominantly genetic pigmentary phenotype, whereas non-familial cases could reflect stronger contributions from hormonal, environmental, or autoimmune mechanisms. Understanding these distinctions is essential for optimizing risk stratification, guiding diagnostic work-ups, and tailoring management strategies. Yet evidence directly comparing melasma severity and thyroid profiles between women with and without a family history remains limited, inconsistent, and underexplored in the literature. Consequently, the current study sought to fill this void by examining the influence of family history on disease severity and thyroid function parameters, including thyroid autoimmunity, in a cohort of women with melasma. As regards patient age, our findings demonstrated that women with a positive family history of melasma were comparable in age to those without a family history, with no statistically significant difference between the two groups (36.2 ± 7.5 *vs*. 37.4 ± 6.6 years, p= 0.7). This indicates that familial predisposition does not appear to influence the age at which melasma presents. This observation is consistent with previous reports showing that the onset age of melasma is relatively uniform across familial and non-familial cases, suggesting that environmental and hormonal triggers often play a more decisive role in determining onset than heredity alone [11,13]. Conversely, Kim *et al*. [14] suggested that women with familial melasma may present at a slightly younger age due to genetic susceptibility and heightened melanocyte reactivity, a trend we observed numerically but which did not reach significance in our cohort. In terms of melasma severity, the mean mMASI score was lower in women with a positive family history compared with those without hereditary predisposition (12.9 ± 1.5 *vs*. 13.5 ± 0.8). Although this difference did not reach statistical significance (p= 0.10; mean difference = 0.60; 95% CI: −0.12 to 1.3), the pattern is noteworthy. Historically, the relationship between family history and melasma severity has been debated. Some studies have reported that familial melasma tends to manifest with more entrenched pigmentary patterns and may be more treatment-resistant due to genetically driven alterations in melanogenesis [15]. However, other research aligns more closely with our results, showing no meaningful association between family history and clinical severity scores, suggesting that while genetics may influence susceptibility, the degree of pigmentation is more strongly shaped by UV exposure, hormonal fluctuations, and cosmetic practices rather than hereditary load [16,17]. Our findings therefore support the growing evidence that family history alone is not a determinant of melasma severity. Instead, both familial and sporadic cases may reach comparable degrees of clinical involvement, reinforcing the multifactorial nature of the disease and the dominant influence of environmental and endocrine triggers. Nevertheless, the non-significant trend toward slightly lower severity among familial cases may warrant exploration in larger studies to determine whether genetically predisposed patients develop earlier but potentially less aggressive forms of the disease. In terms of thyroid function, our study demonstrated no statistically significant differences between women with and without a family history of melasma regarding free T3 (3.1 ± 0.3 *vs*. 3.0 ± 0.7 pg/mL, p= 0.70), free T4 (1.3 ± 0.2 *vs*. 1.2 ± 0.3 ng/dL, p = 0.80), or median TSH levels (3.4 vs. 3.8 µIU/mL,

p= 0.40). This indicates that hereditary predisposition does not appear to influence baseline thyroid hormonal status in affected women. These findings align with several previous studies reporting that thyroid hormone concentrations in melasma patients often remain within normal physiological ranges and do not consistently differ from controls or between melasma subgroups. Lutfi *et al*. [12] found no significant differences in mean FT3 or FT4 levels between melasma patients and healthy controls, suggesting that overt thyroid dysfunction is not a universal feature of the disease. Notably, one patient in our non-familial group exhibited a markedly elevated TSH level (71.5 µIU/mL), which did not affect median-based statistical comparisons but is clinically meaningful. Such isolated cases of severe hypothyroidism have been described in dermatologic populations and are generally interpreted as incidental findings rather than disease-specific manifestations. Importantly, prior reports have not shown an association between extreme TSH elevations and melasma specifically, and familial patterns have not been implicated in such outlier results. Therefore, this unusually high TSH level likely reflects an unrelated, individual thyroid disorder rather than an effect linked to melasma pathogenesis or family history [18]. Overall, our results reinforce the growing evidence that while thyroid autoimmunity may play a role in a subset of melasma patients, baseline thyroid hormone levels (FT3, FT4, and TSH) generally remain normal and do not appear to differ according to hereditary background. These findings contribute to the understanding that melasma's endocrine associations, when present, may be more autoimmune-mediated than hormonally driven. Unlike the thyroid hormone profile, our study demonstrated a significant difference in thyroid autoimmunity between the two groups, with women lacking a family history of melasma showing higher anti-TPO antibody levels compared with those with a positive family history (20.3 ± 6.0 *vs*. 26.0 ± 7.2 IU/mL, *p*= 0.02). This pattern suggests that autoimmune mechanisms may play a greater role in sporadic melasma than in familial cases, where genetic pigmentary predisposition may be the predominant driver. This interpretation aligns with emerging evidence showing that melasma is frequently associated with autoimmune thyroid markers even when thyroid hormone levels remain normal. Multiple studies have documented significantly elevated anti-TPO and anti-thyroglobulin antibodies in melasma patients compared with healthy controls [12,19,20]. Lutfi *et al*. [12] reported that 32% of melasma patients had elevated anti-TPO antibodies versus only 12% of controls, despite similar FT3/FT4 levels, suggesting that thyroid autoimmunity may contribute to melanocyte dysregulation independent of overt thyroid dysfunction. Similarly, our finding that autoimmunity was more prominent in the non-familial group is notable and supported indirectly by studies suggesting that environmental triggers such as chronic UV exposure or hormonal fluctuations can activate autoimmune pathways in genetically susceptible but non-familial individuals [21,22]. In contrast, familial melasma has been consistently linked to inherited traits, including melanocyte hyper-responsiveness, altered melanosome transfer, and genetic polymorphisms in estrogen- and melanogenesis-related genes, none of which inherently involve autoimmunity [23]. The lower anti-TPO levels in our familial group therefore support the concept that hereditary melasma may follow primarily pigmentary–genetic pathways, while sporadic melasma may involve additional autoimmune components. Overall, these findings reinforce that melasma is not a homogeneous disorder but rather a condition with multiple underlying biological pathways—genetic, hormonal, environmental, and autoimmune—whose relative contribution may differ between familial and non-familial cases.

Study strengths

This study has several notable strengths. First, it investigates the relationship between thyroid autoimmunity and melasma while differentiating patients based on family history, which is a point that is rarely addressed in previous literature. This approach allows a clearer distinction between hereditary pigmentary predisposition and immune-mediated mechanisms, contributing to a more refined understanding of melasma pathophysiology. Second, standardized clinical assessment using validated scoring methods ensured objective evaluation of melasma severity across study groups.

Study limitations

Despite its strengths, the study also has important limitations. The cross-sectional design limits the ability to determine causality between thyroid autoimmunity and melasma development; therefore, the observed associations cannot confirm the relationships. The sample size is although small for detecting the differences. Additionally, the study relied on single-time-point hormonal and antibody assessments, which may not fully capture dynamic fluctuations in thyroid function or autoimmunity. Finally, the study population was drawn from a single center, which may limit the generalizability of the results to broader or ethnically diverse populations. Future multicenter, longitudinal studies with larger cohorts would help validate and expand upon these findings. Although this study was not designed to recruit patients with thyroid disease and included a limited sample of melasma patients, incidental cases of thyroid disorders were observed in the melasma case group. Due to the small number of affected participants, the findings do not permit firm conclusions regarding a direct relationship. FT3 levels were numerically higher in group A (3.1 ± 0.3 pg/ml) than in group B (3.0 ± 0.7 pg/ml); however, this difference was not statistically significant (*p*= 0.7), and values in both groups were within the normal range. FT4 levels were slightly higher in Group A (1.3 ± 0.2 ng/dl) compared with Group B (1.2 ± 0.3 ng/dl), with no statistically significant difference (*p*= 0.8), and all values remained within normal limits. TSH

levels were numerically lower in group A [3.4 (2.9–3.9) µIU/ml] than in group B [3.8 (2.8–4.2) µIU/ml]; however, the difference was not statistically significant (p= 0.4), with mean values remaining within the normal range. Anti-TPO antibody levels were significantly higher in group B (26.0 ± 7.2 IU/ml) compared with group A (20.3 ± 6 IU/ml), and this difference reached statistical significance (p= 0.02), suggesting a stronger association with thyroid autoimmunity. In this study, thyroid hormone levels (FT3, FT4, and TSH) showed only numerical differences between women with and without a family history of melasma, with all values remaining within normal reference ranges and without statistical significance. In contrast, Anti-TPO antibody levels were significantly higher in women without a family history of melasma, suggesting that thyroid autoimmunity may be involved in melasma independently of familial predisposition. Our findings indicate that melasma in patients without a family history may be associated with higher levels of thyroid autoimmunity, whereas cases with a familial background appear more likely to reflect an underlying genetic predisposition to pigmentary dysregulation rather than immune-mediated mechanisms. This study included only female participants to reduce biological heterogeneity related to sex hormones, as melasma predominantly affects women; however, this limits the generalizability of the findings to male patients and is also considered a limitation of our study. Only four participants had clinically diagnosed thyroid dysfunction, which limits categorical analyses based on diagnosis. With a larger sample size, a higher number of clinically diagnosed or subclinical thyroid dysfunction cases would be expected, allowing more robust categorical analyses; therefore, this finding represents a limitation of the study. Although all patients were classified as having moderate melasma, the numerical mMASI values showed sufficient within-category variability in severity (range: 9.0–15.3), and because the correlation analysis was performed using continuous mMASI scores, this variability was adequate to detect the observed associations.

Conclusion

This study highlights a distinct difference in thyroid autoimmunity among women with melasma, demonstrating significantly higher anti-TPO antibody levels in patients without a family history compared with those with hereditary predisposition. These findings suggest that non-familial melasma may be more strongly associated with underlying immune-mediated mechanisms, whereas familial cases may be driven primarily by genetic pigmentary tendencies. While thyroid hormone levels did not exhibit significant differences between groups, the variation in anti-TPO titers highlights the possible influence of subclinical autoimmune activity in specific patient subsets. Further large-scale, longitudinal studies are needed to confirm these associations and clarify whether thyroid autoimmunity contributes to melasma onset, severity, or treatment response.

Conflict of interests

The authors declared no conflict of interest.

Funding source

The authors did not receive any source of funds.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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