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Article

A study to assess the association of melasma with iron deficiency anaemia and thyroid disease: a hospital based cross- sectional study

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Abstract

Background: Melasma is a common skin condition characterized by dark brown patches with defined borders, primarily affecting sun-exposed areas of the body, especially the face. It is more prevalent in women, particularly during pregnancy. The precise mechanisms underlying melasma are not yet fully understood. There are reports of associations between melasma and thyroid disorders or iron deficiency anemia.

Methods: This study was conducted in the Department of Dermatology Venerology and Leprosy Index Medical College Hospital and Research Centre Indore Madhya Pradesh, India. 100 cases of clinically diagnosed melasma were selectd. Detailed history and medical examination was done and MASI score was calculated. Then we performed laboratory tests of T3, T4, TSH to evaluated thyroid function and Hb, Sr. Ferritin for iron deficiency anaemia.

Results: Observation from this study revealed that the maximum cases of melasma were in the age group of 20-30 and 88% were females. The commonest site of melasma was malar(74%). Significant relationships were found between melasma severity and thyroid dysfunction, as well as between melasma severity and thyroid stimulating hormone (TSH) levels. However, no significant correlation was observed between melasma severity and hemoglobin or serum ferritin levels.

Conclusion: The study findings suggest that hypothyroidism may play a significant role in the development of melasma, as it was observed in a large proportion of cases. Thyroid disorders were prevalent in 76% of melasma cases. Hemoglobin and serum ferritin levels were mostly within the normal range. There was no association found between melasma and iron deficiency anemia. Despite the advances in peri-operative and ICU care, mortality rates for open repair of ruptured AAA have remained consistently high.

Keywords: Melasma, Iron deficiency anaemia, Hypothyroidism, hyperthyroidism

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Introduction

Melasma is an acquired, symmetrical, chronic and recurrent hypermelanosis manifesting with light to dark brown macules with well- defined geographic borders.1 Mostly affects the sun exposed areas of the body, typically occurring on the face (lower cheeks, forehead, nose and upper lip).(1) According to various studies, the prevalence of melasma varies between 1.5% and 33.3% reckoning on the population.(2,3) The pathogenesis of melasma is multifactorial and not yet fully understood, it has been proposed that a high expression of MSH in the lesional keratinocytes of melasma play a key role in the hyperpigmentation of melasma skin.In a pre-post intervention study conducted by Nelson et al o significatnt improvement was observed in melasma severity following tratment of hyperthyroidism.(4)However, no difference was seen between serum zinc levels in patients with melasma compared to normal population with or without thyroid dysfunction (5). Oxidative stress is another factor which can cause hypopigmentation and hyperpigmentation (6).

Melasma is common and has a wide range of severity which can markedly affect the quality of life so, it should be managed properly and not disregarded. It is relatively easy to diagnose with careful history and adequate clinical evaluation. Rarely, one would require more extensive investigations to rule out alternate diagnoses.

An association with thyroid disorders and iron deficiency anaemia is reported but as both conditions are commonly prevalent so it has not been confirmed beyond doubt. The aim of the study is to investigate any correlation between melasma, thyroid abnormalities, and iron deficiency anemia. The study was approved by the Institutional Ethics Comitee of Index Medical College, Hospital and Research Centre with reference number IMCHRC/IED/2021/11 dated 06.03.2021.

Materials and methods

Study duration: A cross sectional study was conducted over a period of 2 years at a Tertiary Care Hospital in Central India.

Inclusion criteria: All consenting patients of either gender age >18 years and <50 years attending Skin & VD OPD with clinically diagnosed melasma.

Exclusion criteria: Pregnant or breastfeeding women, patients taking OCP/ Hormonal therapy, anticonvulsant drugs, phototoxic drugs, patients having co-existing auto-immune and chronic disorders, patients having associated co-morbidities, history of intake of any drug that might affect thyroid function (glucocorticoids, lithium, amiodarone, iodide & octreotide).

Data collection: After declaring all sufficient information, informed consent was taken from the patients. Detailed history and medical examination was done and MASI score was calculated. Then we performed laboratory tests of T3, T4, TSH to evaluated thyroid function and Hb, Sr. Ferritin for iron deficiency anaemia. The interpretation was done by taking normal values as Hb: Men 13.2-16.6 g/dl and for female 12-16 g/dl , Sr. Ferritin: 20-110 ng/ml, T3: 0.6-1.8 ng/ml, T4: 4.5-14. μg/dL, TSH: 0.35-5.5 uIU/mL.

Scoring system used: The MASI score is calculated by combining the sum of the severity ratings for darkness and homogeneity, multiplied by the value of the area of involvement, for each of the 4 facial areas:

MASI total score = 0.3(Df + Hf)Af + 0.3(Drm + Hrm)Arm + 0.3(Dlm + Hlm)Alm + 0.1(Dc + Hc)Ac

The MASI score ranges from 0-48, with 48 representing the most severe.

Data analysis: The data were collected and entered in MS excel 2010. Data analysis was done using online software. Mean ± standard deviation were calculated for quantitative variables and frequency and percentage for qualitative or categorical variables. The association for categorical dataset were analysed using Chi-Square test and unpaired t- test. p value < 0.05, was considered as statistically significant. Pearson's test was used for calculating correlation.

Results

The study included 100 cases of melisma (Table 1). The age groups were categorized as 20-30, 31-40, and 41-50 years. The majority of cases (48%) were in the 20-30 age group, followed by 35% in the 31-40 age group, and 17% in the 41-50 age group. Among the 100 cases, 88% were females and 12% were males. The most common site of melasma was malar (74%), followed by centrofacial (25%) and mandibular (1%). Based on the findings of a woods lamp examination, 22% of cases had dermal melasma, 36% had epidermal melasma, and 42% had mixed melasma. Among the cases, 8% had Fitzpatrick Skin Type III, 39% had Type IV, and 53% had Type V.

57% of cases had normal haemoglobin levels, and 43% had decreased levels. 60% of cases had normal serum ferritin levels, 26% had decreased levels, and 14% had increased levels. 54% of cases had normal T3 levels, 38% had decreased levels, and 8% had increased levels. 65% of cases had normal T4 levels, 32% had decreased levels, and 3% had increased levels. 35% of cases had normal TSH levels, 59% had increased levels, and 6% had decreased levels. Among the cases, 36% were euthyroid, 5% were hyperthyroid, and 59% were hypothyroid. There was a significant association between thyroid status and age group in melasma cases, with hypothyroidism being most frequently observed. Age groups did not show a significant association with morphologic type in melasma cases. There was no significant association between morphologic type and thyroid status in melasma cases.

The study aimed to investigate the correlation between melasma, iron deficiency anemia, and thyroid abnormalities (Tables 2-5). It involved 100 patients, primarily females (88%) and males (12%), with a mean age of 32 years. The distribution of melasma types showed the malar type to be the most common (74%), followed by centrofacial (25%) and mandibular (1%). Fitzpatrick skin types III, IV, and V were prevalent among the participants. Thyroid dysfunction was observed in 75% of cases with hypothyroidism (59%) being more common than hyperthyroidism (5%). There was a significant association between melasma type and thyroid status, with all types more common in hypothyroid cases. Wood's lamp examination revealed mixed melasma (42%) as the most common type. The study also explored the association between melasma severity, thyroid dysfunction, and iron deficiency anemia. Significant relationships were found between melasma severity and thyroid dysfunction, as well as between melasma severity and thyroid stimulating hormone (TSH) levels. However, no significant correlation was observed between melasma severity and hemoglobin or serum ferritin levels. Overall, the findings suggest a complex relationship between melasma, thyroid dysfunction, and iron deficiency anemia, necessitating further research in this area.

Discussion

Melasma is an acquired, pigmentary disorder that causes significant social and emotional stress to the patient. Despite the presence of many treatment options, managing melasma remains challenging due to its refractory nature.

The aim of the current study was to investigate any correlation between melasma and iron deficiency anemia and thyroid abnormalities, which could be beneficial for the patients.

Sex Distribution:

In our study, we had 100 patients with melasma, out of which 88 (88%) were females and 12(12%) were males.The female-to-male ratio was 7.5:1, which is similar to the ratios reported in studies conducted by Sharma et al., Suman Babu and Hina Mehmood, Satish DA et al, and Simplepreet Kaur et al., which showed ratios of 7.6:1, 7.1:1, 5:1, 4.2:1, and 10:1, respectively. (10,11,12,13,15) The higher prevalence of females could be attributed to autoimmunity against the thyroid gland, which can cause thyroid dysfunction.

Age:

The mean age of the patients in our study was thirty-two years, ranging from twenty to fifty years. Studies by Asma, Javed, Simplepreet Kaur, Hina Mehmood, and Suman Babu reported mean ages of 30-34 years, which aligns with our study The mean age reported in studies by Jagannathan et al. (31.22 years), Achar et al. (29.99 years), and Hexsel et al. (29.8±8.8 years) also aligns with our findings. Lutfi et al.12,13 reported a mean age of 34 years in melasma. However, Shamma Aboobaker and Satish DA et al showed higher mean ages of 40.2±9 and 40.8 years, respectively.(7,8) Thyroid status was also found to have a significant association with age groups, with hypothyroidism being more frequently seen across all age groups. According to literature, melasma is commonly observed in women of childbearing age, typically in their 2nd or 3rd decade, which supports a hormonal relationship in its etiology.

Fitzpatrick Skin Type:

The majority of patients in our study had Fitzpatrick Skin Type V (53%), followed by Type IV (39%) and Type III (8%).This finding is consistent with the study by Jagannathan et al., where most patients had Fitzpatrick Skin Types III and IV. A study on Brazilian women by Tamega et al. found a higher prevalence of melasma in intermediate skin types III, IV, and V. Cakmak et al., in their study on Turkish women, found the majority of patients to be of skin type III (51.1%), followed by types IV and II (14).

Type of Melasma:

In our study, the malar type was the most common distribution pattern, accounting for 74% of cases, followed by centrofacial (25%) and mandibular (1%).This finding aligns with

the studies conducted by Jagannathan et al. and Manjunath et al., where the malar pattern was also the most common. Achar et al. and KrupaShankar et al. found the centrofacial pattern to be the most common, followed by the malar pattern . However, Simplepreet Kaur and Raseena Moosa found a malar distribution of melasma in their studies (14), while other studies have found both centrofacial and malar patterns in their study(15). On wood's lamp examination, the melasma pigment was assessed and classified according to the level of pigment. In our study, the majority of patients had mixed melasma (42%), followed by dermal (22%) and epidermal melasma (36%). Other studies have reported different distributions, such as dermal melasma being more common in Shamma Aboobaker's study (80%), epidermal in Simplepreet's study (58%), and dermal being the most common type in Achar et al.'s study (54%).(14,18) In our study, there was a significant association between the type of melasma and thyroid status ($p = 0.036$), with all three types being more common in cases of hypothyroidism. However, there was no significant association between the type of melasma and age group. Assessing the level of pigment can help determine the prognosis of melasma, with epidermal melasma having a better prognosis and dermal melasma requiring long- term treatment.

Thyroid Dysfunction:

In our study, 25% of the cases were euthyroid, and 75% had thyroid dysfunction, with 59% being hypothyroid and 5% being hyperthyroid. This contrasts with the lower incidence of thyroid disorders (53.65%) reported in the study by Yeaser et al 4 and the 23.7% melasma prevalence in thyroid disease reported by Alka Dogra et al. 5 Hypothyroidism has been found to be associated with melasma in many cases, with abnormal levels of TSH showing a strong relationship with melasma and its severity. Various studies have reported different percentages of hypothyroidism in melasma patients, such as 24%, 37.8%, 31.5%, 10%, and 5 cases in studies by Shamma Aboobaker, Kiani, Almani, Rezvan Talaee et al., Simplepreet, and Suman Babu, respectively.(7,8,9,10) Hina Mehmood et al. reported 19.5% cases of thyroid dysfunction, 17.3% cases of hypothyroidism, and only 3 cases of hyperthyroidism in their study.(15) Our study showed a higher percentage of thyroid dysfunction (both hypothyroidism and hyperthyroidism) in melasma patients compared to other studies. According to the literature, the risk of thyroid dysfunction is fourfold higher in patients with melasma. In our study, high TSH (indicative of hypothyroidism) was found in 59% of patients, and low TSH (indicative of hyperthyroidism) was found in 6% of patients. Tamega et al. found high levels of TSH in 25.3% of patients with melasma and reported a correlation between melasma and intense sun exposure with high levels of TSH. While Suman Babu and Asma found TSH levels (ranging from 2.01-3.01) that were not very high in melasma patients associated with hypothyroidism, this does not coincide with our results. Lutfi et al. found a four-fold higher TSH level in melasma patients (39.4%) and suggested that female hormones (estrogen and progesterone) could trigger melasma in patients with autoimmunity against the thyroid gland. The mean thyroid- stimulating hormone (TSH)

level observed in our study was 7.67±4.63 with a range of 0.10-19.97 uIU/mL. The mean value of TSH showed a significant association with the various types of melasma (p=0.00). Kiani et al. observed a relationship between melasma, hypothyroidism, and thyroid autoimmunity. Rezvan Talaee found a correlation between melasma severity and high TSH levels, and there was a significant statistical relationship between TSH and melasma.(16) In our study, we found a statistically significant relationship between the severity of melasma based on the MASI Score and thyroid dysfunction (p=0.00). Hypothyroid cases had higher MASI scores, followed by euthyroid and hyperthyroid cases. However, Sheth VM and Pandya did not find any correlation between thyroid dysfunction and melasma.

Iron Deficiency Anemia:

In our study, 43% of the patients had anemia (Hb < 12g/dL). Babaie et al. reported low Hb and serum iron levels in women with melasma. Sarkar et al. conducted a study in men to assess the clinical, etiological, and histological characteristics of melasma, and they found that 12.2% of individuals had anemia based on laboratory tests. Serum ferritin levels were raised in 14% of cases, within the normal range in 60% of cases, and decreased in 26% of cases. The mean Hb level in our study was 11.68+1.67 g/dL (range 8.3-14.1), and the mean ferritin level was 94.68+149.40 ng/mL, with a range between 7.05-592. These findings are in line with a research performed in Iran that revealed a mean Hb level of 11.2 with low serum ferritin, indicating a link between melasma and iron deficiency anemia. Najad SB et al. conducted a study to evaluate the prevalence of iron deficiency anemia, folate deficiency, and vitamin B12 deficiency in patients with melasma. Results showed a mean hemoglobin level of 11.2 g/dL. Low serum iron levels were found in 14.3% of cases, and abnormal ferritin levels were found in 8.6% of cases. The correlation between the severity of melasma (MASI) and hemoglobin and serum ferritin levels showed a negative correlation, similar to our findings. In our study, no significant associations were found between MASI and mean Hb (p=0.199) or MASI and mean serum ferritin (p=0.316). Qazi et al. found a favorable connection between MASI score and iron profile, which contrasts with our findings (6).

Conclusion

The study findings suggest that hypothyroidism may play a significant role in the development of melasma, as it was observed in a large proportion of cases. Thyroid disorders were prevalent in 76% of melasma cases. Hemoglobin and serum ferritin levels were mostly within the normal range. There was no association found between melasma and iron deficiency anemia. While other variables showed no significant correlation with melasma severity, hypothyroidism exhibited a strong association. Therefore, it is recommended to screen all melasma patients for thyroid issues, as diagnosing and

managing thyroid disease may lead to improved treatment outcomes and overall quality of life.

Table 1 – Socio-demographic characteristics of the patients

Age Group (years	No. of Cases	Percentage
20-30	48	48.0
31-40	35	35.0
41-50	17	17.0
Total	**100**	**100.0**

Sex	No. of Cases	Percentage
Female	88	88.0
Male	12	12.0
Total	**100**	**100.0**

Table 2 - Comparison of age in relation to the thyroid status

Age Group (years)	Thyroid Status						Total	
	Euthyroid		Hyperthyroid		Hypothyroid			
	No.	%	No.	%	No.	%	No.	%
20-30	19	52.8%	2	40.0%	27	45.8%	48	48.0%
31-40	10	27.8%	2	40.0%	23	39.0%	35	35.0%
41-50	7	19.4%	1	20.0%	9	15.3%	17	17.0%
Total	36	100%	5	100%	59	100%	100	100%
Mean±SD	30.39±7.94		31.60±8.32		34.56±7.67		32.91±7.97	
Range	21-49		20-41		23-50		20-50	
P value	.042, Significant							

Table 3 - Melasma area severity scoring in relation to haemoglobin

Haemoglobin (g/dl)	No. of Cases	Melasma area severity scoring		P value
		Mean±SD	Range	
Decrease	43	13.28±4.95	(6-27)	.199
Normal	57	14.60±5.11	(6-25)	
Total	100	14.03±5.06	(6-27)	

Table 4 - Mean thyroid stimulating hormone levels in relation to morphologic type of melesma

TSH (uIU/mL)	Morphologic Type			P value
	Dermal (n=22)	Epidermal (n=36)	Mixed (n=42)	
Mean±SD 7.67±4.63	11.18±4.43	7.30±4.32	6.15±4.10	0.000
Range (0.10-19.97)	Range (5.12-19.97)	Range (0.17-16.78	Range (0.10-18.09	

Table 5 - The Pearson's Correlation coefficient between MASI score and serum parameters

Parameters	Correlation(r)	P value
Haemoglobin (g/dl)	0.153	.128
Ferritin (mcg/L)	.029	.778
T3	-.287	.004*
T4	-.286	.004*
Thyroid Stimulating Hormone (TSH)	.406	.000*

References

1. Grimes PE. Melasma : etiologic and therapeutic considerations. Arch Dermatol 1995;131:1453-7

2. Pichardo R, Vallejos Q, Feldman SR, Schulz MR, Verma A, Quandt SA, Arcury TA. The prevalence of melasma and its association with quality of life in adult male Latino migrant workers. Int J Dermatol. 2009 Jan;48(1):22-6. doi: 10.1111/j. 1365-4632.2009.03778.x. PMID: 19126046; PMCID: PMC2621062.

3. Werlinger KD, Guevara IL, González CM, Rincón ET, Caetano R, Haley RW, Pandya AG. Prevalence of self-diagnosed melasma among premenopausal Latino women in Dallas and Fort Worth, Tex. Arch Dermatol. 2007 Mar;143(3):424-5. doi: 10.1001/archderm. 143.3.424. PMID: 17372115.

4. Nelson B, Sitohang IBS, Marissa M, Indriatmi W, Wisnu W. A comparative study of melasma severity after hyperthyroid therapy in hyperthyroid subjects with melasma. Acta Dermatovenerol Alp Pannonica Adriat. 2021 Mar;30(1):31-34. PMID: 33765755.
5. Sastrini Sekarnesia I, Sitohang IBS, Agustin T, Wisnu W, Hoemardani ASD. A comparison of serum zinc levels in melasma and non-melasma patients: a preliminary study of thyroid dysfunction. Acta Dermatovenerol Alp Pannonica Adriat. 2020 Jun;29(2):59-62. PMID: 32566951.
6. Katiyar S, Yadav D. Correlation of Oxidative Stress with Melasma: An Overview. Curr Pharm Des. 2022;28(3):225-231. doi: 10.2174/1381612827666211104154928. PMID: 34736377.
7. Al-Shamma MH Y, Al-Wakeel HAH. The Prevalence of Thyroid Disorders in Patients with Melasma .ALQadisiyah Medical journal.2016:12(21).107-101

8. Dogra A, Dua A (2006) Cutaneous changes in hypothyroidism. J Ind H\roLd Soc 45-9.

9. Walker SL, Shah M, Hubbard VG, Pradhan HM, Ghimire M. Skin disease is common in rural Nepal: results of a point prevalence study. Br J Dermatol. 2008;158:334-8.

10. Jamwal A, Gupta V, Sharma A, Rather PA (2013) Cutaneous manifestations of hypothyroidism: Prospective hospital based clinical study. J Adv Med Dent Sci 1: 5-12.

11. Babu S, Patil S. Melasma and thyroid profile: A case control. IP Indian Journal of Clinical and Experimental Dermatology 2020;6(1):76–78.

12. Mehmood H et al, Determination of hypothyroidism among melasma patients in tertiary care hospitals, Pak. J. Med. Health Sci. 2020; 14 (2): 679-681

13. Satish DA, Aparna AD, Radhika VK.A clinico-epidemiological study of melasma in 402 patients in an officebased practice. Clin Dermatology Rev.2019 :3(2).154-156.

14. Kaur et al. A clinico-dermatoscopic study of 100 cases of melasma in a tertiary care hospital.Int J Res Dermatol. 2018:4 (1).41-45.

15. Jagannathan M, Sadagopan K, Ekkarakudy J, Anandan H. Clinico epidemiological study of patients with melasma in a tertiary care hospital A prospective study. Int J Sci Stud. 2017;4:117-20

16. Mahmoud BH, Ruvolo E, Hexsel CL, Liu Y, Owen MR, Kollias N, et al. Impact of long- wavelength UVA and visible light on melanocompetent skin. J Invest Dermatol. 2010;130:2092–7.

17. Cakmak etal.Etiopathogenetic factors, thyroid functions and thyroid autoimmunity in melasma patients.PostepyDermatol Alergol.2015 ; 32(5): 327–330

18. Aboobaker S, karthikayan k.Melasma and hypothyroidism: conflicting coexistence?, Journal of clinical and experimental Dermatology research,2017:8(6).1-3.

19. Kiani A, Ahmari M, Rezvanfar MR. Association of melasma with thyroid disorders. Iran J Dermatol. 2006;9:154–8.