

Clinical and Dermoscopic Evaluation of Periorbital Melanosis

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Abstract

Background: Periorbital melanosis (POM) describes the light-to-dark-colored, brownish-black pigmentation surrounding the eyelids. It can affect an individual's quality of life. Dermoscopic features of POM are not frequently reported in the literature. **Materials and Methods:** This study comprised 100 patients aged above 16 years, who attended our outpatient department (OPD) from November 2018 to October 2019. A detailed history, clinical features, and the dermoscopic study of color, pattern of pigment, and pattern of the blood vessel were recorded with the Dermlite-3N dermoscope (3Gen, San Juan Capistrano, California). On the basis of the eyelids' pigmentation and involvement, patients were clinically graded as Grade 0 to 4, with 4 being deep dark color extending beyond the infraorbital fold. The clinical patterns and the dermoscopic features were correlated. **Results:** Most patients were women (76) and the common age group was 16–25 years. Most of the patients had both the eyelids involved (58%), followed by lower eyelids (28%). The majority of the patients were having POM of grade 2 (47%). Seventeen patients (17%) had a positive family history of POM. The most common clinical form of POM observed was constitutional type (77) followed by postinflammatory type (12). Of 100 patients, 52 had pigmentary, 15 had vascular, and 33 had mixed pigmentary-vascular pattern. Cell phone usage (>4h) and refractory errors (38% each) were the common risk factors observed. Stress and respiratory allergy were significantly associated. In the pigmentation patterns, epidermal (54%), dermal (14%), and mixed (17%) subsets were observed. The reticular pattern was the most common vascular pattern (65%). **Conclusion:** POM is a multifactorial entity. Multiple risk factors play a role in the pathogenesis and aggravation. Clinical forms did not show any specific dermoscopic patterns. Dermoscopy of POM helps to know the underlying pathology, which in turn paves the way to the effective treatment.

Keywords: Dermoscopy, periorbital melanosis, pigmentary patterns, vascular patterns

INTRODUCTION

Periorbital melanosis (POM) describes the light-to-dark-colored, brownish-black pigmentation surrounding the eyelids and affects individual's quality of life. The prevalence was as high as 30.76% from Gujarat, India.^[1] Possible etiological factors of dark circles include excessive pigmentation, thin and translucent skin overlying the orbicularis oculi muscle, shadowing due to skin laxity and tear trough, and constitutional or familial causes.^[1] Prompt identification of different types of POM is necessary for appropriate treatment. Clinical inspection, Woods lamp, ultrasound, and even biopsy vary in their reproducibility of identifying the POM types. Hence, there is a need for a better and effective modality to identify the various patterns. Dermoscopy is a noninvasive diagnostic technique, helps in visualizing different structures in the skin that are not visible to the naked eye. The vessels and the

pigmentation can be better appreciated with dermoscope than the naked eye. Dermoscopic pattern of the POM in the Indian population is sparsely reported.^[2,3] This study endeavors to evaluate POM dermoscopically and identify the correlation between clinical and dermoscopic patterns.

MATERIALS AND METHODS

Patients aged more than 16 years, with POM, who attended our outpatient department (OPD), from November 2018 to October 2019 were recruited to the study. This was a hospital-based cross-sectional study and was approved by the Institutional Ethics committee (GSLMC/RC:495-EC/495-09/18). Patients who were on treatment at

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the time of presentation or 4 weeks prior to the recruitment into the study were excluded from the study.

Demographic data, duration, course, associated comorbidities, other factors like reduced sleep, stress, irregular menstrual cycles, increased usage of cellphone/computers, reading for long hours, refractory errors, and use of kajal and other eye cosmetics were noted. After the informed consent, clinical examination was done and the patterns of POM (constitutional, postinflammatory, vascular and shadow effect) were documented. Skin stretch test was performed and its effect on these patterns was noted. POM was graded 0–4 (0—skin color comparable to other facial skin areas, 1—faint pigmentation of the infraorbital fold, 2—pigmentation more pronounced, 3—deep dark color, all four lids involved and 4—pigmentation spreading beyond the infraorbital fold) [Figure 1].

Dermoscopy was done by using DermLite3N (3Gen, San Juan Capistrano, California). DermLite-3N is a camera-compatible dermoscope designed to view skin lesions with higher magnification and clarity. A high-quality, 25mm, 10× lens with color correction and reduced image distortion helps to get an image-rich surface detail.

Digital photographs of the periorbital region of the patient's left upper and lower eyelids, right upper, and lower eyelids were taken with cross-polarized light with pigment boost to study the level of pigment, whether it is epidermal, dermal, or a combination of both and also the presence of vasculature. Digital camera, OnePlus 5T phone (16/20 megapixels dual horizontal rear camera), was used. The statistical analysis was done by using Statistical Package for the Social Sciences (SPSS) software program, version 20.0 and MS Excel 2010.

RESULTS

One hundred patients with POM were recruited during the study period from November 2018 to October 2019. Demographic and clinical data are shown in Table 1. Most of them were between 16 and 25 years old, and 76 were women. Approximately, 17% had similar POM in their first-degree relatives. In this study, 34 (34%) were housewives, 28(28%) were students, 20(20%) did indoor work, and 18(18%) did outdoor work. Fifty had POM for a duration of less than 5 years, 46 (46%) had for 5–10 years, 4 had for more than 10 years. Associated comorbidities were hypothyroidism (8), iron deficiency anemia (3), and polycystic ovarian disease (3).

The clinical patterns were categorized into constitutional, postinflammatory, vascular, and shadow. Of these, constitutional (77%) was the most common clinical type, followed by postinflammatory (12%), vascular (6%), and shadow (5%). The most common clinical pattern associated with comorbidities was constitutional, except in cases of anemia, where it was a postinflammatory pattern. Both eyelids were involved in 58% and the lower eyelid alone in 28%. Perioral pigmentation along with

POM was observed in 33 patients, textural changes in 25, periocular dryness in 19, and 16 patients had periorbital itching.

In this study, cell phone usage (>4h)/computer >8h/day was seen in 38%, refractive errors were seen in 38%, reduced sleep was in 33%, Kajal usage was seen in 26%, reading>8h/day in 25%, history of respiratory allergy was seen in 24%, photo-aggravation was observed in 24%, stress in the form of emotional distress was seen in 14%, and menstrual irregularities were observed in 5% of patients. The constitutional type was seen most commonly with the aggravating factors. There was a statistically significant correlation with stress ($P = 0.022$) and respiratory allergy ($P = 0.015$).

POM was Grade 2 in 47%, followed by Grade 1 in 27 (27%) patients. Grade 3 in 25 (25%) and Grade 4 was seen in only 1 (1%) patient.

Table 1: Demographic and clinical profiles of 100 periorbital melanosis patients

Parameters	Number/percentage
Age in years	
16–25	30
26–35	23
36–45	20
>46	27
Sex	76 F, 24 M
Family history present	17%
Occupation	
House wives	34%
Students	28%
Indoor work	20%
Outdoor work	18%
Clinical patterns	
Constitutional	77%
Post-inflammatory	12%
Vascular	6%
Shadow	5%
Comorbidities	
Hypothyroidism	8%
Iron deficiency anemia	3%
Polycystic ovarian disease	3%
Associated possible risk factors	
Cell phone usage >4h/computer > 8 h/day	38%
Refractive errors	38%
Reduced sleep	33%
Kajal use	26%
Reading >8 h/day	25%
Photoaggravation	24%
Respiratory allergy	24%
Stress	14%
Dermoscopy patterns	
Pigmentary	33%
Vascular	15%
Mixed	52%

On dermoscopy, three different patterns were observed, pigmentary (33%), vascular (15%), and mixed pigmentary vascular (52%). The clinical patterns showed all the above three patterns dermoscopically [Table 2]. None of the dermoscopic features were specific to any clinical pattern of POM. Mixed pigmentary vascular pattern was seen with altered textural changes, itching, and perioral pigmentation. These mixed patterns have shown a statistically significant correlation with cell phone/computer use.

Pigmentary patterns were further divided into epidermal and dermal [Table 3]. Epidermal patterns were more common and the homogeneous light brown (36%) was more frequently seen. Vascular patterns were seen in 65%, either alone or with pigmentary patterns. The most common vascular pattern observed was reticular in 61(93.8%) patients, followed by a linear pattern in 2 (3.1%), and a combination of reticular and linear pattern in 2(3.1%).

DISCUSSION

POM generally occurs in all age groups. POM is rare in infancy and does not occur in newborns. It exists more commonly among adults but may be present in individuals from childhood onwards. Strachan *et al.*^[4] have stated that the genotype is fixed at conception, but the phenotype may not manifest until adult life.

In this study of 100 patients, the most commonly affected age group was 16–25 years of age group (30%), closely followed by >46 years with 27% patients, 25% in 25–35 age group, and 20% in 36–45 years age group [Table 1]. Sheth *et al.*^[1] have also shown that POM was most prevalent in

the women of age group 16–25 years, but Nayak *et al.*,^[5] Verschoore *et al.*,^[6] and Mendiratta *et al.*^[7] showed that the mean age of onset of POM was 30.44 years, 28 years, and 29.5 years, respectively, suggesting that POM is more common in the third and fourth decades. The penetrance is age-related, which supports the early adulthood onset of POM in most patients in our study. The higher incidence in 16–25 years in our study reflects the cosmetic orientation in this group.

POM is a common complaint in both men and women, but women present more frequently because of aesthetic reasons. In this study, women constituted 76% as compared to men (24%). Similar female preponderance was reported by Ahuja *et al.*,^[2] Jage *et al.*,^[3] and David *et al.*^[8] Malakar *et al.*^[9] stated that POM was an extension of pigmentary demarcation line-F (PDL-F) of the face and they found POM and PDL-F appeared at the same time in 67% of their patients.

In this study, 34 (34%) were housewives, 28 (28%) were students, 20 (20%) did indoor work, and 18 (18%) did outdoor jobs. The higher incidence in homemakers is in concurrence with the number of women. The higher prevalence among students indicates the aesthetic orientation of this group. The incidence in those who work outdoors can be because of sun exposure. Our findings are similar to the studies by Sheth *et al.*^[1] and Mendiratta *et al.*^[7] The majority of the patients were housewives (91, 45.5%). Chatterjee *et al.*^[10] stated that more than occupation per se, there may be circumstances that predispose patients to increased light and sun exposure and exhaustion of periorcular muscles, which seem to play a role in the development of dark circles.

The duration of POM may be inversely proportional to the response to treatment. In this study, 50 had dark circles of period less than 5-year duration, 46 (46%) had POM of duration 5–10 years, 4 (4%) had POM of duration >10 years. Comparatively, early reporting of patients in our study reflects our patients' concerns regarding their facial appearance.

In our study, 17% had a similar problem in the family. Gellin *et al.*^[11] reported familial cases of 22 members in six generations that had a genetically determined form of hyperpigmentation involving the periorbital area. Ahuja *et al.*,^[1] Sheth *et al.*,^[2] and Ranu *et al.*^[12] found positive family history in 81.5%, 63%, and 42.2% of patients, respectively.

Many factors are known to aggravate POM. Various proposed etiologic factors include constitutional pigmentation, vascular prominence, shadowing effect, periorbital edema, dermal melanocytosis, post-inflammatory hyperpigmentation, environmental causes such as ultraviolet (UV) radiation, atopy, lack of sleep, stress, alcohol, and smoking.^[13]

Table 2: Dermoscopic patterns in clinical types

Clinical form	Pigmentary	Vascular	Mixed
Constitutional	29	7	41
Post-inflammatory	2	2	8
Vascular	1	4	1
Shadow	1	2	2

Table 3: Dermoscopic pigmentary patterns

Dermoscopy pattern	Number of patients
Pigmentary	
Epidermal	
Homogeneous light brown	36
Cobble stone	16
Homogeneous light brown with speckled	2
Dermal	
Speckled	11
Globules	1
Cobblestone	2
Mixed (epidermal and dermal)	17

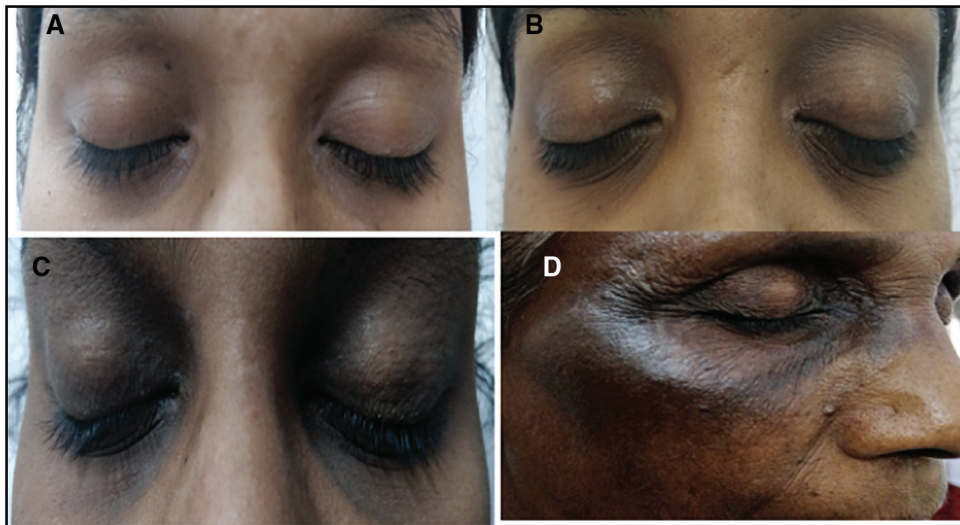


Figure 1: (A) Grade I periorbital melanosis. (B) Grade II periorbital melanosis. (C) Grade III periorbital melanosis. (D) Grade IV periorbital melanosis

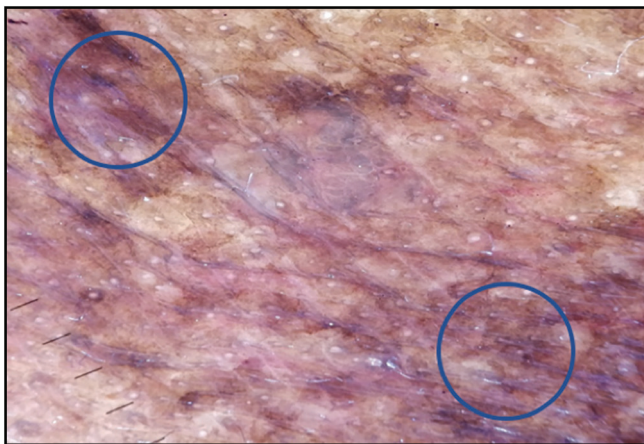


Figure 2: Dermoscopic picture of pigmentary pattern



Figure 3: Dermoscopy showing vascular pattern, reticular

In this study, cell phone usage (>4 h)/computer >8 h/day was seen in 38% patients, reading >8 h/day was seen in 25% of patients, and photo-aggravation was observed in 24 (24%) patients. Stress in the form of emotional distress was found in 14% of patients. Jage *et al.*,^[3] in their study, found anxiety diagnosed by psychiatrists in 4% of cases.



Figure 4: Dermoscopic picture of mixed pigmentary-vascular pattern. Green circle: pigmentary. Red circle: vascular

Patients with stress had aggravation of dark circles due to increased melanocyte-stimulating hormone secretion through the hypothalamic–pituitary–adrenal axis leading to hyperpigmentation.^[1]

Sleep was reduced in 33% of patients in our study, whereas it was lower (18%) in a study by Nayak *et al.*^[5] Refractive errors can contribute to and exacerbate POM. Jage *et al.*^[3] found myopia in 8% of patients, whereas, in our study, 38% had refractive errors. Increased strain on periocular muscles due to refractive errors resulting in muscle fatigue causes POM.^[14]

The use of cosmetics as an aggravating factor was seen in 26% of patients in our study. Jage *et al.*^[3] found cosmetic usage in 4%, and Nayak *et al.*^[5] noted kajal application in 10% of their patients with POM. Omar *et al.*^[15] from Egypt found that long-term and regular application of cosmetics, especially kajal, can lead to deposition of lead sulfide, leading to pigmentation.

In our study, menstrual irregularities were seen in 6.6% women. Nayak *et al.*^[5] have reported menstrual irregularities in 16%, and they also noticed worsening

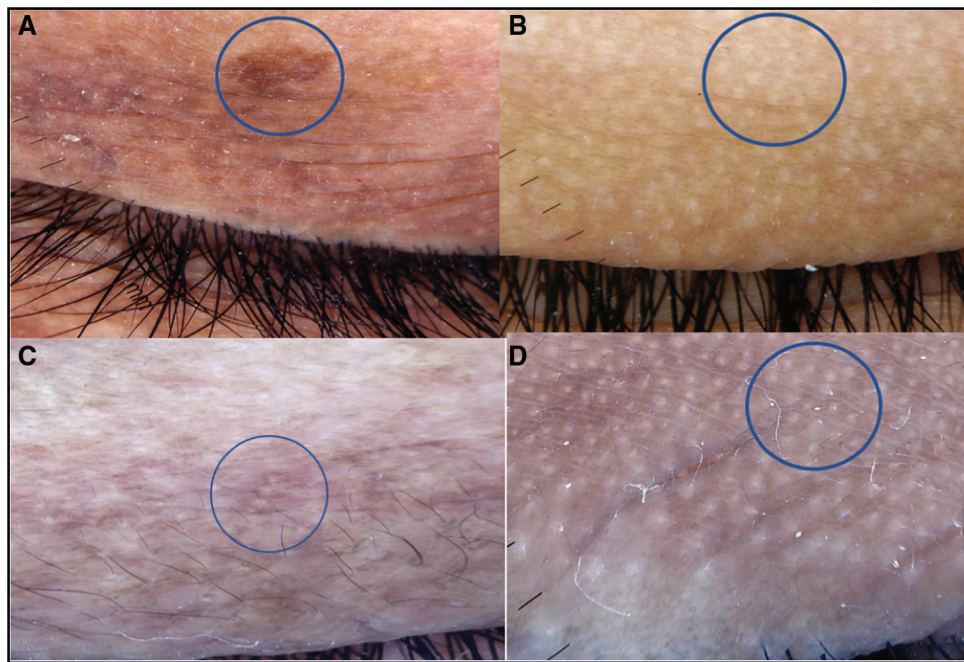


Figure 5: Dermoscopic pictures of epidermal and dermal pigmentation. (A). Epidermal–homogeneous light brown. (B) Epidermal cobblestone. (C) Dermal globules. (D) Dermal cobblestone

of dark circles with each menstrual cycle. Another study showed menstrual irregularities in 30% of patients, and oral contraceptive pills usage was seen in 18% of patients with POM, reflecting the role of hormones in POM.^[1]

Dark circles are prevalent in allergic individuals. Scratching and rubbing the periorbital skin and the accumulation of fluid due to facial allergy increases POM in these individuals.^[16] In our study, history of respiratory allergy/atopy was seen in 24% of patients, similar to a study by Jage *et al.*^[3] (22%) and Nayak *et al.*^[5] (18%), whereas Sheth *et al.*^[1] and Ranu *et al.*^[12] reported atopy in more people, 33% and 55.4%, respectively.

A comparative analysis between POM and stress ($P = 0.022$) and respiratory allergy ($P = 0.015$) showed significant association with POM. The most common clinical pattern in these was a constitutional pattern. The most common aggravating factor we noted was cell phone/computer usage. However, the other aggravating factors such as refractive errors, reduced sleep, and associated features like atopy, irregular menstruation, anemia were not having any significant association in our study, whereas Seth *et al.*^[1] observed high significance between these factors and POM.

Iron deficiency anemia, gastrointestinal diseases, hepatobiliary diseases, renal diseases, thyroid diseases, and suprarenal disorders may be associated with POM.^[3,17] In our study, 8% had hypothyroidism, 3% had polycystic ovarian disease, and other 3% of patients had anemia. Anemia can cause selective vasoconstriction in the skin, resulting in reduced oxygenation to the periorbital

tissues causing POM.^[1,17] Sheth *et al.*^[1] found anemia in 50% patients, elevated serum TSH in 1.5%, whereas TSH was decreased in 1% patients. Jage *et al.*^[3] have observed anemia in 16% of cases and Mendiratta *et al.*^[7] found anemia in 10% and low serum B12 in 12%.

Textural changes like periocular rhytids, skin laxity, dryness were seen in 25%, and perioral pigmentation was seen in 17% of patients in our study. Jage *et al.*^[3] reported atrophy (18%), exaggerated skin markings (22%), and perioral pigmentation (20%).

The most common site was both the eyelids in our study (58%), followed by lower eyelid alone in 28% patients, in contrast to the study done by Sheth *et al.*^[1] where they found that the most common site involved was lower eyelids (67%) followed by involvement of both the eyelids (20.5%).

Ranu *et al.*^[12] classified POM as constitutional, postinflammatory hyperpigmentation, vascular, and shadow effects. They found that constitutional was more common in Indian and Malays. Sheth *et al.*^[1] have observed constitutional (51.5%), postinflammatory (22.5%), and vascular (8%) patterns in their study. In our study also, constitutional was the most common (77%), followed by postinflammatory in 12% patients, vascular in 6% patients, and shadow in 5%, almost similar to Sheth *et al.* But postinflammatory (36%), vascular (41.8%) patterns were commonly seen by Jage *et al.*^[3] and Ranu *et al.*,^[12] respectively.

Comorbidities were seen in 14%, which was not statistically significant ($P > 0.05$), compared to 9% by Sheth *et al.*^[1] The most common clinical pattern associated

with the comorbidities was constitutional, followed by post-inflammatory.

Dermoscopy helps us to determine the cause, whether it is due to pigmentation/melanin or due to underlying vasculature or both. Polarized dermoscopy helped us to evaluate pigment network and vascular structures, whereas nonpolarized dermoscopy was valuable in assessing superficial skin changes such as atrophy and exaggerated skin markings. Atrophy appeared as hypopigmentation and a lack of normal skin markings. Exaggerated skin markings appeared as an increase in crisscross lines of skin markings.

On dermoscopy, pigmentary, vascular, and mixed patterns were observed. Pigmentary pattern was seen as multiple brown, black pigmentary dots of different sizes or a diffuse network of pigment [Figure 2]. Vascular type was seen as diffuse erythema or diffuse vascular network or numerous thin blood vessels [Figure 3]. The combination of both patterns was noticed in the mixed type [Figure 4]. Pigmentary changes can be epidermal, dermal, or a combination of the two.^[18]

The dermoscopic patterns in various clinical types were shown in Table 2. The most common dermoscopic pattern seen in patients with the constitutional clinical pattern was mixed pigmentary vascular, followed by pigmentary. In postinflammatory cases, we found that the most frequent dermoscopic pattern was pigmentary-vascular followed by pigmentary pattern and vascular. Similarly, vascular clinical pattern was mainly associated with the vascular dermoscopic pattern, but few cases also have pigmentary changes. Clinically classified shadow and postinflammatory also showed three dermoscopic patterns, that is, pigmentary, vascular, and a combination.

On dermoscopic examination, 85% showed a dermoscopic pigmentary pattern, either alone or in combination with vascular. Of these, 54% of patients had epidermal (black or brown pigmentation), 14% of patients had dermal (grey to blue pigmentation), and 17% patients had a combination of epidermal and dermal pigmentation. In a study by Ahuja *et al.*,^[2] they found that 39% had epidermal and 9% of patients had dermal.

In pigmentation patterns, epidermal type showed predominantly homogeneous light brown 36% followed by cobblestone (16%) [Table 3]. Dermal type was predominantly speckled (11%), followed by cobblestone (2%) [Figure 5]. Mixed patterns with both epidermal and dermal were seen in 17% of patients [Figure 5]. Ahuja *et al.*^[2] found 39% patients had epidermal type of pigmentation of homogenous or cobblestone type and (9%) patients had dermal type of pigmentation, as multi-component and pigment blotch pattern of pigmentation.

Vascular pattern was seen in 67% of patients. The common pattern was the reticular (65%), and the straight pattern in

(1%), and a combination of reticular and straight pattern in (1%). Ahuja *et al.*^[2] also documented the reticular vascular pattern as the most common (52%).

Gaón *et al.*^[18] found vascular type in 25% patients, 31% had pigmented type, and 44% had combined pigmentary-vascular. The vascular type is genetically determined, with darkening being caused by an extremely thin and translucent skin, favoring the visualization of blood vessels and underlying muscles.^[19]

Histology of POM may show dermal and/or epidermal melanin.^[20] Dermal melanin incontinence and dermal melanophages are found on histology.^[5,9] In addition to this, Nayak *et al.*^[9] found perivascular lymphocytic infiltrate in all patients of POM. Hemosiderin deposition was not seen. Melanin in the superficial epidermis presents as black dots, the basal layer melanin as brown dots, melanin in the papillary dermis as grey dots and in reticular dermis as blue dots. In addition to dots, homogeneous, and speckled patterns are seen in epidermal and dermal melanin, respectively, and cobblestone patterns in both. As the patients may not consent for biopsy of the POM, dermoscopy is a useful tool in identifying various clinical forms. This may modify the treatment according to its etiology as pigmentary, vascular, or the mixed type.

Limitation

This study was a hospital-based study; hence it may not indicate the actual prevalence of POM in general population.

CONCLUSIONS

POM is more common in 16–25 years of age. Constitutional type is the most common form. Stress and respiratory allergy have shown a significant correlation with the severity of POM. Mixed pigmentary-vascular patterns are more common than pigmentary or vascular alone. There is no specific correlation between the clinical type and dermoscopic patterns.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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