Section: Dermatology

Original Research Article

A STUDY ON CLINICAL, ETIOLOGICAL, DERMOSCOPIC AND THERAPEUTIC EVALUATION OF PERIORBITAL MELANOSIS

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ABSTRACT

Background: This study aimed to evaluate the clinical, etiological, dermoscopic, and therapeutic aspects of periorbital melanosis (POM) to understand its characteristics, causes, dermoscopic patterns, and treatment efficacy. The study design is a prospective interventional study was conducted for a period of 2 years, with ethical committee approval.

Materials and Methods: Sixty patients clinically diagnosed with POM were included after providing informed consent.Detailed history, clinical examination, and dermoscopy were performed to assess etiology, pigmentation grade, and dermoscopic patterns. Treatments included glycolic acid (GA) peel, lactic acid-arginine combination peel, azelaic acid 10% cream, or kojic acid cream. Clinical photographs were taken every 4 weeks, and improvement was graded after 3 months. Data were analyzed using categorical and quantitative variables, presented in tables and graphs.

Results: Most patients were aged 31–40 years (35%), predominantly female (70%). Common etiologies were increased screen time (43.3%), atopy (28.3%), and stress (26.7%). Constitutional POM was the most common clinical type (68.3%). Dermoscopy showed blotches (58.3%), globules (31.7%), and cobblestone appearance (23.3%). Treatments showed grade 1 improvement in 40%, grade 2 in 36.7%, and grade 3 in 18.3% of patients. Side effects included erythema (6.7%) and burning (10%).

Conclusion: POM is multifactorial, with constitutional type being most prevalent. Chemical peels and topical treatments are effective, though vascular and shadow types are less responsive. Preventive measures like UV protection and lifestyle modification are crucial.

Keywords: Periorbital melanosis, dermoscopy, chemical peels, hyperpigmentation.

INTRODUCTION

Periorbital melanosis (POM), commonly known as dark circles, is a prevalent dermatological condition characterized by symmetrical, dark brown or brownish-black patches in the periocular region. This cosmetic issue significantly affects self-esteem, particularly among female patients, despite not causing physical illness. POM manifests as round or semicircular patches around the eyes, varying in severity and often presenting bilaterally. The condition can affect the upper or lower eyelids, or both, and may extend to the glabella or upper nose. Its increasing prevalence has led to a surge in dermatological consultations, as patients seek to address the tired, stressed, or aged appearance it imparts. [Figure 1]

The etiology of POM is multifactorial, involving genetic, environmental, and physiological factors. Genetic predisposition is evident, as POM often appears across generations within families, suggesting an autosomal dominant inheritance

pattern. Key contributing factors include melanin deposition in the epidermis and dermis, the visibility of blood vessels in the periorbital region, an the thinness of the palpebral skin. The skin in this area, being physiologically thin, is particularly susceptible to irritants, recurrent trauma, and chronic conditions such as blepharitis or contact dermatitis. These can exacerbate POM through postinflammatory hyperpigmentation, complicating the condition further. Additional triggers include hormonal changes during puberty, ultraviolet (UV) radiation exposure, sleep deprivation, stress, smoking, and excessive alcohol consumption. These factors may not only initiate POM but also worsen its severity, making it a complex condition to manage.

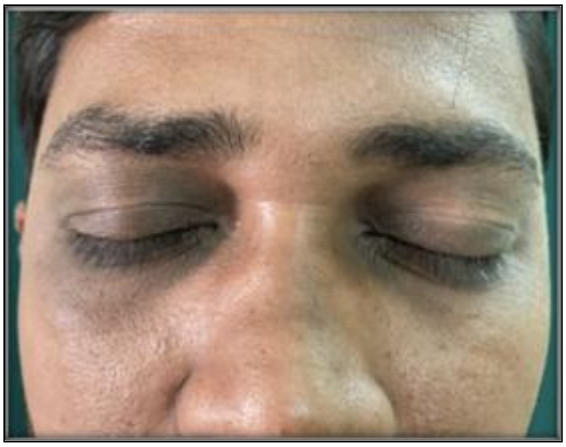


Figure 1: Periorbital melanosis

POM is not merely a cosmetic concern; it may signal underlying systemic issues, such as skin disorders, allergic reactions, nutritional deficiencies, or sleep disturbances. Identifying the etiology is crucial, as it guides appropriate treatment and rules out serious underlying conditions. The condition's aesthetic impact, coupled with its potential to reflect broader health issues, underscores the need for comprehensive evaluation and management.

Dermoscopy, a non-invasive diagnostic tool, has emerged as a valuable method for evaluating POM. By employing trans-illumination, dermoscopy enhances the visualization of subsurface skin structures invisible to the naked eye. It uses an achromatic lens and linkage fluids to improve skin translucency, allowing detailed observation of pigmentary and vascular patterns. When light interacts with the skin, it undergoes reflection, refraction, diffraction, and absorption, enabling dermoscopy to reveal subtle clinical features. Originally developed for studying melanocytic nevi and melanomas, particularly in light-skinned individuals, dermoscopy has been adapted to assess epidermal and dermal pigmentation in conditions like melasma. Its application in POM, however, remains underexplored, with limited evidence supporting its role in treatment planning.

In POM, dermoscopy can differentiate between pigmentary, vascular, and structural components. Pigmentary patterns, such as those caused by melanin deposition, appear as brown or blue-grey hues, while vascular patterns, driven by hemoglobin in blood vessels, present as dots, lines, or reticular networks. Although vascular patterns are less specific than pigmentary ones, they provide critical diagnostic clues. Structural changes, such as skin laxity or bulging contours of the lower eyelid, contribute to shadowing effects, further complicating the clinical picture. Dermoscopy's ability to identify these features makes it a promising tool for tailoring treatment strategies.

The need for this study arises from the limited data on POM's incidence, prevalence, and etiological factors, as well as the lack of standardized approaches to its diagnosis and management. Understanding the interplay of dermal melanin, visible capillary networks, and structural changes is essential for effective treatment. This study aims to investigate the clinical and etiological aspects of POM, characterize its dermoscopic patterns, and evaluate therapeutic outcomes in a cohort of patients. By integrating clinical examination, dermoscopic analysis, and treatment evaluation, we seek to enhance the understanding of POM and improve its management, addressing both its cosmetic and potential systemic implications.

MATERIALS AND METHODS

This prospective interventional study was conducted at the Department of Dermatology, Venereology, and Leprosy, with approval from the Ethical Committee. The study aimed to evaluate the clinical, etiological, dermoscopic, and therapeutic aspects of periorbital melanosis (POM) in 60 patients over a 2-year period.

Study Population and Sample Size: A total of 60 patients clinically diagnosed with POM, presenting to the outpatient department (OPD), were enrolled based on predefined inclusion and exclusion criteria. The sample size was determined to ensure adequate representation of POM characteristics and treatment outcomes.

Inclusion Criteria

Patients of both genders with clinical features of POM, such as symmetrical dark brown or brownish-black pigmentation around the eyelids, were included. Eligible participants were willing to provide informed consent and comply with the study protocol.

Exclusion Criteria

Patients with chronic debilitating diseases, those who were pregnant or lactating, or those with known allergies or hypersensitivity to study formulations were excluded. Additionally, individuals who had undergone recent cosmetic procedures (e.g., laser therapy or dermabrasion)on the affected area within 6 months prior to the study were excluded to avoid confounding treatment effects

Methodology: Patients attending the Department of Dermatology, Venereology, and Leprosy with a

clinical diagnosis of POM were enrolled after providing written informed consent. A detailed history was collected using a pre-designed proforma to identify etiological factors, including stress, sleep deprivation, sun exposure, atopy, cosmetic use, and family history of POM. Clinical examination assessed the severity of POM using a grading scale compared to surrounding skin:

- Grade 0: Skin color comparable to other facial areas
- Grade 1: Faint pigmentation of infraorbital fold
- Grade 2: Pronounced pigmentation
- Grade 3: Deep dark color, all lids involved
- Grade 4: Grade 3 with pigmentation extending beyond the infraorbital fold

A lower eyelid stretch test was performed to determine the clinical type of POM, classified according to Ranu et al. (2011), which includes constitutional, postinflammatory, vascular, and shadow effect types.[1] Dermoscopic examination was conducted for all patients using a dermoscope with both polarized and non-polarized white light. Dermoscopic images were captured to identify pigmentary (e.g., pigmented dots, globules, blotches), vascular (e.g., telangiectasia, erythema), and structural (e.g., atrophy, exaggerated skin markings) patterns, which were correlated with clinical findings and etiology.

Underlying systemic conditions, if identified, were treated, and patients were counseled to avoid triggering factors such as excessive screen time or sun exposure. Treatment was assigned based on clinical and dermoscopic findings: patients received either chemical peels (glycolic acid or lactic acid-arginine combination) every 2 weeks for 3 months or topical preparations (10% azelaic acid cream or kojic acid cream) applied nightly. All patients were instructed to use broad-spectrum sunscreen every morning to protect against UV-induced exacerbation. Clinical photographs were taken under standardized conditions every 4 weeks to monitor progress. Improvement in pigmentation was assessed at the end of 3 months using a visual analog score:

- Grade 1: Slight improvement (25%)
- Grade 2: Moderate improvement (25–50%)
- Grade 3: Obvious improvement (50–75%)
- Grade 4: Marked improvement (>75%)

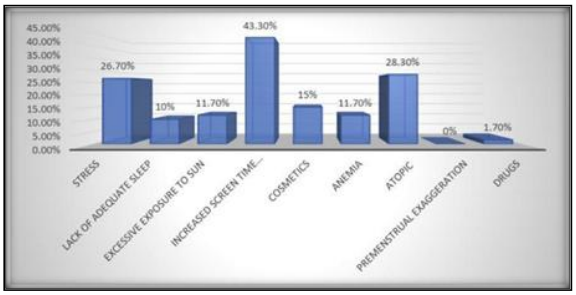
Statistical Analysis: Data were entered using Microsoft Excel and analyzed with the Statistical Package for the Social Sciences (SPSS Version 16) for Windows. Descriptive statistical analysis was performed to summarize categorical variables as frequencies and percentages (n, %) and quantitative variables as mean ± standard deviation. Results were presented in tabular form and visualized using bar or pie diagrams as appropriate. The accuracy of dermoscopic findings compared to clinical examination was evaluated, with a p-value threshold of 0.05 for statistical significance.

RESULTS

This study investigated periorbital melanosis (POM) in 60 patients at the Department of Dermatology, Venereology, and Leprosy.The majority of patients were aged 21–40 years (31–40: 36.7%, 21–30: 33.3%), with females comprising 70% and males 30%. Occupations included students (28.3%), housewives (20.3%), and computer professionals (18.3%). The most common etiologies were increased screen time (43.3%), atopy (26.3%), and stress (26.7%). [Table 1, Graph 1]

Table 1: Distribution of patients based on the ethiology

		Frequency	Percent
Ethiology	Stress	16	26.7%
	Lack of adequate sleep	6	10%
	Excessive exposure to sun	7	11.7%
	Increased screen time >8h/day	26	43.3%
	Cosmetics	9	15%
	Anemia	7	11.7%
	Atopy	17	28.3%
	Premenstrual exaggeration	0	0%
	Drugs	1	1.7%



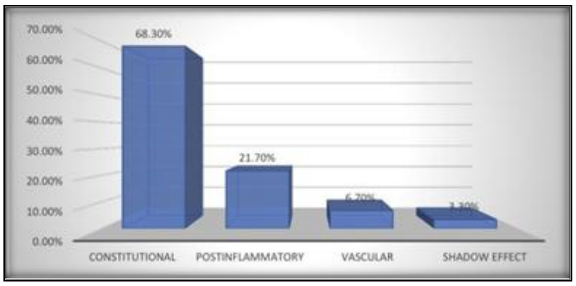
Graph 1: Distribution of patients based on the etiology

Duration of POM was >1 year in 43.3%, 7–12 months in 25%, 3–6 months in 20%, and <3 months in 11.7%.

Grading showed 46.7% with grade 2 (pronounced pigmentation), 26.7% grade 3 (deep dark color), 18.3% grade 4 (very dark), and 8.3% grade 1 (faint pigmentation). Family history was present in 16.7%, atopy in 28.3%, and excess sun exposure in 11.7%. Cosmetic use was reported by 15%, smoking by 3.3%, and refractive error by 11.7%. No patients showed signs of dehydration, while 10% had periorbital edema, 6.7% had visible local vasculature, and 8.3% had tear troughs. Pigmentation in other facial areas was noted in 11.7%. Clinical classification identified 68.3% constitutional, 21.7% post-inflammatory, 6.7% vascular, and 3.3% shadow effect types. [Table 2, Graph 2]

Table 2: Distribution of patients based on the Clinical classification

		Frequency	Percent
Clinical classification	Constitutional	41	68.3%
	Postinflammatory	13	21.7%
	Vascular	4	6.7%
	Shadow Effect	2	3.3%
	Total	60	100%



Graph 2: Distribution of patients based on the Clinical classification

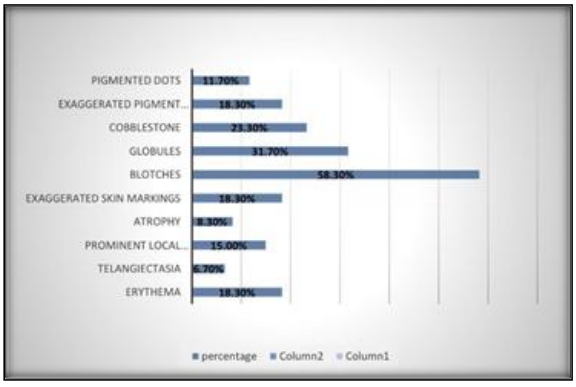
The stretch test showed decreased pigmentation in 71.7%, unchanged in 21.7%, and increased in 6.7%. Dermoscopy revealed epidermal pigmentation in 68.4% and dermal in 28.3%. Dermoscopic patterns included blotches (58.3%), globules (31.7%), cobblestone appearance (23.3%), exaggerated pigment network (18.3%), pigmented dots (11.7%), exaggerated skin markings (18.3%), erythema (18.3%), atrophy (8.3%), and telangiectasia (6.7%). [Table 3, Graph 3]

Table 3: Distribution of patients based on the dermoscopy pattern

		Frequency	Percent
Dermoscopy pattern	pigmented dots	7	11.7%
	Exaggerated pigment network	11	18.3%
	Cobblestone	14	23.3%
	Globules	19	31.7%
	Blotches	35	58.3%
	Exaggerated skin markings	11	18.3%
	Atrophy	5	8.3%
	Telangiectasia	4	6.7%
	Local vasculature	9	15 %
	Erythema	11	18.3%

Table 4: Distribution of patients based on the treatment

		Frequency	Percent
Treatment	GA peel	16	26.7%
	lactic acid and arginine combination peel	17	28.3%
	Azelaic acid 10%	14	23.3%
	Kojic acid	13	21.7%
	Total	60	100%

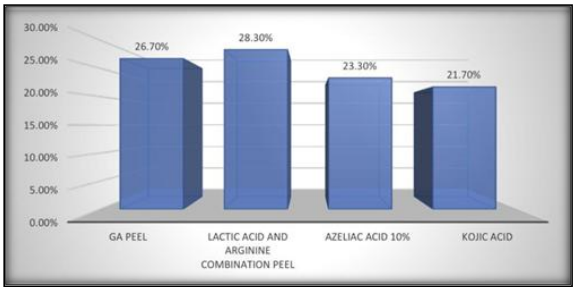


Graph 3: Distribution of patients based on the dermoscopy pattern

Treatments included lactic acid and arginine combination peel (28.3%), glycolic acid (GA) peel (26.7%), azelaic acid 10% (23.3%), and kojic acid (21.7%). [Table 4, Graph 4]

Side effects were diffuse erythema (8.7%), burning (10.9%), dryness (5.6%), desquamation (1.7%), and pruritis (3.3%). Improvement grades were 40% grade 1, 36.7% grade 2, and 18.3% grade 3. Dermoscopy was statistically more accurate than clinical examination in classifying pigmentary and vascular POM types (p=0.05). The post-inflammatory type was associated with an exaggerated pigment network, while globules correlated with constitutional and shadow types, and blotches with the shadow type. Other clinical findings included pigmentation at other sites (20%), visible bulging (10%), tear trough (8%), and superficial vessels (6%). Histopathology showed increased epidermal melanin, melanin in vellus follicular epithelium, and dermal melanophages, with negative Prussian blue tests for hemosiderin. The study confirmed POM's multifactorial etiology, with post-inflammatory being the most common clinical presentation. Increased screen time, atopy, and stress were significant contributors. Dermoscopic patterns aided in precise classification, guiding treatment. Chemical peels were effective, particularly for constitutional POM, with lactic acid and arginine combination peels showing higher patient satisfaction (p=0.008). Both GA and lactic acid peels significantly improved POM from baseline (p<0.01), with no serious long-term side effects. The study underscores the importance of dermoscopy in POM

management and highlights the efficacy of chemical peels, though vascular and shadow types showed limited response, necessitating tailored approaches.



Graph 4: Distribution of patients based on the treatment

DISCUSSION

Periorbital melanosis (POM), commonly known as dark circles, is a frequent dermatological condition characterized by brownish-black pigmentation around the eyelids, giving a tired appearance. Its multifactorial etiology includes genetic predisposition, vasodilation, and lifestyle factors, making treatment challenging and often temporary. No standardized treatment protocol exists, necessitating further research into its clinical presentation, causes, dermoscopic patterns, and therapeutic outcomes.

Age Distribution: The study included 60 patients, predominantly aged 21–40 years (31–40: 35%, 21–30: 30%), followed by 41–50 years (16.7%), 11–20 years (11.7%), and 51–60 years (6.6%). This aligns with prior studies reporting mean ages of 28–32 years, with POM most common in the third and fourth decades. Mendiratta et al. reported a mean age of 29.5 years, Chatterjee et al. noted 31.96 years, and Nayak et al. found a mean onset age of 30.44 years. POM is rare in infants but prevalent in adults, particularly those with mixed racial or Jewish ancestry, though robust epidemiological data is lacking. Higher skin types and older age increase susceptibility, but younger individuals may also be affected.

Gender Distribution: Females comprised 70% of the study population, males 30%. This gender disparity is consistent across studies: Mendiratta et al. reported 84% females, Chatterjee et al. 80.4%, Ranjan et al. 74%, Ramakrishnan et al. 78%, and Ahuja et al. 84.5%. The higher prevalence in females may relate to hormonal influences or cosmetic concerns prompting more consultations.

Occupation: Students (28.3%), housewives (20%), and computer professionals (18.3%) were the most affected. The high incidence among housewives correlates with the female predominance, while students' cosmetic awareness may contribute. Occupations like farming, involving sun exposure, increase POM risk, as noted in broader dermatological literature.

Duration:POM duration was >1 year in 43.3%, 7–12 months in 25%, 3–6 months in 20%, and <3 months in 11.7%. Verschoore et al. reported an average duration of 13 years (range 2–48 years), with 51.5% having POM for <10 years, 27.3% for 10–20 years, and 21.2% for >20 years, indicating chronicity in many cases.[2]

Etiology: The primary etiologies were increased screen time (43.3%), atopy (28.3%), and stress (26.7%). Mendiratta et al. found 8% of patients had sleep deprivation, 18% had prolonged screen exposure, 14% had a family history, and 30% had atopy.[3] Chatterjee et al. noted 81.7% had eye exhaustion from inadequate rest, with 19.5% reporting family history.[4] Ranjan et al. identified stress (32%), sun exposure (26%), and kohl use (10%) as precipitants.[5] Ranu et al. reported 51.1% with sleep deprivation, and Ramakrishnan et al. linked <6 hours of sleep, eye rubbing, and family history (odds ratio >0.8) to POM progression. Ahuja et al. found 81.5% had a positive family history. Jage et al. noted multifactorial causes in 30%, with atopy (22%), anemia (16%), and refractive errors (8%) contributing.[6] Hormonal factors, including menstrual irregularities (30%) and oral contraceptive use (18%), were implicated by Nayak et al.[7]. Chronic illnesses (46%), reduced sleep (18%), and atopy (18%) were also reported. Gathers suggested fatigue, stress, and aging as contributors, with anemia causing vasoconstriction and hormonal changes exacerbating pigmentation via the hypothalamic-pituitary-adrenal axis.[8]

Symptoms: Itching was reported in 15%, burning in 3.3%, and redness in 3.3%. Mendiratta et al. found 32% of atopic patients had periorbital itching, likely due to frequent rubbing or scratching, leading to inflammation and increased pigmentation.[3]

Periorbital Edema: Periorbital edema was present in 10% of patients. The eyelid's spongy nature predisposes it to fluid accumulation, exacerbated by systemic or local factors like high-salt diets. Edema's role in POM is indicated by variable pigmentation intensity, persisting when looking downward.

Tear Trough: Tear troughs, depressions over the inferior orbital rim due to subcutaneous fat loss and skin thinning, were observed in 13.3%. These anatomical changes, combined with cheek descent, accentuate shadowing, contributing to dark circles.

Pigmentary Demarcation Lines (PDLs): PDLs, abrupt transitions between hyperpigmented and lighter skin, were present in 20%. Malakar et al. found 92% of POM cases linked to PDL-F extension,[9] while Nayak et al. noted PDL-F and G in 18%, and Jage et al. reported one case of PDL-F extension.

Clinical Classification: Constitutional POM was most common (68.3%), followed by post-inflammatory (21.7%), vascular (6.7%), and shadow effect (3.3%). Ranu et al. reported vascular (41.8%) as the most common, followed by constitutional (38.6%). Ramakrishnan et al. found constitutional (43%) and shadow effect (32%) predominant.[10] Jage

et al. noted post-inflammatory (36%) as the most common, with associated features like perioral pigmentation (20%) and skin laxity (52%) in Chhabra et al.

Dermoscopy: Dermoscopic patterns included blotches (58.3%), globules (31.7%), cobblestone appearance (23.3%), exaggerated pigment network (18.3%), pigmented dots (11.7%), exaggerated skin markings (18.3%), erythema (18.3%), atrophy (8.3%), and telangiectasia (6.7%). Mendiratta et al. found 90% had upper and lower eyelid involvement, with freckles (12%) and telangiectasia (2%). Ramakrishnan et al. reported scattered pigmented dots (56%), globules (30%), and dilated veins (50%). Ahuja et al. noted mixed pigmentation (52%), epidermal (39%), and dermal (9%).[11] Gaon et al. found vascular (25%), pigmented (31%), and mixed (44%) types.[12] Jage et al. reported multicomponent patterns (64%), with globules (16%) and telangiectases (18%). Chhabra et al. found patchy pigmentation (53.8%) and vascular involvement (80.4%), with telangiectasia (58.8%) predominant.[13] Dermoscopy was statistically more accurate (p=0.05) than clinical examination for classifying pigmentary and vascular POM. [Figure 2]

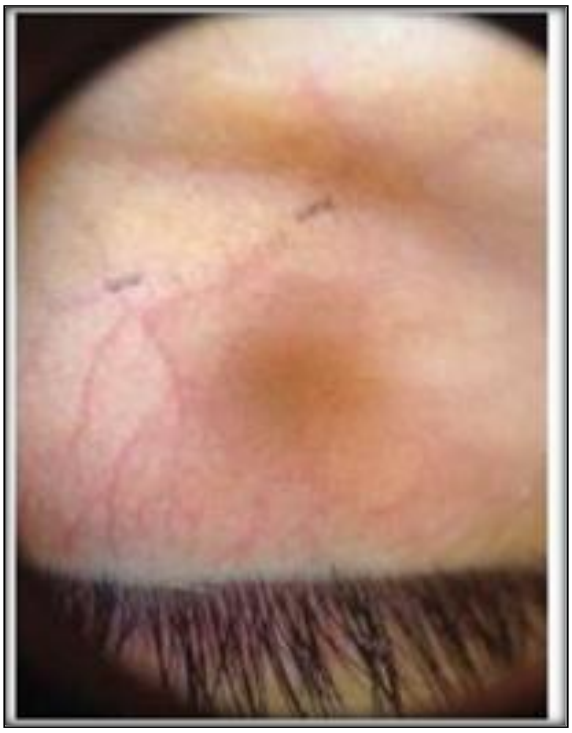


Figure 2: Dermoscopic picture showing prominent local vasculature.

Treatment: Treatments included lactic acid and arginine peel (28.3%), glycolic acid (GA) peel (26.7%), azelaic acid 10% (23.3%), and kojic acid (21.7%). Dayal et al. compared 20% GA, 15% lactic acid, and 20% vitamin C, finding 73.34% of GA peel patients, 56.67% of lactic acid peel patients, and 26.67% of vitamin C patients achieved >50% improvement. GA peels were superior to lactic acid after 12 weeks and vitamin C after 6 weeks. Ahmed et al. found 30% lactic acid peels superior to 20% GA peels (p=0.008), with both showing significant improvement (p<0.01). Hassan et al. reported chemical peels (3.75% trichloroacetic acid, 15% lactic acid) and carboxytherapy effective, with 93.4% and 86.7% achieving good grades, respectively.

Figure 3: These are the pictures showing the improvement in the periorbital melanosis after treatment with 35% glycolic acid peel.

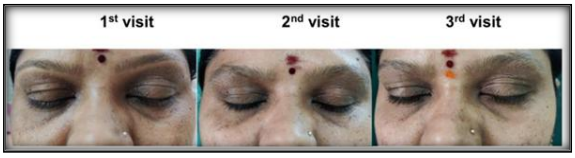


Figure 4: These are the clinical pictures showing improvement in periorbital melanosis on treatment with lactic acid – arginine peel.

Side Effects: Side effects included diffuse erythema (6.7%), burning (10%), dryness (5%), desquamation (1.7%), and pruritis (3.3%). Dayal et al. reported erythema (16.7%), burning (13.3%), and itching (6.7%) with GA peels.[14] Ahmed et al. noted burning and erythema in over 50% of cases, with no long-term sequelae.[15] Chhabra et al. detected erythema and scaling in 47.6% via dermoscopy.

Improvement Grade: Grade 1 improvement was observed in 40%, grade 2 in 36.7%, and grade 3 in 18.3%. Hassan et al. reported 93.4% good and 6.6% fair grades for chemical peels, and 86.7% good and 13.3% fair for carboxytherapy, with significant improvement in pigmented POM.[11]

Limitations: The study's small sample size (60 patients) limits generalizability. The dermoscope's size hindered precise examination of the periorbital area. Further statistical and clinicopathologic correlation is needed to validate etiology and dermoscopic findings.

CONCLUSION

Periorbital melanosis, is rather frequent. Treatment of POH with chemical peels in vascular or shadow type was not much effective. Hence dermoscopic examination is necessary to know the type of POH. Since it has a complex history and deposits melanin in both the dermis and the epidermis, it is resistant to conventional treatments. The most common clinical type is constitutional type. Grade 4 improvement in

periorbital hyperpigmentation after treatment is seen in none of the patients. Hence, measures for preventing periorbital melanosis like use of protective devices like blue screen, ultraviolet filters, avoiding late nights and lifestyle modification should be taken to avoid dark circles. Patients who wish to enhance their facial cosmetic appearance can do so using topical therapies and basic physical therapies like chemical peels, which have been shown to increase patients' quality of life.

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