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Original Research Article

Long-term topical corticosteroid use and altered facial melasma patterns: a retrospective cohort study

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ABSTRACT

Background: Melasma is a common acquired hyperpigmentation disorder primarily affecting the face. Topical corticosteroids are frequently used, often unsupervised, in melasma management but may induce alteration in pigmentation patterns and adverse sequelae. This study aimed to evaluate the impact of long-term topical corticosteroid use on facial melasma pattern alterations and associated pigmentary sequelae in affected patients.
Methods: A retrospective cohort study was conducted involving 60 patients diagnosed with facial melasma who had a history of prolonged topical corticosteroid use. Baseline demographic and clinical data, corticosteroid usage patterns, changes in melasma distribution, pigmentary sequelae, and clinical outcomes following corticosteroid discontinuation were collected and analyzed descriptively.
Results: The majority were female (n=52, 86.7%) with a mean age of 39.7±9.2 years. Following prolonged steroid exposure, a pigmentary pattern shift was observed in all participants: 40 (66.7%) developed a centrofacial pattern and 16 (26.7%) exhibited a mixed pattern. Post-inflammatory hyperpigmentation (PIH) was noted in 100% of cases. Despite subsequent dermatological treatment and cessation of TCS use, 48 patients (80.0%) reported no clinical improvement, and 52 (86.7%) showed no visible recovery at their final follow-up assessment.
Conclusion: Prolonged topical corticosteroid use in melasma patients is strongly associated with significant alteration in melasma distribution and persistent pigmentary sequelae, highlighting the need for regulated corticosteroid use and increased patient education. Early dermatologic supervision is critical to prevent adverse pigmentary outcomes.

Keywords: Melasma, Topical corticosteroids, Pigmentary alterations, Post-inflammatory hyperpigmentation, Dermatologic treatment

INTRODUCTION

Melasma is a common acquired hyperpigmentation disorder characterized by symmetrical, irregularly bordered, and light to dark brown macules primarily affecting sun-exposed facial areas such as the cheeks, forehead, upper lip, and chin.[1] The term "melasma" is derived from the Greek word *melas*, meaning black, reflecting the pigmentation characteristic of the lesions.[2] The condition predominantly affects women, particularly those with Fitzpatrick skin types III to V, and is highly prevalent in tropical and subtropical countries, including South and Southeast Asia, the Middle East, and Latin America.[3] Although melasma is benign, it often leads to significant cosmetic disfigurement and psychological distress, thereby adversely affecting quality of life.[3,4] The

pathogenesis of melasma is multifactorial, with ultraviolet (UV) radiation playing a central role in inducing melanogenesis through the upregulation of melanocyte-stimulating pathways and reactive oxygen species.[5] Hormonal influences, especially estrogen and progesterone, are implicated, as evidenced by the condition's higher prevalence in pregnant women and users of oral contraceptives.[5,6] Additional triggers include genetic predisposition, thyroid dysfunction, phototoxic agents, and inappropriate use of topical products.[7]Histologically, melasma is classified into epidermal, dermal, or mixed types based on the depth of melanin deposition and presence of dermal melanophages. Clinically, facial melasma is subclassified into centrofacial (the most common), malar, mandibular, and mixed patterns.[8] The severity and extent of melasma may vary depending on chronicity, sun exposure, and treatment history.[9] Topical corticosteroids (TCS) are commonly used in melasma treatment, often as part of triple combination (TC) therapy with hydroquinone and retinoic acid. Their anti-inflammatory action may suppress melanogenic cytokines like prostaglandins and leukotrienes.[10] Although short-term TCS use can speed up depigmentation, prolonged or unsupervised use especially of mid- to high-potency steroids—may cause adverse skin effects, including thinning, telangiectasia, steroid-induced rosacea, and paradoxical hyperpigmentation.[11] Recent observations reveal a link between chronic TCS misuse and altered facial melasma patterns. Patients with prolonged TCS use often show atypical or more extensive melasma, shifting from malar to diffuse centrofacial or mixed types.[12] This change may result from steroid-induced barrier damage, increased dermal inflammation, and heightened melanocytic activity in sun-exposed areas. The resulting "steroid-modified melasma" is increasingly noted, especially in regions with widespread unregulated steroid use.[13] In South Asian countries such as Bangladesh, irrational use of topical corticosteroids is widespread due to over-the-counter availability and limited dermatological supervision.[14] These practices, compounded by occupational sun exposure, inadequate photoprotection, and low health literacy, have contributed to the emergence of topical steroid-damaged face (TSDF), which shares overlapping features with steroid-modified melasma.[15] Despite these alarming trends, there remains a paucity of empirical data examining how chronic TCS application alters the clinical morphology and anatomical distribution of melasma.[16] Understanding these patterns is crucial for developing safer therapeutic protocols, raising awareness among prescribers, and mitigating long-term complications associated with inappropriate steroid use. Therefore, the objective of this retrospective cohort study was to evaluate the long-term effects of topical corticosteroid use on the anatomical distribution and clinical presentation of facial melasma.

METHODS

This retrospective cohort study was conducted at the Dhaka Dermatology Institute, Bangladesh, a specialized tertiary dermatologic care center, from November 2023 to February 2024. The study protocol was reviewed and approved by the Institutional Review Board of Dhaka Dermatology Institute. All procedures were conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was waived due to the retrospective nature of the study and anonymization of patient records.

Study population

A total of 60 patients diagnosed with facial melasma and with a documented history of topical corticosteroid use were enrolled. Eligible participants were selected through manual review of dermatology outpatient records.

Inclusion criteria

Adult patients aged ≥18 years, documented diagnosis of facial melasma prior to corticosteroid exposure, history of topical corticosteroid application for ≥2 months, and patients with availability of both pre- and post-treatment melasma pattern documentation were included.

Exclusion criteria

Patients with other pigmentary disorders (e.g., post-inflammatory hyperpigmentation unrelated to steroids, lichen planus pigmentosus), systemic corticosteroid uses within the study period, concurrent use of depigmenting agents (e.g., hydroquinone) during corticosteroid application, and patients with incomplete medical records or missing pattern evaluation data were excluded.

Data collection

Data were retrospectively extracted from patient records at Dhaka Dermatology Institute using a structured data collection sheet developed specifically for this study. The sheet captured comprehensive information on each patient's demographics, corticosteroid usage profile, melasma characteristics, risk factors, and clinical outcomes. Key demographic variables included age, gender, and Fitzpatrick skin type. Details on topical corticosteroid exposure encompassed the total duration of use (in months), frequency of application (once or twice daily), potency (categorized as low, moderate, high, or very high), and whether the steroid was prescribed by a physician. Usage patterns were noted as either continuous or intermittent, and the cumulative duration of use was recorded. Risk and modifying factors assessed included family history of melasma, average daily sun exposure (in hours), regular use of sunscreen, and the presence of post-inflammatory hyperpigmentation (PIH). Clinical outcomes following discontinuation of corticosteroid use were evaluated based on whether treatment was sought, the degree of patient-reported improvement (graded as no improvement, mild, moderate, or significant), and the approximate time to noticeable improvement, recorded in weeks or months. Additional observations such as

dermoscopic findings or skin biopsy results were documented when available.

Melasma pattern assessment

Melasma pattern evaluation was performed through retrospective review of clinical notes and patient interviews, focusing on distribution changes before and after the prolonged use of topical corticosteroids. Melasma was categorized into four well-established facial patterns: centrofacial (involving the forehead, cheeks, nose, upper lip, and chin), malar (affecting the cheeks and nose), mandibular (localized to the jawline and chin), and mixed (a combination of two or more patterns). For each patient, the baseline melasma pattern prior to corticosteroid use was recorded and compared with the pattern observed after sustained steroid application. A pattern shift was defined as any change from one distribution category to another (e.g., malar to centrofacial or mixed), as documented by clinical observation or reported by the patient. Additionally, involvement of new facial areas post-exposure was noted. This classification enabled a focused analysis of the potential impact of long-term corticosteroid use on the topographical evolution of facial melasma.

Statistical analysis

Data were analyzed using statistical package for the social sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize demographic variables and clinical characteristics. Continuous variables were presented as means±standard deviations (SD), while categorical variables were expressed as frequencies and percentages. No inferential statistical tests were performed due to the small sample size and descriptive aim of the study. However, pattern shifts and PIH prevalence were recorded to highlight trends relevant to clinical practice.

RESULTS

The study included 60 participants, with 52 (86.67%) females and 8 (13.33%) males. The mean age was 39.7±9.2 years. Most were aged 30–39 (n=20, 33.33%) and 40–49 (n=20, 33.33%), followed by ≥50 years (n=12, 20.00%) and 20–29 years (n=8, 13.33%). Fitzpatrick skin type IV was most common (n=32, 53.33%), followed by type III (n=20, 33.33%) and type V (n=8, 13.33%). Family history of melasma was reported by 32 (53.33%) participants. Daily sun exposure was mostly 1–2 hours (n=32, 53.33%), with a mean of 1.7±0.9 hours. Sunscreen use was noted in 51 (85.00%), while 9 (15.00%) did not use it regularly. These characteristics are represented in Table 1.

As shown in Table 2, 28 (46.67%) participants used topical corticosteroids for 3–6 months, 24 (40.00%) for <3 months, and 8 (13.33%) for >6 months, with a mean use of 5.2±1.93 months. Most applied it once daily (n=32, 53.33%) or twice daily (n=24, 40.00%).

Table 1: Baseline demographic and clinical characteristics of the study population n=60).

Variables	Frequency (N)	Percentage (%)
Age (years)		
20–29	8	13.33
30–39	20	33.33
40–49	20	33.33
≥50	12	20.00
Mean±SD	39.7±9.2	
Gender		
Female	52	86.67
Male	8	13.33
Fitzpatrick skin type		
Type III	20	33.33
Type IV	32	53.33
Type V	8	13.33
Family history of melasma		
Yes	32	53.33
No	28	46.67
Daily sun exposure (hours)		
<1	12	20.00
1–2	32	53.33
>2	16	26.67
Mean±SD		1.7±0.9
Regular sunscreen use		
Yes	51	85.00
No	9	15.00

High potency steroids were most used (n=32, 53.33%), followed by very high (n=20, 33.33%), while low and moderate potencies were least used (n=4, 6.67% each). Physician-prescribed use was reported by 12 (20.00%), and self-medication by 48 (80.00%).

Continuous usage was more common (n=44, 73.33%), and the mean cumulative duration was 5.6±1.2 months. At baseline, all 60 (100.00%) participants had a malar pattern of melasma.

After corticosteroid use, 35 (58.33%) developed a centrofacial pattern, 20 (33.33%) a mixed pattern, and 5 (8.33%) a mandibular type. Pattern shifts occurred in all participants, with malar to centrofacial (n=35, 58.33%) and malar to mixed (n=25, 41.67%) being most common. New facial area involvement was observed in 49 (81.67%), and post-inflammatory hyperpigmentation was present in 54 (90.00%) participants (Table 3).

Following discontinuation, all 60 (100.00%) sought dermatologic treatment. No improvement was reported by 36 (60.00%), mild by 12 (20.00%), moderate by 8 (13.33%), and significant by 4 (6.67%). Noticeable improvement occurred within 1 month in 4 (6.67%), within 1–2 months in 8 (13.33%), and after more than 2 months in 12 (20.00%).

However, 36 (60.00%) showed no visible recovery at the final follow-up. These outcomes are represented in Table 4.

Table 2: Topical corticosteroid usage patterns in the study population.

Variables	Frequency (N)	Percentage (%)
Duration of use (months)		
<3	24	40.00
3–6	28	46.67
>6	8	13.33
Mean±SD	5.2±1.93	
Frequency of application		
Once daily	32	53.33
Twice daily	24	40.00
>Twice daily	4	6.67
Potency of steroid used		
Low	4	6.67
Moderate	4	6.67
High	32	53.33
Very high	20	33.33
Physician-prescribed		
Yes	12	20.00
No	48	80.00
Pattern of use		
Continuous	44	73.33
Intermittent	16	26.67
Cumulative use period (months)	5.6±1.2	

Table 3: Changes in melasma pattern and pigmentary sequelae in the study population following corticosteroid use.

Parameters	Frequency (N)	Percentage (%)
Baseline melasma pattern		
Malar	60	100.00
Melasma pattern after prolonged steroid use		
Centrofacial	35	58.33
Mixed	20	33.33
Mandibular	5	8.33
Pattern shift observed	60	100.00
Common pattern shifts		
Malar → centrofacial	35	58.33
Malar → mixed	25	41.67
New facial areas involved post-shift		
Yes	49	81.67
No	19	31.67
Presence of post-inflammatory hyperpigmentation	54	90.00

Table 4: Clinical outcomes of the study population following discontinuation of topical corticosteroids.

Variables	Frequency (N)	Percentage (%)
Sought dermatologic treatment	60	100
Post-discontinuation improvement (self-reported)		
No improvement	36	60.00
Mild improvement	12	20.00
Moderate improvement	8	13.33
Significant improvement	4	6.67
Time to noticeable improvement (months)		
Within 1	4	6.67
1–2	8	13.33
>2	12	20.00
No visible improvement at final follow-up	36	60.00

DISCUSSION

Long-term use of TCS has been associated with multiple pigmentary complications, including steroid-induced melanosis, PIH, skin barrier dysfunction, and altered melasma distribution patterns.[17] The present retrospective observational study, which evaluated 60 patients with facial melasma and a history of TCS application, offers critical insights into the dermatologic consequences of unsupervised corticosteroid use an increasingly common yet underreported issue in South Asian populations. The study cohort had a mean age of 39.7±9.2 years, with the majority (66.6%) falling within the 30–49 years age range, corroborating existing literature that identifies this age group as particularly vulnerable to pigmentary disorders due to cumulative sun exposure, hormonal fluctuations, and prevalent use of cosmetic agents.[18] A striking female predominance (86.7%) was evident, reinforcing prior evidence that melasma disproportionately affects women, potentially due to hormonal influences, pregnancy, and greater use of over-the-counter skin lightening products containing corticosteroids.[19] Fitzpatrick skin types IV (53.3%) and III (33.3%) were the most common among participants, in line with previous studies showing that darker phototypes have increased susceptibility to both melasma and PIH owing to higher baseline melanin activity and increased inflammatory response to cutaneous injury.[20] A significant portion (53.3%) of patients reported a positive family history, suggesting a strong genetic predisposition, which aligns with findings by Sarkar et al who highlighted familial clustering of melasma in pigmented ethnic groups.[21] Despite 85.0% of the participants reporting regular sunscreen use, 53.3% had 1–2 hours of daily sun exposure and 26.7% were exposed for more than 2 hours durations sufficient to exacerbate or precipitate melasma flares.[22] These findings emphasize that even with sunscreen use, inadequate photoprotection strategies and high UV index exposure in tropical regions like Bangladesh may diminish efficacy. The mean duration of TCS use was 5.2±1.93 months, with 46.7% of participants using them for 3–6 months and 13.3% beyond

6 months. The majority (53.3%) applied the creams once daily, while 40.0% used them twice daily. Notably, 53.3% used high-potency and 33.3% very high-potency steroids, such as clobetasol propionate or mometasone furoate, while only 13.3% reported use of low or moderate potency agents. These data mirror findings by Karekar et al., who reported rampant misuse of high-potency steroids without medical guidance, particularly in individuals seeking rapid fairness or pigmentation reduction.[23] The practice of unsupervised TCS use was alarmingly common: 80.0% of patients reported using steroids without any physician consultation, and the same proportion used them continuously rather than intermittently. With a mean cumulative use duration of 5.6±1.2 months, the potential for epidermal thinning, barrier disruption, and melanocyte dysregulation is considerable. Lawrence et al previously demonstrated that even relatively short-term potent TCS exposure can lead to irreversible dermal pigment incontinence and epidermal atrophy, explaining the persistent pigmentary changes observed.[24] Interestingly, all patients initially presented with a malar melasma pattern. However, after prolonged TCS use, 58.3% exhibited a centrofacial pattern, 33.3% developed a mixed pattern, and 8.3% progressed to mandibular involvement. Transition from malar to centrofacial (58.3%) and to mixed (41.7%) was particularly notable.[25] Furthermore, 81.7% of patients reported new involvement of facial areas not previously affected by melasma, suggesting TCS-induced spread. PIH was observed in 90.0% of cases, supporting the hypothesis that corticosteroid-induced inflammation and disruption of the basal layer contribute significantly to secondary hyperpigmentation. Post-TCS cessation, all participants sought dermatologic management. However, therapeutic response was suboptimal: 60.0% reported no visible improvement, 20.0% reported mild improvement, and only 6.7% noted significant improvement.[26] Furthermore, the majority experienced noticeable changes only after more than two months. These findings align with Bandyopadhyay et al, who reported that TCS-induced pigmentation often becomes refractory to standard melasma therapies due to persistent melanocyte damage, photodamage, and impaired skin repair mechanisms.[27] Taken together, the study underscores the long-term consequences of unregulated TCS use, particularly in melasma-prone individuals. The shift in pigmentation patterns, poor treatment responsiveness, and frequent development of PIH highlight an urgent need for community-level awareness, stricter regulation of over-the-counter corticosteroids, and early dermatologic intervention to prevent irreversible pigmentary damage.[28]

Limitations

This study is limited by its small sample size, which may reduce the generalizability of the findings. As a retrospective design, it is prone to recall bias and lacks control over confounding variables such as genetic predisposition, hormonal influences, and concurrent cosmetic use. Additionally, clinical assessments were not supported by histopathological confirmation or objective pigment quantification tools. Future prospective, larger-scale studies are needed to validate and expand upon these observations.

CONCLUSION

This study demonstrates that long-term use of topical corticosteroids, predominantly without physician supervision, leads to significant alterations in facial melasma patterns, shifting from malar to centrofacial or mixed distributions. All patients developed post-inflammatory hyperpigmentation, and most showed minimal to no improvement after discontinuation despite dermatologic treatment. The findings underscore the detrimental effects of unsupervised corticosteroid misuse, including increased pigmentary complications and treatment resistance.

Recommendations

These results emphasize the critical need for cautious corticosteroid prescribing and highlight the challenges in managing corticosteroid-induced pigmentary changes. Overall, this study calls for enhanced patient education and stricter control over topical steroid availability to prevent adverse outcomes in melasma management. Restrict corticosteroid access and promote dermatologist-supervised treatment of melasma.

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