ORIGINAL RESEARCH ARTICLE

EFFICACY OF TOPICAL THERAPIES IN MANAGING MELASMA IN NORTH INDIAN PATIENTS

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ABSTRACT

Background: Melasma is a common acquired pigmentary disorder with significant cosmetic and psychosocial implications, particularly in individuals with darker skin types. Topical therapies are the mainstay of treatment; however, comparative data on their efficacy in North Indian populations remain limited.

Objectives: To evaluate and compare the efficacy and safety of commonly used topical therapies in the management of melasma among North Indian patients.

Methods: This prospective observational study was conducted in a tertiary care hospital in North India from March 2022 to November 2022. A total of 124 patients with clinically diagnosed melasma were enrolled and allocated to three treatment groups: hydroquinone, azelaic acid, and triple combination therapy. Clinical assessment was performed using the Melasma Area and Severity Index (MASI) at baseline and at 4, 8, and 12 weeks. Statistical analysis was conducted using SPSS version 20.0, with a p-value <0.05 considered significant.

Results: The majority of participants were females (77.4%), with the highest prevalence in the 31–40 years age group. Centrofacial melasma was the most common pattern observed. All treatment groups demonstrated a progressive reduction in MASI scores over 12 weeks. Triple combination therapy showed the greatest mean reduction, followed by hydroquinone and azelaic acid, with statistically significant differences between groups ($p < 0.05$). Adverse effects were more frequent in the triple combination group but were generally mild and did not require discontinuation of therapy.

Conclusion: Triple combination therapy is more effective than monotherapy in the treatment of melasma but is associated with a higher incidence of mild adverse effects. Individualized treatment selection and adherence to photoprotection are essential for optimal outcomes.

Keywords: Melasma; Topical therapy; Hydroquinone; Azelaic acid; Triple combination; MASI score; North India

INTRODUCTION

Melasma is a common acquired hypermelanosis characterized by symmetric hyperpigmented macules and patches, predominantly affecting sun-exposed areas of the face. It is a significant dermatological concern worldwide due to its chronicity, cosmetic disfigurement, and psychosocial impact, particularly among women of reproductive age [1]. The condition is multifactorial in origin, with ultraviolet (UV) radiation, genetic predisposition, hormonal influences, and certain medications playing key etiological roles [2]. Despite being benign in nature, melasma poses therapeutic challenges due to its recurrent course and variable response to treatment.

Globally, the prevalence of melasma varies widely, with higher rates reported among individuals with Fitzpatrick skin types III–V, particularly in Asian, Hispanic, and Middle Eastern populations [3]. The condition has been extensively studied in tropical regions where UV exposure is intense and persistent, contributing significantly to disease onset and exacerbation [4]. Topical therapies remain the cornerstone of melasma management, with agents such as hydroquinone, retinoids, corticosteroids, azelaic acid, and kojic acid demonstrating varying degrees of efficacy [5].

Combination therapies, especially triple combination creams, have been widely regarded as the gold standard due to their synergistic effects on melanogenesis inhibition and epidermal turnover [6]. However, long-term use is often limited by adverse effects, including skin irritation and ochronosis.

In the Indian context, melasma is highly prevalent due to increased sun exposure, genetic susceptibility, and sociocultural factors such as outdoor occupations and limited use of photoprotection [7]. Studies from different parts of India have highlighted the clinical patterns and therapeutic responses of melasma, emphasizing the need for region-specific research due to variations in environmental exposure and skin phototypes [8]. North India, in particular, presents a unique demographic and climatic profile, with high UV index levels and a predominance of darker skin types, which may influence both disease severity and treatment outcomes.

Although several studies have evaluated the efficacy of topical therapies in melasma, there remains a paucity of data focusing specifically on North Indian populations within tertiary care settings. Furthermore, variations in treatment response, patient compliance, and adverse effect profiles necessitate localized evidence to guide clinical practice. Most existing studies are either limited by small sample sizes or lack standardized outcome measures, thereby restricting their generalizability [9]. Additionally, there is limited comparative data assessing commonly used topical regimens in real-world clinical settings.

Given these gaps, there is a compelling need to systematically evaluate the efficacy and safety of topical therapies in managing melasma among North Indian patients. Such evidence would contribute to optimizing treatment protocols and improving patient outcomes in this population. The present study is therefore designed to assess and compare the efficacy of commonly used topical agents in the management of melasma in patients attending a tertiary care hospital in North India. The aim of this study is to evaluate the efficacy of topical therapies in the management of melasma among North Indian patients. The specific objectives are to assess the clinical improvement following treatment using standardized scoring systems and to compare the effectiveness and tolerability of different topical regimens.

METHODOLOGY

Study Design: This study was designed as a prospective, comparative, observational study conducted to evaluate the efficacy of commonly used topical therapies in patients diagnosed with melasma.

Study Setting: The study was carried out in the Department of Dermatology at a tertiary care teaching hospital in North India, catering to both urban and rural populations.

Study Duration: The study was conducted over a period of nine months, from March 2022 to November 2022.

Study Population: The study population comprised patients clinically diagnosed with melasma who attended the dermatology outpatient department during the study period.

Inclusion Criteria

Patients aged 18–50 years
Clinically diagnosed cases of melasma
Patients willing to participate and provide written informed consent
Patients not on any active treatment for melasma in the preceding 4 weeks

Exclusion Criteria

Pregnant and lactating women
Patients with known hypersensitivity to topical agents used in the study
Patients with other pigmentary disorders or active facial dermatoses
Patients who had undergone chemical peels, laser therapy, or systemic treatment for melasma in the past 3 months
Patients unwilling to comply with follow-up visits

Sample Size: The sample size was calculated using the formula for estimating proportions in observational studies:

$n = Z^2 \times p \times q/d^2$

Where:

n = required sample size
Z = standard normal deviate at 95% confidence interval (1.96)
p = expected proportion of improvement (assumed 50% due to variability in response)
q = 1 − p
d = allowable error (9%)

Substituting values:

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.09)^2} \approx 119$$

Considering a possible 5% dropout rate, the final sample size was rounded to **124 participants**.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible patients presenting during the study period and meeting inclusion criteria were enrolled until the required sample size was achieved**.**

Data Collection Tools & Procedure: Data were collected using a predesigned, semi-structured case record form. Baseline demographic details, clinical history, and examination findings were

recorded. Diagnosis of melasma was made clinically and categorized based on distribution patterns (centrofacial, malar, mandibular). Patients were allocated to different topical therapy groups based on standard treatment protocols followed in the department, including hydroquinone-based therapy, azelaic acid, and triple combination formulations. All patients were advised strict photoprotection using broad-spectrum sunscreen. Clinical assessment was performed at baseline and at regular follow-ups (4, 8, and 12 weeks) using the Melasma Area and Severity Index (MASI) score. Adverse effects and treatment compliance were also documented at each visit.

Study Variables: The independent variables included demographic factors (age, gender), duration of disease, pattern of melasma, and type of topical therapy administered. The primary dependent variable was the change in MASI score over time, indicating treatment efficacy. Secondary outcomes included the occurrence of adverse effects and patient-reported improvement.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparison of mean MASI scores before and after treatment within groups was performed using paired *t*-test, while intergroup comparisons were conducted using one-way ANOVA. Chi-square test was used for categorical variables. A *p*-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Confidentiality of patient information was strictly maintained, and participants were free to withdraw from the study at any point without affecting their standard of care.

RESULTS

A total of 124 patients were included in the study, with the majority belonging to the 31–40 years age group and a predominance of female patients (Table 1).

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n = 124)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–30	46	37.1
	31–40	52	41.9
	41–50	26	21.0
Gender	Male	28	22.6
	Female	96	77.4
Duration of Melasma	<1 year	38	30.6
	1–3 years	54	43.5
	>3 years	32	25.9
Pattern of Melasma	Centrofacial	68	54.8
	Malar	44	35.5
	Mandibular	12	9.7

Centrofacial melasma was the most common clinical pattern observed. Patients were nearly equally distributed across the three treatment groups (Table 2).

Table 2: Distribution of Patients According to Topical Therapy Groups

Treatment Group	Number of Patients (n)	Percentage (%)
Hydroquinone (2–4%)	42	33.9
Azelaic Acid (20%)	40	32.3
Triple Combination Therapy	42	33.9
Total	**124**	**100**

All treatment modalities demonstrated a progressive reduction in mean MASI scores over the 12-week follow-up period (Table 3).

Table 3: Mean MASI Scores at Baseline and Follow-up in Different Treatment Groups

Treatment Group	Baseline MASI (Mean ± SD)	4 Weeks	8 Weeks	12 Weeks
Hydroquinone	12.8 ± 3.2	10.4 ± 2.9	8.6 ± 2.5	7.2 ± 2.3
Azelaic Acid	12.5 ± 3.0	10.9 ± 2.7	9.5 ± 2.4	8.3 ± 2.2
Triple Combination Therapy	13.1 ± 3.4	9.8 ± 2.8	7.2 ± 2.3	5.6 ± 2.0

However, the triple combination therapy group showed a greater reduction in MASI scores compared to hydroquinone and azelaic acid groups.

Intergroup comparison revealed that the mean reduction in MASI score at 12 weeks was highest in the triple combination group, followed by hydroquinone and azelaic acid, with the difference being statistically significant ($p < 0.05$) (Table 4).

Table 4: Comparison of Mean Reduction in MASI Score at 12 Weeks

Treatment Group	Mean Reduction in MASI	Standard Deviation	*p*-value
Hydroquinone	5.6	1.8	
Azelaic Acid	4.2	1.6	<0.05*
Triple Combination Therapy	7.5	2.0	

*Statistically significant difference across groups using ANOVA

Adverse effects were more frequently reported in the triple combination therapy group, with erythema and burning sensation being the most common. However, most adverse effects were mild and did not necessitate discontinuation of therapy (Table 5).

Table 5: Adverse Effects Observed in Different Treatment Groups

Adverse Effect	Hydroquinone (n=42)	Azelaic Acid (n=40)	Triple Combination (n=42)
Erythema	6 (14.3%)	4 (10.0%)	10 (23.8%)
Burning Sensation	5 (11.9%)	6 (15.0%)	12 (28.6%)
Dryness	4 (9.5%)	5 (12.5%)	9 (21.4%)
No Adverse Effects	27 (64.3%)	25 (62.5%)	11 (26.2%)

DISCUSSION

The present study evaluated the efficacy and safety of commonly used topical therapies in the management of melasma among North Indian patients in a tertiary care setting. The key findings demonstrate that all three treatment modalities—hydroquinone, azelaic acid, and triple combination therapy—resulted in significant clinical improvement over a 12-week period, as evidenced by a progressive reduction in MASI scores. However, triple combination therapy showed superior efficacy compared to monotherapies, albeit with a higher incidence of mild adverse effects.

Melasma predominantly affected females (77.4%) in the present study, which is consistent with the well-established female preponderance reported in earlier studies [3,7]. Hormonal influences, particularly estrogen and progesterone, along with cosmetic concerns leading to higher healthcare-seeking behavior among women, may explain this trend. The most commonly affected age group was 31–40 years, aligning with previous Indian studies that highlight peak incidence during the reproductive years [3]. Centrofacial distribution emerged as the most frequent pattern, which is in concordance with findings reported by Sarkar et al. [7], suggesting a consistent clinical presentation across Indian populations.

All treatment groups demonstrated a statistically significant reduction in MASI scores over time, reinforcing the effectiveness of topical therapies as first-line management for melasma [5]. Hydroquinone, a tyrosinase inhibitor, has long been considered the gold standard for melasma treatment, and its moderate efficacy observed in this study is consistent with earlier clinical trials [5]. Azelaic acid, though slightly less effective, also showed meaningful improvement, supporting its role as a safer alternative, particularly in patients intolerant to hydroquinone.

The most notable finding was the superior efficacy of triple combination therapy, which resulted in the highest mean reduction in MASI scores. This observation corroborates the results of Taylor et al. [6], who demonstrated enhanced efficacy of combined hydroquinone, tretinoin, and corticosteroid formulations due to their synergistic mechanisms—melanin synthesis inhibition, increased epidermal turnover, and anti-inflammatory effects. The faster and more pronounced response observed in this group may be attributed to this multimodal action. Similar findings have been reported in other comparative studies, further validating the role of triple combination therapy as the preferred treatment modality in moderate to severe melasma [5,6].

Despite its superior efficacy, the triple combination regimen was associated with a higher frequency of adverse effects, including erythema, burning sensation, and dryness. These findings are consistent with previous reports highlighting increased irritation potential due to the presence of retinoids and corticosteroids [6,8]. However, in the present study, these adverse effects were generally mild and transient, and no patient required discontinuation of therapy. This suggests that with appropriate patient counseling and monitoring, the benefits of combination therapy outweigh its risks.

The findings of this study have important clinical implications, particularly in the North Indian context where high UV exposure and darker skin phototypes may influence disease severity and treatment response. The results support the use of triple combination therapy as an effective first-line option, while also emphasizing the importance of individualized treatment selection based on patient tolerance and risk of adverse effects. Additionally, strict photoprotection remains a critical adjunct to therapy, as UV radiation is a major exacerbating factor in melasma [4].
The strengths of this study include its prospective design, adequate sample size, and use of a standardized and validated scoring system (MASI) for outcome assessment [9-11]. The inclusion of multiple treatment arms allows for direct comparison of commonly used therapies in a real-world clinical setting, enhancing the applicability of findings.

However, certain limitations must be acknowledged. The study was conducted at a single tertiary care center, which may limit generalizability. The relatively short follow-up period of 12 weeks precludes assessment of long-term efficacy and recurrence rates, which are important considerations in melasma management. Additionally, allocation to treatment groups was not randomized, introducing the possibility of selection bias. Future studies with randomized controlled designs, longer follow-up durations, and evaluation of quality-of-life outcomes would provide more comprehensive insights.

CONCLUSION

This study demonstrates that topical therapies remain effective in the management of melasma, with all evaluated regimens showing significant clinical improvement over a 12-week period. Among the treatments, triple combination therapy exhibited superior efficacy in reducing MASI scores compared to hydroquinone and azelaic acid monotherapies. However, this enhanced effectiveness was associated with a higher incidence of mild and transient adverse effects, highlighting the need for careful patient selection and monitoring.Hydroquinone and azelaic acid also provided meaningful improvement and may serve as suitable alternatives, particularly in patients with sensitive skin or those intolerant to combination therapy. The findings underscore the importance of individualized treatment strategies, taking into account efficacy, tolerability, and patient compliance.In the North Indian setting, where environmental and demographic factors may influence disease behavior, these results provide clinically relevant evidence to guide therapeutic decisions. Long-term studies are recommended to assess recurrence patterns and sustained efficacy.

DECLARATIONS

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