

Hyperpigmentation Management Perspectives: A Nationwide Survey of Indian Dermatologists

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Abstract

Objective: Hyperpigmentation is a prevalent dermatological concern in India, with melasma and Post-Inflammatory Hyperpigmentation (PIH) being the most common presentations and more than 80% of the Indian population exhibits facial pigmentation heterogeneity. These disorders significantly affect individual's quality of life. This survey study aimed to assess the clinical practices, treatment preferences and perceptions of Indian dermatologists in managing hyperpigmentation.

Methods: A pan-India survey was conducted in 2024 among 409 dermatologists using a 21-question online questionnaire.

Key findings: Melasma (50.2%) and PIH (49.8%) were the most frequently encountered hyperpigmentation types. Sun exposure (59.2%) was identified as the leading etiological factor, followed by hormonal changes (26.4%) and acne (14.4%). Hydroquinone combinations (45.5%) were the preferred first-line agent, while kojic acid (45.5%) and azelaic acid (30.9%) were commonly used as second-line options. The Cleanse, Treat, Moisturize and Protect (CTMP®) regimen was followed by 86.3% of dermatologists. Hyperpigmentation relapses were commonly attributed to poor sun protection (34.7%) and treatment non-compliance (32.8%). Agents such as azelaic acid (25%), tranexamic acid (21.9%), niacinamide (21.9%) were the most accepted new depigmenting agents in clinical practice. Ferulic acid, glycolic acid, salicylic acid and mandelic acid were commonly accepted exfoliating agents. The most recommended sunscreen types were broad-spectrum SPF 50+, PA++++, tinted (60.2%), followed by broad-spectrum SPF 50+, PA++++, non-tinted (35.2%).

Conclusion: This pan-India survey study highlights the significant burden of hyperpigmentation and reinforces the importance of a holistic skincare regime (CTMP®) as the foundation of management. Incorporating newer depigmenting agents along with appropriate cleansing, moisturization and broad-spectrum sunscreens use offers more effective, safer, holistic and sustainable outcomes compared to traditional therapies alone in hyperpigmentation management.

Keywords: Hyperpigmentation; Melasma, Post-Inflammatory Hyperpigmentation; Depigmenting Agents; Sunscreen

Abbreviations

PIH: Post-Inflammatory Hyperpigmentation; HCPs: Healthcare Professionals; CTMP: Cleanse, Treat, Moisturize and Protect; SPF: Sun Protection Factor; UV: Ultraviolet Radiation; AEs: Adverse Events; DNA: Deoxyribonucleic Acid; PA: Protection Grade of UVA; UVA: Ultraviolet A; UVB: Ultraviolet B

Introduction

Hyperpigmentation is a frequently encountered dermatological concern, particularly affecting individuals with darker skin phototypes, including most of the Indian population. Among these disorders, melasma, Post-Inflammatory Hyperpigmentation (PIH) and periorbital hyperpigmentation are notably prevalent. These disorders cause psychological distress and can negatively impact an individual's quality of life [1].

Sun exposure is recognized as the leading contributor to hyperpigmentation [2]. Management involves a multifaceted approach, including a holistic skincare routine encompassing Cleansing, Treatment, Moisturization and Photoprotection (CTMP), systemic agents and procedural interventions [3]. Commonly used topical treatments for Melasma and Hyperpigmentation include skin-lightening agents such as triple combination cream, hydroquinone and retinoids, while newer options such as topical tranexamic acid, azelaic acid and potassium azeloyl diglycinate serums have shown promising efficacy as emerging options [3,4]. Procedural treatments, including chemical peels and light-based therapies, can also be effective but may carry the risk of adverse effects depending on the patient's skin type and clinical condition. In addition, the chronic and often relapsing course of hyperpigmentation makes it essential to select treatment strategies tailored to the patient's needs [3].

Despite the availability of multiple treatment options, real-world data reflecting dermatologists' clinical experiences with such therapies in the Indian setting are limited. Understanding prescribing patterns, treatment outcomes, patient compliance and barriers to care is essential to optimizing therapeutic strategies for hyperpigmentation.

Methodology

Study Design and Participants

A pan-India survey was conducted in 2024 to evaluate current clinical practices, preferences and perceptions among dermatologists regarding the management of hyperpigmentation and related skin conditions. Dermatologists were recruited using a convenience sampling approach through professional dermatology networks and digital outreach. Invitations were circulated electronically to approximately 500 registered dermatologists across India.

Inclusion criteria comprised registered dermatologists actively involved in clinical practice and routinely managing patients with hyperpigmentation. Trainees, residents or medical officers without independent dermatology practice, dermatologists not currently in active clinical practice or did not provide consent or who submitted incomplete questionnaires were excluded from the final analysis. Respondents represented diverse geographic regions across India, including metropolitan, tier-2 and tier-3 cities. Most participants were engaged in private clinical practice, followed by institutional or hospital-based practice. The majority had more than 5 years of dermatology practice experience, reflecting substantial clinical exposure to pigmentary disorders.

Survey Tool and Data Collection

A 21-question structured questionnaire was administered through a secure online survey platform (Google Forms®) via a web-based survey link in 2024. The survey assessed the following aspects of hyperpigmentation management:

- Common types and etiological factors of hyperpigmentation seen in clinical practice
- Treatment preferences, including first- and second-line therapies
- Use of moisturizers, sunscreens and newer agents in hyperpigmentation
- Patient awareness and compliance trends
- Specific practices related to melasma, PIH and peri-orbital pigmentation
- Familiarity with and use of the Holistic skincare regime (Cleanse, Treat, Moisturize, Protect (CTMP®))
- Preferred ingredients, formulations (serum, cream, lotion) and product combinations in different patient demographics

The questionnaire was developed based on literature review and expert inputs; however, it was not a formally validated instrument. Participation was voluntary and responses were anonymized to ensure confidentiality.

Data Analysis

All survey responses were compiled and analyzed using Microsoft Excel. Descriptive statistics, including frequencies and percentages, were calculated to summarize the distribution of responses for each survey question.

Incomplete, inconsistent or partially missing responses were handled by excluding those specific responses from question-wise analysis, without imputing missing data. The total number of valid responses varied slightly across individual questions and is reflected in percentage calculations.

Results

Survey Participants

A total of 409 dermatologists across India participated in the survey to share their clinical perspectives and experiences with the management of hyperpigmentation.

Prevalent Types and Etiology of Hyperpigmentation

Melasma (50.2%) and PIH (49.8%) were reported as the most common forms of hyperpigmentation in routine clinical practice. Most dermatologists observed that 21% to 30% of their patients were affected with melasma (38.1% respondents), followed closely by 10% to 20% (37.7% respondents) (Fig. 1).

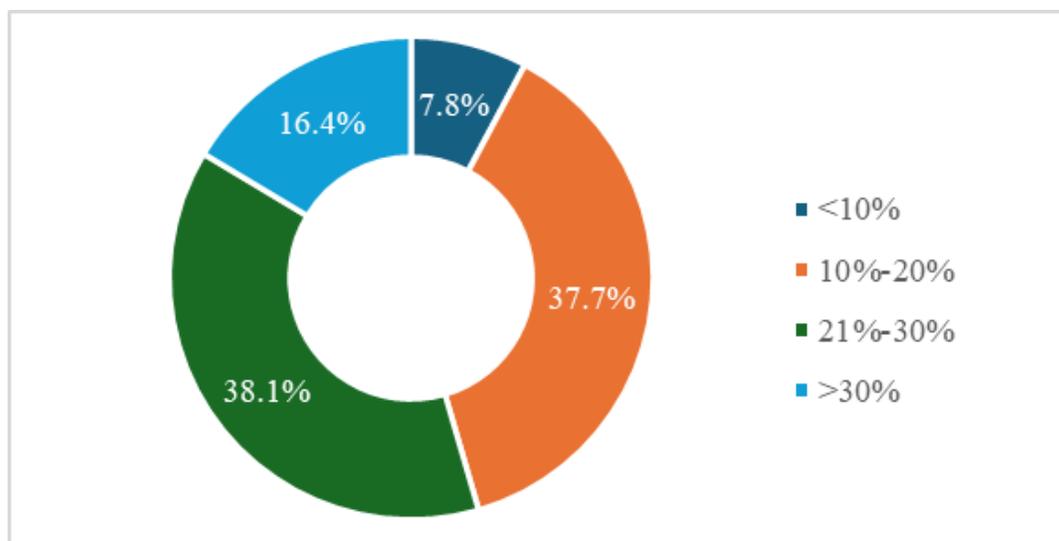


Figure 1: Prevalence of melasma cases in clinical practice.

Sun exposure (59.2% respondents) was identified as the most common etiological factor contributing to hyperpigmentation in the Indian population, followed by hormonal changes (26.4% respondents) and acne (14.4% respondents). Most dermatologists (49.1%) rated skin barrier dysfunction as a moderately significant factor in the etiology of hyperpigmentation, while others rated it as highly significant (39.6%), slightly significant (9.8%) or not significant (1.5%).

Treatment Preferences

Most dermatologists (86.3%) widely followed a Holistic skincare routine (CTMP®) in the management of hyperpigmentation and melasma. To manage peri-orbital hyperpigmentation, topical treatments were preferred by 54.4% of dermatologists, while 35.0% preferred laser therapy. The remaining (10.6%) did not mention any preference.

For acne-induced PIH, a combination approach was favored by most dermatologists. The majority (67.5%) used depigmenting agents along with acne treatment, while others opted for depigmentation agents alone (18.8%), chemical peels (9.5%) or laser therapy (4.2%).

Triple combination therapy (Hydroquinone + Tretinoin + Fluocinolone acetonide) for melasma was accepted among patients, according to dermatologists, with 40.8% reporting it as very accepted and 45.5% as somewhat accepted. A minority reported not very accepted (10.5%) or not accepted at all (3.2%) (Fig. 2).

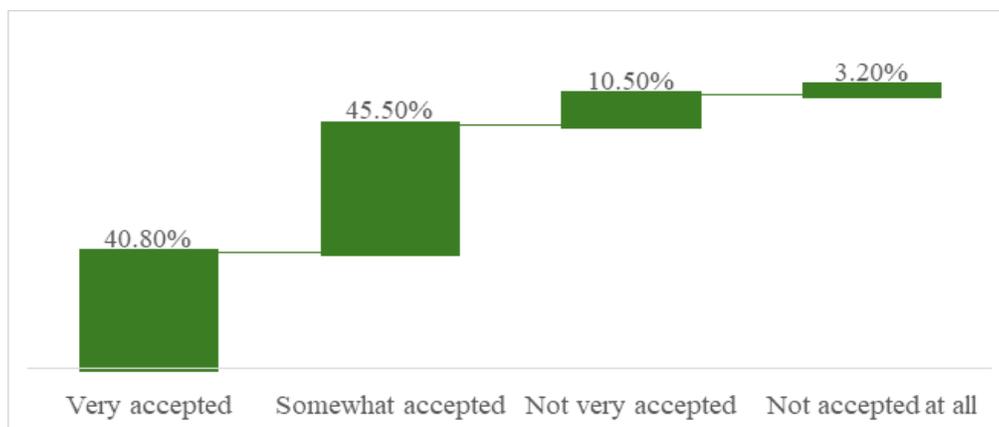


Figure 2: Acceptance of triple combination therapy for melasma management.

Preferred Treatment Agents

Hydroquinone combinations was most favored as the first-line treatment option for hyperpigmentation (45.5%), followed by kojic acid-based formulations (20%), glycolic acid (12.7%), azelaic acid (9.1%) and other depigmenting agents (12.7%). For second-line therapy, dermatologists favored kojic acid (45.5%), azelaic acid (30.9%) and chemical peels (10.9%) or other depigmenting and demelanizing agents (12.7%) (Fig. 3). The majority of dermatologists (81.4%) considered moisturizers to be a mainstay in hyperpigmentation management, while the remaining (18.6%) did not prefer it.

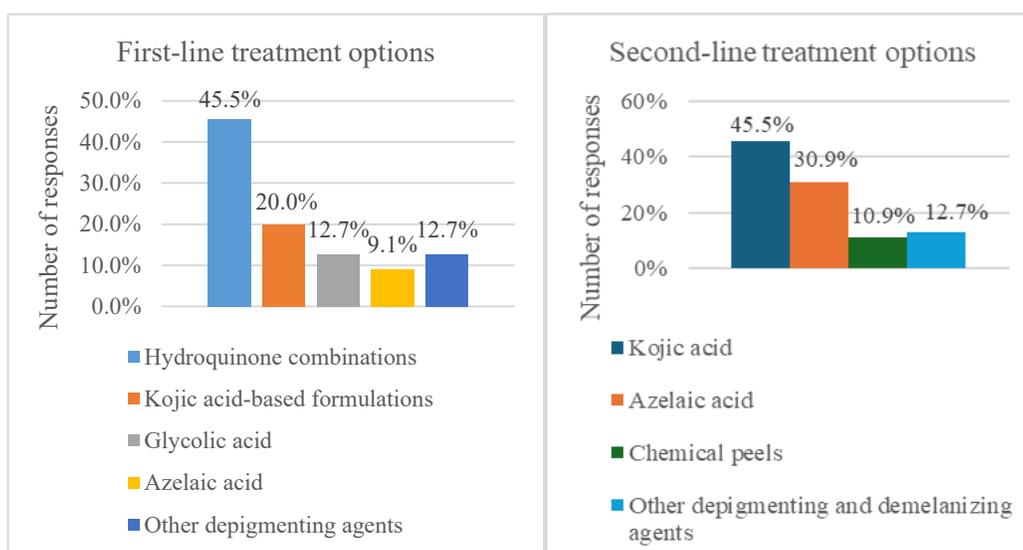


Figure 3: First- and second-line treatment options for hyperpigmentation.

Side Effects of Hydroquinone

A number of dermatologists (40.6%) observed signs of exogenous ochronosis with prolonged hydroquinone use in 10%-25% of their patients. While 31.3% dermatologists observed this in < 10% of their patients.

Steroid Acceptance and Tolerance

When comparing topical steroid acceptability and tolerability, fluocinolone was preferred over mometasone by most dermatologists (53.3% vs. 13.7%), while 29.1% considered both equally acceptable and tolerated. Only 3.9% noted poor acceptance of either option.

Hyperpigmentation Relapse

Most dermatologists (43.8%) reported that relapse during hyperpigmentation treatment was observed in 25%-50% of their patients. The most common causes of relapse were inadequate sun protection (34.7%) and treatment non-compliance (32.8%). Hormonal factors (19.6%) and acne (12.9%) were also identified.

Acceptance of Newer Agents and Preferred Formats

Azelaic acid (25%), tranexamic acid (21.9%), niacinamide (21.9%) and kojic acid (12.5%) were one the most accepted new depigmenting agents in clinical practice. Preferred formulations were serums and creams, followed by lotions. For exfoliating agents, glycolic acid, salicylic acid, mandelic acid and ferulic acid were commonly accepted. Creams were the preferred format (91.1%), with lower preference for lotions (5.2%) and serums (3.7%). These agents were frequently used for acne-related pigmentation, PIH and melasma.

Patient Compliance with Day and Night Serum-Based Regimens for Hyperpigmentation

Most dermatologists reported moderate to high patient compliance with day and night serum-based regimens for hyperpigmentation, with 53.1% rating it as moderately well and 39.9% as very well. Few reported low compliance, with 6.6% rating it as not very well and 0.4% as not at all compliant.

Appropriate Ingredients Based on Age Group and Safety in Pregnancy

Most dermatologists (42.9%) commonly recommended niacinamide when considering age group and safety in pregnancy, followed by azelaic acid (23.4%) and tranexamic acid (14.3%).

Sunscreen Awareness and Preferences

Patient awareness regarding the importance of sunscreen in their skincare regimen varied, with 38.6% dermatologists rating it as very high, 25.2% as high and 31.1% as moderate and 5.1% as low awareness levels. Most dermatologists reported that the important criteria for selecting sunscreen for hyperpigmentation management were formulation type (physical vs. chemical; 39.8%) and SPF rating (39.4%).

In practice, the most recommended sunscreen types were broad-spectrum SPF 50+, PA++++, tinted (60.2%), followed by broad-spectrum SPF 50+, PA++++, non-tinted (35.2%) and chemical sunscreen, SPF 30+, PA+++ non-tinted (4.6%) (Fig. 4).

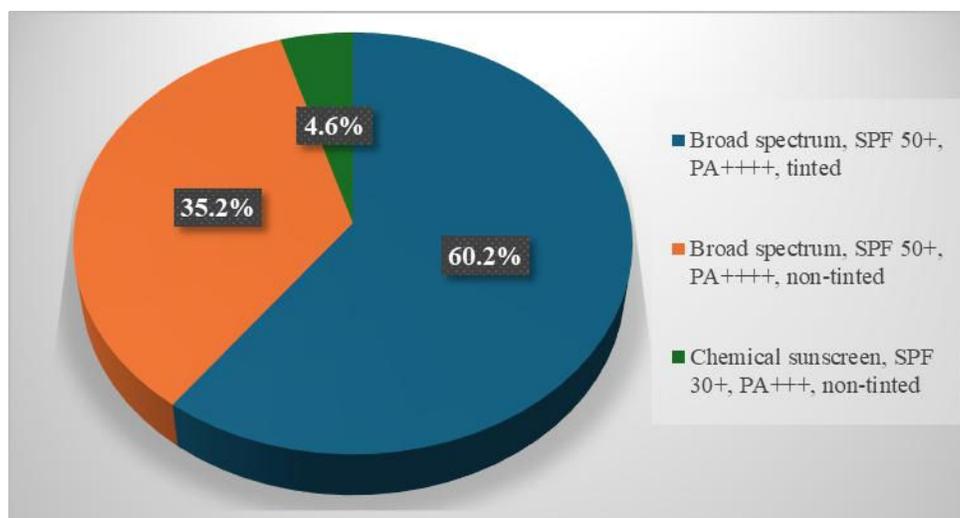


Figure 4: Sunscreen recommendations in hyperpigmentation.

Discussion

The present survey highlights the burden, clinical patterns and perspectives in management of hyperpigmentation among Indian patients. Melasma was reported as the most common type of hyperpigmentation, closely followed by PIH. Melasma is more common in females, with a reported female-to-male ratio of approximately 4:1 [5,6]. In India, the prevalence of melasma among women aged 40–65 years is estimated at 20–30%, while in pregnancy, it can reach up to 70% [1,7]. In our study, most dermatologists observed melasma in 21%–30% of their patient population, suggesting a substantial clinical burden.

Increased sun exposure was the most common trigger for hyperpigmentation, consistent with earlier findings that UV radiation serves as the primary external stimulus for melanocyte activity [1,7,8]. The role of skin barrier dysfunction in hyperpigmentation was considered significant by most dermatologists, which reflects the interplay between epidermal barrier health and

melanogenesis [9]. Epidermal layer disruption can trigger inflammatory pathways, stimulate melanocyte activity and worsen pigmentation, especially in conditions such as acne or atopic dermatitis [10].

Management of hyperpigmentation requires a comprehensive approach to reduce melanocyte activity, inhibit melanosome synthesis and promote pigment degradation [11]. In this survey, most dermatologists reported adopting the CTMP® routine in the management of melasma and other pigmentary disorders, underscoring a growing emphasis on holistic skincare to optimize outcomes and prevent relapse. Guidelines recommend using a mild cleanser and a non-perfumed moisturizer for dry skin, along with a broad-spectrum sunscreen with very high protection factor (SPF 50+) for the management of melasma [12]. Treatment of acne-induced PIH often requires a combined approach. In our survey, most dermatologists favored using depigmenting agents in combination with acne-specific treatments. This combination approach is consistent with best-practice guidelines, which advocate targeting both the underlying inflammation and resulting pigmentation concurrently [13].

Triple combination therapy (Hydroquinone + Tretinoin + Fluocinolone acetonide) was accepted well by most dermatologists. Evidence suggests triple combination therapy is the most effective first-line treatment for melasma [14,15]. Combination creams are more effective depigmenting agents than monotherapies. The formulation of hydroquinone, retinoic acid and a topical corticosteroid was designed to enhance the efficacy of each component, shorten treatment duration and minimize Adverse Events (AEs). Tretinoin stabilizes hydroquinone by preventing oxidation and improves epidermal penetration, while the corticosteroid reduces irritation from hydroquinone and retinoic acid and suppresses melanocyte activity, leading to an earlier response in melasma. The synergistic effect of these agents results in significantly greater depigmentation compared with individual agents, with noticeable improvement typically observed within 8 weeks [14].

Hydroquinone was most favored as the first-line treatment option for hyperpigmentation. However, side effects such as irritation and the risk of exogenous ochronosis persist as concerns with prolonged hydroquinone use [13]. In this survey, a number of dermatologists observed ochronosis in 10%–25% of patients using long-term hydroquinone, followed by <10% of patients. Despite the availability of multiple therapeutic options, relapse remains a significant concern in the long-term management of hyperpigmentation. In this survey, most dermatologists reported that 25%–50% of their patients experienced recurrence after treatment. The most frequently cited causes of relapse were inadequate sun protection and treatment non-compliance. These results reinforce the critical role of consistent photoprotection and adherence to prescribed regimens in maintaining treatment efficacy.

In recent years, newer depigmenting and exfoliating agents have gained recognition in clinical practice, providing alternatives to traditional therapies. These agents have demonstrated efficacy with lower side-effect profiles compared to hydroquinone alone [11,13]. The characteristics of newer depigmenting and exfoliating agents are summarized in Table 1.

Agents	Mechanism	Skin Condition
Depigmenting agents		
Azelaic acid [11]	<ul style="list-style-type: none"> • Interferes with DNA synthesis • Inhibits mitochondrial oxidoreductase • Favorably targets abnormal and highly active melanocytes • Competitively inhibits tyrosinase • Reduces free radical formation 	Melasma, PIH and other forms of Hyperpigmentation
Kojic acid [11]	<ul style="list-style-type: none"> • Inhibits tyrosinase enzyme 	Melasma, PIH and other forms of Hyperpigmentation
Niacinamide [11]	<ul style="list-style-type: none"> • Inhibits transfer of melanosome to keratinocytes 	Solar lentigines, Melasma, PIH and other forms of Hyperpigmentation
Tranexamic acid [16,17]	<ul style="list-style-type: none"> • Reduction of melanin production • Anti-angiogenesis, anti-inflammation effects • Acceleration of skin barrier repair 	Melasma, PIH and other forms of Hyperpigmentation

Potassium azeloyl diglycinate [4]	<ul style="list-style-type: none"> • A chemical modification of azelaic acid • Competitive inhibition of tyrosinase • Better tolerated than azelaic acid 	Melasma, PIH and other forms of Hyperpigmentation
Exfoliating agents		
Ferulic acid [18]	direct inhibition of melanocytic processes and indirect stabilization of ascorbic acid.	Melasma
Glycolic acid [19,20]	<ul style="list-style-type: none"> • Accelerates desquamation and removes excess epidermal pigmentation • Direct tyrosinase inhibition 	Melasma
Salicylic acid [19,21]	<ul style="list-style-type: none"> • Reduces tyrosinase production and activity in human epidermal melanocytes via inhibition of the respective transcriptional regulator • Decreases transfer of melanin from melanocytes to local keratinocytes by reducing melanophilin transport complexes 	Melasma and PIH

Table 1: Characteristics of natural depigmenting and exfoliating agents.

Sunscreens are widely recognized as essential photoprotective agents in dermatologic care. Their role extends beyond preventing sunburn to include the prevention of photocarcinogenesis, photoaging and the management of pigmentary disorders [22]. In this survey, patient awareness regarding the role of sunscreen in managing hyperpigmentation varied widely. Most dermatologists rated a very high to moderate level of awareness among their patients. In clinical practice, the most frequently recommended sunscreen was a tinted, broad-spectrum SPF 50+ with PA⁺⁺⁺⁺, followed by non-tinted, broad-spectrum SPF 50+ PA⁺⁺⁺⁺. The ideal sunscreen, as supported by Indian expert consensus, should offer broad-spectrum coverage against UVA, UVB and visible light, be photostable and have high patient acceptability with minimal side effects. A high SPF value (SPF 30-50, SPF >50) protects against UVB-induced sunburn, while PA ratings (with PA⁺⁺⁺) provides UVA protection. Tinted sunscreens, have demonstrated additional benefits in melasma and other visible light-induced pigmentary conditions. These formulations not only prevent exacerbations but also improve the appearance of existing hyperpigmentation, making them a crucial adjunct in the comprehensive management of melasma and PIH [22]. While the survey highlights prevailing real-world practices, the findings should be interpreted in the context of methodological constraints inherent to observational surveys. The use of a convenience sampling approach may introduce selection bias, as dermatologists with greater interest in pigmentary disorders or skincare practices may have been more likely to participate. Self-reported responses are also subject to recall and response bias. Additionally, the absence of a validated questionnaire and the predominantly descriptive nature of the analysis limit causal inference.

Conclusion

This pan-India survey underscores the substantial clinical and psychosocial burden of hyperpigmentation in the Indian population. Despite the availability of multiple therapies, dermatologists consistently emphasized the importance of a holistic skincare approach incorporating cleansing, treatment, moisturization and protection (CTMP®) as the cornerstone of management. The findings highlight that while agents such as hydroquinone and triple combination therapy remain first-line choices, long-term safety concerns and relapse rates necessitate the use of safer, effective and well-tolerated alternatives and maintenance therapies. Integration of newer depigmenting agents such as azelaic acid, kojic acid, Potassium azeloyl diglycinate and tranexamic acid within a structured CTMP® framework, directly addresses these challenges by not only improving efficacy but also enhancing tolerability, adherence and long-term outcomes. Additionally, adjunctive use of moisturizers and broad-spectrum sunscreens further strengthens treatment durability and minimizes recurrence.

Conflict of Interest

Dyotona Sen, Sanjay Choudhary and Soma Iyer are employees of Galderma India. CTMP® is a registered trademark of Galderma International and is associated with promoting Holistic skincare practices. The authors declare that survey responses reflect independent clinical opinions of participating dermatologists. Other authors declare no conflict of interest.

Financial Disclosure

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Informed Consent Statement

Informed consent was obtained from the participant involved in this study.

Authors' Contributions

All authors have contributed equally to this work and have reviewed and approved the final manuscript for publication.

Consent for Publication

Informed consent for publication was obtained from the participant involved in this study.

Ethical Statement

Ethical approval was not required for this study, as it was a non-interventional survey conducted among healthcare professionals and did not involve patient identifiable personal information.

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