

Evaluation of a 2-Mercaptonicotinoyl glycine-containing serum for the management of facial hyperpigmentation in Morocco

Abstract

Introduction: Facial hyperpigmentation, including melasma and post-inflammatory hyperpigmentation, is a common condition with significant psychosocial impact, particularly in individuals with Fitzpatrick phototypes III–VI. Current treatments, photoprotection, depigmenting agents, peels, and lasers may be limited by adverse effects and recurrence. A novel molecule, 2-mercaptonicotinoyl glycine (2-MNG) reduces pigmentation by trapping melanin precursors while preserving melanocyte viability.

This study evaluated the efficacy of a 2-MNG-containing serum (MB3 serum) on hyperpigmentation disorders in subjects of any phototype.

Material and methods: This prospective observational study, conducted in Morocco evaluated MB3 serum in 522 subjects aged 17–75 years with mild-to-moderate hyperpigmentation. Applied once or twice daily for three months alongside broad spectrum SPF50+/UVA photoprotection, efficacy was assessed through clinical evaluations, patient-reported outcomes, stigmatisation (PUSH-D), compliance, satisfaction, and local tolerance.

Results: Among 522 subjects (mean age 35.3 years; 85.4% women), melasma (44.8%) and post-inflammatory hyperpigmentation (49.6%) were the most common hyperpigmentation disorders. After 3 months of MB3 serum use, over 83% showed improvement in hyperpigmentation severity, visibility, and associated bother. Perceived stigma decreased by approximately 60% ($p < 0.001$). Treatment compliance, satisfaction, recommendation rates, and local tolerance were exceptionally high, supporting the effectiveness and acceptability of MB3 serum in routine practice.

Conclusion: Results from this study suggest that MB3 serum is an effective and well-tolerated treatment for facial hyperpigmentation, significantly improving pigmentation, reducing disease burden and stigma, and achieving high patient satisfaction in routine practice.

Keywords: hyperpigmentation disorders, melasma, post-inflammatory hyperpigmentation, 2-MNG, 2-mercaptonicotinoyl glycine

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Introduction

Facial hyperpigmentation disorders, including melasma, post-inflammatory hyperpigmentation (PIH), and solar lentigines, are common skin conditions that substantially impair quality of life (QoL) and self-esteem.^{1,2} Current management primarily relies on strict photoprotection, as ultraviolet (UV) radiation accounts for more than 80% of pigmentary irregularities.^{2,3} Therapeutic options include topical depigmenting agents such as hydroquinone, triple-combination creams (eg, Kligman's formula), and thiamidol, as well as procedural approaches including chemical peels and laser therapies.^{4–6} However, these treatments can often be limited by variable durability of response and adverse effects including irritation, post-inflammatory erythema, and potentially hydroquinone-induced exogenous ochronosis.^{7–13}

The recently developed molecule 2-mercaptonicotinoyl glycine (2-MNG/MelasyI™; L'Oréal Research and Innovation, France) represents a novel, well-tolerated anti-pigmenting agent with a unique mechanism of action. Rather than inhibiting tyrosinase, 2-MNG selectively captures reactive melanin precursors—including dopaquinone, DHI-quinone (5,6-dihydroxyindole), and DHICA-quinone (5,6-dihydroxyindole-2-carboxylic acid)—thereby preventing their incorporation into eumelanin and pheomelanin. This

results in balanced inhibition of melanin synthesis while preserving melanocyte function.^{14,15}

The tested 2-MNG containing serum (MB3 serum, Mela B3® serum; La Roche-Posay Laboratoire Dermatologique, Levallois-Perret, France) contains 0.5% 2-MNG together with niacinamide, *Cystoseira tamariscifolia* extract, lipohydroxy acid, carnosine, retinyl palmitate, dipotassium glycyrrhizate, hyaluronic acid, and glycerin. Its efficacy and tolerability have been demonstrated in several clinical studies involving patients with melasma and PIH.^{16,17} Additional data further suggest superior efficacy compared with thiamidol and cysteamine.¹⁸

The present real-world observational study conducted in Morocco evaluated the efficacy of MB3 serum on hyperpigmentation in subjects with Phototype III and above.

Material and methods

This study was conducted between July 2024 and January 2025 in private practices in Morocco. Owing to its regulatory status assessing the benefit of a cosmetic over-the-counter product under real-life conditions, ethics committee approval was not required under applicable local regulations, and no waiver was necessary.

Nevertheless, the study was conducted in accordance with all relevant local regulatory requirements and the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to study enrolment.

The study enrolled 612 female and male subjects aged 17–75 years with mild-to-moderate hyperpigmentation, defined by a clinical severity score of 1–4 on a 6-point scale (0 = none to 5 = very severe). Of these, 522 subjects were included in the efficacy analysis. Ninety subjects were excluded because of missing post-baseline assessments (n = 7), treatment duration of less than 3 months (n = 82), or absence of hyperpigmentation at baseline (n = 1).

Participants received MB3 serum and were instructed to apply it once or twice daily (morning and/or evening) after their usual cleansing routine to the face and/or other affected areas (eg, neck or hands) for 3 months. They were advised to avoid excessive sun exposure throughout the study and were prescribed *solar lentigines* a broad-spectrum SPF50+/UVA sunscreen.

Demographic characteristics were recorded at baseline. Clinical evaluations performed at baseline and Month 3 included hyperpigmentation severity (0 = none to 5 = very severe) and lesion visibility (0 = barely visible to 4 = highly visible). Treatment compliance and investigator satisfaction were assessed at Month 3.

At baseline and Month 3, subjects rated how much they were bothered by their hyperpigmentation (0 = not at all to 5 = very much). Patient-reported outcomes included global efficacy (6-point scale ranging from worsened to completely clear), global satisfaction (4-point scale from 0 = very dissatisfied to 3 = very satisfied), and visual analogue scale (VAS; 0–10) assessments of skin radiance, skin evenness, affected surface area, and pigmentation intensity. Participants were also asked whether they would recommend the serum to others and whether they would use it again. Perceived stigmatization was evaluated using the PUSH-D questionnaire at baseline and Month 3.¹⁹

Local tolerability was assessed throughout the study based on spontaneously reported adverse events.

Qualitative variables were summarized as frequencies and percentages, with 95% confidence intervals calculated where appropriate. Quantitative variables were described using the number of observations, mean, standard deviation, median, minimum, maximum, and missing values. Statistical analyses were performed using two-sided tests with a significance level of 5%, except for the Shapiro–Wilk normality test, which used a 1% significance threshold. All analyses were conducted using SAS software (version 9.4; SAS Institute Inc., Cary, NC, USA).

Results

Detail subject demographic and baseline hyperpigmentation data are provided in Table 1 and Table 2.

Table 1 Demographic data at baseline

	Years
Age	
Mean±SD	35.3±10.7
Min;Max	17;72
	n (%)
Gender	
Female	446 (85.4)

Table 1 Continued....

Male	76 (14.6)
Ethnicity	
African	344 (65.9)
Caucasian	161 (30.8)
Asian	1 (0.2)
Other	16 (3.1)
Phototype	
I	3 (0.6)
II	17 (3.3)
III	191 (36.6)
IV	276 (52.9)
V	33 (6.3)
VI	2 (0.3)

Table 2 Hyperpigmentation data at baseline

	n (%)
Hyperpigmentation disorders*	
Melasma	234 (44.8)
Post-inflammatory hyperpigmentation (PIH)	259 (49.6)
Solar lentigo	23 (4.4)
Other	6 (1.2)
Melasma type	
Epidermal	69 (34.5)
Mixed	131 (65.5)
Post-inflammatory hyperpigmentation origin	
Post-acne	194 (80.2)
Post-procedure	22 (9.1)
Post injury	12 (4.9)
Other	14 (5.8)
Localisation*	
Face	508 (97.5)
Hands	9 (1.7)
Neck	11 (2.1)
Cosmetic camouflage methods*	
Camouflage association	283 (54.2)
Tinted sunscreen	212 (40.6)
Face powder	60 (11.5)
Loose powder	31 (5.9)
BB cream	86 (16.5)
Reasons for cosmetic camouflage**	
Blemishes	74 (14.2)
Dark spots	205 (39.3)
Scars	56 (10.7)
Others	11 (2.1)
Missing	176 (33.7)
Other camouflage methods*	
Hat	371 (71.1)
Clothes	198 (37.9)
Sun avoidance	466 (89.3)
Treatment of underlying disease	210 (40.2)

*multiple combinations possibles

**answers missing

The mean age of the subjects was 35.3±10.7 years. The study population consisted predominantly of women (85.4%). Overall, 65.9% of subjects were of African origin, and 89.5% had Fitzpatrick skin phototypes III or IV.

Hyperpigmentation lesions were predominantly located on the face (97.5%). The most frequently reported hyperpigmentation disorders were melasma (44.8%) and PIH (49.6%). Among subjects with melasma, mixed melasma was the most common subtype (65.5%), while post-acne PIH accounted for 80.2% of PIH cases.

Cosmetic camouflage methods primarily consisted of combinations of different approaches (e.g wearing hats and/or avoiding sun exposure and topical depigmentation products; 54.2%) and tinted sunscreens (40.6%). Camouflage make-up was mainly used to conceal dark spots (39.3%). Other camouflage measures included avoiding sun exposure (89.3%) and wearing hats (71.1%). MB3 serum was primarily prescribed as alone (49.1%) or adjunctive care (48.2%), while 2.7% of subjects received it as maintenance care.

When used alone, MB3 serum was most frequently prescribed for twice-daily application (50.6%), followed by once-daily evening application (37.5%). Once-daily morning application accounted for 11.9% of prescriptions. When used as adjunctive care (n = 251), MB3 serum was also most frequently prescribed for twice-daily application (41.1%). The proportions of once-daily prescriptions were comparable for morning use (26.9%) and evening use (32.0%).

As adjunctive care, MB3 serum was most commonly prescribed in combination with hydroquinone (38.2%) or other topical or systemic treatments (28.9%). Tranexamic acid and procedural treatments each accounted for 14.4% of prescriptions. Among procedural treatments, chemical peels represented 73.9% and laser procedures 26.4%. The Kligman formula was prescribed in 4.1% of subjects. When used as maintenance care, MB3 serum was mainly prescribed for once-daily evening application (45.1%) or twice-daily application (41.5%).

Baseline clinical characteristics of hyperpigmentation are presented in Table 3.

Table 3 Clinical baseline hyperpigmentation parameters

Parameter	n (%)
Severity	
No hyperpigmentation	0 (0)
Almost no hyperpigmentation	13 (2.5)
Mild hyperpigmentation	109 (20.9)
Moderate hyperpigmentation	271 (51.9)
Severe hyperpigmentation	116 (22.2)
Very severe hyper pigmentation	13 (2.5)
Visibility	
Barely visible	6 (1.2)
Slightly visible	67 (12.8)
Moderately visible	202 (38.7)
Visible	200 (38.3)
Very visible	47 (9.0)
Being bothered	
Not at all	4 (0.8)
A little bit	45 (8.6)
Moderately	154 (29.5)
Much	213 (40.8)
Very much	106 (20.3)

At baseline, hyperpigmentation severity was mainly rated as moderate (51.9%) or mild (43.4%), while visibility was reported as mild (44.3%), moderate (38.7%), or severe (17.0%). Subjects reported being moderately (29.5%) or greatly (40.8%) bothered by their hyperpigmentation. Mean self-assessment scores on the visual analogue scale (VAS) were 3.8 for skin radiance, 3.9 for skin evenness,

5.1 for affected surface area, and 5.6 for pigmentation intensity. The mean PUSH-D scores were 7.9 for the felt-stigma dimension, 2.7 for the enacted-stigma dimension, and 10.6 overall.

After 3 months of treatment, 83.5% of subjects showed an improvement of at least one point in hyperpigmentation severity, while 84.0% exhibited an improvement of at least one point in hyperpigmentation visibility (Figure 1 and Figure 2).

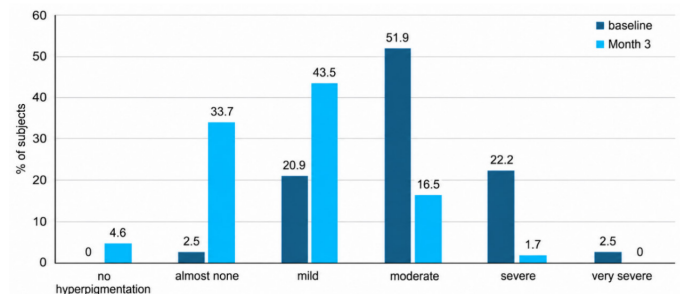


Figure 1 Improvement in facial hyperpigmentation severity in subjects after 3 months of treatment (% of subjects).

According to the investigators, the severity of facial hyperpigmentation was significant ($p < 0.001$) reduced after 3 months.

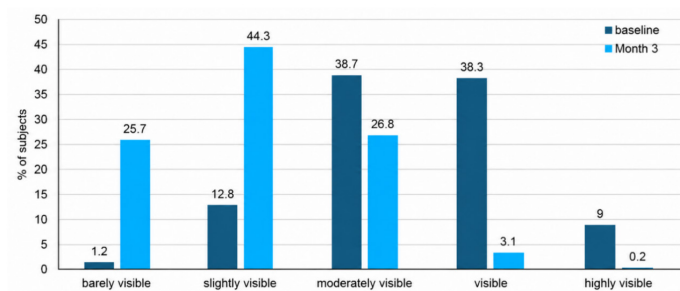


Figure 2 Improvement in facial hyperpigmentation visibility in subjects after 3 months of treatment (% of subjects).

According to the investigators, the visibility of facial hyperpigmentation was significant ($p < 0.001$) reduced after 3 months.

Overall, 83.4% of subjects reported at least a one-point improvement in the extent to which they were bothered by their hyperpigmentation (Figure 3). Furthermore, 97.7% reported at least slight improvement in their hyperpigmentation. The PUSH-D felt-stigma score decreased from 7.9 to 3.1 after 3 months, corresponding to a 61.4% reduction. Over the same period, the enacted-stigma score decreased from 2.7 to 1.2 (-57.3%), while the total score decreased from 10.6 to 4.2 (-60.4%).

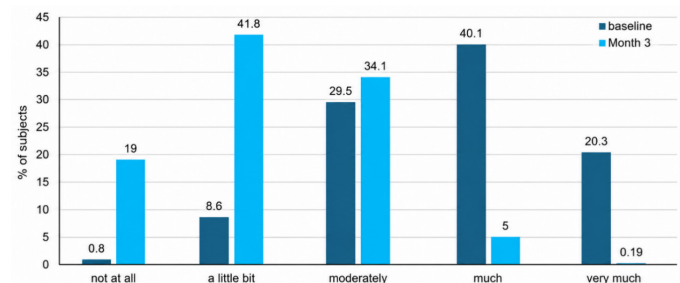


Figure 3 Percentage of subjects reported feeling bothered by hyperpigmentation at baseline and after 3 months (% of subjects).

The reduction of feeling bothered after 3 months was statistically significant ($p < 0.001$).

All changes from baseline of assessed efficacy parameters were statistically significant ($p < 0.001$). Treatment compliance was considered excellent by investigators, reaching 90.3%. Treatment satisfaction was high, with 93.7% of investigators and 93.9% of subjects reporting satisfaction. Overall, 99.8% of investigators stated that they would recommend MB3 in the future and considered it suitable for the treatment of melasma, solar lentigines, and PIH. Similarly, 98.9% of subjects indicated that they would use the product again, and 99.2% would recommend it to others. In addition, 44.1% reported that MB3 serum was more effective than their previous treatment. Local tolerance, as assessed by both investigators and subjects, was rated as excellent.

Discussion

This large prospective real-world study conducted in routine dermatological practice in Morocco demonstrated that MB3 serum was associated with significant ($p < 0.001$) improvements in hyperpigmentation after 3 months of use, whether prescribed as monotherapy, adjunctive therapy, or maintenance treatment. The study population was representative of patients commonly affected by hyperpigmentary disorders, consisting predominantly of women with Fitzpatrick phototypes III and IV and including a high proportion of individuals of African origin.^{20,21} Melasma and post-inflammatory hyperpigmentation (PIH), the two most frequent acquired facial hyperpigmentation disorders worldwide, accounted for almost all cases included in the study.²²

Hyperpigmentation disorders except solar lentigos are frequently observed in individuals with darker skin phototypes and are often associated with considerable psychosocial burden.²³ In the present study, lesions were located predominantly on the face, highlighting the visibility of these conditions and their potential impact on self-esteem and quality of life.^{24,25} This burden was reflected by baseline assessments showing that more than two-thirds of subjects reported being moderately or greatly bothered by their hyperpigmentation. Furthermore, baseline PUSH-D scores indicated substantial perceived stigma, particularly in the felt-stigma dimension, confirming that pigmentary disorders extend beyond a purely cosmetic concern and may significantly affect psychological well-being and social interactions.²⁶

Approximately half of the subjects received MB3 serum as monotherapy, while the remainder received it in combination with established depigmenting treatments such as hydroquinone, tranexamic acid, chemical peels, laser procedures, or other topical and systemic therapies. This prescribing behaviour suggests that clinicians considered MB3 serum suitable for different therapeutic settings, including first-line management, combination approaches, and long-term maintenance of melasma, solar lentigo and PIH. The high frequency of twice-daily administration further indicates a good integration into the subjects' routine skincare regimens. An issue which is very important to consider due to the chronicity of PIH requiring regular care.²⁷

More than 80% of subjects experienced at least a one-point improvement in both hyperpigmentation severity and visibility, while almost all subjects reported some degree of improvement. Importantly, these objective and subjective improvements were accompanied by a marked reduction in the extent to which subjects were bothered by their condition. Such concordance between clinical improvement and subjective perception is particularly relevant in pigmentary disorders, where treatment success is determined not only by lesion clearance but also by patient satisfaction and psychosocial benefit.²⁴

One of the most noteworthy findings was the substantial improvement in stigma-related outcomes. The PUSH-D total score decreased by more than 60% over the study period, with marked reductions observed in both felt and enacted stigma dimensions. These findings suggest that improvement in visible hyperpigmentation may rapidly translate into improved self-confidence, reduced self-consciousness, and better social comfort.²⁷ Given the well-known psychosocial consequences of facial hyperpigmentation, the level of these changes highlights the potential value of effective depigmenting strategies beyond their dermatological effects alone.²⁸

The high degree of treatment satisfaction reported by both investigators and subjects further support the clinical relevance of the observed benefits. More than 93% of investigators and subjects expressed satisfaction with treatment outcomes, while almost all participants indicated that they would recommend the product or consider future use. Notably, nearly half of the subjects considered MB3 serum more effective than previous treatments they had used, suggesting a favourable perception of efficacy in a population likely to have had prior experience with depigmenting interventions.

Treatment adherence was excellent, with compliance exceeding 90%. Such adherence is particularly important in hyperpigmentation management, where therapeutic success often requires sustained application over prolonged periods. The excellent local tolerance reported by both investigators and subjects may have contributed to this high level of compliance.

Several limitations should be considered when interpreting these findings. The study was observational and lacked a control group, preventing definitive conclusions regarding causality and limiting direct comparisons with other therapeutic approaches. In addition, treatment regimens were heterogeneous, with a substantial proportion of subjects receiving concomitant therapies that may have contributed to clinical improvement. Outcomes were assessed over a relatively short follow-up period of 3 months, and longer-term studies are needed to evaluate the durability of the observed benefits and the role of MB3 serum in preventing relapse. Nevertheless, the large sample size, prospective design, routine-practice setting, and inclusion of patient-reported outcomes provide valuable information regarding the real-world performance of 2-MNG serum in a diverse population affected by facial hyperpigmentation.

Conclusion

In conclusion, the results of this study again confirms that MB3 serum is an effective and well-tolerated option for the management of facial hyperpigmentation in routine clinical practice.^{17,18} Its use was associated with significant improvements in hyperpigmentation severity and visibility, substantial reductions in disease burden and perceived stigma, high treatment satisfaction, and excellent tolerability. These findings support the use of MB3 serum as both a standalone and adjunctive component of comprehensive hyperpigmentation management strategies.

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Conflict of interest

Shermine Wardé and Caroline le Floc'h are employees of La Roche-Posay, Laboratoire Dermatologique, France. Dr Rachadi

received honoraria from L'Oréal LDB, Morocco. Dr Maliani, Dr Doum, Dr Mansouri and Dr Akhiyaye have no conflict of interest to disclose.

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