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Self-Reported Effects of Daily Oral Liposomal Glutathione Supplementation on Skin Appearance, Energy, And Digestive Comfort in Healthy Indian Adults: A Prospective Open-Label Pilot Study

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ABSTRACT

Background: Indians are exposed to environmental and psychosocial oxidative stress that triggers the production of reactive oxygen species (ROS) that systematically deplete the endogenous antioxidant reservoir of glutathione (GSH).

Aim: The present pilot study evaluated the effect of daily oral supplementation with *Cellular Prime* Liposomal Glutathione (CP Lipo-GSH), formulated using Lipoedge™ technology by West Bengal Chemical Industries Limited (WBCIL), on self-reported skin appearance, energy level and digestive comfort in healthy Indian adults.

Method: Self-reported ratings (0–10 scale; higher = better) for skin look and feel, energy level, and digestive comfort were collected at Week 0 and weekly thereafter for 17 participants who took a 650 mg oral tablet/day.

Results: Of 17 participants, 11 reported improvements in skin look and feel (mean change +1.18 points; $p = 0.05$), 8 reported improved energy level (mean change +0.65 points; $p = 0.301$), and 7 reported improvement in digestive comfort, with 5 unchanged and 5 declining (mean change 0.00; $p = 1.000$). Digestive comfort was fully preserved at the group level.

Conclusion: These preliminary findings indicate that daily CP Lipo-GSH supplementation is associated with a positive trend in self-reported skin appearance in the majority of participants within an Indian consumer population exposed to chronic pollution- and stress-driven oxidative load, with little or no effect on digestive comfort. Larger, controlled trials are required to confirm these observations.

ARTICLE DETAILS

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KEYWORDS: Cellular Prime Liposomal Glutathione, Lipoedge™, WBCIL, Indian, oxidative stress, psychological stress, pollution, consumer trial

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INTRODUCTION

Glutathione (γ-glutamylcysteinylglycine, GSH) is the most abundant low-molecular-weight endogenous antioxidant, synthesised intracellularly from glutamate, cysteine, and glycine (1). It functions as the primary scavenger of reactive oxygen and nitrogen species (ROS and RNS respectively). It regenerates vitamins C and E, maintains cellular redox balance, and strengthens immune function (2). Declining GSH status is a well-established biomarker of oxidative stress and has been associated with accelerated cellular ageing, immune dysfunction, metabolic disease, and deterioration of the skin barrier (3, 4).

Indians face a severe and multi-source oxidative stress burden due to severe environmental pollution and everyday chronic psychological stress. According to the 2024 IQAir World Air Quality Report, 74 of the world's 100 most polluted cities are located in India, and the country's national annual average PM2.5 concentration of 50.6 μg/m³ is ten times higher than

the World Health Organization's (WHO) safe guideline of 5 μg/m³ (5). The Air Quality Life Index further estimates that particulate pollution alone reduces the average life expectancy of Indians by 3.5 years, with residents of the Northern Plains facing an average loss of 5 years of life expectancy relative to the WHO guideline (6). In Delhi, the most polluted capital city in the world (as recorded in 2024), residents experienced only one day of 'Good' air quality in the entire year (5).

Fine particulate matter (PM2.5), polycyclic aromatic hydrocarbons (PAHs), ozone, nitrogen dioxide (NO_2), and volatile organic compounds (VOCs), upon penetrating the skin surface, trigger intracellular ROS generation through activation of aryl hydrocarbon receptor (AhR), NADPH oxidase induction, and direct peroxidation of membrane lipids (7, 8). The resulting oxidative cascade depletes the skin's endogenous antioxidant reservoir, including GSH, vitamin E, and vitamin C, faster than it can be replenished, leaving the skin in a state of chronic oxidative stress (8). This manifests clinically as accelerated pigmentation, disrupted skin barrier, collagen degradation, premature wrinkling, and a dull, uneven skin tone. These effects are generally more pronounced in Indian skin, which is predisposed to post-inflammatory hyperpigmentation due to higher melanocyte activity (9). Air pollutants also activate matrix metalloproteinases (MMPs) via nuclear factor kappa β (NF-κB), resulting in skin barrier damage and subsequent inflammation (7).

The second major oxidative stressor affecting India's urban population is chronic psychological stress. According to India's National Mental Health Survey (2015–16), 10.6% of Indian adults suffer from psychological disorders, with prevalence in urban metro regions (13.5%), which is nearly double that in rural areas (6.9%) (10). An Ipsos survey conducted for World Mental Health Day 2024 found that 1 in 2 Indians in urban cities experience severe stress that negatively impacts their daily functioning (11). The McKinsey Health Institute (2023) estimated that 59% of Indian employees exhibit active burnout symptoms, one of the highest rates globally (12). Chronic psychological stress activates the hypothalamic-pituitary-adrenal (HPA) axis, upregulating glucocorticoid expression and increasing ROS production (13); these stress-elevated glucocorticoids suppress the Nrf2-mediated antioxidant pathway, which in turn downregulates glutathione synthesis and depletes GSH (14). This stress-induced GSH deficit triggers ROS-mediated Matrix Metalloproteinase (MMP) activation, melanocyte stimulation, and release of inflammatory proteins that collectively impair skin appearance and disrupt mitochondrial function, resulting in chronic fatigue widely reported in chronically stressed Indian adults (9, 15). Thus, against this backdrop, Indians face a compounded, daily oxidative stress with well-characterised downstream effects on skin quality, vitality, and gastrointestinal health.

A persistent pharmacokinetic challenge for conventional oral GSH is its susceptibility to hydrolysis by gastrointestinal gamma-glutamyltranspeptidase (ggt), which reduces systemic GSH bioavailability (16). CP Lipo-GSH is a 650 mg oral liposomal glutathione tablet formulated using Lipoedge™, a high-precision liposomal glutathione ingredient manufactured by WBCIL, designed to protect the encapsulated GSH through the gastrointestinal tract. In a one-month pilot study of oral liposomal GSH (500 or 1000 mg/day) in 12 healthy adults conducted by Sinha et al., it was reported that there was an increase of up to 40% in whole blood GSH, a reduction in oxidative stress biomarkers, and an enhancement in immune cell function (17). In another three-month randomised, placebo-controlled trial of a commercial oral liposomal GSH formulation in adults with type 2 diabetes, reduced malondialdehyde (MDA), an oxidative stress marker and inflammatory markers (18).

However, to date, no published data on real-world, consumer-level self-reported outcomes following oral liposomal GSH supplementation across three combined domains (skin appearance, energy level and digestive comfort) in an Indian population exists. Our present pilot study extends this evidence into a real-world Indian consumer setting, reporting self-monitored outcomes across these combined domains following up to four weeks of daily CP Lipo-GSH supplementation.

PARTICIPANTS AND METHODS

Participants

Healthy individuals aged 18 to 50 years, who had no major health issues like a history of heart conditions; a history of immunocompromising conditions; a known or suspected hypersensitivity or intolerance to GSH products; a history of allergy to any ingredient in the nutraceutical, hepatic or renal impairment, metabolic disorders, diabetes, or use dietary supplements that may interfere with the study results; and a history of drug abuse within a year the study is conducted.

Seventeen of 20 enrolled participants completed at least three weekly assessments and were included in the analysis (Table 1, 2). The cohort comprised 8 female and 9 male participants; 11 of 17 were in the 35–50-year age band, 5 in the 26–35-year band, and 1 in the 18–25-year band. 13 participants reached the Week 4 assessment; 4 were last assessed at Week 3. No serious adverse events were reported.

Table 1. Participant compliance funnel.

Stage	n
Enrolled and dispatched product	20
Submitted at least one weekly follow-up	19
Reached Week-3 or Week-4 (analysed cohort)	17

Table 2. Demographic and intervention characteristics of the analysed cohort (n = 17).

Characteristic	Value
Total cohort	n = 17
Sex	8 female, 9 male
Age band 18–25	1
Age band 26–35	5
Age band 35–50	11
Last recorded response at Week 3	4 participants
Last recorded response at Week 4	13 participants
Intervention	CP Lipo-GSH 650 mg oral tablet once daily

Study design and treatments

This was a prospective, single-arm, open-label pilot study conducted among self-selected healthy adult volunteers across India. No placebo or active comparator arm was included; no blinding was employed. All outcome data were self-reported via a structured weekly follow-up form. Findings should be interpreted as preliminary observations.

Twenty healthy adult volunteers were recruited through an open-interest online intake form. Participants provided information on demographics, current health status, supplement history, known allergies, and wellness goals. Eligibility was based on expressed interest and the absence of contraindications; no formal clinical screening was performed. Each enrolled participant received CP Lipo-GSH (650 mg oral tablet, once daily) for the duration of the trial.

The nutraceutical (CP Lipo-GSH) is a solid liposomal nutraceutical formulation. It consists of 650 mg of L-GSH and non-genetically modified (GMO) sunflower lecithin (> 90% Phosphatidylcholine).

Participants self-rated three wellness outcomes at baseline (Week 0) and at the end of each subsequent week of use, using a 0–10 numerical rating scale (higher = better on all three measures):

- Skin look and feel: "How would you rate your skin's current look and feel?"
- Energy level: "How frequently do you feel drained or lacking energy?", scored such that a higher value indicates less frequent energy depletion.
- Digestive comfort: "How often do you experience digestive discomfort (such as bloating or heaviness)?", scored such that a higher value indicates less frequent discomfort.

No biochemical assays, dermatological imaging, or clinician-assessed endpoints were collected. All outcome data are entirely based on participant self-report.

Study Outcome

Of 20 enrolled participants, 19 (95%) submitted at least one weekly follow-up response. The analysis cohort comprises the 17 participants (85% of enrolled) who completed at least three weeks of follow-up (Table 1). Each participant's primary outcome is the change between their Week-0 baseline score and their last recorded score, capped at Week 4. Participant characteristics are summarised in Table 2.

Statistical Analysis

Paired samples t-tests were used to compare baseline and last-recorded scores for each outcome measure. Given the pilot nature of this study and the small sample size, p-values are reported descriptively; no formal multiple-comparison corrections were applied. Primary interpretation is based on the number and direction of individual participant changes, recognising the heterogeneity expected in a real-world consumer cohort.

RESULTS

Skin Look and Feel

11 of 17 participants reported higher skin scores at their last visit than at baseline; 4 were unchanged, and 2 reported a decline. Mean skin score increased from 4.88 ± 2.23 at baseline to 6.06 ± 1.71 at last visit (mean change +1.18 ± 2.30; $p = 0.05$). Among those who improved, the gains ranged from 1 to 5 points on the 0–10 scale, with the largest improvements observed in Participants F and K, both of

whom had reported poor skin scores at baseline (1 and 2 out of 10, respectively) and reached 6 and 7 by their last recorded visit. The two participants who declined did so by 1 point and 5 points, respectively; the larger of these declines occurred in a participant who had entered the trial with the highest baseline skin score in the cohort (9 out of 10), leaving limited room for further improvement and consistent with a ceiling effect on the rating scale. No participant reported any skin-related adverse event during the trial period (Table 3 & 4) (Figure 1, 2).

Energy Level

8 of 17 participants reported higher energy scores at their last visit than at baseline, 4 were unchanged, and 5 reported a decline. Mean energy score increased from 5.06 ± 2.44 at baseline to 5.71 ± 2.37 at last visit (mean change +0.65 ± 2.50; p = 0.301). Among those who improved, gains ranged from 1 to 5 points, with the two largest improvements (5 points each) occurring in participants who reported frequent fatigue at baseline, reaching scores of 9 and 8 out of 10, respectively, at their last visit. Of the five who declined, three had entered the trial with high baseline energy scores of 7, 8, or 9 out of 10, leaving limited room for further improvement on the scale; this pattern is consistent with a ceiling effect rather than a genuine adverse response. The remaining two who declined did so by 1 point each from lower starting scores. The non-significant p-value (p = 0.301) reflects the heterogeneity of individual responses in this small cohort, with gains and losses of similar magnitude partially offsetting each other at the group level (Table 3 & 4, Figure 2).

Digestive Comfort: One major problem with GSH is that it causes gastrointestinal discomfort (21). Therefore, we wanted to know how our product influences digestion. Of 17 participants, 7 reported higher digestive comfort scores at their last visit than at baseline, 5 were unchanged, and 5 reported a decline. The mean digestive comfort score was identical at baseline and last visit (6.53 ± 2.32 versus 6.53 ± 2.65; mean change 0.00 ± 2.03; p = 1.000), indicating CP Lipo-GSH supplementation had no adverse impact on digestive comfort in this cohort. Among those who improved, gains ranged from 1 to 4 points. Among the 5 who declined, 2 entered the trial with baseline digestive comfort scores of 8 out of 10, leaving limited upward range on the scale and making a downward drift statistically more likely; this pattern is consistent with regression toward the mean rather than a product-related gastrointestinal effect. Only 1 of the 5 who declined had a mild allergic reaction, and the remainder reported no known gastrointestinal sensitivity. The p-value of 1.000 suggests a null effect: supplementation neither improved nor impaired digestive comfort at the group level, supporting the gastrointestinal safety and tolerability of CP Lipo-GSH in this Indian consumer cohort (Table 3 & 4, Figure 2).

Table 3. Individual participant scores at baseline and last recorded visit (maximum Week 4). All scales 0–10; higher scores indicate a better outcome.

Participant	Last week	Skin Base→Last	Δ	Energy Base→Last	Δ	Digestion Base→Last	Δ
Participant A	Wk 4	4→6	+2	8→6	-2	7→9	+2
Participant B	Wk 4	3→3	0	4→5	+1	5→6	+1
Participant C	Wk 4	7→9	+2	4→9	+5	9→9	0
Participant D	Wk 3	5→7	+2	4→4	0	9→9	0
Participant E	Wk 4	2→3	+1	2→2	0	8→8	0
Participant F	Wk 4	1→6	+5	1→2	+1	1→2	+1
Participant G	Wk 3	3→6	+3	3→6	+3	8→8	0
Participant H	Wk 4	5→7	+2	5→6	+1	5→7	+2
Participant I	Wk 4	8→8	0	9→9	0	8→8	0
Participant J	Wk 4	4→4	0	3→2	-1	3→1	-2
Participant K	Wk 4	2→7	+5	3→8	+5	4→8	+4
Participant L	Wk 4	6→5	-1	5→5	0	5→4	-1
Participant M	Wk 4	9→4	-5	9→4	-5	8→4	-4
Participant N	Wk 3	5→7	+2	8→7	-1	7→8	+1
Participant O	Wk 4	7→7	0	6→9	+3	9→10	+1

Participant P	Wk 3	6→7	+1	5→7	+2	8→4	-4
Participant Q	Wk 3	6→7	+1	7→6	-1	7→6	-1

Table 4. Summary statistics for self-reported outcomes at baseline and last recorded visit. All scales 0–10; higher scores indicate a better outcome.

Outcome	n	Baseline mean (SD)	Last-visit mean (SD)	Mean Δ (SD)	Improved / Unchanged / Declined	p-value (paired t-test)
Skin look and feel (0–10)	17	4.88 (2.23)	6.06 (1.71)	+1.18 (2.30)	11 / 4 / 2	0.05 *
Energy / reduced drained feeling (0–10)	17	5.06 (2.44)	5.71 (2.37)	+0.65 (2.50)	8 / 4 / 5	0.301
Digestive comfort (0–10)	17	6.53 (2.32)	6.53 (2.65)	+0.00 (2.03)	7 / 5 / 5	1.000
** Borderline significance (0.05 ≤ p < 0.10); paired two-tailed t-test. Improved / Unchanged / Declined counts reflect each participant's last-visit score relative to baseline.*						

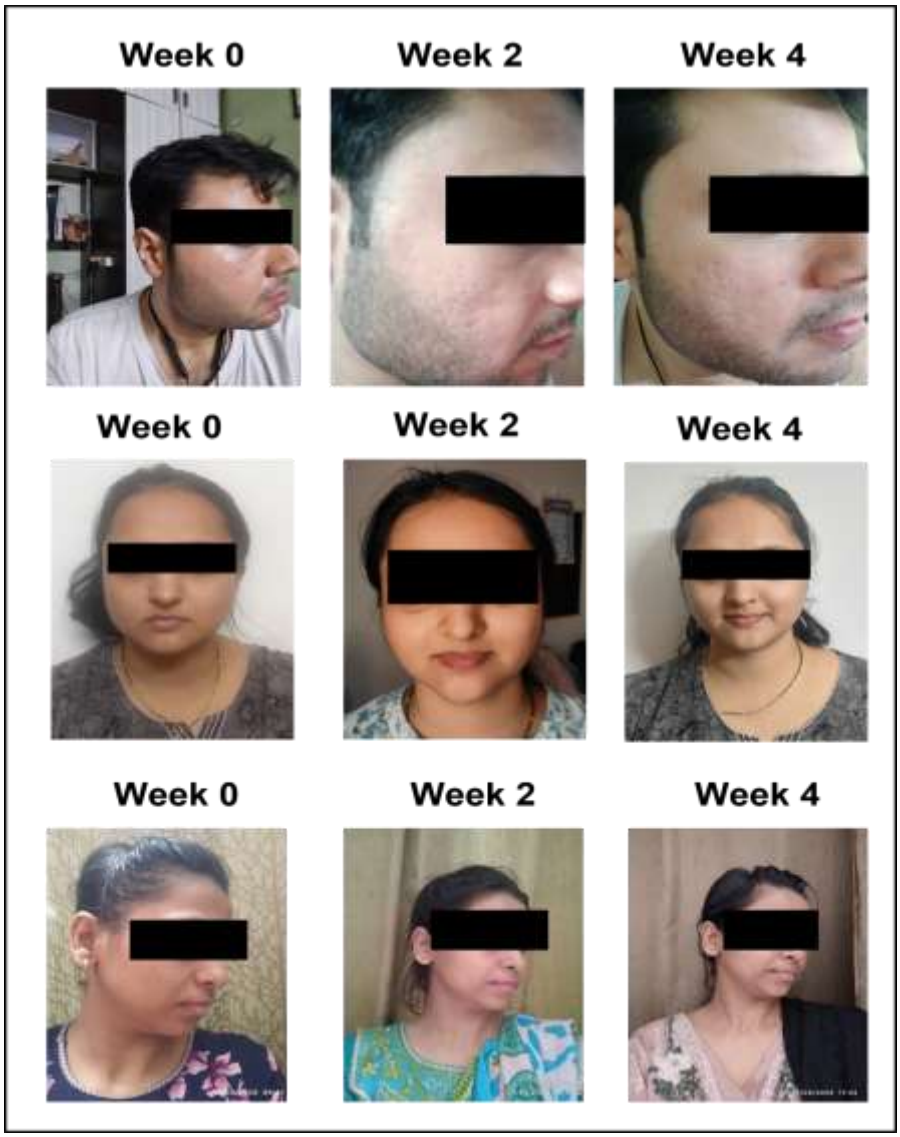

Figure 1: Effect on skin of *Cellular Prime* Liposomal Glutathione

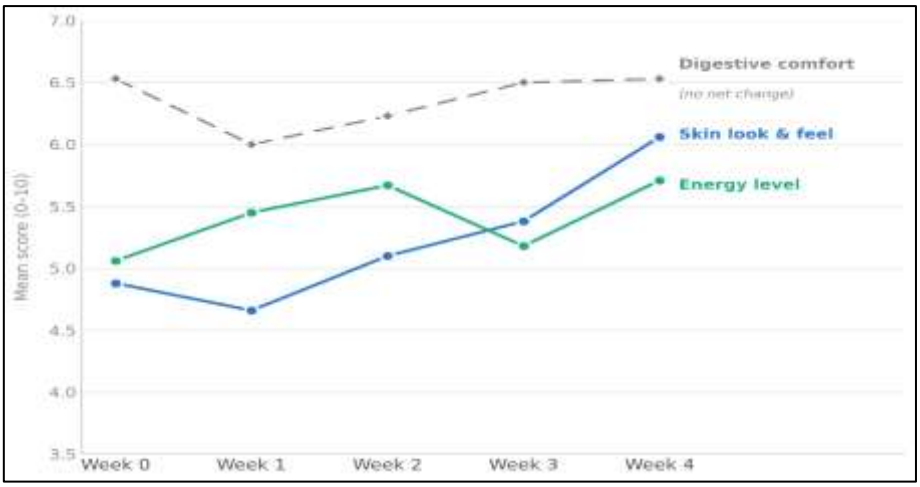

Figure 2: Line graph showing the effect of CP-Lipo-GSH on skin look, energy level and digestive comfort

DISCUSSION

These preliminary findings from a one-month open-label pilot study of daily CP Lipo-GSH supplementation (650 mg/day) in healthy Indian adults demonstrate a positive upward trend in self-reported skin appearance in 11 of 17 participants. This finding is particularly important in the Indian context, where daily exposure to PM2.5 concentrations exceeding ten times the WHO guideline (19) chronically depletes the cutaneous antioxidant reservoir, including GSH, vitamin E, and vitamin C, through ROS-mediated oxidation and NF-κB-driven inflammation (7, 8). Pollution-generated free radicals activate melanocytes and upregulate tyrosinase, the rate-limiting enzyme in melanin synthesis, driving hyperpigmentation and post-inflammatory darkening, which are among the most common dermatological concerns for Indian consumers (9).

The anti-melanogenic mechanism of GSH, which inhibits tyrosinase and shifts melanogenesis from darker eumelanin toward lighter pheomelanin (20), directly addresses this pollution-mediated hyperpigmentation. The borderline significance of our skin result ($p = 0.05$) at $n = 17$ mirrors the experience of Sinha et al. (17), who had reported limited statistical power in their 12-subject liposomal GSH pilot yet still reported significant increases in whole blood GSH and immune markers. A 4-week clinical trial of oral GSH (500 mg/day) in 60 healthy adults corroborates our findings, reporting significant melanin reductions at sun-exposed skin sites relative to placebo (4).

In the Indian scenario, where the McKinsey Health Institute (2023) estimates that 59% of employees exhibit burnout symptoms (12) and chronic psychosocial stress that suppresses Nrf2-mediated GSH synthesis (13), restoring GSH status through liposomal supplementation offers a plausible route to improved energetic function. The clinical trial by To et al. (18) reported significant reductions in MDA levels following oral supplementation with liposomal GSH in diabetic adults, supporting improved redox balance as the underlying mechanism. Since GSH plays a pivotal role in mitigating oxidative stress, a well-established contributor to fatigue under stressed conditions (both pollution and psychological stress), we expected a positive trend (15).

When we looked at energy levels, we observed that 8 of 17 participants reported improvement, with the largest gains in C (4 → 9), K (3 → 8), and O (6 → 9); all of these participants had reported frequent fatigue at baseline. In our study,3 of the 5 who reported a decline in energy status had entered the trial with high baseline scores (7–9/10), consistent with a scale ceiling effect rather than a genuine adverse response.

Plain GSH is known to cause digestive discomfort. However, in our study we observed that supplementation with CP Lipo-GSH did not compromise gastrointestinal function in this cohort. Mean digestive comfort was completely preserved at the group level (6.53 at baseline versus 6.53 at the 4^{th} week; mean change was 0; $p = 1.000$), indicating that daily CP Lipo-GSH supplementation did not compromise gastrointestinal function in this cohort. Of the 5 participants who declined improvement, 2 (M and P) entered the trial with baseline digestive scores of 8, consistent with regression toward the mean on a bounded rating scale, and only 1 of the 5 reported a mild allergic reaction. These findings support the gastrointestinal tolerability of CP Lipo-GSH in an Indian consumer population.

LIMITATION

The principal strength of this trial lies in its real-world design. All participants were self-selected adults living under the ambient environmental and psychosocial conditions of urban India, using the product at home without clinical supervision, providing outcomes that directly reflect the product's performance in its target users. These are preliminary reports from a small pilot study and should be treated as a starting point rather than a definitive conclusion. Larger, placebo-controlled trials with validated biochemical and dermatological markers are needed to confirm the results.

CONCLUSION

In this prospective, open-label pilot study of daily supplementation with 650 mg of CP Lipo-GSH (formulated with Lipoedge™ technology) in 17 healthy Indian adult volunteers over a maximum of four weeks, the majority of participants reported improvements in self-rated skin appearance (11 of 17), and a positive trend was observed in energy level (8 of 17). These findings are particularly relevant for Indian consumers, who face a dual oxidative stress burden from both chronic air pollution and psychological stress and occupational burnout, both of which systematically deplete the endogenous GSH reservoir and manifest as skin quality deterioration, fatigue, and impaired well-being. Digestive comfort was fully preserved at the group level, supporting the gastrointestinal tolerability of CP Lipo-GSH in this population. These preliminary findings are consistent with the previous studies on liposomal GSH supplementation and support the feasibility and tolerability of CP Lipo-GSH as a daily antioxidant supplement for the Indian consumer. A placebo-controlled trial in an Indian population, incorporating biomarkers of GSH status, oxidative stress, and skin quality, is needed to understand how CP Lipo-GSH modulate these pathways.

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Consent

We have taken written consent from the participants for the inclusion of material pertaining to themselves, including their photographs, for this study.

Disclosure of Interest

This study was conducted by West Bengal Chemical Industries Limited, the manufacturer of the Lipoedge™ L-Glutathione active ingredient used in CP Lipo-GSH. The authors report no conflict of interest.

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This work was supported internally by West Bengal Chemical Industries Limited. No external funding was received.

Author Contributions

All authors contributed equally to conceptualisation, data collection, analysis, writing, review, and editing. Mr Sunil Agarwal provided supervision and guidance.

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