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Patient Perceptions, Perceived Efficacy, and Satisfaction With Opaque Gummies for Hair, Skin, and Sleep Wellness: A Hospital-Based Cross-Sectional Survey

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Abstract

Introduction: Gummy-based wellness supplements are increasingly used to support hair, skin, and sleep wellness. However, information regarding patient-reported perceptions and satisfaction with such products in routine clinical settings remains limited. This study evaluated patient perceptions and the perceived efficacy of opaque gummies (Inline Pharmaceuticals, Hyderabad, India) across hair, skin, and sleep domains.

Materials and methods: A hospital-based cross-sectional observational survey was conducted among adult patients. Participants who had used opaque gummies for at least seven consecutive days were recruited using convenience sampling. A structured questionnaire was used to assess demographic characteristics, duration and frequency of use, perceived efficacy across hair, skin, and sleep domains, overall satisfaction, likelihood of recommendation, repurchase intention, and perceived value for money. Domain-specific outcomes were assessed using a 5-point Likert scale. Data were analyzed using descriptive statistics, independent-samples t-tests, one-way analysis of variance, and post-hoc comparisons.

Results: Among 600 participants, 565 (94.2%) completed the survey. The hair, skin, and sleep domain scores were 3.42 ± 1.18, 3.24 ± 1.18, and 3.54 ± 1.12, respectively. Positive perceptions were reported for stronger and healthier hair by 294 (52.0%), healthier-looking skin by 266 (47.1%), and faster sleep onset by 316 (55.9%). Overall satisfaction was positive among 271 (48.0%), while 294 (52.0%) reported positive repurchase intention. Females had higher hair, skin, and sleep scores than males ($p < 0.001$, $p = 0.001$, and $p = 0.011$, respectively). Perceived efficacy also differed significantly according to the duration of use across the hair, skin, and sleep domains ($p < 0.001$, $p < 0.001$, and $p = 0.004$, respectively).

Conclusion: Participants reported favorable perceptions of opaque gummies, particularly for sleep-related wellness. Perceived outcomes varied according to sex and duration of product use. These findings should be interpreted as patient-reported experiences and may provide a basis for further prospective evaluations.

Categories: Integrative/Complementary Medicine, Public Health
Keywords: dietary supplements, hair wellness, satisfaction, skin wellness, sleep wellness, survey

Introduction

Gummy-based nutritional supplements have gained increasing interest as a convenient and palatable approach for wellness support [1]. Opaque gummies (Inline Pharmaceuticals, Hyderabad, Telangana, India) are formulated for three broad wellness domains - hair, skin, and sleep - and contain combinations of nutritional, bioactive, and botanical constituents. According to the manufacturer-provided formulation information provided by the manufacturer on request, the hair formulation included biotin, hydrolyzed marine collagen peptides, keratin hydrolysate, zinc, B-complex vitamins, saw palmetto, Eclipta alba (Bhringraj), and bamboo extract. The skin formulation contained hyaluronic acid, collagen peptides, ceramides, reduced glutathione, vitamin C, vitamin E, astaxanthin, and curcumin, whereas the sleep formulation contained melatonin, L-theanine, gamma-aminobutyric acid (GABA), 5-hydroxytryptophan (5-HTP), magnesium glycinate, ashwagandha, chamomile, valerian root, and passionflower.

Several constituents of these formulations have been investigated either individually or as components of nutritional formulations. Nutritional factors such as zinc and selected B vitamins have been associated with normal hair growth and maintenance, although evidence for their supplementation in individuals without deficiency remains limited [2,3]. Previous research has suggested that zinc plays an important role in hair health, with lower serum zinc concentrations observed among individuals with several forms of hair loss,

particularly alopecia areata and telogen effluvium [4].

Saw palmetto-containing preparations have also shown potential benefits in studies of androgenetic alopecia, although the evidence remains heterogeneous [5]. For skin health, oral collagen peptides and hyaluronic acid have been investigated for outcomes such as hydration and elasticity, with a systematic review reporting potentially favorable effects [6]. Similarly, melatonin and L-theanine have been studied in relation to sleep onset and subjective sleep quality [7]. These findings provide a biological rationale for investigating patient perceptions of formulations containing such constituents; however, they do not establish the efficacy of the combined opaque gummy formulation. The present cross-sectional survey aimed to assess consumer-reported perceived efficacy of opaque gummies across the hair, skin, and sleep wellness domains and to evaluate overall consumer satisfaction, likelihood of recommending the product, intention to repurchase, and perceived value for money. Additionally, differences in domain-specific perceived efficacy according to sex and duration of product use were examined.

Materials And Methods

Study design and setting

A hospital-based, cross-sectional observational survey was conducted in the Department of Pharmacology, Ayaan Institute of Medical Sciences, Hyderabad, India, where patients attending outpatient departments (OPDs) and receiving opaque gummies as part of their routine wellness-related care were approached for participation. The study was conducted over a period of one year between March 2024 and March 2025. The survey methodology was structured in accordance with recommendations for reporting observational and survey-based studies, including the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) framework [8] and the Consensus-Based Checklist for Reporting of Survey Studies (CROSS) [9]. The study protocol was reviewed and approved by the institute (approval number: 96/AIMS/RO/2024, dated February 21, 2024). The study was conducted in accordance with the ethical principles applicable to research involving human participants [10]. Before participation, eligible patients were informed about the purpose of the study, the voluntary nature of participation, the confidentiality of their responses, and their right to withdraw at any stage without affecting their clinical care. Written informed consent was obtained from all the participants before administering the questionnaire.

Study population and eligibility criteria

The study population comprised adult patients attending the hospital who had been prescribed or were using opaque gummies for hair, skin, or sleep. The eligibility criteria were defined prior to recruitment (Table *1*).

Inclusion criteria	Exclusion criteria
Adults aged ≥18 years.	Individuals who had never used opaque gummies.
Patients who had used opaque gummies for at least seven consecutive days.	Individuals who had used opaque gummies for less than seven consecutive days.
Ability to read and understand English.	Individuals unable to provide reliable self-reported information.
Willingness to participate and provide informed consent.	Patient not willing to participate.

TABLE 1: Inclusion and exclusion criteria.

Opaque gummies manufactured by Inline Pharmaceuticals (Hyderabad, Telangana, India).

All patients attending the outpatient departments during the study period were assessed for eligibility. Eligible patients were consecutively invited to participate until the target sample size was reached. Of the patients approached, 600 consented and were enrolled, while 565 completed the questionnaire and were included in the final analysis. The participant selection and screening process, including the number of respondents assessed, excluded, and included in the final analysis, is illustrated in Figure *1*.

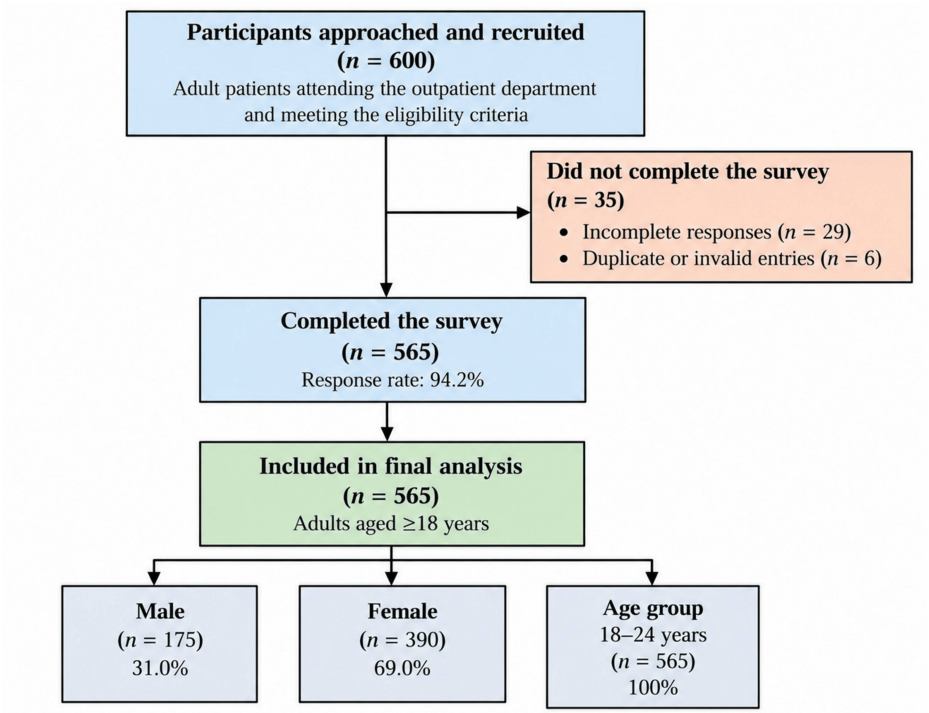


FIGURE 1: Participant selection and flow of respondents through the study.

Source: Prepared by the authors using Canva (Canva Pty Ltd, Surry Hills, Australia).

Sampling technique and recruitment

A non-probability convenience sampling technique was employed. Patients who met the eligibility criteria and attended the OPD of the hospital during the study period were consecutively approached according to their availability and willingness to participate. The questionnaire was administered directly to eligible participants after obtaining informed consent. Participants completed the questionnaire independently; assistance was provided only when clarification of the instructions was required without influencing their responses. This approach was selected because the study aimed to capture the perceptions and experiences of actual product users in a routine clinical setting.

Questionnaire development and content validation

The questionnaire was developed collaboratively by the investigators based on the study objectives and a review of relevant literature addressing dietary supplement use and the hair, skin, and sleep domains [5-7]. The initial questionnaire was reviewed by the investigators for relevance, clarity, comprehensibility, and appropriateness of individual items, followed by expert content review and pilot testing. During expert content validation, the experts assessed whether the items adequately represented the intended constructs of perceived efficacy and satisfaction. The questionnaire was subsequently pilot-tested in 30 participants before commencement of the main survey to assess clarity, comprehension, acceptability, and administration time. Feedback from the pilot study was used to refine the wording and sequence of questions, where necessary. Internal consistency was assessed using Cronbach's alpha during the pilot phase. Cronbach's alpha evaluates the internal consistency of items intended to measure the same construct, with a value of approximately 0.70 or higher commonly considered acceptable for research instruments [11]. The overall Cronbach's alpha for the questionnaire was 0.82.

Questionnaire structure

The final questionnaire consisted of structured questions divided into several sections (Appendix). The first section collected data on demographic characteristics, including age, sex, and educational status. The second section assessed product-use characteristics, including duration of opaque gummy use, frequency of use, and the primary reason for purchase or use. The principal outcome section assessed perceived benefits across three domains: the hair domain, which evaluated perceived improvements in hair growth, hair strength, overall health, reduction in hair fall, improvement in hair texture, and satisfaction with hair-related benefits; the skin domain, which assessed perceived improvements in skin tone, radiance, texture, overall skin appearance, and satisfaction with skin-related benefits; and the sleep domain, which evaluated perceived reduction in the time required to fall asleep, improvement in sleep quality, feeling more rested

after sleep, maintenance of a regular sleep cycle, and satisfaction with sleep-related benefits. The questionnaire also included a separate section addressing the participants' experiences of side effects during product use.

Scoring criteria

Perceived efficacy in the hair, skin, and sleep domains was assessed using five items within each domain on a 5-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree [12]. Higher scores indicated more favorable perceptions. For each domain, the mean of the five item scores was calculated as a composite ranging from 1 to 5. Overall satisfaction, repurchase intention, and perceived value for money were assessed on five-point response scales, and scores of 4 or 5 were classified as positive responses. Likelihood of recommending the product was rated from 0 to 10; scores of 9 or 10 were classified as a positive recommendation response.

Data collection procedure

After ethical approval and completion of the pilot test, the finalized questionnaires were distributed to eligible participants. Participants were approached during their hospital visit and invited to complete the questionnaire after providing informed consent. Completed questionnaires were checked for completeness before entering the study database. The participants were not required to disclose information that could directly identify them, thereby maintaining confidentiality. The survey was designed to capture patient-reported perceptions rather than objective clinical efficacy; therefore, the findings represent the participants' experiences and perceptions of the product.

Sample size

The required sample size for this cross-sectional survey study was determined using the standard formula for estimating a single population proportion, as no prior reference study was available to derive an effect size for perceived efficacy or adverse event rates specific to opaque gummies. To adopt the most conservative approach and maximize statistical power, the expected proportion of respondents reporting a positive outcome (such as satisfaction or perceived efficacy) was assumed to be 50% (p = 0.5). This assumption yields the maximum possible variance (0.25), thereby ensuring that the calculated sample size is sufficiently powered, regardless of the true population proportion. At a 95% confidence level (Z = 1.96) and desired margin of error (precision) of 5% (d = 0.05), the minimum required sample size was calculated as follows:

$$ n = \frac{Z^2 \times p \times (1-p)}{d^2} $$

This gave a minimum of 385 participants. Allowing approximately 25% for incomplete or invalid questionnaires raised the recruitment target to about 480. The study enrolled 600 participants, of whom 565 completed the survey, exceeding the minimum of 385.

Statistical analysis

Data were coded and analyzed using IBM SPSS Statistics (version 26.0; IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages, while continuous domain scores were presented as means and standard deviations. The Shapiro-Wilk test confirmed the normality of the continuous domain scores. Comparisons between two groups, such as sex, were performed using independent-samples t-tests for normally distributed domain scores. Differences among more than two groups, such as categories of duration of product use, were assessed using one-way analysis of variance (ANOVA). When the overall ANOVA was statistically significant, Tukey’s post-hoc test was used for pairwise comparisons. All statistical tests were two-sided, and a p-value < 0.05 was considered statistically significant.

Results

A total of 600 participants were enrolled in the survey, of which 565 (94.2%) completed the questionnaire and were included in the final analysis. The largest proportion of participants belonged to the 25-34-year-old age group, followed by the 35-44-year-old, 18-24-year-old, 45-54-year-old, and ⩾55-year-old age groups. Females constituted a greater proportion of the study population than males. Regarding educational status, 230 (40.7%) participants had a bachelor's degree, 140 (24.8%) had a postgraduate degree, 120 (21.2%) had secondary education, and 75 (13.3%) had a primary education. With respect to the duration of product use, 260 (46.0%) participants had used opaque gummies for less than three months, 140 (24.8%) for three to six months, and 165 (29.2%) for more than six months. Hair health was the most frequently reported primary reason for product use, followed by the combination of two or more purposes, skin wellness, and sleep improvement. Daily use was reported by 325 (57.5%) participants, 165 (29.2%) weekly use, and 75 (13.3%) occasional use (Table *2*).

Characteristic	Category	N (%)
Age group, years	18-24	85 (15.0%)
	25-34	195 (34.5%)
	35-44	160 (28.3%)
	45-54	80 (14.2%)
	55+	45 (8.0%)
Sex	Male	175 (31.0%)
	Female	390 (69.0%)
Education level	Primary	75 (13.3%)
	Secondary	120 (21.2%)
	Bachelor's degree	230 (40.7%)
	Postgraduate degree	140 (24.8%)
Duration of use	<3 months	260 (46.0%)
	3-6 months	140 (24.8%)
	>6 months	165 (29.2%)
Primary reason for purchase	Hair health	175 (31.0%)
	Skin wellness	120 (21.2%)
	Sleep improvement	110 (19.5%)
	Combination (2+ reasons)	160 (28.3%)
Frequency of use	Daily	325 (57.5%)
	Weekly	165 (29.2%)
	Occasionally	75 (13.3%)

TABLE 2: Demographic characteristics and product-use patterns of the survey participants (n = 565).

Data are presented as frequency (n) and percentage (%), Percentages may not total 100% because of rounding.

Perceived efficacy across wellness domains

In the hair domain, the highest proportion of participants agreed or strongly agreed that their hair felt stronger and healthier, followed by reduced hair fall and improved hair growth. Improvement in hair texture was reported by 254 (45.0%) participants, while 249 (44.1%) expressed satisfaction with hair-related benefits. The overall hair-domain composite score was 3.42 ± 1.18. In the skin domain, the highest proportion of participants reported that their skin looked healthier overall, followed by increased radiance or glow, improved skin tone, and improved skin texture. Satisfaction with skin-related benefits was reported by 226 (40.0%) participants. The composite skin-domain score was 3.24 ± 1.18. The sleep domain demonstrated the highest composite score among the three domains (3.54 ± 1.12). The highest proportion of participants reported falling asleep faster, followed by improved sleep quality, feeling more rested after sleep, satisfaction with sleep-related benefits, and maintenance of a regular sleep cycle (Table *3*).

Domain	Item	Mean ± SD	n (%) Agree/Strongly Agree
Hair domain	Improved hair growth	3.40 ± 1.20	271 (48.0%)
	Stronger/healthier hair	3.60 ± 1.10	294 (52.0%)
	Reduced hair fall	3.50 ± 1.20	283 (50.0%)
	Improved hair texture	3.30 ± 1.10	254 (45.0%)
	Satisfied with hair benefits	3.30 ± 1.30	249 (44.1%)
	Hair composite score (mean of 5 items)	3.42 ± 1.18	-
Skin domain	Improved skin tone	3.20 ± 1.20	237 (42.0%)
	More radiant/glowing skin	3.30 ± 1.10	254 (45.0%)
	Improved skin texture	3.20 ± 1.20	232 (41.1%)
	Healthier-looking skin	3.40 ± 1.10	266 (47.1%)
	Satisfied with skin benefits	3.10 ± 1.30	226 (40.0%)
	Skin composite score (mean of 5 items)	3.24 ± 1.18	-
Sleep domain	Fall asleep faster	3.70 ± 1.00	316 (56.0%)
	Improved sleep quality	3.60 ± 1.10	300 (53.1%)
	Wake up more rested	3.50 ± 1.10	283 (50.1%)
	Maintains regular sleep cycle	3.40 ± 1.20	266 (47.1%)
	Satisfied with sleep benefits	3.50 ± 1.20	277 (49.0%)
	Sleep composite score (mean of 5 items)	3.54 ± 1.12	-

TABLE 3: Perceived efficacy of opaque gummies across hair, skin, and sleep domains (n = 565).

Data are presented as mean ± standard deviation (SD) and frequency (n) with percentage (%). Perceived efficacy was assessed using a 5-point Likert scale, with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The percentage represents participants who selected "agree" or "strongly agree." Domain composite scores represent the mean scores across the five items within each domain.

Overall satisfaction and behavioral outcomes

The mean overall satisfaction score was 3.40 ± 1.20, with 271 (48.0%) participants reporting a positive satisfaction rating. The mean likelihood of recommending the product was 7.20 ± 2.50 on the 0-10 scale, with 158 (28.0%) participants classified as promoters. The mean repurchase-intention score was 3.50 ± 1.30, and 294 (52.0%) participants reported a positive intention to repurchase. Perceived value for money had a mean score of 3.20 ± 1.30, with 237 (42.0%) participants reporting a positive perception (Table 4).

Outcome variable	Mean ± SD	N (%) Positive response
Overall satisfaction (1-5)	3.40 ± 1.20	271 (48.0%)
Likelihood to recommend (0-10)	7.20 ± 2.50	158 (28.0%)
Likelihood of repurchase (1-5)	3.50 ± 1.30	294 (52.0%)
Value for money perception (1-5)	3.20 ± 1.30	237 (42.0%)

TABLE 4: Overall satisfaction, recommendation, repurchase intention, and perceived value for money among survey participants (n = 565).

Data are presented as mean ± standard deviation (SD) and frequency (n) with percentage (%). Positive responses for satisfaction, repurchase intention, and value for money were defined as scores of 4 or 5 on the 5-point Likert scale. Likelihood of recommendation was rated on a 0–10 numeric rating scale, with scores of 9-10 classified as positive recommendation responses.

Comparison of perceived efficacy according to sex

Female participants demonstrated significantly higher perceived efficacy scores than did male participants across all three domains. The mean hair-domain score was 3.55 ± 1.15 among females compared with 3.13 ± 1.20 among males ($p < 0.001$). Similarly, the mean skin-domain score was 3.35 ± 1.15 among females and 3.00 ± 1.20 among males ($p = 0.001$). For the sleep domain, females had a mean score of 3.62 ± 1.10, compared with 3.36 ± 1.15 among males ($p = 0.011$). Although the differences were statistically significant, the effect sizes indicated relatively modest between-group differences (Table *5*).

Domain	Female, mean ± SD (n = 390)	Male, mean ± SD (n = 175)	t (df = 563)	p-value	Effect size
Hair	3.55 ± 1.15	3.13 ± 1.20	3.96	< 0.001*	0.36
Skin	3.35 ± 1.15	3.00 ± 1.20	3.30	0.001*	0.30
Sleep	3.62 ± 1.10	3.36 ± 1.15	2.56	0.011*	0.23

TABLE 5: Comparison of domain composite scores according to sex (n = 565).

Data are presented as mean ± standard deviation (SD). Between-group comparisons were performed using the independent-samples t-test. Effect size is presented as Cohen's d. *$p < 0.05$ was considered statistically significant.

Among the 565 participants, gastrointestinal discomfort was the most frequently reported adverse event, followed by skin rash, allergy, sore throat, and headaches. Overall, reported events were relatively infrequent in the surveyed population (Figure *2*).

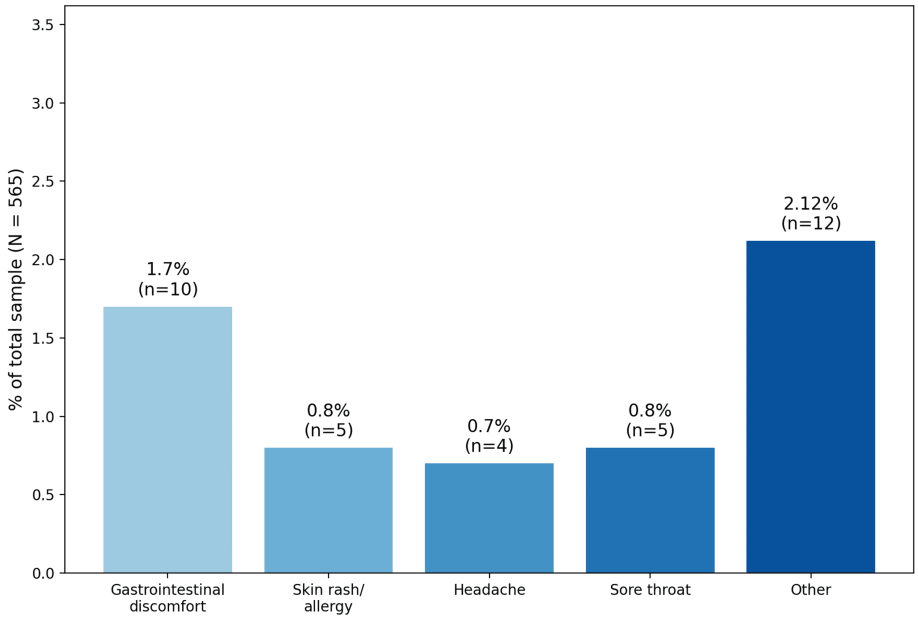


FIGURE 2: Adverse effects reported by participants using opaque gummies.

Data are presented as percentage of the analyzed sample (N = 565), with the corresponding number of participants (n) shown above each bar. The figure was created using Canva (Canva Pty Ltd, Surry Hills, Australia). Opaque gummies were manufactured by Inline Pharmaceuticals (Hyderabad, Telangana, India).

Comparison of perceived efficacy according to duration of use

Significant differences were observed across the duration-of-use groups in hair, skin, and sleep domains. Participants who had used the product for more than six months reported the highest mean scores for hair (3.76 ± 1.60), skin (3.56 ± 1.50), and sleep (3.72 ± 1.80) domains, whereas those who had used the product for less than three months reported the lowest scores for hair (3.05 ± 1.30), skin (3.05 ± 1.20), and sleep (3.25 ± 1.20). One-way ANOVA demonstrated significant differences across the duration groups for hair ($p < 0.001$), skin ($p < 0.001$), and sleep ($p = 0.004$) domain scores (Table 6).

Domain	<3 months (n = 260)	3-6 months (n = 140)	>6 months (n = 165)	F (2, 562)	p-value
Hair	3.05 ± 1.30	3.45 ± 1.40	3.76 ± 1.60	13.06	< 0.001*
Skin	3.05 ± 1.20	3.25 ± 1.30	3.56 ± 1.50	7.55	< 0.001*
Sleep	3.25 ± 1.20	3.55 ± 1.40	3.72 ± 1.80	5.67	0.004*

TABLE 6: Comparison of domain composite scores according to duration of opaque gummy use (n = 565).

Data are presented as mean ± standard deviation (SD). Between-group comparisons were performed using one-way analysis of variance (ANOVA), and *$p < 0.05$ was considered statistically significant. Opaque gummies were manufactured by Inline Pharmaceuticals (Hyderabad, Telangana, India).

Hair-domain scores differed significantly between participants who had used the product for less than three months and those who had used it for three to six months ($p = 0.020$), as well as between those who had used it for less than three months and those who had used it for more than six months ($p < 0.001$). The difference between the three-to-six-month group and the more-than-six-month group was not statistically significant ($p = 0.139$). For the skin domain, a significant difference was observed only between the less-than-three-months group and the more-than-six-month group ($p < 0.001$); the comparisons between less than three months and three to six months ($p = 0.318$) and between three to six months and more than six months ($p = 0.102$) were not statistically significant. For the sleep domain, a significant difference was observed between the less-than-three-months group and the more-than-six-month group ($p = 0.003$), whereas the other pairwise comparisons were not statistically significant, including less than three months

compared with three to six months (p = 0.119) and three to six months compared with more than six months (p = 0.563) (Table 7).

Paired group	Hair		Skin		Sleep	
	Test statistics	p-value	Test statistics	p-value	Test statistics	p-value
<3 months vs. 3-6 months	3.81	0.020*	2.05	0.318	2.80	0.119
<3 months vs. >6 months	7.11	< 0.001*	5.50	< 0.001*	3.42	0.003*
3-6 months vs. >6 months	2.69	0.139	2.89	0.102	1.24	0.563

TABLE 7: Post-hoc comparison of domain composite scores according to duration of opaque gummy use.

Pairwise comparisons were performed using Tukey's post-hoc test following one-way analysis of variance (ANOVA), and *p-value < 0.05 was considered statistically significant. Opaque gummies were manufactured by Inline Pharmaceuticals (Hyderabad, Telangana, India).

Discussion

This hospital-based cross-sectional survey evaluated patient-reported perceptions, perceived efficacy, and satisfaction with opaque gummies across three wellness domains: hair, skin, and sleep. Overall, the findings indicated moderately favorable perceptions, with the sleep domain demonstrating the highest composite score, followed by the hair and skin domains. These findings provide an overview of how individuals using the product in routine clinical settings perceive its benefits and acceptability.

In the hair domain, 52.0% of participants reported that their hair felt stronger and healthier, 50.0% reported less hair fall, and 48.0% perceived improved hair growth. The formulation information provided by Inline Pharmaceuticals includes biotin, zinc, B-complex vitamins, hydrolyzed marine collagen peptides, keratin hydrolysate, saw palmetto, Eclipta alba, and bamboo extract among its principal constituents. Some of these components have a plausible nutritional basis. A systematic review of micronutrients in androgenetic alopecia identified vitamin B and zinc as potentially relevant to hair growth and maintenance, although the evidence was inconsistent [13]. Evidence for routine biotin supplementation is limited: a review of vitamins and minerals did not support biotin for androgenetic alopecia or telogen effluvium [14], and a later review found that high-quality studies do not support biotin as a hair supplement [15]. The favorable perceptions in the present survey should therefore not be attributed to biotin or to any single constituent.

Saw palmetto is another relevant component of hair formulation. A systematic review of oral and topical saw palmetto-containing preparations reported potentially favorable effects on hair quality and density in patients with androgenetic alopecia and telogen effluvium, although the authors emphasized the need for larger and better-designed studies [5]. A recent randomized, double-blind, placebo-controlled trial reported that daily supplementation with a proprietary Serenoa repens (saw palmetto) extract significantly improved terminal hair count, vellus hair count, and total hair density over 180 days compared to placebo, supporting the potential role of saw palmetto in promoting hair growth [16].

Eclipta alba has also demonstrated hair growth-promoting activity in experimental models, including promotion of the transition toward the anagen phase [17]. A comparative study found that a polyherbal formulation containing Eclipta alba significantly promoted hair growth in rats, reducing hair-growth initiation time and increasing the proportion of follicles in the anagen phase, suggesting its potential hair growth-promoting activity [18]. These findings provide a biological context for the hair-related perceptions observed in the present survey. Nevertheless, because opaque gummies contain multiple constituents, the contribution of any individual component could not be determined from the present study.

The skin domain produced a composite score of 3.24 ± 1.18. The skin formulation contained collagen peptides, hyaluronic acid, ceramides, reduced glutathione, vitamins C and E, astaxanthin, and curcumin. Oral collagen has been investigated extensively. A systematic review and meta-analysis of randomized controlled trials reported improvements in skin hydration and elasticity following hydrolyzed collagen supplementation, although differences in study quality and formulation should be considered [6]. A more recent systematic review similarly reported favorable effects of collagen-based supplementation on hydration and elasticity while emphasizing heterogeneity and methodological limitations [19]. Oral hyaluronic acid has also been evaluated in randomized clinical studies, with reported improvements in skin hydration and some measures of skin appearance [20,21]. Thus, the skin-related perceptions in the present study are biologically plausible in the context of the formulation; however, they should not be interpreted as confirmation that these individual ingredients produced the observed outcomes.

The sleep domain demonstrated the highest perceived efficacy. The manufacturer's formulation information identified melatonin, L-theanine, GABA, 5-HTP, magnesium glycinate, and several botanical extracts as components of the sleep formulation. Among these constituents, melatonin has relatively established evidence for reducing sleep onset latency and modestly improving total sleep time in controlled studies [22]. A meta-analysis of 19 randomized placebo-controlled trials involving 1,683 participants found that melatonin significantly reduced sleep-onset latency, increased total sleep time, and improved overall sleep quality, supporting its potential role in improving sleep-related outcomes [23]. These findings provide a reasonable context for the relatively favorable sleep-related perceptions observed in the present survey. However, the current study did not objectively measure sleep using actigraphy or polysomnography; therefore, the findings represent subjective patient-reported experiences.

An additional finding was the association between product use duration and perceived efficacy. Participants who had used opaque gummies for more than six months reported the highest mean scores across the hair, skin, and sleep domains, whereas those who had used the product for less than three months reported the lowest scores. A possible explanation is that participants may perceive changes more readily with continued use of nutritional supplements. However, these findings should be interpreted with caution. Since the study was cross-sectional, a longer duration of use cannot be considered as evidence that prolonged use caused greater benefit. Individuals with more favorable initial experiences may also have been more likely to continue using the product.

Female participants reported significantly higher scores than did male participants across all three domains. Although these differences were statistically significant, the corresponding effect sizes were small, suggesting that practical differences between the groups may be modest. A cross-sectional survey from Saudi Arabia reported that dietary supplement use was relatively common, with 58% of participants using at least one supplement during the preceding year. Use was more frequent among women and individuals with higher educational attainment, while health promotion, symptom relief, and physical appearance were among the commonly reported motivations [24].

Overall, satisfaction was positive in 48.0% of the participants, while 52.0% reported a positive intention to repurchase. These findings indicate reasonable acceptability of the product among the surveyed participants. However, satisfaction and repurchase intention are subjective behavioral outcomes that may be influenced by factors beyond perceived efficacy, including expectations, convenience, taste, perceived value, and previous experiences with similar products. Gummy formulations have been explored as convenient delivery systems for vitamins, minerals, and other bioactive compounds. Previous studies have demonstrated the feasibility of incorporating micronutrients and bioactive compounds into gummy matrices while maintaining acceptable physicochemical and sensory properties, supporting their potential as an alternative format for nutritional supplementation [25].

Clinical implications

The present findings provide preliminary information on how patients using opaque gummies perceive their benefits in routine clinical settings. The combination of nutritional and bioactive constituents provides a plausible rationale for the formulation, particularly in the hair, skin, and sleep domains. However, clinicians should consider these products as nutritional wellness supplements rather than assuming that patient-reported improvement represents established clinical efficacy. Individual nutritional status, dietary intake, underlying conditions, and other lifestyle factors should also be considered when discussing dietary supplementation.

Limitations

A cross-sectional design limits the ability to establish temporal or causal relationships. The study also relied primarily on self-reported perceptions without objective measurements of hair growth, skin characteristics, or sleep parameters. Convenience sampling may limit the generalizability of the findings to other populations, while the absence of a comparison group and baseline assessment further restricts the interpretation of perceived changes. In addition, because opaque gummies contain multiple active constituents, the present study could not determine which individual ingredient or combination of ingredients may have contributed to participants' perceptions. The relatively small proportion of participants reporting individual adverse events should not be interpreted as evidence of established safety, as the study was not designed or powered to detect uncommon, rare, or delayed adverse effects. Prospective studies incorporating systematic adverse-event monitoring, standardized severity grading, clinical evaluation, and formal causality assessment are warranted to provide a more comprehensive safety profile.

Furthermore, the interpretation of domain-specific responses may be influenced by differences in the formulations used by participants. However, formulation-specific use was not clearly documented, limiting the interpretation of responses across the hair, skin, and sleep domains. Participant expectations and prior beliefs regarding wellness supplements may also have influenced perceived benefits. Notably, fewer than half of the participants reported positive overall satisfaction, indicating that perceptions were not uniformly favorable. Accordingly, the findings should be regarded as preliminary evidence of consumer perceptions and satisfaction rather than evidence of product effectiveness.

Future recommendations

Future studies should adopt a prospective longitudinal design with baseline and follow-up measurements. Objective outcomes such as phototrichographic hair parameters, validated dermatological measurements, and actigraphy or polysomnography could provide a more robust assessment of the respective domains [26]. Randomized controlled studies comparing the complete formulation with an appropriate control would also help determine whether the perceived benefits observed in the present survey translate into measurable clinical outcomes. Further research examining the dose, duration, nutritional status, and contribution of individual formulation components may provide additional insight into the observed patient-reported outcomes. Further prospective studies incorporating baseline and objective outcome measurements are warranted to determine whether these reported perceptions correspond to measurable changes in hair, skin, and sleep-related outcomes.

Conclusions

This hospital-based cross-sectional survey identified mixed consumer perceptions of opaque gummies across the hair, skin, and sleep wellness domains, with the most favorable perceived outcomes reported for sleep-related wellness. Overall satisfaction and intention to repurchase varied among participants, indicating that experiences were not uniformly positive. Perceived efficacy scores differed according to sex and duration of product use, with female participants and those reporting longer product use showing higher domain-specific scores. These findings provide preliminary insight into consumer-reported experiences and perceptions in a routine clinical setting. However, given the cross-sectional design, reliance on subjective outcomes, and absence of baseline measurements, objective assessments, and a comparison group, the findings should not be interpreted as evidence of clinical efficacy.

Appendices

Demographic details	Responses				
Age group (years)	18 to 24	25 to 34	35 to 44	45 to 54	55+
Sex	Male	Female			
Education level	Primary	Secondary	Bachelor	Postgraduate	
Duration of gummy use	< 3 months	3 to 6 months	> 6 months		
Frequency of usage	Daily	Weekly	Occasionally		
Primary reason for purchase	Hair	Skin	Sleep	Combination	
Hair domain					
I have noticed improvement in my hair growth since using opaque gummies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My hair feels stronger and healthier.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have observed a reduction in hair fall.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My hair texture has improved.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am satisfied with the hair-related benefits of this product.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Skin domain					
My skin tone has improved since using this product.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My skin feels more radiant/glowing.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I have noticed improvement in skin texture.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My skin looks healthier overall.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

I am satisfied with the skin-related benefits of this product.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Sleep domain					
I have fallen asleep faster since taking opaque gummies.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My sleep quality has improved.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I wake up feeling more rested.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
This product helps me maintain a regular sleep cycle.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I am satisfied with the sleep-related benefits of this product.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Overall satisfaction & behavioral outcomes					
Overall satisfaction (5-point Likert: Very Dissatisfied to Very Satisfied)	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
Likelihood to recommend	0 to 10				
Likelihood of repurchase (5-point Likert)	Very unlikely	Unlikely	Neutral	Likely	Very likely
Value for money perception (5-point Likert)	Very poor	Poor	Neutral	Good	Very good
Adverse event and side effect					
Have you experienced any side effects while using opaque gummies?	Yes	No			
If yes, select all that apply (checklist): gastrointestinal discomfort (cramps, nausea, loose motions), skin rash/allergy, sore throat, headache, dizziness, mood changes, and other.					
Severity of side effects.	Mild	Moderate	Severe		
Did you discontinue use due to side effects?	Yes	No			
Please describe any side effects or adverse reactions you experienced.					

TABLE 8: Questionnaire developed for this study.

Hair, skin, and sleep items used a 5-point scale (1 = strongly disagree, 5 = strongly agree). The recommendation was rated from 0 to 10.

Credit: All authors. Opaque gummies were manufactured by Inline Pharmaceuticals (Hyderabad, Telangana, India).

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Ethical Committee of Ayaan Institute of Medical Sciences, Hyderabad issued approval 96/AIMS/RO/2024 dated February 21, 2024. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** Harry Ganesh; Srilakshmi Yarlagadda; Trinath Tumepalli declare(s) employment and receipt of study product/materials from Inline Pharmaceuticals Private Limited, Hyderabad, Telangana, India. The listed authors are employees of Inline Pharmaceuticals Private Limited, the manufacturer of opaque gummies evaluated in this study. The company provided the study product and formulation information. The manufacturer was not involved in participant recruitment, questionnaire administration, data collection, or statistical analysis and did not have access to the raw study dataset. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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