

Cosmetic Product Usage and Cosmetovigilance Awareness among Healthcare Students in a Tertiary Care Centre: A Quasi-experimental Study

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ABSTRACT

Introduction: Cosmetic products are used almost universally by young adults, yet cosmetovigilance, the systematic surveillance of Adverse Cosmetic Reactions (ACRs) remains poorly recognised among healthcare students, who will later identify and report such reactions in clinical practice.

Aim: To assess cosmetic product usage patterns among healthcare students and to evaluate the effect of a structured educational intervention on their cosmetovigilance knowledge, practice intentions and attitudes.

Materials and Methods: A single group quasi-experimental pretest–post-test study was conducted between July and September 2025 among healthcare students (MBBS, Nursing and Allied Health Sciences) at a South Indian tertiary care teaching institution. A self-administered questionnaire covering demographics, usage patterns, knowledge, practice intentions and attitudes was administered through Google Forms before and after a structured cosmetovigilance seminar. Pretest and post-test records were linked by respondent e-mail identifier and analysed as matched pairs using the paired t-test in Statistical Package for Social Sciences (SPSS) version 21, with $p < 0.05$ taken as significant.

Results: Of 339 pretest and 334 post-test responses, 302 formed complete matched pairs. The cohort was predominantly female (178; 58.9%) and mainly MBBS students (192; 63.6%). Daily cosmetic use was reported by 150 (49.7%) participants, chemical based products predominated (105; 34.8%) and online platforms were the commonest source of purchase (128; 42.4%). All seven knowledge items improved significantly: awareness of the term cosmetovigilance rose from 25.5% to 90.1%, knowledge of where to report from 25.5% to 86.8% and knowledge of the patch test from 45.0% to 89.4% (all $p < 0.001$). Confidence in recognising ACRs rose from a mean of 3.24 to 3.67, and intention to report an ACR to a healthcare provider from 66.2% to 88.7% (both $p < 0.001$). Cautious product selection ($p = 0.587$), skin monitoring ($p = 0.069$) and the belief that marketed cosmetics are completely safe ($p = 0.824$) did not change.

Conclusion: A single structured seminar produced large, statistically significant gains in cosmetovigilance knowledge and in reporting related attitudes, but did not alter established preventive behaviours or product safety beliefs. Cosmetovigilance merits formal inclusion in undergraduate healthcare curricula, delivered as reinforced rather than one off teaching.

Keywords: Adverse cosmetic reactions, Consumer product safety, Cosmetics, Health education, Medical students, Product surveillance

INTRODUCTION

Cosmetics are defined as substances or preparations intended to be applied to the external parts of the human body, including the skin, hair, nails, lips and external genital organs, for the purpose of cleaning, perfuming, changing appearance or maintaining them in good condition [1]. Over recent decades the global cosmetic industry has witnessed sustained growth, with young adults representing its largest consumer group. Increased social media exposure, rising disposable incomes and evolving aesthetic standards have collectively fuelled this trend, making regular cosmetic use near universal in the 18 to 25 year age group [2].

Despite their widespread use, cosmetic products are not without risk. Adverse Cosmetic Reactions (ACRs) encompass a spectrum of undesirable effects including contact dermatitis, allergic sensitisation, photodermatoses, pigmentary disturbances and hair or nail disorders, attributable to both active ingredients and preservative agents within formulations [1,3]. Fragrance compounds and preservatives such as parabens, formaldehyde releasing agents and methylisothiazolinone have been consistently identified as leading sensitisers, contributing to a measurable burden of dermatological morbidity in the general population [4,5]. Studies have documented that a substantial majority of regular cosmetic users report at least one ACR during their lifetime, yet most such reactions are never reported

to regulatory authorities, primarily because of limited consumer awareness and the absence of a structured reporting culture [6,7].

Cosmetovigilance is the systematic monitoring of undesirable effects arising from the use of cosmetic products within a population and was formally conceptualised as the cosmetic analogue of pharmacovigilance and represents a critical component of consumer safety frameworks [8,9]. Regulatory bodies such as the European Commission and India's Central Drugs Standard Control Organisation (CDSCO) have taken steps to mandate post-market surveillance of cosmetics; however, implementation remains inconsistent, and under-reporting of ACRs continues to undermine the effectiveness of these systems [6,8,10]. The dermatotoxicological profile of many commonly used cosmetic ingredients further underscores the necessity for robust post-market monitoring, as skin absorption of potentially harmful compounds may result in both localised and systemic adverse effects [4].

Healthcare students occupy a pivotal position in this landscape. As future clinicians and health advocates, their knowledge of cosmetovigilance directly influences their capacity to counsel patients, recognise ACRs in clinical settings and facilitate appropriate reporting. Existing literature from Indian institutions reveals a substantial gap in cosmetovigilance knowledge among medical and allied health students, despite routine cosmetic use in

this cohort [2,6,7]. Educational interventions delivered as structured health seminars have demonstrated measurable improvement in pharmacovigilance related knowledge in comparable populations [11], and the quasi-experimental pretest-post-test design is an established approach for evaluating such interventions in health sciences education [12]. Equivalent data for cosmetovigilance specific interventions nevertheless remain sparse, particularly from South Indian tertiary care settings [7].

The present study was therefore designed to assess cosmetic product usage patterns among healthcare students and to evaluate whether a single structured educational intervention improves cosmetovigilance knowledge, practice intentions and attitudes in this group.

MATERIALS AND METHODS

This single group quasi-experimental study, using a pretest-post-test design without a concurrent control group, was conducted over three months from July to September 2025 in the Department of Pharmacology, Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu, India. The study protocol was approved by the Institutional Ethics Committee of Meenakshi Medical College Hospital and Research Institute (MMCH&RI IEC/PG/13/MAY/25). The study was conducted in accordance with the principles of the Declaration of Helsinki (1975, revised 2013). All participants were informed about the purpose, procedure, benefits and confidentiality safeguards of the study, and written informed consent was obtained electronically before participation. Participation was voluntary and responses were handled confidentially.

Inclusion criteria: Students of MBBS, Nursing and Allied Health Sciences (AHS) programmes aged 18 to 25 years enrolled at the institution during the study period, who used cosmetic products at least once, provided informed consent, and completed both the pre-intervention and post-intervention assessments.

Exclusion criteria: Students who declined consent, those who did not attend the educational seminar, and those for whom a matching pretest and post-test record could not be established were excluded.

Sample size calculation: The sample size was calculated using the formula $n = Z^2 PQ/d^2$, taking the prevalence of cosmetic use related adverse reactions as 71.4% from a previous study [7], with a 95% confidence level and an absolute precision of 5%. The calculated sample size was 314 participants.

All eligible students on the institutional roll were invited to participate, and the questionnaire link was circulated to the full eligible cohort.

Study Procedure

A prestructured, self-administered questionnaire comprising of demographic details (age, sex, field of study, monthly allowance for personal care products), cosmetic usage patterns (frequency of use, predominant product type, source of purchase, factors influencing brand choice, monthly expenditure), seven dichotomous knowledge items on cosmetovigilance, five dichotomous practice intention items, and five attitudinal statements rated on a five point Likert scale (1=strongly disagree to 5=strongly agree).

The questionnaire was administered through Google Forms as the pretest. A structured health education seminar on cosmetovigilance was then delivered, covering the concept and scope of cosmetovigilance, common cosmetic sensitizers, recognition of ACRs, the patch test, and the mechanism and channels for reporting adverse reactions. The identical questionnaire was re-administered immediately after the seminar as the post-test. The questionnaire was approved and validated by a team of five experts from the same department.

STATISTICAL ANALYSIS

Responses were exported from Google Forms to Microsoft Excel and analysed using the SPSS version 21. Pretest and post-test

records were linked at individual level using the respondent e-mail identifier; duplicate submissions were removed, retaining the first response per participant, and only participants contributing both a pretest and a post-test record were included in the paired analysis. Dichotomous responses were coded as 1 for yes and 0 for no, and Likert responses were coded from 1 to 5. Categorical variables are presented as frequencies and percentages. Pretest and post-test scores were compared using the paired t-test, and mean differences are reported with 95% confidence intervals. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 339 pretest and 334 post-test responses were received. After removal of duplicate submissions and linkage by respondent identifier, 302 participants contributed a complete matched pair and formed the analytical cohort; the remaining records could not be matched and were excluded. The demographic profile and cosmetic usage pattern of the analytical cohort are presented in [Table/Fig-1].

Characteristics	Category	Frequency (n)	Percentage (%)
Sex	Male	124	41.1
	Female	178	58.9
Field of study	MBBS	192	63.6
	Nursing	83	27.5
	Allied Health Sciences	27	8.9
Monthly allowance for personal care products	Less than Rs 500	150	49.7
	Rs 500 to 1000	70	23.2
	Rs 1000 to 2000	46	15.2
	More than Rs 2000	36	11.9
Frequency of cosmetic use	Daily	150	49.7
	Once or twice weekly	78	25.8
	Once or twice monthly	49	16.2
	Rarely	25	8.3
Predominant product type	Chemical based	105	34.8
	Organic	80	26.5
	Medicinal or prescribed	67	22.2
	Others	32	10.6
	Ayurvedic	18	6.0
Source of purchase	Online	128	42.4
	Medical shop	64	21.2
	Shopping mall	58	19.2
	Local store	43	14.2
	Random vendors	9	3.0
Factor influencing brand choice	Doctor's advice	76	25.2
	Peer recommendation	73	24.2
	Advertisement	71	23.5
	Family	53	17.5
	Price	26	8.6
	Packaging	3	1.0

[Table/Fig-1]: Demographic profile and cosmetic usage pattern of the study participants (n=302).

Percentages are calculated on the total analytical cohort (n=302) and may not sum to exactly 100 because of rounding

Demographic and cosmetic usage profile: The cohort was predominantly female (178; 58.9%) and drawn mainly from the MBBS programme (192; 63.6%). Nearly half the participants (150; 49.7%) received less than Rs 500 per month towards personal care products, and a similar proportion (150; 49.7%) used cosmetics daily. Chemical based preparations were the predominant product type (105; 34.8%), and online platforms were the commonest source of purchase (128; 42.4%), exceeding all conventional retail channels

combined for any single category. A doctor's advice was the single most influential factor in brand selection (76; 25.2%), closely followed by peer recommendation (73; 24.2%) and advertisement (71; 23.5%).

Effect of the intervention on knowledge: All seven knowledge items improved significantly after the seminar [Table/Fig-2]. The largest gains were in awareness of the term cosmetovigilance, which rose from 25.5% to 90.1%, and in knowledge of where an ACR should be reported, which rose from 25.5% to 86.8%. Items on which baseline knowledge was already comparatively high were that cosmetics may cause adverse reactions, and that such reactions can be reported, showed correspondingly smaller absolute gains, consistent with a ceiling effect rather than a weaker intervention effect on those items.

Knowledge item (proportion responding "yes")	Pretest (%)	Post-test (%)	Mean difference (95% CI)	p-value
Has heard the term cosmetovigilance	25.5	90.1	0.646 (0.589 to 0.702)	<0.001*
Cosmetics can cause adverse reactions	71.5	85.8	0.142 (0.092 to 0.193)	<0.001*
Adverse reactions to cosmetics can be reported	73.5	90.4	0.169 (0.118 to 0.219)	<0.001*
Knows how to report an adverse cosmetic reaction	28.8	86.4	0.576 (0.515 to 0.637)	<0.001*
Knows where to report an adverse cosmetic reaction	25.5	86.8	0.613 (0.555 to 0.671)	<0.001*
Can identify label ingredients likely to cause a reaction	47.7	80.8	0.331 (0.271 to 0.392)	<0.001*
Knows what a patch test is and how to perform one	45.0	89.4	0.444 (0.383 to 0.505)	<0.001*

[Table/Fig-2]: Comparison of knowledge item responses before and after the educational intervention (n=302).

CI: Confidence interval. Responses coded as yes=1 and no=0. Mean difference is post-test minus pretest, tested by paired t-test. *Statistically significant at p<0.05

Effect of the intervention on practice intentions: Three of the five practice intention items improved significantly [Table/Fig-3]. Reporting an adverse effect to a healthcare provider rose from 66.2% to 88.7%, willingness to report a reaction should one occur rose from 77.5% to 87.4%, and willingness to encourage others to report rose from 80.5% to 88.7%. In contrast, the belief that daily cosmetic use requires cautious ingredient based selection showed a small negative change that was not significant (mean difference -0.013, p=0.587), and the intention to monitor the skin after using a new product did not reach significance (mean difference 0.043, p=0.069). Baseline endorsement of both these items already exceeded 84%, leaving limited scope for measurable improvement.

Practice intention item (proportion responding "yes")	Pretest (%)	Post-test (%)	Mean difference (95% CI)	p-value
Reports adverse effects to a healthcare provider	66.2	88.7	0.225 (0.167 to 0.283)	<0.001*
Considers cautious ingredient based selection necessary	85.8	84.4	-0.013 (-0.061 to 0.035)	0.587
Will monitor the skin after using a new product	84.1	88.4	0.043 (-0.003 to 0.089)	0.069
Will report a reaction if one occurs	77.5	87.4	0.099 (0.048 to 0.151)	<0.001*
Would encourage others to report adverse reactions	80.5	88.7	0.083 (0.036 to 0.129)	<0.001*

[Table/Fig-3]: Comparison of practice intention responses before and after the educational intervention (n=302).

CI: Confidence interval. Responses coded as yes=1 and no=0. Mean difference is post-test minus pretest, tested by paired t-test. A negative value denotes a fall from pretest to post-test. *Statistically significant at p<0.05

Effect of the intervention on attitudes: Four of the five attitudinal statements showed significant change [Table/Fig-4]. The largest

shift was in confidence in recognising an ACR, where the mean score rose from 3.24 to 3.67, followed by agreement that reporting benefits public health (3.72 to 4.02) and support for including cosmetovigilance in the medical curriculum (3.64 to 3.88). Agreement that marketed cosmetics are completely safe was essentially unchanged (2.48 to 2.49, p=0.824); the pretest mean below the neutral midpoint of 3 indicates that participants already doubted blanket cosmetic safety before the seminar.

Attitudinal statement	Pretest mean	Post-test mean	Mean difference (95% CI)	p-value
Adverse cosmetic reactions should be reported	3.82	3.99	0.172 (0.040 to 0.304)	0.011*
Cosmetovigilance should be included in the medical curriculum	3.64	3.88	0.242 (0.134 to 0.350)	<0.001*
Cosmetics available in the market are completely safe	2.48	2.49	0.013 (-0.103 to 0.130)	0.824
Confident of recognising an adverse cosmetic reaction	3.24	3.67	0.434 (0.303 to 0.564)	<0.001*
Reporting of adverse cosmetic reactions benefits public health	3.72	4.02	0.308 (0.187 to 0.429)	<0.001*

[Table/Fig-4]: Comparison of attitudinal scores before and after the educational intervention (n=302).

CI: Confidence interval. Scores on a five point Likert scale (1=strongly disagree to 5=strongly agree). Mean difference is post-test minus pretest, tested by paired t-test. *Statistically significant at p<0.05

A sensitivity analysis restricted to the 271 participants who satisfied both the age criterion of 18 to 25 years and the criterion of at least weekly cosmetic use produced mean differences and significance levels closely comparable to those of the full matched cohort for every item, indicating that the findings were not driven by participants outside the stated eligibility criteria.

DISCUSSION

This quasi-experimental study evaluated cosmetic usage patterns and the effect of a single structured educational intervention on cosmetovigilance knowledge, practice intentions and attitudes among 302 healthcare students at a South Indian tertiary care institution. Two findings stand out. First, baseline cosmetovigilance awareness was very low despite near universal cosmetic use, with only about a quarter of participants having heard the term or knowing where to report a reaction. Second, a single seminar largely closed the knowledge gap but left established preventive behaviours and product safety beliefs substantially unchanged.

The predominance of female participants (58.9%) and their higher frequency of daily cosmetic use aligns with broader trends reported in the literature, where female sex is consistently associated with greater cosmetic engagement [2,7]. The preponderance of chemical based cosmetics (34.8%) over organic (26.5%) and medicinal or prescribed products (22.2%) is noteworthy, given that synthetic ingredients, particularly fragrances and preservatives are the most frequently implicated sensitizers in ACRs [1,3,5]. The reliance on online purchasing platforms (42.4%) is of public health concern, as online marketplaces often lack the regulatory oversight applied to conventional retail channels, increasing exposure to unregistered or inadequately labelled products [2,13].

That a doctor's advice was the most influential factor in cosmetic selection (25.2%) reinforces the public health significance of training healthcare professionals in cosmetovigilance. If future clinicians are inadequately informed, this advisory role may inadvertently perpetuate unsafe cosmetic practices. Advertisement (23.5%) and peer recommendation (24.2%) together influenced almost half the cohort, highlighting the vulnerability of young consumers to marketing pressure in the absence of evidence based guidance [6,7].

The pre-intervention assessment revealed a critical gap: only 25.5% of participants had heard of cosmetovigilance, and 25.5% to 28.8% knew where or how to report an adverse cosmetic reaction. These findings are consistent with those of Yohini et al., who reported poor knowledge and attitudes regarding cosmetovigilance among healthcare students [6], and with Abiramy et al., who documented that a substantial proportion of medical students in Puducherry were unaware of adverse reaction reporting systems [7]. The persistence of this gap is striking given that cosmetovigilance was formally defined more than a decade ago [8,9], underscoring the failure of the concept to percolate into undergraduate healthcare curricula.

Following the seminar, awareness of cosmetovigilance rose to 90.1% and knowledge of reporting mechanisms to between 86.4% and 86.8%. These gains are substantial and are consistent with prior interventional studies in the pharmacovigilance domain, where educational sessions have reliably improved knowledge scores among healthcare students [11]. Statistically significant improvement across all seven knowledge items confirms that a focused, content rich seminar can act as an effective catalyst for knowledge acquisition even within a single exposure, in keeping with the established utility of the pretest-post-test design for evaluating targeted educational interventions [12].

The improvement in attitudinal parameters — particularly confidence in recognising ACRs (3.24 to 3.67) and agreement that reporting benefits public health (3.72 to 4.02) — suggests that the intervention addressed motivational as well as factual barriers to reporting. The unchanged perception of cosmetic safety ($p=0.824$) is best interpreted in the light of the pretest mean of 2.48, which lies below the neutral midpoint: participants were already sceptical of blanket safety claims, so the intervention had little room to shift this belief. Similar attitudinal stability has been observed in pharmacovigilance intervention studies [11].

The absence of significant improvement in cautious cosmetic selection ($p=0.587$) and skin monitoring ($p=0.069$) illustrates the well recognised gap between knowledge acquisition and behavioural change, although in this cohort the interpretation is tempered by high baseline endorsement of both items, which constrained the measurable effect. It is also relevant that the post-test was administered immediately after the seminar, so these items capture stated intention rather than observed behaviour. Kaličanin and Velimirović showed that consumers underestimate their exposure to potentially harmful cosmetic ingredients [1], and Lucca JM et al. found that adverse reactions are frequently attributed to other causes, impeding appropriate reporting [3]. Together these observations argue for integration of cosmetovigilance education into formal medical, nursing and allied health curricula, delivered through repeated and case based teaching rather than isolated sessions [3,13].

Limitation(s)

The study was conducted at a single tertiary care institution, which limits the generalisability of the findings to broader healthcare student populations. The single group design without a concurrent control group means that observed changes cannot be attributed to the intervention with the certainty afforded by a controlled design, and testing effects from repeat administration of the same instrument cannot be excluded. The post-test was administered immediately after the seminar and no longer term follow-up was undertaken, so the durability of the knowledge gains is unknown and the practice items reflect stated intention rather than observed behaviour. Of 339 pretest and 334 post-test responses, only 302 could be matched into complete pairs, and the unmatched respondents may differ systematically from those analysed. All data were self-reported and therefore, subject to social desirability bias, which is likely to be accentuated in a post-test administered immediately after teaching. Finally, the questionnaire did not include an item capturing personal

experience of adverse cosmetic reactions, so the prevalence of self-reported ACRs in this cohort could not be determined.

CONCLUSION(S)

Cosmetovigilance awareness among healthcare students at this tertiary care institution was markedly deficient at baseline despite near universal cosmetic use, and improved substantially after a single structured educational seminar. Significant gains were recorded across all knowledge items, in three of five practice intention items, and in four of five attitudinal parameters. Preventive behaviours already endorsed by most participants and the belief that marketed cosmetics are completely safe did not change, indicating that a single session is sufficient to transfer information but not to reshape established practice or entrenched belief. Given that healthcare students are both substantial cosmetic consumers and future clinical advisors, cosmetovigilance training carries a dual benefit: safeguarding their own health and equipping them to counsel patients responsibly. These findings support the formal inclusion of cosmetovigilance in undergraduate medical, nursing and allied health curricula, delivered as reinforced and case based teaching rather than as a single seminar, and evaluated with longer follow-up and a controlled design.

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