

Original Research Article

Awareness and usage pattern of cosmeceuticals among undergraduate medical students and their dermatological concerns

Dinesh Kumar*, Naveen K. Goel, Tanya Goel, Twisha Gupta

¹Department of Community Medicine, Government Medical College and Hospital, Chandigarh, India

²Department of Medical Education, Government Medical College and Hospital, Chandigarh, India

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*Correspondence:

Dr. Dinesh Kumar,

E-mail: dinesh.walia17@gmail.com

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ABSTRACT

Background: Cosmetic products have become an integral part of daily life across all age groups and socioeconomic strata. Medical students are expected to possess adequate knowledge regarding cosmetic safety and evidence-based skincare practices. Present study attempts to assess their awareness and usage pattern of cosmetic and skin care products with associated factors.

Methods: A cross-sectional descriptive study was conducted during August 2025 to December 2025 among 241 undergraduate medical students using Google forms.

Results: Study included 153 (63.5%) females and 88 (36.5%) males. Advertisements and social media were the primary sources of awareness regarding cosmetic products (41.9%) with significantly higher proportion of females ($P=0.003$), followed by. Whereas, family members (24.9%) being the second most common source and significantly higher proportion of males relied on it ($p=0.005$). Awareness of skincare products was 53.1% and overall user rate of these products was 41.9%, with sunscreen being the most recognized (17.8%) and frequently used (19.1%) product. Acne, blackheads, and whiteheads were the most common skincare concerns reported by 34.0% students, and cosmetic use was mainly for the purpose of treating these conditions reported by 61.8% of users. Overall, 58.1% of users experienced at least one cosmetic-related adverse reaction with no significant gender differential.

Conclusions: Cosmetic use was highly prevalent among medical students mainly due to influence of social media and advertisements. More than half of the users reported cosmetic-related adverse effects. Study suggests the need to strengthen cosmetovigilance and to integrate cosmetic safety education into medical training.

Keywords: Awareness and usage, Cosmeceuticals, Cosmetovigilance, Medical students

INTRODUCTION

Cosmetic products have become an integral part of daily life across all age groups and socioeconomic strata, with their use extending beyond beautification to include perceived health, hygiene, and social benefits. The widespread availability of these products through both traditional and digital platforms has further accelerated their consumption. The United States Food and Drug Administration defines cosmetics as products intended to

be applied to the human body for cleansing, beautifying, promoting attractiveness, or altering appearance.¹ Cosmetic products encompass a broad range of items, including skin care products, hair care preparations, fragrances, deodorants, oral hygiene products, and decorative cosmetics such as lipsticks, foundations, and eye make-up.² Over the past few decades, the cosmetic industry has experienced remarkable expansion worldwide, largely driven by urbanization, changing lifestyle patterns, increased disposable income, and the

growing influence of social media, advertising, and beauty standards.^{1,2}

Young adults and university students represent one of the largest consumer groups of cosmetic products. Among them, medical students are particularly exposed to social interaction, academic pressure, and professional expectations related to grooming and personality, which may influence cosmetic usage patterns. The increasing emphasis on physical appearance and self-image, especially among young females, has contributed substantially to the growing consumption of cosmetic products.^[2] Although cosmetics are generally regarded as safe when used appropriately, irrational or excessive use may lead to various adverse health consequences.¹

Hair cosmetic products warrant special attention because of their widespread and repeated application. Products such as shampoos, conditioners, hair dyes, and chemical straightening agents contain surfactants and various chemical compounds capable of altering the structural integrity of the hair shaft and scalp. Excessive or inappropriate use of these products may result in dryness, increased hair fragility, frizz, breakage, scalp irritation, and damage to the cuticular layer of hair.³ Repeated exposure to chemical agents may further predispose individuals to long-term hair and scalp disorders.³

Cosmetic formulations contain numerous chemical substances, including preservatives, fragrances, pigments, surfactants, and other additives that may induce undesirable reactions in susceptible individuals. Adverse effects associated with cosmetic use may range from mild irritation and allergic reactions to severe dermatological and systemic complications.^{4,5} Frequently reported adverse reactions include itching, erythema, acneiform eruptions, pigmentation disorders, allergic contact dermatitis, conjunctivitis, scalp irritation, and hair damage.^{1,4,5} While certain reactions occur immediately after application, others may develop gradually following prolonged or repeated exposure to cosmetic ingredients.¹ Traditional cosmetic practices may also pose significant health hazards. Kajal or kohl, which is commonly applied around the eyes in many South Asian households, has been reported to contain substantial amounts of lead and other heavy metals. Chronic exposure to these substances may result in anemia, neurotoxicity, ocular complications, and other systemic manifestations, particularly among children.⁶ These findings emphasize that both modern and traditional cosmetic products may adversely affect health when used irrationally or without adequate awareness regarding their safety profile.

Even occasional or minimal exposure to cosmetic products may result in adverse health effects, ranging from mild dermatological reactions such as irritation, contact dermatitis, and allergic responses to more serious systemic effects associated with prolonged exposure to certain chemical constituents. Concerns have also been raised regarding the cumulative impact of preservatives,

fragrances, heavy metals, endocrine-disrupting chemicals, and other potentially harmful ingredients present in some cosmetic formulations. Furthermore, inappropriate use, inadequate consumer knowledge, and lack of awareness regarding adverse event reporting may exacerbate these risks.

Despite the widespread use of cosmetic products, awareness regarding their ingredients, expiry dates, methods of application, safety precautions, and potential adverse effects remains inadequate among many consumers.^{1,2} Previous studies have demonstrated that a considerable proportion of users do not read product labels, perform patch testing, or follow appropriate usage instructions before applying cosmetic products.^[1] Furthermore, practices such as sharing cosmetics, mixing multiple products, frequent brand switching, and continued use of expired products may significantly increase the risk of adverse reactions.^{1,2}

In recent years cosmetovigilance, the surveillance and monitoring of adverse effects associated with cosmetic products, has emerged as an important public health concern.¹ Increasing awareness regarding safe cosmetic practices and encouraging reporting of cosmetic-related adverse events are essential for minimizing preventable health hazards. Medical students, being future healthcare professionals, are expected to possess adequate knowledge regarding the rational use of cosmetics and their associated risks. However, there is limited literature exploring awareness, patterns of cosmetic use, and related health hazards among medical students, particularly in the Indian context.

Cosmetics constitute an important component of personal care and are widely utilized for cleansing, beautification, protection, and enhancement of physical appearance. Nevertheless, awareness regarding cosmetic safety, adverse effects, and cosmeto-vigilance remains limited among both consumers and healthcare professionals in many settings. Consequently, the potential risks associated with cosmetic use continue to be under recognized, underreported, and inadequately addressed. Strengthening public awareness, promoting responsible cosmetic use, and establishing robust cosmeto-vigilance systems are therefore essential to safeguard consumer health and ensure the safe use of cosmetic products.

As future healthcare professionals, medical students are expected to possess adequate knowledge regarding cosmetic safety and evidence-based skincare practices. Therefore, the present study was undertaken to assess the awareness and pattern of cosmetic use of skin care products with associated factors and cosmetic-related adverse events among medical students. The findings of this study will identify the gap between the awareness and practices and potential risks of cosmeceuticals. It may be useful in developing interventions for promoting safe usage strengthening cosmetovigilance and public health education among young adults.

METHODS

Study design

A cross-sectional descriptive study was conducted during August 2025 to December 2025 among undergraduate medical students aged 18 years to 25 years studying at Government Medical College and Hospital, Sector 32, Chandigarh, India. The study aimed to assess the awareness, perceptions, and patterns of cosmetic and skincare product use among medical students. The study was conducted among willing undergraduate students using Google form designed specifically for this study.

Sample size and sampling technique

Power analysis was used to calculate the optimum sample size for the proposed study. The sample size was calculated by using the following formula:

$$n_{opt} = Z_{1-\alpha/2}^2 (1-p) / \epsilon^2 P$$

Where, P = anticipated population proportion, $1-\alpha$ = confidence coefficient, ϵ = Relative precision, and Z (.) is the value of standard normal variate.

On the basis of 90 % of youths reporting cosmetics use as the most important outcome parameter reported in the existing literature and assuming a 95% confidence coefficient and 5% relative precision, the sample size came out to be 239. A total of 241 students participated in the study. Participants were recruited using a convenience sampling technique after obtaining informed consent.

Inclusion criteria

Undergraduate medical students aged 18 to 25 years who were present during the study period and willing to participate were included in the study.

Exclusion criteria

Students above 25 years of age and who were not willing to take part in the study.

Data variables

Data were collected using a validated pre-designed, pre-tested, self-administered structured questionnaire. The questionnaire comprised sections on socio-demographic characteristics, including age, gender, place of residence, religion, family type, socioeconomic status, parental education, and parental occupation. Information regarding skincare practices, cosmetic use patterns, frequency and duration of product use, switching of cosmetic brands, sources of awareness regarding cosmetic products, skin care concerns, reasons for cosmetic use, awareness and utilization of various cosmetic products, commonly used brands, and self-reported adverse reactions associated with cosmetic use was also obtained.

Statistical analysis

Data analysis was carried out by using descriptive statistics and frequency distributions for different variables. Descriptive statistics were used to summarize the study findings. Categorical variables were expressed as frequencies and percentages. Normal test of proportions was used for testing significance of differences between proportions among male and female students. Chi square test was used for testing significance of factors associated with awareness and usage among males and females. A p value of less than 0.05 was considered statistically significant. Data analysis was carried out by using IBM Statistical Package for Social Sciences (SPSS) version -26.0 software.

Ethical considerations

The volunteers received the information sheet and were told about the objectives of the study and their confidentiality was ensured. Only willing participants were asked to take part in the survey. Before administration of the questionnaire, the objectives and purpose of the study were explained to the participants. Participation was entirely voluntary, and anonymity and confidentiality of the information provided were ensured. The volunteers received the information sheet and were told about the objectives of the study and their confidentiality was ensured. Only willing participants were asked to take part in the survey.

RESULTS

A total of 241 medical students participated in the present study, comprising 153 (63.5%) females and 88 (36.5%) males. The socio-demographic characteristics of the study participants are presented in Table 1. The majority of participants belonged to the age group of 20-24 years (71.0%), followed by 17-19 years (24.5%). Most participants were from urban areas (88.4%) and belonged to families comprising 3-5 members (81.3%). Nearly half of the participants belonged to the low socioeconomic category (47.7%). Hinduism was the predominant religion (73.9%), followed by Sikhism (18.3%). A substantial proportion of parents had postgraduate (44.8%) or graduate-level education (34.9%), while service-related occupations were most commonly reported (55.6%).

The major sources of awareness regarding cosmetic products are shown in Table 2. Advertisements and social media constituted the leading source of awareness (41.9%), followed by family members (24.9%), friends (14.9%), and doctors (12.0%). Female participants more frequently reported advertisements and social media as their source of awareness, whereas family members constituted a relatively more common source among male participants.

Significant gender differences were observed in the sources of awareness regarding cosmetic products. Female participants reported advertisements/social media as a source of information significantly more often than males (49.0% vs. 29.5%; $\chi^2=8.70$, $p=0.003$). In contrast, males were more likely to cite family members as their primary source of awareness compared with females

(35.2% vs. 19.0%; $\chi^2=7.91$, $p=0.005$). Awareness through healthcare professionals was also significantly higher among females than males (15.7% vs. 5.7%; $\chi^2=5.28$, $p=0.022$). No statistically significant gender differences were observed for awareness through friends ($p=0.148$) or other sources ($p=0.051$).

Table 1: Socio-demographic characteristics of study participants by gender (n=241).

Variables	Female, N (%) (n=153)	Male, N (%) (n=88)	Total, N (%)
Age group (years)			
17-19	33 (21.6)	26 (29.5)	59 (24.5)
20-24	111 (72.5)	60 (68.2)	171 (71.0)
25-27	9 (5.9)	2 (2.3)	11 (4.6)
Family size			
3-5 members	122 (79.7)	74 (84.1)	196 (81.3)
6-9 members	22 (14.4)	13 (14.8)	35 (14.5)
10-12 members	9 (5.9)	1 (1.1)	10 (4.1)
Socioeconomic status			
Low	72 (47.1)	43 (48.9)	115 (47.7)
Middle	8 (5.2)	7 (8.0)	15 (6.2)
High	20 (13.1)	10 (11.4)	30 (12.4)
No response	53 (34.6)	28 (31.8)	81 (33.6)
Religion			
Hindu	115 (75.2)	63 (71.6)	178 (73.9)
Sikh	24 (15.7)	20 (22.7)	44 (18.3)
Others/no response	14 (9.1)	5 (5.7)	19 (7.8)
Locality			
Urban	135 (88.2)	78 (88.6)	213 (88.4)
Rural	9 (5.9)	7 (8.0)	16 (6.6)
Others/no response	9 (5.9)	3 (3.4)	12 (5.0)
Parental education			
Postgraduate	72 (47.1)	36 (40.9)	108 (44.8)
Graduate	50 (32.7)	34 (38.6)	84 (34.9)
Secondary school or below	11 (7.2)	9 (10.2)	20 (8.3)
Doctorate	11 (7.2)	4 (4.5)	15 (6.2)
No response	9 (5.9)	5 (5.7)	14 (5.8)
Parental occupation			
Service	91 (59.5)	43 (48.9)	134 (55.6)
Business	33 (21.6)	24 (27.3)	57 (23.7)
Others/no response	29 (18.9)	21 (23.8)	50 (20.7)

Table 2: Sources of awareness regarding cosmetic products among participants by gender (n=241).

Source of awareness	Female, N (%)	Male, N (%)	Total, N (%)	χ^2 , (p value)
Advertisements/social media	75 (49.0)	26 (29.5)	101 (41.9)	$\chi^2= 8.70$ (P=0.003)
Family	29 (19.0)	31 (35.2)	60 (24.9)	$\chi^2=7.91$ (P=0.005)
Friends	19 (12.4)	17 (19.3)	36 (14.9)	$\chi^2=2.09$ (P=0.148)
Doctor	24 (15.7)	5 (5.7)	29 (12.0)	$\chi^2=5.28$ (P=0.022)
Others/none	6 (3.9)	9 (10.3)	15 (6.3)	$\chi^2=3.81$ (P=0.051)

Skin care practices and cosmetic use patterns among participants are summarized in Table 3. Regular skin care practices were reported by 36.1% of participants, whereas 48.1% did not follow a regular skin care routine. Daily skin care practices were observed among 27.4% of

participants, while 29.9% reported occasional skin care practices. Cosmetic products were used daily by 30.3% of participants and a similar proportion reported usage a few times per week. Most participants had been using cosmetic products for 1-2 years (36.5%) or for less than

one year (32.8%). More than half of the respondents (52.3%) reported that they rarely switched cosmetic

brands or products.

Table 3: Skin care practices and cosmetic use pattern among participants by gender (n=241).

Variables	Female, N (%)	Male, N (%)	Total, N (%)	χ^2 , (p value)
Regular skin care practice				
Yes	65 (42.5)	22 (25.0)	87 (36.1)	$\chi^2= 15.40$, (p<0.001)
No	59 (38.6)	57 (64.8)	116 (48.1)	
Maybe	29 (19.0)	9 (10.2)	38 (15.8)	
Frequency of skin care				
Daily	48 (31.4)	18 (20.5)	66 (27.4)	$\chi^2= 25.49$, (p<0.001)
Few times/week	48 (31.4)	12 (13.6)	60 (24.9)	
Occasionally	42 (27.5)	30 (34.1)	72 (29.9)	
Rarely	15 (9.8)	28 (31.8)	43 (17.8)	
Frequency of cosmetic use				
Daily	56 (36.6)	17 (19.3)	73 (30.3)	$\chi^2= 30.18$, (p<0.001)
Few times/week	54 (35.3)	19 (21.6)	73 (30.3)	
Occasionally/rarely	30 (19.6)	26 (29.5)	56 (23.2)	
Never	6 (3.9)	20 (22.7)	26 (10.8)	
No response	7 (4.6)	6 (6.8)	13 (5.4)	
Duration of cosmetic use in years				
<1	47 (30.7)	32 (36.4)	79 (32.8)	$\chi^2= 20.41$, (p<0.001)
1-2	65 (42.5)	23 (26.1)	88 (36.5)	
3-5	24 (15.7)	7 (8.0)	31 (12.9)	
>5	7 (4.6)	5 (5.7)	12 (5.0)	
No response	10 (6.5)	21 (23.9)	31 (12.9)	
Switching cosmetic brands/products				
Rarely	83 (54.2)	43 (48.9)	126 (52.3)	$\chi^2= 15.45$, (p<0.001)
Occasionally	54 (35.3)	19 (21.6)	73 (30.3)	
Never	16 (10.5)	26 (29.5)	42 (17.4)	

Significant gender differences were observed across all domains of skin care practices and cosmetic use patterns. Female participants were significantly more likely to engage in regular skin care practices compared with males, while males more frequently reported not following any skin care regimen ($\chi^2=15.40$, p<0.001). Similarly, females reported significantly higher frequencies of daily and weekly skin care practices, whereas males were more likely to practice skin care only occasionally or rarely ($\chi^2=25.49$, p<0.001). The frequency of cosmetic product use also varied significantly by gender ($\chi^2=30.18$, p<0.001). Females demonstrated greater routine cosmetic use, with a higher proportion reporting daily or weekly use, while males were more likely to report occasional use or complete non-use of cosmetic products. Notably, the prevalence of participants who never used cosmetic products was substantially higher among males than females.

Duration of cosmetic use differed significantly between genders ($\chi^2=20.41$, p<0.001). Female participants generally reported longer periods of cosmetic product use, particularly in the 1-2 year and 3-5-year categories, whereas males were more commonly represented among recent users and non-responders. These findings indicate greater continuity of cosmetic use among females.

Significant gender differences were also observed in patterns of switching cosmetic brands or products ($\chi^2=15.45$, p<0.001). Females were more likely to switch products occasionally, whereas males more frequently reported never changing brands. Overall, females exhibited greater engagement with skin care and cosmetic products, while males demonstrated comparatively lower utilization and experimentation with cosmetic products.

Skin care concerns and reasons for cosmetic product use are presented in Table 4. Acne, blackheads, and whiteheads were the most frequently reported skin concerns (34.0%), followed by uneven skin tone (27.0%) and skin brightening concerns (22.8%). Similarly, treatment of acne and blackheads emerged as the leading reason for cosmetic product use (61.8%). Female participants more commonly reported concerns related to uneven skin tone, whereas male participants more frequently reported use of products for skin brightening purposes. Among skin care concerns, uneven skin tone was reported significantly more frequently by females than males (31.4% vs. 19.3%; $\chi^2=4.12$, p=0.042). However, concerns related to acne/blackheads, brightening skin tone, and redness/irritation did not differ significantly between genders (p>0.05). Regarding reasons for cosmetic product use, females were

significantly more likely than males to use products for managing uneven skin tone (32.0% vs. 15.9%; $\chi^2=7.52$, $p=0.006$). No significant gender differences were

observed for treatment of acne/blackheads ($p=0.911$), brightening skin tone ($P=0.075$), or redness/irritation ($p=0.667$).

Table 4: Skin care concerns and reasons for cosmetic product use among participants by gender (n=241).

Variables	Female, N (%)	Male, N (%)	Total, N (%)	χ^2 , (p value)
Skin care concerns*				
Acne/blackheads/whiteheads	50 (32.7)	32 (36.4)	82 (34.0)	$\chi^2=0.34$ ($p=0.561$)
Uneven skin tone	48 (31.4)	17 (19.3)	65 (27.0)	$\chi^2=4.12$ ($p=0.042$)
Brightening skin tone	32 (20.9)	23 (26.1)	55 (22.8)	$\chi^2=0.87$ ($p=0.352$)
Redness/irritation	24 (15.7)	11 (12.5)	35 (14.5)	$\chi^2=0.46$ ($p=0.499$)
Reasons for use*				
Treatment of acne/blackheads	95 (62.1)	54 (61.4)	149 (61.8)	$\chi^2=0.01$ ($p=0.911$)
Brightening skin tone	39 (25.5)	32 (36.4)	71 (29.5)	$\chi^2=3.18$ ($p=0.075$)
Uneven skin tone	49 (32.0)	14 (15.9)	63 (26.1)	$\chi^2=7.52$ ($p=0.006$)
Redness/irritation	24 (15.7)	12 (13.6)	36 (14.9)	$\chi^2=0.19$ ($p=0.667$)

*Multiple responses

Patterns of awareness and use of cosmetic/skincare products are summarized in Table 5. More than half of the participants (53.1%) demonstrated awareness regarding multiple skincare products. Sunscreen was the most commonly recognized individual product category (17.8%), followed by moisturisers (12.0%) and cleansers or facewash products (7.5%). Use of multiple skincare products was reported by 41.9% of participants, while sunscreen was the most commonly used individual product (19.1%). Female participants demonstrated comparatively higher awareness and use of multiple skincare products than male participants. Awareness regarding multiple skincare products was significantly higher among females than males (59.5% vs. 42.0%; $\chi^2=6.82$, $p=0.009$). Similarly, the actual use of multiple skincare products was significantly more common among

females (47.7% vs. 31.8%; $\chi^2=5.80$, $p=0.016$). No statistically significant gender differences were observed in awareness or use of sunscreen, moisturizers, or cleansers/facewash products (all $p>0.05$), although moisturizer awareness showed a borderline association with gender ($p=0.070$). Brand preference varied modestly by gender. Use of Cetaphil products was significantly higher among females compared with males (11.1% vs. 3.4%; $\chi^2=4.36$, $p=0.037$). No significant gender differences were observed for the use of Aqualogica/Aquasoft, Dot & Key, Derma Co, or mixed brands (all $p>0.05$). The prevalence of adverse reactions following cosmetic product use did not differ significantly between female and male participants (57.5% vs. 59.1%; $\chi^2=0.06$, $p=0.811$), suggesting a comparable burden of cosmetic-related adverse effects across genders.

Table 5: Patterns of awareness and use of cosmetic/skincare products among participants by gender (n=241).

Variables	Female, N (%)	Male, N (%)	Total, N (%)	χ^2 , (p value)
Awareness regarding products*				
Multiple skincare products	91 (59.5)	37 (42.0)	128 (53.1)	$\chi^2=6.82$ ($p=0.009$)
Sunscreen	29 (19.0)	14 (15.9)	43 (17.8)	$\chi^2=0.35$ ($p=0.552$)
Moisturiser	14 (9.2)	15 (17.0)	29 (12.0)	$\chi^2=3.29$ ($p=0.070$)
Cleanser/facewash	10 (6.5)	8 (9.1)	18 (7.5)	$\chi^2=0.53$ ($p=0.468$)
Products used*				
Multiple skincare products	73 (47.7)	28 (31.8)	101 (41.9)	$\chi^2=5.80$ ($p=0.016$)
Sunscreen	32 (20.9)	14 (15.9)	46 (19.1)	$\chi^2=0.91$ ($p=0.341$)
Moisturiser	18 (11.8)	17 (19.3)	35 (14.5)	$\chi^2=2.57$ ($p=0.109$)
Cleanser/facewash	13 (8.5)	12 (13.6)	25 (10.4)	$\chi^2=1.59$ ($p=0.208$)

*Multiple responses

Commonly used cosmetic brands and adverse reactions associated with cosmetic product use are presented in Table 6. More than half of the participants (54.8%) reported using mixed or multiple brands. Among individual brands, Cetaphil was the most commonly reported brand (8.3%), followed by Aqualogica/Aquasoft and Dot & Key (4.1% each). Female participants showed relatively greater preference for Cetaphil, Dot & Key, and

Dr. Sheth's products, whereas Garnier use was comparatively higher among male participants. Overall, 58.1% of participants reported experiencing at least one adverse reaction associated with cosmetic product use, whereas 41.9% did not report any adverse effects. Female participants generally demonstrated greater involvement in regular skin care practices, higher awareness regarding

cosmetic products, and greater use of multiple skincare

products compared to male participants.

Table 6: Commonly used cosmetic brands and adverse reactions among participants (n=241).

Variables	Female, N (%)	Male, N (%)	Total, N (%)	χ^2 , (p value)
Commonly used brands*				
Others/mixed brands	79 (51.6)	53 (60.2)	132 (54.8)	$\chi^2=1.67$ (p=0.197)
Cetaphil	17 (11.1)	3 (3.4)	20 (8.3)	$\chi^2=4.36$ (p=0.037)
Aqualogica/Aquasoft	9 (5.9)	1 (1.1)	10 (4.1)	$\chi^2=3.16$ (p=0.075)
Dot and Key	8 (5.2)	2 (2.3)	10 (4.1)	$\chi^2=1.23$ (p=0.268)
Derma Co	7 (4.6)	1 (1.1)	8 (3.3)	$\chi^2=2.06$ (p=0.151)
Adverse reactions				
No adverse reaction	65 (42.5)	36 (40.9)	101 (41.9)	$\chi^2=0.06$ (p=0.811)
At least one adverse reaction	88 (57.5)	52 (59.1)	140 (58.1)	$\chi^2=0.06$ (p=0.811)

DISCUSSION

The present study evaluated awareness, utilization patterns, and adverse effects associated with cosmetic products and provides comprehensive understanding among 241 undergraduate medical students, of whom 63.5% were females and 36.5% were males. Most participants belonged to the 20-24-year age group (71.0%) and urban areas (88.4%). Cosmetic use was highly prevalent, with 30.3% of students reporting daily use and an equal proportion using cosmetics several times per week. More than one-third (36.1%) followed a regular skincare routine, whereas 48.1% did not maintain a consistent skincare regimen. Female students demonstrated significantly greater engagement in skincare practices and cosmetic use than males across all measured domains ($p<0.001$). Advertisements and social media emerged as the predominant source of cosmetic awareness, reported by 41.9% of participants, followed by family members (24.9%), friends (14.9%), and healthcare professionals (12.0%). Female students relied significantly more on advertisements and social media than males (49.0% vs. 29.5%; $p=0.003$), while males more frequently depended on family members for information (35.2% vs. 19.0%; $p=0.005$). These findings are consistent with previous studies demonstrating the growing influence of social media platforms, digital marketing, and online influencers on cosmetic purchasing behavior among young adults and healthcare students.^{7,8} Similar observations have been reported highlighting the transformative role of digital media in shaping skincare practices.⁹

Female students exhibited significantly greater awareness and utilization of cosmetic products than males. Although female participants demonstrated higher levels of cosmetic awareness and product use, adverse reactions were reported at similar rates in both genders, indicating that increased utilization was not associated with a proportionately higher occurrence of self-reported adverse effects. Awareness of multiple skincare products was reported by 53.1% of participants, while 41.9% used multiple products simultaneously. Awareness of multiple products was significantly higher among females than

males (59.5% vs. 42.0%; $p=0.009$), as was their use (47.7% vs. 31.8%; $p=0.016$). These findings corroborate earlier studies among Indian college and medical students that have consistently demonstrated greater cosmetic use and skincare engagement among women.^{10,11} Nevertheless, the substantial use of cosmetic products among male students observed in the present study supports emerging evidence of increasing cosmetic acceptance and grooming practices among men.¹²

Similar findings have been reported in several studies, where female participants showed higher cosmetic utilization owing to greater concern regarding personal appearance, skin health, and self-care practices.¹³ A Study shows that 80% were aware of adverse drug reaction, and it can be reported to pharmacovigilance centre. It could be due to awareness about the cosmetovigilance and reporting adverse events due to cosmetics.¹⁴

Acne, blackheads, and whiteheads were the most frequently reported skincare concerns, affecting 34.0% of participants, followed by uneven skin tone (27.0%) and skin-brightening concerns (22.8%). Treatment of acne and related conditions represented the primary reason for cosmetic use (61.8%). Female students reported concerns regarding uneven skin tone significantly more often than males (31.4% vs. 19.3%; $p=0.042$). These observations are in agreement with epidemiological studies indicating that acne affects a large proportion of adolescents and young adults and remains a major driver of skincare product utilization.^{15,16}

More than half of the respondents (53.1%) were aware of multiple skincare products, and sunscreen was the most recognized (17.8%) as well as the most frequently used (19.1%) individual product. The relatively high awareness of sunscreen use is encouraging because photoprotection constitutes an important component of preventive skincare. Similar findings have been reported among medical students, who generally demonstrate better awareness of sun-protective measures than the general population. A notable finding of the present study was the high prevalence of cosmetic-related adverse reactions. More than half of participants (58.1%) reported

experiencing at least one adverse reaction associated with cosmetic use. The prevalence was comparable among females (57.5%) and males (59.1%; $p=0.811$), indicating that despite greater cosmetic use among females, both sexes were similarly susceptible to adverse effects. Comparable findings have been reported in India and internationally, although prevalence estimates vary according to study population and cosmetic categories evaluated.^{17,18} Siddiqui et al reported adverse reactions in nearly half (49.6%) of cosmetic users.¹⁹ Mehta et al observed adverse effects in 32.9% of skincare product users, with hair loss, allergies, and dry skin being the most common manifestations.²⁰ The higher prevalence observed in the present study may reflect increasing use of multiple products, self-medication for dermatological concerns, and inadequate awareness regarding product ingredients and safety.

Despite widespread cosmetic use and relatively satisfactory awareness regarding cosmetic products, knowledge of cosmetovigilance remains limited. Similar concerns have been reported among medical students in Puducherry, where nearly half of participants experienced cosmetic-related adverse reactions, yet only 27.6% were aware of cosmetovigilance.²¹ Yohini et al reported that only 46.1% of healthcare students were aware of cosmetovigilance, while merely 24.4% knew how to report adverse cosmetic reactions.²² A study on 800 women reported that 41.1% of working women and 35.1% of nonworking women experienced adverse effects of cosmetic usage.²³ International studies have also documented inadequate consumer awareness regarding cosmetic safety and adverse-event reporting.^{24,25} Collectively, these findings emphasize the need for strengthening cosmetovigilance education and reporting systems among future healthcare professionals.

Although the study provides valuable insights into cosmetic use and associated adverse effects among medical students, certain limitations should be acknowledged. The cross-sectional design limits causal inference, and the reliance on self-reported information may have introduced recall and reporting biases. Furthermore, the study was conducted in a single educational setting, which may limit generalizability. The limited sample size and lack of face-to-face data collection from the respondents with the participants were the main limitations of this study. Since participants self-reported via Google Forms, responses may be prone to error. Nevertheless, the findings highlight important gaps between cosmetic use, cosmetic safety awareness, and adverse-event reporting practices among young adults. This study could be considered as a basis for future studies which can consider a bigger sample size that is a realistic representative of India's population of cosmetics users.

CONCLUSION

Overall, cosmetic use was highly prevalent among medical students, particularly among females. Social media and advertisements were the leading sources of information, acne-related concerns constituted the principal reason for cosmetic use, and more than half of participants reported experiencing cosmetic-related adverse effects. These findings underscore the need for incorporating cosmetovigilance and cosmetic safety education into medical curricula, promoting evidence-based cosmetic use, and strengthening adverse-event reporting systems. Larger multicentric studies are warranted to evaluate long-term safety outcomes and determinants of cosmetic use in the Indian population.

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