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Research Paper

A community-based study on prevalence of over-the-counter cosmeceutical usage among college students of Dakshina Kannada

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ABSTRACT

Background: Tiopronin is a pharmaceutical agent used in the treatment of cystinuria and other medical conditions. Accurate and reliable analytical methods are essential for its determination in pharmaceutical formulations.
Objective: To develop a simple, sensitive, and accurate spectrophotometric method for determining tiopronin using an oxidative coupling reaction with dimethyl phenylene diamine (DMPD).
Methods: The proposed method was based on the oxidative coupling of tiopronin with DMPD in the presence of ferric chloride ($FeCl_3$). The resulting purple-colored product was analyzed using UV-visible spectrophotometry. Optimal reaction conditions, including reagent volumes, temperature, reaction time, and wavelength, were investigated. Accuracy, precision, recovery, detection limits, and pharmaceutical applicability were evaluated.
Results: Maximum absorbance was observed at 552 nm. The method demonstrated linearity over a concentration range of 5–30 µg/mL, with a correlation coefficient of 0.9993. The reaction was completed within 2 minutes at 25°C, and the colored product remained stable for 60 minutes. Recovery was approximately 99.42%, with relative standard deviation values below 1%. The method was successfully applied to tiopronin tablets.
Conclusion: The developed spectrophotometric method provides a simple, rapid, sensitive, and reliable approach for determining tiopronin in pharmaceutical formulations.

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1. INTRODUCTION

The use of over-the-counter (OTC) cosmeceuticals among college students has become increasingly prevalent in recent years. This demographic, often navigating the complexities of academic life, social pressures, and personal identity, is seeking convenient and effective solutions for various skin concerns. Cosmeceuticals, which blend cosmetic and therapeutic benefits, offer a compelling option for students. These products typically contain active ingredients designed to improve skin health, treat specific skin conditions, and enhance appearance, without requiring a prescription. OTC cosmeceuticals, such as skincare creams, serums, and supplements, are widely available and are used for a variety of purposes, including improving skin appearance, treating acne, and preventing the signs of aging.

College life often comes with its own set of challenges, including increased stress levels, irregular sleep patterns, and exposure to new environmental factors. Many students also face changes in their diet, routine, and social environment, all of which can impact their skin. These pressures contribute to the rising demand for effective and accessible skincare solutions. In this context, OTC cosmeceuticals provide a convenient means for students to address their skin concerns. The availability of these products in local drugstores, supermarkets, and online platforms allows students to easily find solutions tailored to their specific needs. OTC cosmeceuticals are often seen as an affordable and quick fix for various skin issues, making them especially attractive to students who may not have the time, resources, or financial means to seek professional dermatological care.

One of the key factors driving the rise in OTC cosmeceutical usage among college students is accessibility and affordability. Students are often on tight budgets, balancing tuition, living expenses, and other financial obligations. OTC cosmeceuticals offer an affordable alternative to expensive dermatological consultations and prescription treatments. These products are easily available in most local stores and online marketplaces, allowing students to purchase them without the need for a prescription or medical consultation. This ease of access is a major contributing factor to the growing trend, as students are able to address their skin concerns at their own convenience and without the added stress of navigating healthcare systems. In addition to affordability, OTC cosmeceuticals cater to the fast-paced and demanding lifestyle of college students. With busy schedules, students may not have the time to visit a dermatologist for personalized care, making OTC products a convenient option for addressing skin issues in a quick and straightforward manner. The use of these products aligns with the desire for practical, time-efficient solutions to the challenges that students face in their daily lives.

Another significant factor influencing the use of OTC cosmeceuticals among college students is the pervasive influence of social media and beauty trends. Platforms like Instagram, Facebook, YouTube, and TikTok have become central sources of information and inspiration for young adults seeking to improve their skincare routines. Influencers and beauty enthusiasts often promote specific products, sharing their personal experiences and providing skincare tips that resonate with their audience. This creates a culture where skincare routines are not only encouraged but also celebrated as an essential part of self-care. The rise of "influencers" individuals who build large followings by showcasing skincare products and routines has further popularized OTC cosmeceuticals. These influencers often recommend a range of over-the-counter products, making them seem more accessible and effective. This has contributed to an increased awareness among college students of the importance of skincare and self-care. For many students, using OTC cosmeceuticals has become part of a broader cultural movement that emphasizes the value of personal appearance and well-being. As a result, students are more inclined to invest time and money into products that promise visible results. In a college environment, where social and academic pressures are high, self-care practices, including skincare, have become an important means of improving self-esteem and

presenting one's best self. The desire for clearer skin, anti-aging effects, or an overall healthier appearance is often linked to the broader pursuit of self-improvement. OTC cosmeceuticals provide an affordable and accessible tool for achieving these goals, contributing to their growing popularity among students.

The growing trend of OTC cosmeceutical usage among college students can be attributed to several factors, including accessibility, affordability, and the desire for self-care in a fast-paced lifestyle. Many students are looking for quick, effective solutions to manage the skin issues that often arise due to stress, lack of sleep, or environmental changes. OTC cosmeceuticals offer a solution that is both affordable and convenient, which is particularly appealing to students who may not have the financial resources to invest in more expensive skincare treatments or professional dermatological consultations. In addition, the cultural shift toward self-care, driven in part by the influence of social media and beauty trends, has played a significant role in promoting OTC cosmeceuticals among students. With a greater emphasis on appearance and self-esteem, students are more motivated to seek out products that promise to improve their skin and overall appearance. The easy availability of these products through online and retail platforms has made them an attractive option for students looking to address specific skin concerns, whether it's acne, dryness, or early signs of aging.

Understanding the prevalence and factors influencing OTC cosmeceutical usage among college students is crucial for both consumers and healthcare providers. For consumers, it is important to be aware of the potential risks associated with using OTC products without proper knowledge of their ingredients or potential side effects. While these products can be beneficial, improper use or overuse may lead to adverse reactions, such as skin irritation or allergic responses. Healthcare providers, including dermatologists and pharmacists, can play a vital role in educating students about safe and effective skincare practices. By promoting informed consumer choices and encouraging students to seek professional advice when necessary, healthcare professionals can help ensure that students make well-informed decisions about the products they use. This can help prevent misuse and minimize the risks associated with OTC cosmeceuticals.

The rising trend of OTC cosmeceutical use among college students reflects broader social, economic, and cultural shifts. The accessibility, affordability, and influence of social media have made these products an attractive option for students seeking to improve their skin health and appearance. While OTC cosmeceuticals offer convenience and effectiveness, it is essential for students to be informed about the proper use of these products to avoid potential risks. By promoting education and awareness, healthcare providers can help guide students toward safer and more effective skincare practices, ensuring that they benefit from these products without compromising their health.

Some of the objectives of OTC cosmeceutical usage:

- To determine the prevalence of OTC cosmeceutical usage among college students.
- To identify the types of OTC cosmeceutical products commonly used by college students.
- To explore the reasons for OTC cosmeceutical usage among college students.
- To assess college students and knowledge of potential hazards associated with OTC cosmeceutical products.

2. RELATED WORK

This study was conducted in Dakshina Kannada, a region in the southwestern part of India, with the participation of 350 college students. The majority of the participants were female, and most were pursuing undergraduate degrees in health or medical fields. The purpose of the study was to assess the use, awareness, and potential risks associated with over-the-counter (OTC) cosmeceutical products among this population. Cosmeceuticals are products that blend cosmetic and pharmaceutical properties, often used for skin care, acne treatment, anti-aging purposes, or sun protection.

A significant finding from the study was that a large number of students reported using OTC cosmeceuticals regularly. Most of the participants used these products for improving skin appearance, protecting their skin from sun damage, or addressing skin conditions such as acne. This aligns with similar studies conducted in other regions. For example, a study at a university in Saudi Arabia revealed that many

participants used OTC cosmetics, with nearly half of them using these products specifically for dry skin treatment, and about one-third for addressing alopecia (hair loss) [1]. These results indicate that OTC cosmetic use is not confined to a specific geographic or cultural area, but rather a widespread practice among young adults, especially those in health-related fields. The study also explored how students made decisions regarding their choice of OTC cosmetic products. A majority of the participants reported obtaining their information from social media platforms, recommendations from family and friends, and online advertising or promotional materials [2]. These findings are consistent with those of who found that social media and personal recommendations played a central role in influencing consumer choices related to OTC cosmetics. The increasing reliance on digital platforms for product information is a growing trend, particularly among younger generations, who often turn to social media influencers or peer reviews rather than consulting medical professionals or scientific sources. Regarding purchasing habits, the study revealed that the majority of students buy their OTC cosmeceutical products from online retailers or drugstores/pharmacies. The convenience of online shopping [3], coupled with the wide availability of these products, has likely contributed to the growing popularity of such purchases. However, the fact that many participants purchase these products without seeking professional advice or ensuring their safety is concerning. While OTC products are generally considered safe for use, there is still a risk of misuse or adverse effects when they are not used correctly. A concerning aspect of the study was the observation that some participants had experienced adverse reactions after using OTC cosmetic products. However, many were uncertain about the nature of the reaction, and a significant number of participants did not take any precautions to minimize potential hazards associated with the use of these products. This lack of precaution may stem from a general lack of awareness about the risks involved, such as allergic reactions, skin irritation, or more severe side effects like photosensitivity and teratogenic effects. For example, highlighted the risk of doxycycline, an antibiotic commonly used for acne treatment, which may cause photosensitivity when exposed to sunlight, leading to increased susceptibility to sunburn or skin irritation. In more severe cases, certain OTC cosmetic ingredients can even cause teratogenic effects, leading to birth defects if used during pregnancy. Such examples emphasize the importance of educating consumers about the potential hazards of cosmeceuticals, especially when they are used without proper knowledge or guidance. One key finding from this study was that the majority of participants did not seek advice or recommendations from healthcare professionals before purchasing OTC cosmeceutical products. This highlights a significant gap in knowledge and awareness among the students, which could have serious implications for their health and safety. The lack of professional consultation suggests that students may not fully understand the potential risks of using OTC products without proper guidance, which could result in negative outcomes like skin damage, allergic reactions, or the misuse of ingredients. In light of these findings, it is crucial to emphasize the need for greater education and awareness regarding the use of OTC cosmeceuticals. One potential solution is to conduct awareness programs and workshops that inform young adults, particularly students in health and medical fields, about the safe use of cosmetic products. Pharmacists, who are often the primary source of healthcare information in the public sector, could play a central role in this education process. By providing students with accurate, evidence-based information about the benefits and risks of OTC products, pharmacists could help reduce the likelihood of adverse reactions and encourage safer use of these products [4].

This study highlights the widespread use of OTC cosmeceuticals among college students in Dakshina Kannada, particularly those in the health/medical fields. While these products are popular for improving skin appearance and treating various skin conditions, the study also reveals concerning gaps in consumer knowledge regarding the potential risks and adverse effects associated with their use. The lack of professional consultation and the widespread reliance on social media and peer recommendations for product information suggests a need for increased education and awareness. To mitigate the risks associated with OTC cosmetic products, it is essential to implement educational programs that inform consumers, particularly young adults, about safe usage practices and the potential hazards of these products. Pharmacists, healthcare professionals, and academic institutions should collaborate to provide reliable information, raise awareness, and promote safer practices when it comes to OTC cosmetic use. In

doing so, the health and well-being of consumers can be better protected, and the benefits of these products can be realized without unnecessary risks [5].

3. METHODOLOGY

- **Data Collection:** A structured questionnaire will be developed based on relevant literature and research objectives. The questionnaire will include sections on demographic information, OTC cosmeceutical usage patterns, reasons for usage, knowledge of potential hazards, and sources of information.
- **Ethical Considerations:** Ethical approval will be obtained from the appropriate institutional review board prior to data collection. Informed consent will be obtained from all participants, and measures will be taken to ensure confidentiality and anonymity of responses.
- **Data Analysis:** Descriptive statistics will be used to analyze the prevalence of OTC cosmeceutical usage, types of products used, reasons for usage, and sources of information. Inferential statistics, such as chi-square tests or regression analyses, may be employed to examine associations between demographic variables and OTC cosmeceutical usage patterns.
- **Dissemination of Findings:** The findings of this study will be disseminated through academic publications, conference presentations, and community forums. Recommendations for promoting safe and informed OTC cosmeceutical usage practices among college students will be shared with relevant stakeholders and policymakers.
- **Limitations:** Potential limitations of this study may include self-report bias, limited generalizability due to convenience sampling, and challenges in establishing causality in observational data.
- Study Site: Community of Dakshina Kannada
- **Study Type:** This study will utilize a cross-sectional design to collect data on prevalence of OTC cosmeceutical usage among college students in Dakshina Kannada.
- **Study Duration:** 2 Month
- **Sample Size:** 350 people

3.1 Inclusion Criteria

- College students currently enrolled in academic programs within the community.
- Students aged 18 years and above.
- Students who provide informed consent to participate in the study.

3.2 Exclusion Criteria

- Individuals who are not currently enrolled in college or academic programs.
- Students below the age of 18.
- Students who do not provide informed consent to participate in the study.

4. RESULTS AND DISCUSSION

The study on the prevalence of over-the-counter (OTC) cosmeceutical usage among college students in Dakshina Kannada revealed several notable findings. Among the demographic information collected, the majority of respondents were aged between 19 to 22 years, with females comprising a higher percentage than males. Additionally, a significant proportion of students were in their second and third academic years, primarily enrolled in health or science-related fields [6].

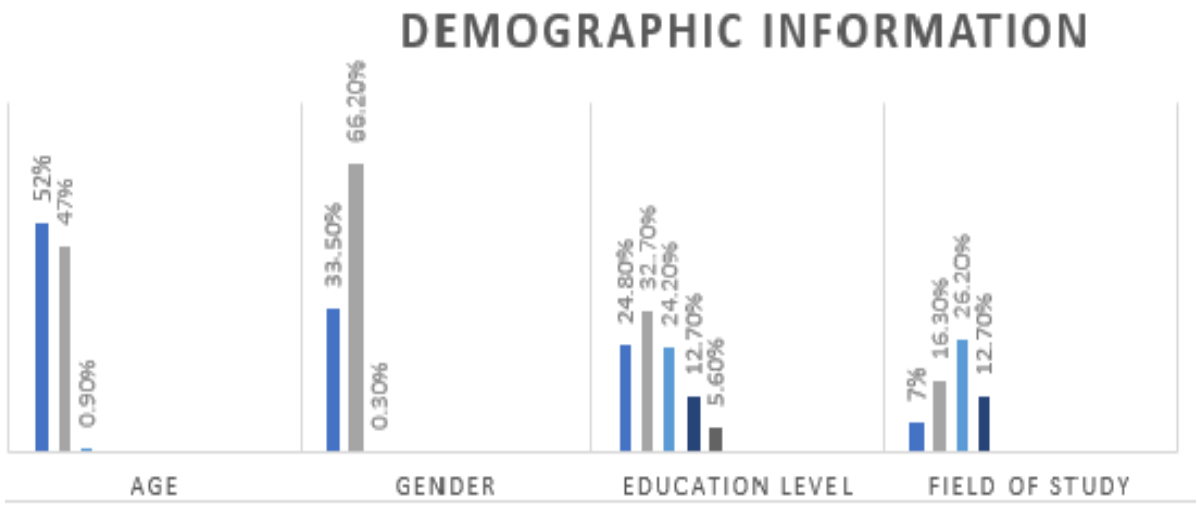


Figure 1. Demographic Characteristics of the Study Participants

Table 1. Demographic Characteristics of the Study Participants

QUESTIONS	N (%)
1. Age	
• 18-20	186 (52.4%)
• 21-25	166 (46.8%)
• 26-32	3 (0.9%)
2. Gender?	
• Male	119 3.5%)
• Female	235 (66.2%)
• Other	1 (0.3%)
120 Academic year?	
• First year	88 (24.8%)
• Second year	116 (32.7%)
• Third year	86 (24.2%)
• Fourth year	45 (12.7%)
• Postgraduate	20 (5.6%)
121 Field of education?	
• Arts/Humanities	25 (7%)
• Science	58 (16.3%)
• Engineering/Technology	93 (26.2%)
• Business/Management	45 (12.7%)
• Health/Medicine	134 (37.7%)

Table 2. Over The Counter Cosmeceutical Usage

QUESTION	N (%)
Do you use over-the-counter cosmeceutical products (e.g., skin creams, serums, supplements) as part of your skincare routine?	
• Yes	241 (67.9%)
• No	23 (6.5%)
• Sometimes	91 (25.6%)
How often do you use over-the-counter cosmeceutical products?	
• Daily	147(41.4%)

• 2-3 times a week	53 (14.9%)
• Once a week	33 (9.3%)
• Occasionally	67 (18.9%)
• Rarely	55 (15.5%)
Which types of over-the-counter cosmeceutical products do you use? (Check all that apply)	
• Moisturizers	221 (62.3%)
• Anti-aging creams/serums	58 (16.3%)
• Acne treatments	104 (29.3%)
• Sunscreen	207(58.3%)
• Vitamin supplements	61 (17.2%)
• Others (please specify: _____) Alovera gel Whitening cream Face oil Face wash and eye cream Anti-sebum toner Tan removal cream.	 2 (0.6%) 1 (0.3%) 1 (0.3%) 1 (0.3%) 1 (0.3%) 1 (0.3%)
What are the main reasons for using over-the-counter cosmeceutical products? (Check all that apply)	
• To improve skin appearance	230 (64.8%)
• To prevent aging	67 (18.9%)
• To treat acne or other skin conditions	119 (33.5%)
• To protect skin from sun damage	190 (53.5%)
• To supplement vitamins and nutrients	59 (16.6%)
From which sources do you primarily receive information about over-the-counter cosmeceutical products? (Check all that apply)	
• Social media influencers	182 (51.3%)
• Online beauty blogs or websites	110 (31%)
• Recommendations from friends or family	182 (51.3%)
• Advertising or promotional materials	103 (29%)
• Product reviews on e-commerce platforms	88 (21.7%)
Where do you usually purchase over-the-counter cosmeceutical products?	
• Drugstore/pharmacy	111 (31.3%)
• Supermarket	64 (18%)
• Online retailers	131 (36.9%)
• Specialty beauty stores	47 (13.2%)
• Others (please specify: _____) Local retailer Local vendor	 1 (0.3%) 1 (0.3%)

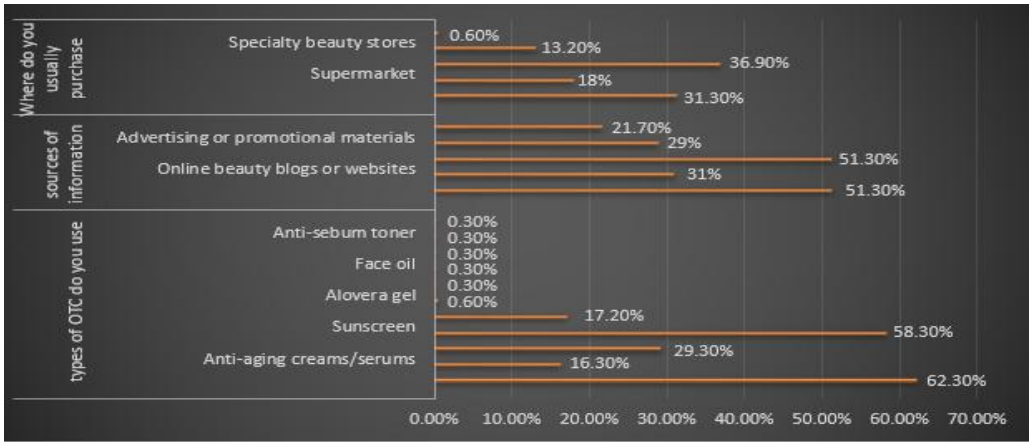


Figure 2. Over the Counter Cosmeceutical Usage

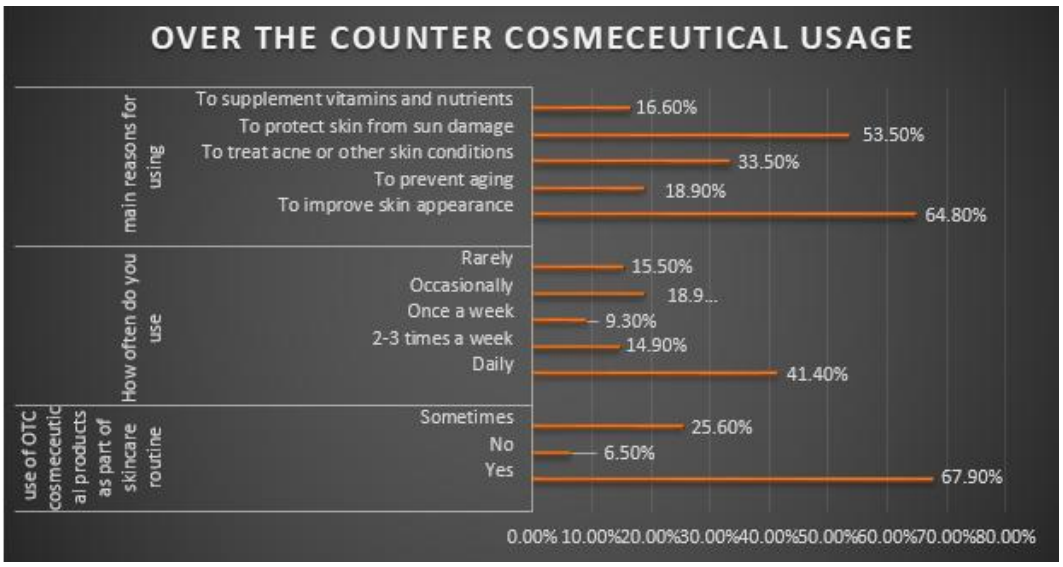


Figure 3. Over the Counter Cosmeceutical Usage

In terms of perceived benefits and concerns, a majority of users expressed satisfaction with the results obtained from OTC cosmeceutical products. However, safety and effectiveness were significant considerations when choosing products, with concerns about adverse effects such as skin irritation, chemical burns, and sensitivity to sunlight being prevalent. Despite these concerns, only a minority of respondents sought advice from healthcare professionals before purchasing such products.

Table 3. Perceived Benifits, Concerns, and Hazards

QUESTIONS	N (%)
How satisfied are you with the results of using over-the-counter cosmeceutical products?	
• Very satisfied	35 (9.9%)
• Satisfied	161 (45.4%)
• Neutral	138 (38.9%)
• Dissatisfied	16 (4.5%)
• Very dissatisfied	5 (1.4%)
What are your main concerns or considerations when choosing over-the-counter cosmeceutical products? (Check all that apply)	
• Effectiveness	243 (68.5%)
• Safety	272 (76.6%)

• Price	99 (27.9%)
• Brand reputation	99 (27.9%)
• Ingredient quality	58 (16.3%)
Have you experienced any adverse effects or reactions from using over-the-counter cosmeceutical products?	
• Yes	95 (26.8%)
• No	181 (51%)
• Not sure	79 (22.3%)
What types of hazards associated with over-the-counter cosmeceutical products are you aware of? (Check all that apply)	
• Skin irritation/allergic reactions	267 (74.4%)
• Chemical burns	185 (52.1%)
• Sensitivity to sunlight	167 (47%)
• Adverse interactions with medications	40 (11.3%)
Do you take any precautions to minimize potential hazards when using over-the-counter cosmeceutical products?	
• Yes	86 (24.2%)
• No	169 (47.6%)
• Sometimes	100 (28.2%)

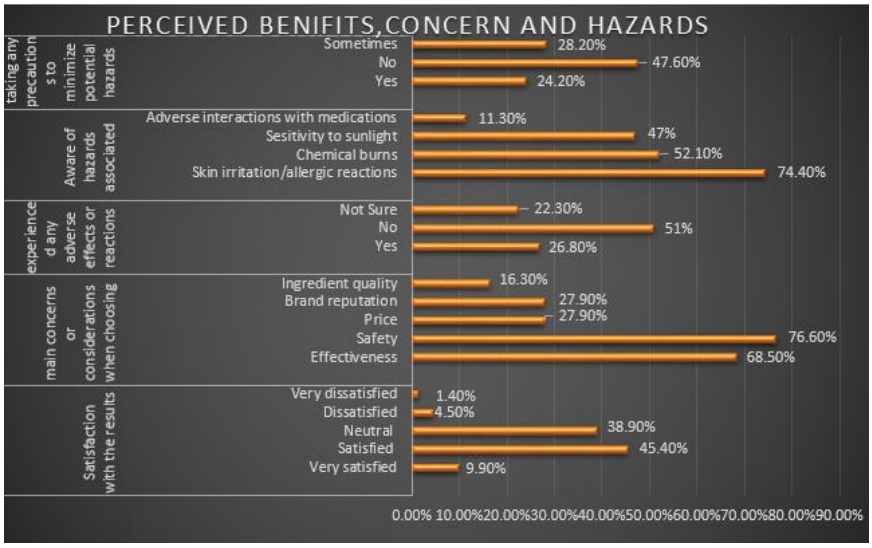


Figure 4. Perceived Benefits, Concerns and Hazards

In terms of perceived benefits and concerns, the majority of users expressed satisfaction with the results obtained from OTC cosmeceutical products. Nonetheless, safety and effectiveness were significant considerations when choosing these products. Common concerns included potential adverse effects such as skin irritation, chemical burns, and sensitivity to sunlight. Despite these concerns, only a minority of respondents sought advice from healthcare professionals before purchasing these products.

Table 4. Additional Information

QUESTIONS	**N (%)**
Do you seek advice or recommendations from healthcare professionals (e.g., dermatologists, pharmacists) before purchasing over-the-counter cosmeceutical products?	
• Yes	57 (16.1%)
• No	175 (49.3%)

• Sometimes	123 (34.6%)
Would you be interested in learning more about the safety and efficacy of over-the-counter cosmeceutical products?	
• Yes	231 (65.1%)
• No	37 (10.4%)
• Maybe	87 (24.5%)

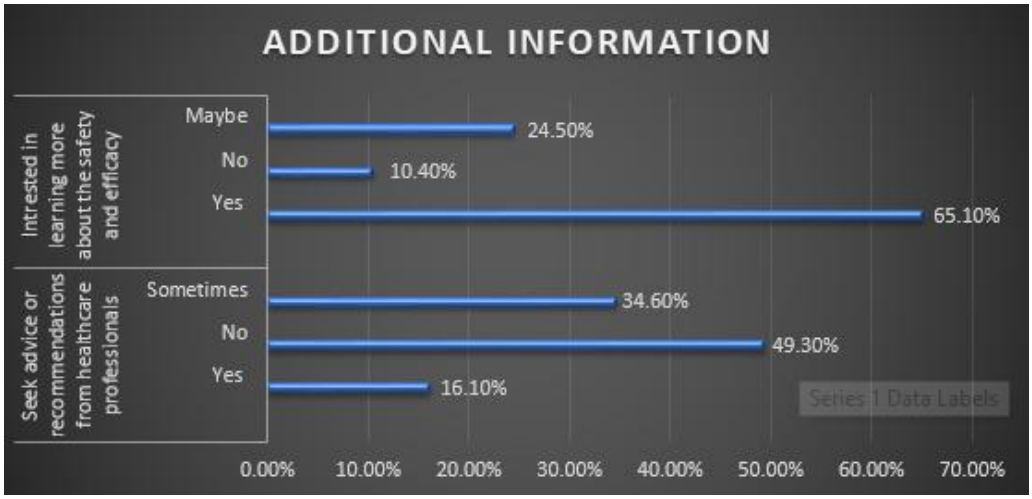


Figure 5. Additional Information

On enquiry about precautions taken to minimize hazards, a notable portion of respondents indicated that they did not take any specific measures. However, a considerable proportion expressed interest in learning more about the safety and efficacy of OTC cosmeceutical products, highlighting a potential gap in consumer knowledge and the need for increased awareness and education in this area.

4.1 Discussion

This study is conducted in Dakshin Kannada among college students total of 350 students participated in this study among which majority was female and most of the proportions were pursuing undergraduate degree in health/medical fields. Greater number of people use over the counter cosmeceutical products on daily basis for improving the skin appearance, to protect from sun damage, to treat acne or other skin conditions. Similarly, a study previously done in university of Saudi Arabia reported that majority were using OTC cosmetics and states that among the participants using OTC cosmetics nearly half used medication for treatment of dry skin and one third used it for treating alopecia [7].

The majority of the participants in the cross-sectional study reported that their source of information governing their choice of OTC cosmetic was obtained from social media, recommendation from family/friends and online and advertising or promotional materials. Same was observed in the study done by. In the present study it was observed that participants usually purchase OTC cosmetic product from online retailers, Drugstore/pharmacy. Some have experienced adverse reactions by using OTC cosmetics where as some are not sure about the adverse reaction. Greater number of participants don't take any precautions to minimize potential hazards while using OTC cosmetic products. This may be due to lack of awareness about the potential hazards of cosmetical might cause severe and fatal adverse effects. One prominent example given by was Doxycycline widely used for treatment of acne vulgaris may cause photosensitivity to skin and teratogenic effect [8].

The current study shows that majority of them do not seek any advice or recommendation from healthcare professionals before purchasing OTC cosmetics products this can be the reason for lack of awareness among students. This can be prevented by conducting pragmas about usage of OTC cosmetic, pharmacist can provide information to the consumer about the usage because pharmacist are main source of information to public sector [9].

4.2 Key Findings

- **High Prevalence of OTC Cosmeceutical Usage:** The study revealed a substantial prevalence of over-the-counter (OTC) cosmeceutical usage among college students in Dakshina Kannada, with 67.9% of respondents indicating regular use as part of their skincare routine.
- **Commonly Used Products:** Moisturizers (62.3%) and sunscreen (58.3%) emerged as the most frequently used OTC cosmeceutical products among the surveyed students, highlighting their importance in daily skincare regimens [10].
- **Influence of Information Sources:** Social media influencers (51.3%) and recommendations from friends or family (51.3%) were identified as significant sources of information influencing product choice, underscoring the impact of peer recommendations and digital media on consumer behaviour.
- **Perceived Benefits and Concerns:** While a majority of users expressed satisfaction with the results obtained from OTC cosmeceuticals (55.3%), safety (76.6%) and effectiveness (68.5%) were primary considerations when selecting products. Concerns regarding adverse effects, such as skin irritation (74.4%) and chemical burns (52.1%), highlighted the need for vigilance and informed decision-making.
- **Limited Consultation with Healthcare Professionals:** Despite safety concerns, only a minority of respondents sought advice from healthcare professionals (16.1%) before purchasing OTC cosmeceuticals, suggesting a potential gap in consumer awareness and engagement with professional guidance.
- **Interest in Education and Awareness:** A significant proportion of respondents expressed interest in learning more about product safety and efficacy (65.1%), indicating a willingness to engage with educational resources to make informed skincare choices.
- **Low Adherence to Precautionary Measures:** Despite awareness of potential hazards associated with OTC cosmeceuticals, few respondents actively took precautions to minimize risks (24.2%), highlighting a need for increased emphasis on risk mitigation strategies and consumer empowerment initiatives.

5. CONCLUSION

The study underscores the importance of promoting consumer education, safety awareness, and informed decision-making regarding OTC cosmeceutical usage among college students in Dakshina Kannada to ensure optimal skincare practices and risk management.

Also, the study provides valuable insights into the prevalence, usage patterns, and perceptions surrounding OTC cosmeceutical products among college students, emphasizing the importance of informed decision-making and risk mitigation strategies in skincare practices.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Nafisatul Misriya Raseena	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Satish S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
A.R. Shabaraya	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
I : **I**nvestigation
R : **R**esources
Vi : **Vi**sualization
Su : **Su**pervision

So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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