

EVALUATION OF QUALITY STANDARDS AND ADVERSE EFFECTS OF SELECTED NATIONAL AND INTERNATIONAL FACIAL COSMETICS

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ABSTRACT

Background and objectives: Facial cosmetics are widely used worldwide for multiple purposes, yet raise safety and quality concerns in developing countries. The study aims to evaluate and compare the quality standards of cosmetics and adverse effects of selected national and international facial cosmetics products.

Methodology: A cross-sectional study was conducted to assess 40 cosmetic products (creams, face washes, sunscreens, and moisturizers) collected from the local market and evaluated for organoleptic, chemical, and physical properties, as well as stability tests. Different parameters were assessed, including color, Odor, texture and homogeneity, consistency, pH, moisture content, bacterial load, and phase separation. Statistical analysis was performed using the independent t-test and chi-square test, considering a p-value of $p < 0.05$

Results: International cosmetic brands demonstrated superior performance in organoleptic parameters and exhibited smoother textures compared to national brands. The physical testing showed greater homogeneity and consistency among the international cosmetic range. The pH analysis showed that several locally manufactured moisturizers exceeded the pH range, with average values of 4.5-6.0; however, products from international brands remained consistent. The chemical profile showed higher moisture and fat content in the national brands, whereas the microbial count was slightly higher among the international brands, with a statistical significance of <0.001 . The phase separation was tested for both products and showed that international products maintained the smooth texture throughout the testing phase.

Conclusion: International cosmetic brands have demonstrated better compliance with quality standards, stability, and safety parameters. The study's findings highlighted the need for regulatory compliance for locally manufactured products, which should align with international benchmarks.

KEYWORDS: Cosmetics, Organoleptic properties, Creams, PH

INTRODUCTION

Cosmetic products are widely used for various purposes, such as personal hygiene, enhancing appearance, and beautification. Facial cosmetics such as moisturizers, creams, and cleansers are widely used on the skin to enhance beauty. Products applied directly to the skin require quality and safety assurance to prevent risks such as infections, skin irritation, and toxicity. 1-3

The complexity of the biological and chemical components in facial cosmetic formulations makes them more vulnerable to chemical and microbial contamination during production and storage, as well as during storage for consumer use. Studies have shown high bacterial counts of *Staphylococcus aureus* and other pathogens in cosmetic products 4-7

A few cosmetics have been found to contain hazardous substances, including lead, arsenic, cadmium, and nickel, which can penetrate the skin and cause dermal health issues in addition to microbial hazards. The dermatological problems are associated with the systemic toxicity associated with the use of cosmetic products. Cosmetic products are applied directly to the skin, worsening skin conditions through hazardous substances. 8 The implementation of quality and safety standards for cosmetic products has remained a matter of debate despite legal regulations and guidelines. Developing countries have many locally produced cosmetics in which standards are not fully followed and uniform quality-control procedures are not adhered to. Customers may face serious consequences, ranging from skin irritations to long-term health problems, due to noncompliance with standards and guidelines and variations in quality standards. 9

An assessment of the quality standards of facial products, like microbial load, chemical safety profile, and regulatory compliance, is essential across all demographic groups. To evaluate the quality and safety issues in the study among the various facial cosmetics found in the market.

The microbial load in cosmetic products has remained a major global concern; however, various studies have evaluated their quality, texture, contamination profiles, and fungal loads.

Consumers reported multiple health concerns about chemical safety, particularly heavy metals and microbial contamination in facial products. 11 The research has shown that metal involvement increases the risk of skin problems, and certain toxic metals that exceed limits have shown significant effects post-application; hence, these unforeseen outcomes have raised regulatory concerns. 12

Facial cosmetics are widely used worldwide for multiple purposes, yet raise safety and quality concerns in developing countries. The study aims to evaluate and compare the quality standards of cosmetics and adverse effects of selected national and international facial cosmetics products.

METHODOLOGY

A cross-sectional study was conducted to assess the quality standards of local and branded facial cosmetics available in the market locally. The study was conducted to assess the organoleptic properties; physicochemical and microbial factors were also evaluated using conventional laboratory procedures reported in the literature. Creams, face washes, sunscreens, and moisturizers across four categories were selected from the market. Each category included local and branded cosmetic products. To avoid bias, the analysis was performed after coding the cosmetics and maintaining them at the same temperature until the assessment. The reagents used for the analysis were of analytical grade. The organoleptic characteristics, such as color, Odor, and texture, were assessed using visual and manual techniques; however, the bacterial count and fungal load were assessed in the laboratory, and phase separation was performed using a centrifuge. The nutrient agar medium was used for the microbial examination in a laminar airflow cabinet under aseptic conditions. The serial dilutions were prepared after diluting 1 g of each cosmetic product in distilled water. The inoculated nutrient agar plates were incubated for 24 hours at 37°C. The statistical analysis was performed using SPSS version 23.

RESULTS

The organoleptic, microbial, and physicochemical characteristics of national and international brands were assessed, and it was shown that international brands had a smooth texture and a consistent appearance. By contrast, only a few locally manufactured cream samples were observed, with slight variations, low consistency, and comparatively poor texture.

Table No. 1: The Organoleptic Properties and Physical Properties of Cream

Product Type	National Brands (n=20)	International Brands (n=20)	p-value
Acceptable colour (%)	85%	95%	0.04
Pleasant Odor (%)	70%	90%	0.03
Smooth texture (%)	65%	95%	0.01
Homogeneous formulations (%)	75%	95%	0.02
Acceptable consistency (%)	70%	90%	0.04

The physical evaluation of the different brands was observed to be more uniform and consistent than that of the local brands. The creams, face washes, and sunscreen were within the range; however, the moisturizers were observed to have granular, unstable formulations. Several locally manufactured moisturizers, such as Olivia and Care Honey, exceeded the pH range (4.5-6.0), whereas the multinational products Neutrogena and Revlon stayed within the allowable range.

Table No. 2: The PH Values of Products (Mean ±SD)

Product Type	National Brands	International Brands	Recommended Range (4.5–6.0)	p-value
Creams	5.7 ± 0.5	5.6 ± 0.2	Within range	0.21
Face washes	5.9 ± 0.4	5.6 ± 0.2	Within range	0.03
Sunscreens	5.8 ± 0.3	5.6 ± 0.2	Within range	0.04
Moisturizers	6.6 ± 0.6	5.8 ± 0.2	Several exceed range	0.01

The results showed significant variation in the stability of cosmetics formulations between local and multinational brands. 30% of locally made products, specifically creams, showed phase separation. However, other international creams and cosmetics were found to remain stable during centrifugation. Similarly, 20% of national face washes showed instability, while international samples showed 100% firmness in their ingredients and full stability. Sunscreen from national brands also showed some stability; moisturizers showed stability across both national and international brands. The integrity of formulation was reinforced significantly in all groups and products with a p-value of 0.01

Table No. 3: The Stability of Creams (Phase Separation

Product Type	National Brands (n=20)	International Brands (n=20)	p-value
Stable formulations (%)	70%	95%	0.01
Phase separation observed (%)	30%	5%	0.01

The results for fat content in cosmetic products showed higher moisture and fat levels in locally manufactured products, along with a higher microbial count, compared to international brands. The stability testing revealed that international brands-maintained stability across formulations, whereas phase separation was significantly more prevalent among national brands in creams, face washes, and moisturizers. The international brands showed the positive impact of formulation integrity with a significant level of $p < 0.05$

Table no. 4: Comparative analysis of facial cosmetics products (International vs National)

Parameter	National Brands (Mean $\pm$ SD)	International Brands (Mean $\pm$ SD)	p-value
pH value	6.12 $\pm$ 0.45	5.58 $\pm$ 0.18	0.003
Moisture content (% w/w)	5.98 $\pm$ 1.12	3.42 $\pm$ 0.85	0.001
Total fat content (% w/w)	26.84 $\pm$ 4.21	20.31 $\pm$ 2.75	0.005
Spreadability (g·cm/sec)	3.42 $\pm$ 0.65	4.82 $\pm$ 0.51	0.002
Microbial count (CFU/g)	1780 $\pm$ 620	420 $\pm$ 180	
Phase separation (unstable) (%)	32%	4%	0.001

DISCUSSION

Cosmetic products are widely used for multiple purposes across the globe, hence making it mandatory that they be of high quality and not harmful. The implementation of quality and safety standards for cosmetic products has remained a matter of debate despite legal regulations and guidelines. Developing countries have many locally produced cosmetics in which standards are not fully followed and uniform quality-control procedures are not adhered to. Customers may face serious consequences, ranging from skin irritations to long-term health problems, due to noncompliance with standards and guidelines and variations in quality standards.

Our study assessed the properties and characteristics of national and international facial cosmetic products. The organoleptic analysis showed that certain national creams and face washes had poor texture and exhibited phase separation; however, the international brands were consistent and maintained a smooth texture. The results align with the literature, indicating that locally manufactured products may rely on inexpensive raw materials and chemicals, making them easier for consumers, whereas international formulations use quality materials and are hence more stable¹³⁻¹⁴

The organoleptic, microbial, and physicochemical characteristics of national and international brands were assessed, and it was shown that international brands had a smooth texture and a consistent appearance. By contrast, only a few locally manufactured cream samples were observed, with slight variations, low consistency, and comparatively poor texture. The results are supported by the literature on cosmetic emulsions, which reports rheological findings and repeatability; international standards for cosmetics provide uniformity and consistency. Worldwide, cosmetic companies invest in testing raw materials and their repeatability, thereby delivering high-quality materials and stability¹⁵.

The physical analysis revealed that the different brands were more uniform and consistent than the local brands. The creams, face washes, and sunscreen were within the range; however, the moisturizers were observed to have granular, unstable formulations. Several locally manufactured moisturizers, such as Olivia and Care Honey, exceeded the pH range (4.5-6.0), whereas the multinational products Neutrogena and Revlon remained within the allowable range. The importance of regulatory oversight, global quality standards, and adherence to global quality standards in the cosmetic production industry. The cosmetic products showed phase separation, and among the national brands, widely and need for dermatologically tested formulations and stringent enforcement of cosmetics standards in developing countries like Pakistan for consumers' safety¹⁶⁻¹⁷.

The study showed significant variation in the stability of cosmetic formulations between local and multinational brands. 30% of locally made products, specifically creams, showed phase separation, as reported in studies¹⁹⁻²⁰. However, other international creams and cosmetics remained stable during centrifugation, which supported our findings in studies²¹⁻²². Sunscreen from national brands also showed some stability; moisturizers showed stability across both national and international brands. The integrity of the formulation was significantly reinforced across all groups and products ($p=0.01$).

CONCLUSION

The study concluded that national and international facial cosmetics differ significantly in their safety profiles and quality requirements. Several local products exhibited pH variation and elevated microbial levels, along with instability, which can cause irritation and compromise on the safety of customers. The comparative analysis contributed to the broader need for cosmetic regulations and public health regulatory compliance for consumer products.

REFERENCE

1. Alshehrei FM. Microbiological Quality Assessment of Skin and Body Care Cosmetics by Using Challenge Test. *Saudi J Biol Sci.* 2024;31(4):103965. doi:10.1016/j.sjbs.2024.103965.
2. Almukainzi M, Alotaibi L, Abdulwahab A, Albukhary N, El Mahdy AM. Quality and Safety Investigation of Commonly Used Topical Cosmetic Preparations. *Sci Rep.* 2022;12:18299. doi:10.1038/s41598-022-21771-7.
3. Bashir A, Lambert P. Microbiological Study of Used Cosmetic Products: Highlighting Possible Impact on Consumer Health. *J Appl Microbiol.* 2020;128(2):598–605. doi:10.1111/jam.14479.
4. Assessment of Microbial Contamination and Metabolite Exposure in Cosmetic Products Used in Women's Beauty Salons. *PMC.* 2010.
5. Akhtar A, Kazi TG, Afridi HI, Khan M. Human Exposure to Toxic Elements Through Facial Cosmetic Products: Dermal Risk Assessment. *Regul Toxicol Pharmacol.* 2022;131:105145. doi:10.1016/j.yrtph.2022.105145.
6. Sami Alyahya R, AlHasson MA, Alhsaon MA. Assessing the Adverse Effects and Safety Concerns Related to Cosmetic and Skincare Products: A Systematic Review. *Cureus.* 2025;17(4):e81759. doi:10.7759/cureus.81759.
7. Kaushik M, Farooq U, Ali MS, et al. Safety Concern and Regulatory Status of Chemicals Used in Cosmetics and Personal Care Products. *Dermato.* 2023;3(2):131-157. doi:10.3390/dermato3020011.
8. Almukainzi M, Alotaibi L, Abdulwahab A, et al. Quality and safety investigation of commonly used topical cosmetic preparations. *Sci Rep.* 2022;12:18299. doi:10.1038/s41598-022-21771-7.
9. Rashed Noor, Nagma Zerine, Kamal Kanta Das, et al. Safe usage of cosmetics in Bangladesh: a quality perspective based on microbiological attributes. *J Biol Res-Thessaloniki.* 2015;22:10.
10. Cosmetics Preservation: A Review on Present Strategies. *Molecules.* 2018;23(7):1571.
11. Opoku Gyamfi, James Aboko, Edward Ankapong, et al. A systematic review of heavy metals contamination in cosmetics. *Cutan Ocul Toxicol.* 2024;43(1):5-12.
12. Draeos, Z. D. (2012). *Cosmetic dermatology: Products and procedures*. Wiley-Blackwell. – Discusses sensorial attributes (odor, texture, color) and their importance in consumer acceptance of cosmetics.
13. Tadros, T. (2016). *Emulsion formation, stability, and rheology*. Wiley-VCH. – Provides detailed insights into homogeneity, consistency, and rheological stability of cosmetic emulsions.
14. Lambers, H., Piessens, S., Bloem, A., Pronk, H., & Finkel, P. (2006). Natural skin surface pH is on average, below 5, which is beneficial for its resident flora. *International Journal of Cosmetic Science*, 28(5), 359–370. – Demonstrates the importance of maintaining acidic pH in skincare products for barrier function and microbiome balance.
15. Baki, G., & Alexander, K. S. (2015). *Introduction to cosmetic formulation and technology*. John Wiley & Sons. – Explains formulation stability, phase separation, and the role of emulsifiers and preservatives in cosmetic product integrity.
16. Mukherjee, S., & Mitra, A. (2019). Quality assessment of cosmetic creams marketed in India. *Journal of Applied Pharmaceutical Science*, 9(3), 45–52. – Comparative study highlighting microbial contamination and physicochemical variability in local vs. international cosmetic brands
17. Patil A, Bhide S, Bookwala M, Soneta B, Shankar V, Almotairy A, Almutairi M, Narasimha Murthy S. Stability of organoleptic agents in pharmaceuticals and cosmetics. *AAPS pharmscitech.* 2018 Jan;19(1):36-47.
18. Volnyanska OV, Mironyak MO, Myrhorodska-Terentieva VD, Avdienko TM, Nikolenko MV. Development of a cosmetic product for the face based on hyaluronic acid and honey. *Voprosy Khimii i Khimicheskoi Tekhnologii.* 2024 Sep 1;4:17-24.
19. Irfan M, Shafeeq A, Siddiq U, Bashir F, Ahmad T, Athar M, Butt MT, Ullah S, Mukhtar A, Hussien M, Lam SS. A mechanistic approach for toxicity and risk assessment of heavy metals, hydroquinone and microorganisms in cosmetic creams. *Journal of hazardous materials.* 2022 Jul 5;433:128806.
20. Suliman RS, Alghamdi SS, Ahmad D, Alghamdi RI, Alotaibi R, Alghwainm M, Aljammaz NA. Comparative analysis of the heavy metals content in selected colored cosmetic products at Saudi market. *Journal of advanced pharmaceutical technology & research.* 2021 Oct 1;12(4):430-4.
21. Redondo GL, Salas MF, Rojas MC, Corrales DG, Navarro EP, Barquero MR. Characterization and Comparison of Quality Management Systems for Cosmetic Products Worldwide. *International Journal of Drug Regulatory Affairs.* 2021;9(3):47-56.
22. Mehlala N. Determination of illegal and toxic ingredients in face creams.