

Cosmetic Science, Common Concern Related Health and Importance of Cosmetic Science in Pharmacy

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Abstract: Cosmetic science stands at the crossroads of art and chemistry, orchestrating a harmonious blend of innovation aimed at enhancing human appearance. It has journeyed through centuries, evolving from ancient beauty traditions into a modern, multidisciplinary discipline that shapes the core of the beauty industry. At its foundation, cosmetic science merges principles from chemistry, biology, dermatology, and even consumer psychology into a seamless practice. Rooted in cultural heritage and social customs, the field has progressed from simple, rudimentary preparations to highly precise and scientifically engineered formulations. The transformative leap came in the 20th century, when breakthroughs in chemistry and technology introduced advanced emulsifiers, preservatives, and synthetic pigments, revolutionizing the nature of cosmetics. Today, its scope surpasses mere aesthetics, addressing skincare health and ethical responsibilities. Modern research delves deep into active ingredients such as retinoid and hyaluronic acid, aiming to balance visual enhancement with dermatological well-being. The discipline also navigates complex aspects such as regulatory compliance, eco-friendly innovation, and the influence of evolving consumer preferences. In doing so, cosmetic science becomes a living canvas, reflecting human creativity while responding to societal and environmental demands. Looking ahead, the integration of nanotechnology, artificial intelligence, and sustainable formulations is set to redefine the industry. This ongoing journey embodies a unique interplay between scientific precision and cultural influence, weaving together a legacy that honors the past, addresses present challenges, and anticipates a future rich with possibilities.

Key words: Cosmetic science, Cosmetic formulations, Hyaluronic acid, Retinoid, Dermatology, Consumer psychology, Sustainable cosmetics, Regulatory compliance, Ethical beauty, Cosmetic chemistry.

I.INTRODUCTION

Cosmetic science, an intricate fusion of artistic expression and chemical innovation, has progressed from ancient beauty rituals into a sophisticated, multidisciplinary field that significantly influences the global beauty industry. Historically, adornment served as a reflection of cultural traditions and social standing, beginning with basic natural mixtures and advancing to today's precisely engineered formulations.(1) The 20th century marked a turning point, as rapid developments in chemistry enabled the creation of stable, effective products through the use of emulsifiers, preservatives, and synthetic pigments. In the present era, cosmetic science incorporates skincare benefits, exploring active compounds such as hyaluronic acid, retinoid, and antioxidants to ensure dermatological effectiveness (2). Ethical considerations, eco-friendly manufacturing, and strict regulatory oversight have become integral to the discipline. Industry responsiveness to consumer demands has driven ongoing adaptation in formulations and marketing strategies. With emerging technologies like nanotechnology and artificial intelligence, cosmetic science reflects the enduring human quest for beauty, health, and innovation. (3, 4, 5)

Overview of the Drugs and Cosmetics Act, 1940, and Rules, 1945

India's primary legal framework for regulating drugs and cosmetics is governed by the Drugs and Cosmetics Act, 1940, along with the Drugs and Cosmetics Rules, 1945. Together, these provisions ensure the safety, efficacy, and quality of products intended for public

use. The Act governs the import, manufacture, distribution, and sale of drugs and cosmetics, setting definitions, licensing protocols, and classification systems based on safety profiles. It also outlines procedures for clinical trials and quality checks. (6, 7) Enforcement is led by the Central Drugs Standard Control Organization (CDSCO) at the national level and State Drug Control Authorities within individual states. The Rules of 1945 serve as an operational guide to the Act, detailing procedures for licensing, labeling, packaging, and quality control. They also regulate import and export requirements, set fee schedules, and adapt to evolving global standards through periodic amendments. Together, they form a comprehensive system prioritizing public health, product quality, and innovation while fostering consumer trust. (8, 9)

Active Ingredients in Cosmetics

When evaluating skincare formulations, attention should focus on active ingredients—the functional components responsible for delivering results. For hydration, hyaluronic acid is widely recognized, while retinol is valued for anti-aging benefits. Antioxidants protect against oxidative stress, and preservatives, such as parabens or natural alternatives, ensure product longevity. Claims of “natural” or “organic” should be substantiated by recognized certifications to avoid misleading “greenwashing. (10)” Fragrances, dyes, and certain alcohols may cause irritation, particularly in sensitive skin, so hypoallergenic and dermatologically tested options are preferred. In baby care, mild, plant- derived ingredients without harmful additives are recommended. In men’s grooming, the focus should include targeted actives, sun protection, and alcohol content control to prevent skin dryness. Evidence-based selection and adherence to safety standards improve both consumer confidence and product performance. (11)

II.COMMON COSMETIC-RELATED HEALTH CONCERNS

1. Skin Conditions

Cosmetic products such as creams, lotions, powders, foundations, lipsticks, perfumes, and hair dyes may sometimes lead to different skin problems, particularly

in individuals with sensitive skin or when these products are overused. A frequent issue is contact dermatitis, which can be either irritant or allergic and may produce symptoms like redness, itching, burning, swelling, and even blisters due to certain ingredients such as fragrances, preservatives, or coloring agents. The use of oily or pore-blocking cosmetics can result in acne cosmetica, characterized by pimples, blackheads, and whiteheads. Products that contain alcohol or strong exfoliating substances may cause dryness, flaking, and a feeling of tightness in the skin. Some cosmetics can also trigger hyperpigmentation, leading to dark spots, especially if they cause allergic reactions or make the skin more sensitive to sunlight. Increased photosensitivity may further result in rashes or sunburn. Moreover, expired, contaminated, or shared cosmetic items can contribute to bacterial or fungal infections. Taking precautions such as conducting a patch test, checking expiration dates, avoiding the sharing of products, and selecting cosmetics suitable for one’s skin type can help reduce the risk of these skin-related problems.

- Acne: Characterized by pimples, blackheads, and whiteheads.
- Eczema (Dermatitis): Causes red, itchy, and dry skin due to inflammation.
- Rosacea: Redness with visible blood vessels and sometimes pus-filled bumps.
- Skin Cancer: Uncontrolled skin cell growth, often linked to UV exposure.(12)

2. Oral Health

Oral cosmetic products such as toothpastes, mouthwashes, whitening treatments, and lip care items may sometimes lead to oral health issues when used excessively or when they contain strong chemical ingredients. Certain toothpastes and mouth rinses with high fluoride content, alcohol, or intense flavoring agents can cause gum irritation, a burning feeling, or mouth sores in sensitive individuals. Overuse of teeth-whitening products may weaken the enamel, leading to tooth sensitivity and irritation of the surrounding gums. Lipsticks and lip balms may also trigger allergic reactions, dryness, or darkening of the lips due to the presence of artificial colors, fragrances, or preservatives. Additionally, using expired or

contaminated oral cosmetic products can increase the risk of infections in the mouth. Therefore, selecting appropriate products, following usage instructions carefully, and maintaining good oral hygiene practices are essential to prevent cosmetic-related oral health problems.

- Dental Caries: Tooth decay caused by acid-producing bacteria.
- Gingivitis: Gum inflammation due to poor oral hygiene.
- Periodontitis: Advanced gum disease involving tooth-supporting structures.
- Oral Thrush: Fungal infection producing white tongue patches.

Hair Disorders

- Alopecia: Hair loss due to genetic, hormonal, or medical factors.
- Dandruff: Flaking and itching from scalp imbalance.
- Split Ends: Hair shaft splitting from heat, chemicals, or dryness.
- Alopecia Aerate: Autoimmune-related patchy hair loss.
- Trichotillomania: Compulsive hair pulling.

Nail Disorders

- Fungal Nail Infection: Thickened, brittle, discolored nails.
- Ingrown Toenails: Nail growth into surrounding skin.
- Nail Psoriasis: Pitting, ridges, and discoloration.
- Onychophagia: Chronic nail biting.
- Beau's Lines: Horizontal nail depressions linked to illness or trauma.

Body Cavity-Related Issues

- Urinary Tract Infections (UTIs): Painful bacterial infections in the urinary system.
- Gastrointestinal Disorders: Conditions like gastritis, IBS, and IBD.
- Reproductive Disorders: Endometriosis, PCOS, sexually transmitted infections.
- Respiratory Conditions: Asthma, COPD, and infections.
- Pelvic Inflammatory Disease (PID): Infection of female reproductive organs, often from STIs.(13)

3. Facial Care Essentials

Facial care essentials include the fundamental products and steps needed to keep the skin clean, healthy, and radiant. An effective skincare routine generally consists of cleansing, toning, moisturizing, and applying sunscreen. Cleansers are used to eliminate dirt, excess oil, makeup, and other impurities, helping to prevent clogged pores and breakouts. Toners help restore the skin's natural pH balance, minimize the appearance of pores, and provide a refreshing effect. Moisturizers are important for maintaining hydration, keeping the skin smooth, and protecting the skin barrier from dryness. Sunscreen plays a crucial role in shielding the skin from harmful ultraviolet (UV) rays, thereby preventing sunburn, early signs of aging, and dark spots. Depending on individual skin needs, additional products such as exfoliants, serums, and face masks may also be incorporated. Maintaining a consistent skincare routine tailored to one's skin type helps promote overall skin health and prevents common skin issues.

A. Cleansing

- Use a gentle facial cleanser suitable for your skin type.
- Cleanse twice a day (morning and night) to remove dirt, oil, and makeup.
- Avoid hot water as it can strip natural oils; use lukewarm water instead.
- Gently pat your face dry with a soft towel to avoid irritation.

B. Moisturizing

Apply a moisturizer to keep the skin hydrated.

Choose a product based on your skin type:

- Oily skin – lightweight, oil-free moisturizer
- Dry skin – rich, hydrating cream
- Combination skin – balanced formula

Apply moisturizer while your skin is slightly damp to lock in hydration. (14,15)

C. Sun Protection

- Use sunscreen with at least SPF 30 daily, even on cloudy days.
- Reapply every two hours when outdoors.

- Don't forget areas like the neck, ears, and back of hands.
- Use broad-spectrum sunscreen for UVA & UVB protection. (16)

4. Eye Hygiene

Eye hygiene involves maintaining proper cleanliness and care of the eyes to avoid irritation, infections, and other related complications. The use of eye cosmetics such as kajal, eyeliner, mascara, eye shadow, and contact lenses can sometimes lead to redness, itching, watering, or infections if they are not used correctly. Sharing eye makeup, applying products with unwashed hands, or using expired items can increase the risk of bacterial contamination. Failing to remove eye makeup properly may block the oil glands of the eyelids, which can result in problems like styes or conjunctivitis. Additionally, wearing contact lenses for extended periods without proper cleaning and care may cause discomfort and eye infections. Therefore, practicing good eye hygiene—such as washing hands before touching the eyes, avoiding the sharing of cosmetics, regularly replacing eye products, gently removing makeup before sleeping, and following appropriate lens care instructions—is important for maintaining healthy eyes.

- Avoid touching or rubbing your eyes to prevent irritation.
- Use a clean, damp cloth to gently wipe the eyelids.
- Keep pillowcases and makeup brushes clean to avoid infections.

5. Eye Care Products

Eye care products are specially formulated items intended to maintain the health, comfort, and appearance of the eyes and the delicate skin around them. These include eye drops, contact lens cleaning solutions, under-eye creams, gels, serums, as well as cosmetic products like mascara, eyeliner, and eye shadow. Lubricating or medicated eye drops are commonly used to ease dryness, irritation, redness, and allergic symptoms, while contact lens solutions help in cleaning, disinfecting, and safely storing lenses. Products designed for the under-eye area help reduce puffiness, dark circles, and fine lines by

providing hydration and nourishment to the sensitive skin. However, incorrect usage, sharing products, or using expired items can result in irritation, infections, or allergic responses. Therefore, selecting reliable products, following proper instructions, maintaining hygiene during application, and replacing items when necessary are important steps to ensure eye health and safety.

- Remove all eye makeup completely before bedtime.
- Renew eye makeup every 3–6 months to reduce the risk of bacterial buildup.
- Keep makeup in a cool, dry place, shielded from direct sunlight, to maintain its quality.
- Use cool compresses to reduce puffiness or swelling.

6. Lifestyle Tips for Healthy Skin & Eyes

Keeping the skin and eyes healthy depends largely on maintaining positive daily habits along with proper personal care. Eating a nutritious diet that includes essential vitamins, minerals, and antioxidants—particularly vitamins A, C, and E—supports skin health and protects vision. Staying well-hydrated by drinking enough water helps maintain skin softness and prevents dryness, while also keeping the eyes properly lubricated. Adequate sleep is important because it allows the body to repair and refresh the skin and helps reduce eye strain and dark circles. Regular physical activity boosts blood circulation, which enhances the skin's natural glow and benefits overall eye function. Protecting the skin and eyes from strong sunlight by applying sunscreen and wearing UV-protective sunglasses is also essential. Additionally, avoiding smoking and managing screen time can help prevent early skin aging and reduce stress on the eyes. Practicing these healthy lifestyle habits consistently can promote clear skin and comfortable, healthy eyes.

- Drink at least 2–3 liters of water daily.
- Eat foods rich in vitamins A, C, and E for skin and eye health.
- Get 7–8 hours of quality sleep each night
- Manage stress with relaxation techniques (yoga, meditation). (17)

7. Personal Care and Hygiene Practices in Cosmetic Science

Personal hygiene and care are essential components of cosmetic science, as they contribute to maintaining cleanliness, health, and an attractive appearance of the skin, hair, nails, and body. Good hygiene habits such as regular bathing, proper hand washing, oral cleanliness, hair maintenance, and wearing clean clothes help prevent the accumulation of dirt, sweat, and harmful microorganisms. In cosmetic science, it is important to identify individual skin types, scalp conditions, and sensitivities in order to choose suitable products like face washes, moisturizers, shampoos, deodorants, and dental care items. Safe cosmetic use also involves carefully reading labels, checking expiration dates, and reviewing ingredients to reduce the risk of irritation or allergic reactions. Beauty tools such as makeup brushes, sponges, and combs should be cleaned frequently to avoid contamination. Sharing cosmetics should be avoided because it can transmit infections. Furthermore, storing products properly and using them according to instructions helps maintain their quality and safety. Overall, combining proper hygiene practices with informed cosmetic selection supports better health and minimizes cosmetic-related issues.

Skin Hydration

Maintaining optimal skin hydration is essential for overall skin health. Moisturizers should be selected according to skin type—whether oily, dry, or combination—to ensure balanced moisture levels. Consistent application after cleansing helps lock in hydration and strengthen the skin barrier (18, 19).

Sun Protection

Daily application of broad-spectrum sunscreen with an SPF of at least 30 is vital, even on overcast days. Reapplication every two hours during sun exposure helps reduce the risk of premature aging, hyperpigmentation, and skin cancer.

Eye and Eyelid Care

Good ocular hygiene includes avoiding unnecessary touching or rubbing of the eyes to prevent irritation. The eyelids can be gently cleansed using a clean, damp

cloth. When using eye cosmetics, complete removal before bedtime is crucial to avoid bacterial buildup, and makeup products should be replaced periodically for hygiene purposes.

Oral and Gum Health

Effective oral hygiene entails brushing twice daily with fluoride toothpaste and flossing once a day to eliminate plaque between the teeth. Regular dental check-ups and professional cleanings support the prevention of cavities, gingivitis, and periodontitis. The avoidance of tobacco products significantly reduces the risk of oral cancer and gum disease.(20)

Hair and Scalp Care

Hair should be washed regularly using a mild shampoo, with the frequency adjusted according to hair type and lifestyle. Conditioning focuses on the hair tips to maintain smoothness while avoiding the scalp in oily hair types. Gentle scalp massage can enhance blood circulation, and minimizing heat styling helps prevent structural damage.

Lip Care

to prevent dryness and chapping, lip balms—preferably with SPF—should be applied regularly. Gentle exfoliation removes dead skin cells, while excessive lip licking should be avoided as it contributes to dryness.

Nail and Cuticle Maintenance

Keeping nails clean and trimmed reduces the risk of bacterial or fungal infections. Regular miniaturization of cuticles supports nail health, while refraining from nail biting helps prevent damage and infection.

Neck and Body Care

Daily cleansing with mild soap or body wash removes sweat, oil, and environmental pollutants. Body moisturizers maintain skin softness and prevent dryness. Sunscreen should also be applied to exposed areas of the neck and body during outdoor activities.

Odor Control

The use of deodorants or antiperspirants effectively manages underarm odor. Formulations should be selected based on skin sensitivity and personal preference. (21,22)

III.IMPORTANCE OF COSMETIC SCIENCE IN PHARMACY (10)

Cosmetic science is an important branch of pharmaceutical education that focuses on the formulation, development, evaluation, and safety of cosmetic and personal care products. In pharmacy, it bridges the gap between healthcare and beauty care by applying scientific principles to ensure that cosmetic products are safe, stable, and effective for human use.

1. Formulation and Development of Cosmetic Products

Pharmacists are trained in pharmaceutics, chemistry, and pharmacology, which helps them design and prepare various cosmetic formulations such as creams, lotions, ointments, gels, shampoos, conditioners, lip balms, and sunscreens. They understand the role of different ingredients like emulsifiers, preservatives, antioxidants, humectants, and fragrances. This knowledge ensures that products have proper consistency, stability, and therapeutic or protective effects.

2. Safety and Quality Assurance

Cosmetic products are applied directly to the skin, hair, nails, and oral cavity. Therefore, their safety is very important. Pharmacists study toxicology and microbiology to evaluate possible side effects such as skin irritation, allergic reactions, photosensitivity, and infections. They also perform quality control tests like pH determination, stability testing, microbial limit tests, and compatibility studies to maintain product standards.

3. Knowledge of Skin and Hair Physiology

Cosmetic science provides detailed knowledge of skin structure, hair growth cycle, and scalp conditions. This helps pharmacists recommend suitable products according to skin type (dry, oily, combination, sensitive) and hair type. It also helps in understanding conditions like acne, dandruff, pigmentation, and premature aging.

4. Patient Counseling and Professional Guidance

Pharmacists play a key role in guiding patients about the correct selection and use of cosmetic and cosmeceutical products. They can advise on medicated cosmetics such as anti-acne preparations, anti-dandruff shampoos, sunscreens, depigmenting agents, and anti-aging creams. Proper counseling reduces misuse and prevents adverse effects.

5. Regulatory and Legal Aspects

Pharmacy students learn about cosmetic regulations, labeling requirements, and legal standards set by authorities. This ensures that products manufactured and marketed are safe, properly labeled, and comply with regulatory guidelines.

6. Career Opportunities

Cosmetic science opens various career paths in cosmetic industries, pharmaceutical companies, research and development (R&D), quality control (QC), quality assurance (QA), product testing laboratories, marketing, and regulatory affairs.

7. Contribution to Public Health

By ensuring safe cosmetic practices and promoting hygiene, pharmacists help prevent skin disorders, infections, and other cosmetic-related health problems. Thus, cosmetic science supports overall health and well-being.

IV.CONCLUSION

Cosmetic science is a rapidly growing and interdisciplinary field that combines principles of pharmaceutics, chemistry, dermatology, and toxicology to develop safe and effective products for skin, hair, and personal care. In recent years, cosmetics have moved beyond beautification and now play a significant role in maintaining skin health, preventing damage, and improving overall quality of life. With increasing consumer awareness and demand for scientifically validated products, cosmetic science has become an essential area of study within pharmacy. Common health concerns related to cosmetics include skin irritation, allergic reactions, contact dermatitis, photosensitivity, acne formation, and long-term safety

issues associated with preservatives, colorants, and fragrances. Improper formulation, contamination, and misuse of products may further increase health risks. Therefore, scientific evaluation of ingredients, stability studies, safety assessment, and regulatory compliance are crucial to ensure consumer protection.

The importance of cosmetic science in pharmacy lies in its foundation on drug delivery principles, formulation technology, stability testing, and quality control. Pharmacists possess the knowledge of skin physiology, excipient compatibility, and regulatory standards, making them well-equipped to design, evaluate, and counsel patients regarding cosmetic products. Cosmeceuticals, which bridge the gap between cosmetics and pharmaceuticals, further highlight the expanding role of pharmacy professionals in research, product development, and patient education. In conclusion, cosmetic science is not merely about aesthetic enhancement but is closely linked to health, safety, and therapeutic care. Its integration into pharmacy education and practice strengthens product innovation, ensures consumer safety, and supports the development of evidence-based cosmetic formulations. As the cosmetic industry continues to expand globally, the role of pharmaceutical expertise will remain vital in advancing safe, effective, and scientifically sound cosmetic products.

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