

## МЕДИЦИНА

UDC 349.3

DOI <https://doi.org/10.32689/2663-0672-2024-3-1>

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### THE IMPACT OF MAKEUP ON SKIN HEALTH: BENEFITS AND RISKS

The article is devoted to the study of the impact of decorative cosmetics on skin health, in particular, assessing its potential benefits and risks. **The goal** is to analyse the components of cosmetic products, determine their possible effects on the skin, and assess consumers' awareness of the ingredients and possible consequences of makeup use.

The research was conducted by analysing literary and informational sources related to the composition of cosmetic products and their effects on the skin. Additionally, a questionnaire survey was used, in which 294 female students aged 16 to 22 participated. The obtained data were analysed using statistical tools, particularly the STATISTICA 7.0 program.

73.5% of respondents use decorative cosmetics daily, with most choosing mascara, foundation creams, and lipstick. The analysis of popular cosmetic products' composition revealed the presence of potentially harmful components, such as lead, cadmium, chromium, and other heavy metals, which may hurt the skin and the body as a whole. The level of consumer awareness about harmful ingredients and the expiration date of cosmetics was low, which increases the risk of allergic reactions and other dermatological issues.

**The study's results** indicate the need to raise consumer awareness about the ingredients and potential risks of using decorative cosmetics. The findings can be used by a wide range of professionals in the field of cosmetology and the production of cosmetic products. This information will also be helpful to consumers considering alternatives, such as green cosmetics, which contain safer ingredients and may become one of the effective ways to reduce the negative impact of makeup on the skin.

**Key words:** decorative cosmetics, skin health, toxic components, heavy metals, green cosmetics, consumer awareness, allergic reactions.

### Юлія Довжанин. ВПЛИВ МАКІЯЖУ НА ЗДОРОВ'Я ШКІРИ: КОРИСТЬ І РИЗИКИ

Стаття присвячена дослідженню впливу декоративної косметики на здоров'я шкіри, зокрема, оцінці її потенційних переваг і ризиків. **Метою** є аналіз компонентів косметичних засобів, визначення їх можливого впливу на шкіру, а також рівня обізнаності споживачів про склад та можливі наслідки використання макіяжу.

Дослідження проводилося шляхом аналізу літературних та інформаційних джерел, які стосуються складу косметичних засобів та їхнього впливу на шкіру. Додатково використовувався метод анкетного опитування, у якому взяли участь 294 студентки віком від 16 до 22 років. Отримані дані були проаналізовані за допомогою статистичних інструментів, зокрема програми STATISTICA 7.0.

Встановлено, що 73,5% респонденток використовують декоративну косметичку щоденно, при цьому більшість обирає туш для вій, тональні креми та губну помаду. Аналіз складу популярних косметичних засобів показав наявність потенційно небезпечних компонентів, таких як свинець, кадмій, хром та інші важкі метали, які можуть мати негативний вплив на шкіру та організм у цілому. Рівень обізнаності споживачів про шкідливі інгредієнти та термін придатності косметики виявився низьким, що підвищує ризик виникнення алергічних реакцій та інших дерматологічних проблем.

**Результати** дослідження вказують на необхідність підвищення рівня інформованості споживачів про склад та можливі ризики використання декоративної косметики. Результати дослідження можуть бути використані широким колом фахівців в галузі косметології та виробництва косметичних засобів. Дана інформація також буде корисна споживачам, які розглядають альтернативу використанню зеленої косметики, яка містить безпечніші інгредієнти, може стати одним із ефективних шляхів зменшення негативного впливу макіяжу на шкіру.

**Ключові слова:** декоративна косметика, здоров'я шкіри, токсичні компоненти, важкі метали, зелена косметика, обізнаність споживачів, алергічні реакції.

**Statement of the problem in general and its connection with significant scientific or practical problems.** Makeup is an integral part of many people's lives, used to enhance individuality, boost confidence and create an aesthetically pleasing appearance. However, despite its popularity, there is a controversial question about how makeup affects skin health [1, 2]. Some believe modern cosmetic products developed

using innovative technologies can protect the skin and improve its condition. Others emphasise makeup risks, such as irritation, acne, allergic reactions and other dermatological problems. The problem lies in the lack of understanding of the impact of makeup ingredients on the skin, especially with long-term use [3]. Despite the wide range of cosmetic products, there is no clear information on how different ingredients interact

with the skin and what conditions can contribute to developing adverse effects. The subject of this article is related to important scientific and practical tasks, such as dermatological studies of the effects of cosmetics on the skin and the development of safe formulas for their use [4]. Studies on this topic have contradictory results, which makes it challenging to create a clear picture of the impact of makeup on skin health [1, 5]. Therefore, there is a need for a comprehensive analysis of the impact of makeup on the skin, including both positive and negative aspects and risks of using cosmetics, as well as developing recommendations for their safe use.

**Recent research and publications analysis.** O. Korobkova studied the methodology and effectiveness of using creamy textures in decorative cosmetics to ensure long-lasting makeup, which became the basis for analysing the components used in cosmetic products [1]. V.O. Lebedynets, I.S. Kazakova, and V.S. Kazakova made an essential contribution to the study of medicinal cosmetics and the evaluation of their effectiveness, which made it possible to study the relationship between the components of decorative cosmetics and their effect on skin health [2]. T.F. Kharchenko and colleagues analysed the problem of cosmetics being contaminated with toxic elements, which helped assess the health risks to consumers associated with using makeup and their possible consequences [3]. J. Gorski and co-authors studied the use of dexpanthenol for wound healing after cosmetic procedures, which helped to understand ways to improve the skin condition after the use of decorative cosmetics [4]. A.S. Rodrigues and colleagues provided important information about green cosmetics, their environmental benefits and role in reducing the risks associated with the use of conventional cosmetics,

which was part of the analysis of the article [5]. E. Herawati and L. Yulastri focused on developing and evaluating Secang stem extract in decorative cosmetics, which helped to highlight the use of natural ingredients in cosmetic products [6]. O. Kuchmistova et al. studied the development of a new medicinal and cosmetic product in the form of lipstick, which made it possible to evaluate the latest approaches to creating safer cosmetic products [7]. F. Teixeira and co-authors studied the impact of makeup on children's skin health and the importance of its careful use, which allowed to consider the prevention of skin diseases when using decorative cosmetics [8]. B. I. Meena and co-authors conducted a study on the presence of toxic metals in makeup and nail products, which contributed to an understanding of the potential risks to skin health when using makeup [9]. A. B. Y. Yakovlev and O. A. G. Golanova highlighted the clinical and mycological problems of the use of decorative cosmetics, which allowed for a deeper understanding of the possible dermatological risks associated with the use of cosmetics [10].

**The study aims** to investigate the impact of decorative cosmetics on skin health, assess its potential benefits and risks, and analyse the level of consumer awareness of cosmetics' composition and impact on the body.

**Materials and methods of the study.** For the study, a comprehensive analysis of thematic literature and information sources was carried out, as well as the composition of individual samples of decorative cosmetics based on the information provided by manufacturers on product labels [9, 10]. The literature review provided up-to-date data on the effects of cosmetics ingredients on the skin, their safety and possible health risks. To collect the primary data,

<p>1. Age:                  16–18 years old                  19–20 years old  <input type="checkbox"/> 21–22 years old</p> <p>2. How often do you use makeup?  <input type="checkbox"/> Daily                  3–5 times a week                  1–2 times a week  <input type="checkbox"/> Rarely (less than 1 time per week)  <input type="checkbox"/> Never</p> <p>3. What types of cosmetics do you use most often? (you can choose several options)  <input type="checkbox"/> Foundation/base                  Powder  <input type="checkbox"/> Lipstick/lip gloss  <input type="checkbox"/> Eye shadow  <input type="checkbox"/> Mascara  <input type="checkbox"/> Eye pencil/eyeliner  <input type="checkbox"/> Other (specify) _____</p> <p>4. Do you have allergic reactions or irritations to certain cosmetic products?                  Yes                  No                  If yes, please specify which products: _____</p>	<p>5. How often do you check the composition of cosmetic products before buying them?  <input type="checkbox"/> Always  <input type="checkbox"/> Often  <input type="checkbox"/> Sometimes                  Rarely  <input type="checkbox"/> Never</p> <p>6. Do you know what cosmetics ingredients can harm the skin?                  Yes                  No  <input type="checkbox"/> Partially</p> <p>7. Have you experienced any skin problems that you think could be related to using cosmetics?                  Yes                  No                  If so, what kind of problems:                  Acne  <input type="checkbox"/> Dry skin  <input type="checkbox"/> Redness or irritation  <input type="checkbox"/> Other (specify) _____</p> <p>8. Do you pay attention to the expiry date of cosmetics?  <input type="checkbox"/> Always  <input type="checkbox"/> Often</p>
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<input type="checkbox"/> Sometimes <input type="checkbox"/> Rarely <input type="checkbox"/> Never 9. Do you use cosmetics with natural or organic ingredients? Yes, often <input type="checkbox"/> Sometimes No <input type="checkbox"/> Don't know 10. Does the use of cosmetics affect your self-esteem? Significantly increases Slightly increases <input type="checkbox"/> Does not affect	<input type="checkbox"/> Slightly reduces Significantly reduces 11. What sources of information do you use to learn about cosmetic product safety? (you can choose several options) <input type="checkbox"/> Internet (articles, blogs, social media) <input type="checkbox"/> Recommendations from friends or family <input type="checkbox"/> Dermatologist's advice Labels and product descriptions <input type="checkbox"/> Advertising Other (please specify) _____ 12. Do you have any additional comments or suggestions on the impact of cosmetics on skin health? ____
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we used a questionnaire survey method, which was conducted using a questionnaire developed by the authors.

**Questionnaire to study the impact of cosmetics on skin health.** *Instructions:* Please answer the questions in this questionnaire about using makeup and its impact on skin health. Your answers will help us study the problem's relevance and raise awareness of possible risks. All answers are anonymous and will be used for research purposes only.

The survey covered 294 female students of Ukrainian universities aged 16 to 22. The questionnaire included questions about the frequency of cosmetics use, types of cosmetics, and possible skin problems associated with the use of cosmetics.

The collected data was organised in an electronic format for further processing. The research results were statistically analysed using STATISTICA 7.0 and Microsoft Excel.

**Results.** Cosmetic products regularly applied to the skin, mucous membranes, hair, and nails must be safe for users' health [1, 2]. In recent years, this issue has become a growing concern as the quality and safety of cosmetics are scrutinised by consumers and scientists [9, 10]. Cosmetics have traditionally been associated with both women and men, essential in improving their appearance and boosting self-esteem and confidence. The manufacturing process of cosmetic products is strictly controlled through a system of inspection and licensing by state regulatory authorities. At the same time, imports of cosmetics are regulated by separate laws to ensure that products meet quality and safety standards. By definition, cosmetics are products intended to be applied to the human body for cleansing, beautifying, improving appearance or changing the appearance without changing the structure or function of the body [3]. However, despite the attractiveness and popularity of cosmetics, there is a growing public concern about the possible content of toxic substances in these products. The use of decorative cosmetics can pose a potential health hazard due to heavy metals and other toxic components in its composition. These substances can be found in cosmetics as intentional ingredients

(dyes, preservatives, UV filters) and as accidental contaminants that get into the products during production.

Lipstick is one of the most popular cosmetic products, and its components can come into direct contact with the body when eating, drinking, or licking the lips. Lipstick is known to often contain heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr), arsenic (As), mercury (Hg), cobalt (Co), and nickel (Ni) [7]. These metals can accumulate in the body and severely impact health [3].

– Lead (Pb): Lead has been detected in many lipstick samples, and levels can be dangerous even with regular use. Lead enters the body through the gastrointestinal tract or lungs, destroying red blood cells and reducing their ability to carry oxygen, which can lead to anaemia and other serious health problems [4].

– Cadmium (Cd): Cadmium is used in colour pigments and can be found in many cosmetic products. Studies show that cadmium can damage the cardiovascular system and is associated with diabetes and hypertension. Exposure to it can alter the function of hormonal glands, which can affect reproductive health [7].

– Chromium (Cr): Chromium is often found in lipstick and eyeliners. Even in small amounts, it is genotoxic and hepatotoxic, meaning potential damage to the liver and genetic material. Contact with chromium can cause skin irritation and ulcers, especially in people with hypersensitivity [3,7].

Mascara is one of the most popular cosmetic products among women. However, even this product can contain harmful ingredients such as preservatives, parabens, silicones, and heavy metals that can cause irritation to the eyes and skin around the eyes. Prolonged use of mascara with such ingredients can increase the risk of allergic reactions, dry and red eyes, and weakened and brittle lashes [4].

Heavy metals in decorative cosmetics can enter the body through the skin and the respiratory tract through accidental inhalation during product application [5]. They can affect various body systems, including the nervous, digestive, reproductive, and respiratory systems. Even low concentrations of heavy metals can

lead to cognitive impairment, metabolic disorders, and serious diseases such as cancer.

Green cosmetics, or biocosmetics, is a sustainable and environmentally friendly alternative to traditional cosmetic products [5, 6]. It uses natural ingredients derived from renewable sources, such as vegetable oils (e.g. coconut, almond, argan oils) and other natural ingredients such as aloe vera. The main goal of green cosmetics is to minimise the harmful effects on the skin and the environment, avoiding toxic chemicals often found in popular brands [8]. Green cosmetics have advantages, as natural ingredients are less likely to cause skin irritation, and their use can help improve overall health and beauty over time [5]. According to forecasts, the organic cosmetics market is expected to reach USD 25.211 billion by 2025, which indicates the growing popularity and demand for these products. Green cosmetics are developed by the principles of ecological chemistry, which consider both the impact of cosmetic products on human health and their environmental sustainability. Green cosmetics products aim to reduce the risks associated with using synthetic substances that can

cause allergic reactions or negatively impact the environment. According to research, young female consumers, particularly in the Ukraine region, agree that the government should support the production of green cosmetics and promote their popularisation. However, one of the problems is the lack of consumer awareness of the benefits and properties of these products [8]. This indicates the need for active marketing, including labelling and certification of green cosmetics, to raise awareness among buyers. The benefits of green cosmetics include using natural ingredients, which reduces the risk of skin allergies and irritations. The production of green cosmetics is less harmful to the environment, as such products do not contain harmful chemicals [3]. Green cosmetics are not tested on animals and have environmentally friendly packaging.

The survey results found that all the respondents use decorative cosmetics. The frequency of use of cosmetics was distributed as follows: 73.5% of respondents prefer daily makeup, 8.8% use cosmetics about three times a week, and 5.9% use cosmetics only on weekends. In addition, 11.8% of respondents

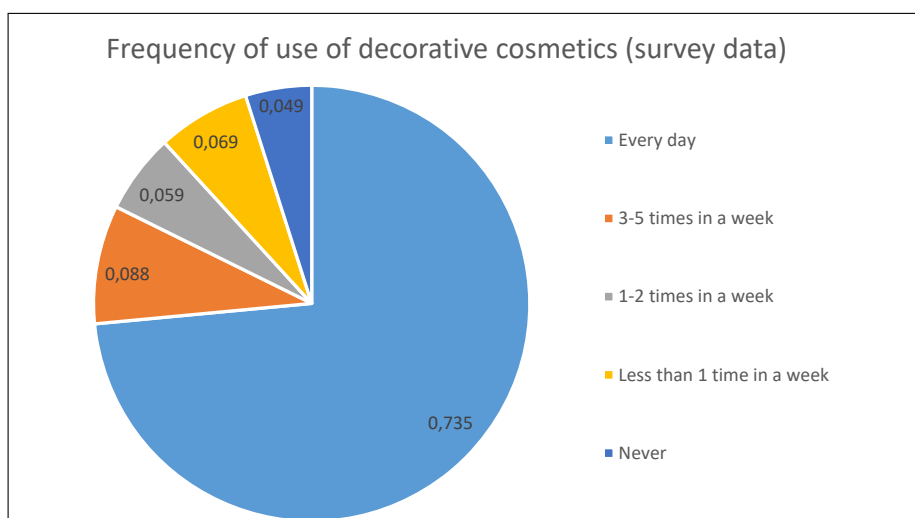


Fig. 1. Frequency of using decorative cosmetics among female respondents (survey results)

Table 1

Observed and predicted values of make-up use among youth

	Observed	Predicted	Residual	Standard	Standard	Std.Err .	Mahalanobis	Deleted	Cook's
1	0.78500	0.78401	0.000985	1.787290	0.028167	0.034965	3.196827	1.241942	314,903
2	0.03800	0.05771	-0.019715	-0.435441	-0.563624	0.028894	1.929312	-0.062061	0.537
3	0.059000	0.03158	0.027418	-0.515417	0.783824	0.021722	0.742482	0.044626	0.157
4	0.049000	0.05805	-0.009057	-0.434395	-0.258927	0.033786	2.931826	-0.135093	3,479
5	0.069000	0.068631	0.000369	-0.402037	0.010562	0.034977	3.199554	3.311451	2240,302
Minimum	0.038000	0.031582	-0.019715	-0.515417	-0.563624	0.021722	0.742482	-0.135093	0.157
Maximum	0.785000	0.784015	0.027418	1.787290	0.783824	0.034977	3.199554	3.311451	2240,302
Mean	0.200000	0.200000	0.000000	-0.000000	0.000000	0.030869	2,400,000	0.880173	511,875
Median	0.059000	0.058057	0.000369	-0.434395	0.010562	0.033786	2.931826	0.044626	3,479

wear makeup exclusively for special occasions, such as holidays or significant life events (Fig. 1).

The statistical evaluation of the results presented in Figure 1 is given in Table 1.

The following conclusions can be drawn based on the statistical analysis of the observations:

1. Observed & Predicted Values:

- The observed values ranged from 0.038 to 0.785.
- The predicted values had a very close range from 0.031582 to 0.784015.
- The average value for both the observed and predicted values was 0.200, indicating a good level of agreement between these values.

2. Residuals:

- The residual values, which show the difference between the observed and predicted values, ranged from -0.019715 to 0.027418.
- This indicates that the model can accurately predict the outcomes, as the residuals have a small absolute value.

- The average residual value is 0, meaning the predictions have no systematic error.

3. Standard Predicted Values & Standard Residuals:

- The standard residuals range from -0.563624 to 0.783824.
- This indicates a slight deviation from the mean, which suggests that most predictions are pretty accurate.

4. Mahalanobis Distance:

- The value of Mahalanobis Distance varies from 0.742482 to 3.199554.
- This is a measure of each observation's distance from the centre of the data, taking into account correlations between variables. Values in this range indicate that the distance is acceptable for detecting possible anomalies or outliers in the data.

5. Deleted Residuals and Cook's Distance statistics:

- The removed residuals range from -0.135093 to 3.311451, indicating some potential deviations, although they remain within the acceptable range.
- The Cook's Distance statistic varies considerably, with a maximum value of 2240.302. This may indicate that several points significantly affect the model and may require further analysis or exclusion from the data set.

6. Main statistical characteristics:

- Minimum value: 0,038000
- Maximum value: 0,785000
- Average value: 0,200000
- Median value: 0,059000

In general, the statistical analysis indicates that the model predicts the results well, although a few outliers require more detailed consideration. The high Cook's Distance value for some observations may indicate that some data points significantly impact the model and should be analysed separately to avoid bias in the results.

It was also found that a significant proportion of female students pay attention to the composition of cosmetics, checking the information on the label before buying. However, only a tiny percentage of respondents are aware of the possible risks associated with certain ingredients in cosmetics and regularly choose products with natural or organic ingredients.

The survey found that all the participants were already well aware of a wide range of decorative cosmetics and actively used various products to improve their appearance. The most popular product among female students was mascara, which was regularly used by 91.2% of respondents [3]. An analysis of the composition of these cosmetic products showed that they often contain ingredients such as silicone, PEG-6, sorbitan stearate, propylparaben, butyl hydroxytoluene, titanium dioxide, aluminium powder and various dyes. Some of these components are known to cause allergic reactions or skin irritation, increasing consumer health risks.

The second most popular product among female students was foundation, which was used by 73.5% of respondents at the time of the survey. This indicates that essential skin care products for creating an even complexion are an integral part of the cosmetic arsenal of most young women. Other popular cosmetic products that students actively use include lipstick (used by 61.8% of respondents), powder (52.9% of respondents), eye shadow (41.2%), as well as eyeliner and blush, which are in the cosmetic bags of 38.2% of the survey participants. Lip concealer and lip pencils also remain in demand, with 26.5% of the girls surveyed using them.

Although many cosmetic products contain ingredients that can potentially affect skin health, only 74.5% of female students expressed interest in the composition of products when purchasing them. As for the shelf life of cosmetics, 28.6% of respondents overlooked this factor despite its importance in maintaining product safety and reducing health risks.

The survey results also showed that the main criterion for choosing cosmetics for most girls (71.4% of respondents) is the product's affiliation with a particular brand, which indicates a high level of trust in brands and their reputation in the market. Current trends indicate an increase in demand for products from well-known brands that guarantee the quality and safety of their products. However, the composition and safety of ingredients are still essential aspects for a significant number of consumers.

**Limitations of the study.** The study was conducted among women aged 16 to 22 and considered cosmetic products available on the Ukrainian market.

**Discussion.** Makeup is an essential part of everyday life for many people, helping to create the desired appearance, increase self-confidence and emphasise individuality [1, 5]. However, the impact of makeup on

skin health remains controversial, as it can have both positive and negative effects [8].

Modern cosmetic products often contain active ingredients that can positively affect the skin. For example, moisturising foundations and primers help to retain moisture in the skin, protecting it from drying out. Some products contain antioxidants, sunscreens (SPF) and other ingredients that help protect the skin from the harmful effects of UV rays and free radicals. Thus, adequately selected cosmetics can act as a decorative element and as additional protection and skin care [5, 6].

Despite its possible benefits, makeup can cause several dermatological problems, mainly if used improperly or not adequately cared for. Wearing makeup for a long time can clog pores, leading to acne and other breakouts [8]. Some ingredients in cosmetics, such as fragrances, preservatives, and dyes, can cause allergic reactions, irritation, or even inflammation of the skin. In addition, using low-quality or expired products increases the risk of bacterial contamination, which can lead to infections [2].

The impact of makeup on skin health depends on the quality of the products, the frequency of their use and proper skin care. To minimise the risks, it is essential to choose cosmetics suitable for your skin type, regularly cleanse your face of makeup, and prefer products with natural and hypoallergenic ingredients [5]. Therefore, green cosmetics are an alternative type of decorative cosmetics. Despite its growing popularity, green cosmetics face specific challenges, such as limited consumer awareness and high production costs [6]. To further develop this industry, it is necessary to raise awareness

of the environmental and health benefits of such products and promote the development of more affordable and certified green cosmetics. Green cosmetics is a promising trend in the cosmetics industry, focused on reducing the harmful effects on the skin and the environment, and is becoming an essential element of a healthy and environmentally responsible lifestyle [1].

**Conclusion.** The article revealed the impact of decorative cosmetics on skin condition, particularly the potential benefits and risks of its use. The study included a review of scientific sources, an analysis of the composition of various cosmetics, and the results of a survey of young women on their use of decorative cosmetics. It was found that makeup can have both positive effects, giving the skin a well-groomed appearance, and adverse effects, such as skin irritation, allergic reactions or even more severe disorders due to the content of harmful substances. Particular attention should be paid to ingredients containing heavy metals and other potentially toxic components. A significant proportion of respondents used makeup daily, yet the awareness of these products' composition and potential risks remains insufficient. At the same time, there is growing interest in green cosmetics, which are positioned as a safer alternative to traditional products. This article also highlights the importance of further studying the impact of individual components of decorative cosmetics on skin health and the need to improve consumer awareness of safe products. The study results can be used to develop recommendations for the safe use of makeup and promote green cosmetics, which will help reduce health risks.

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