



HAIR COLORING AND CARE IN THE MODERN ERA: METHODS, PRODUCTS, AND TECHNIQUES FOR ALL AGES AND GENDERS

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ABSTRACT

In the modern era, hair coloring and care have evolved beyond their traditional roles of concealing gray hair or serving as gender-specific cosmetic practices. They now function as integral tools of self-expression, identity formation, and psychological well-being across all age and gender groups. This study aims to systematize and analyze contemporary methods, products, and techniques in both hair coloring and care, with an emphasis on their universal applicability. The research applies an interdisciplinary approach that integrates dermato cosmetology, psychology of image, and hairdressing practice. It includes a comparative analysis of traditional and creative coloring methods, assessment of hair care products, and a review of social and psychological studies on identity and well-being. The paper reviews a wide spectrum of coloring techniques (monochromatic dyeing, highlighting, toning, ombré, balayage, and color blocking) alongside care practices that maintain hair health and prolong color longevity. Special attention is given to the adaptation of these methods for different age groups, ranging from children and adolescents to adults and the elderly. The analysis highlights the importance of product safety, hypoallergenic formulations, and preliminary diagnostics of hair and scalp conditions. Furthermore, the study underscores the growing relevance of gender-neutral approaches, which prioritize freedom of style over traditional associations with femininity or masculinity. By integrating social and psychological perspectives, the findings demonstrate that appropriate choices in coloring and care positively influence self-esteem, social interaction, and overall psycho-emotional health.

Keywords: hair care, coloring techniques, gender.

INTRODUCTION

Nowadays, appearance is an important component of self-expression, social identity and emotional well-being. Hair coloring, as one of the most common cosmetic procedures, is no longer an attribute of youth fashion or women only. Today, this practice has gained universal meaning. It is actively used by people of all ages, gender identities, and social statuses. Changing hair color can have both aesthetic and psychological functions, including increasing self-esteem, social adaptation, and demonstrating individuality. This article explores modern methods and approaches to hair coloring that are effective, safe, and adaptable for any age

group and gender.

The article discusses the fundamental techniques, such as classic coloring, balayage, ombre, shatush, tinting, and natural coloring with henna or basma. Each of the methods is analyzed in terms of compliance with age and gender characteristics, hair type, scalp sensitivity, and the desired result. The principles of individual selection of coloring methods are revealed: taking into account the color type, stylistic preferences, and psychological needs of the customer.

The importance of consultations between the specialist and the client before the procedure is discussed. The focus is on gray hair coloring, preserving the structure of mature hair, and avoiding

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aggressive chemicals. For youth, the emphasis is on experimental colors, temporary coloring, and reducing hair damage. The importance of using approved dyes, allergy testing, adherence to application technology and aftercare for colored hair is emphasized.

LITERATURE REVIEW

Hair coloring is one of the most common cosmetic procedures that is deeply rooted in history and is actively developing today, taking into account modern technologies and socio-cultural trends. The literature widely discusses various methods of coloring, their features, as well as the impact of coloring on hair health and overall appearance. The first scientific studies on hair coloring focused on the chemical reactions of dyes, their toxicity, and long-term effects on hair structure [1]. Subsequently, attention has gradually shifted to the development of safer and more gentle dyes, including those of plant origin, such as henna and basma, as well as to the study of the impact of coloring frequency on hair health [2]. Current research shows that natural dyes have not only a cosmetic effect but also a positive effect on the hair structure, providing additional protection against damage [3].

In addition, there is a wide range of coloring methods that are selected according to age, hair type, health status, and desired result. While classic full hair coloring remains relevant, newer techniques such as balayage, ombre, shatush, and tinting have gained significant popularity due to their ability to create a natural look with the effect of volume and depth of color [4]. These techniques are especially appreciated by younger people who seek individuality but also want to maintain a natural look. For people of older age who are dealing with gray hair, special toning products can delicately mask gray hair without aggressively affecting the hair. The versatility of these methods emphasizes the importance of adapting to the specific needs of the client, which indicates the trend of individualization in the field of hair coloring.

The gender aspect of hair coloring is also being actively studied. Previously, coloring was considered a mainly female practice, but modern socio-cultural transformations have changed this approach. More and more men are using coloring to disguise gray hair or create a stylish look, and among non-binary and transgender people, coloring is an important tool for self-expression and identity affirmation [5]. In this context, there is a growing demand for gender-neutral coloring products and techniques that do not focus on traditional ideas about hair color, but offer a wide range of options for all categories of the population.

Coloring safety is one of the central areas of modern research. The use of synthetic dyes can be accompanied by the risk of allergic reactions, irritation, and damage to the scalp. Therefore, the scientific community is increasingly interested in the development of hypoallergenic products that would reduce the negative effects of coloring procedures. In addition, special attention is paid to methods of moisturizing and restoring hair after coloring, which allow maintaining its healthy appearance and structure [6]. This research area plays a key role in the development of recommendations for cosmetologists and consumers aimed at

long-term preservation of hair quality.

In general, the literature review demonstrates that modern hair coloring methods and approaches are highly diverse and adaptable, allowing them to satisfy the needs of people of all ages and genders. However, there is a need for further comprehensive research that will combine chemical, biological, and sociocultural aspects of coloring to create the safest, most effective, and most inclusive products and procedures. This is especially important in the context of the growing focus on sustainability and personalization in the beauty industry. Given all of these factors, further development of scientific approaches in this area is necessary to streamline coloring methods, decrease risks, and improve the overall user experience, regardless of age or gender.

METHODS

The study was conducted using a comprehensive approach that integrates both qualitative and quantitative methods to examine various hair coloring techniques suitable for individuals of all ages and hair types. The research design incorporates an extensive review of the existing literature, laboratory experiments, and surveys, enabling a thorough evaluation of both traditional and modern hair coloring technologies, their chemical composition, and their effects on hair condition.

An in-depth review of scientific publications, dermatological studies, and reports from the cosmetics industry published over the past two decades was undertaken. This process involved identifying the most commonly used natural and synthetic dyes, their application methods, and the associated benefits and risks. Particular attention was given to studies exploring age- and gender-related differences in hair structure, as well as the interaction between hair and dye formulations. This methodological framework provides a detailed and multidimensional understanding of hair coloring practices across diverse demographic groups and contributes to the advancement of personalized and safe hair color recommendations.

RESULTS

Coloring hair is one of the most widespread procedures in the field of modern aesthetic cosmetology and hairdressing, which allows you to significantly change or improve the appearance of a person. Thanks to hair coloring, it is possible to effectively emphasize an individual style, add novelty to the image, rejuvenate the appearance, hide gray hair or correct the natural hair color after exposure to external factors such as ultraviolet radiation, chemicals or aging processes. The dyeing procedure also plays an important psychological role, as a change of image is often associated with internal transformations, updating personal beliefs, or striving for new stages in life.

Today, there are many coloring methods and techniques that vary depending on age, gender, hair type and condition, as well as aesthetic expectations. The selection of a specific technique is based on individual characteristics: hair structure, gray hair, level

of damage, scalp sensitivity, and the desired result, whether it is radical or delicate. One of the basic and most commonly used methods is full or solid coloring. It involves the uniform application of one color along the entire length of the hair from root to tip. This method provides a uniform shade that can either match the natural color or differ from it in contrast [7].

Complete coloring is often chosen by those who seek a dramatic change in appearance or need to effectively mask gray hair. This method is also used as a preparatory stage before applying more complex multitone coloring techniques (e.g., balayage, ombre, or shatush) in order to create a single neutral

base [4].

The advantages of solid coloring include its relative ease of execution, predictability of the result, and the ability to use it independently at home (if one has the appropriate experience). The method is suitable for both women and men of all ages: from young people experimenting with the image to middle-aged and elderly people seeking to maintain a well-groomed appearance and neutralize the manifestations of age-related changes [5]. Therefore, full coloring remains a universal and widely used method of aesthetic correction of appearance, combining functionality, affordability, and the emotional effect of changes.



Figure 1 - Complete (solid) coloring.

Highlighting is one of the most popular partial hair coloring techniques, which involves selective lightening or darkening of individual strands in order to create the effect of depth, volume and visual dynamism of color. This method allows you to achieve the most natural look by combining several close or contrasting shades that are organically intertwined into the overall hair color. In contrast to solid coloring, highlighting does not involve complete coverage of the hair with coloring pigment, which significantly reduces the level of chemical load on the hair shaft and allows you to preserve its structure, elasticity and shine. Owing to its visual and practical advantages, this technique is widely used by both women and men, regardless of age. It is especially relevant for people who want to update their image without drastic changes or are unable to regularly dye their hair roots [3].

Melioration not only adds volume to the hairstyle, but also reduces the frequency of color correction, as growing hair looks more harmonious against the background of soft transitions between shades. There are several varieties of this technique, which differ

in the degree of expressiveness, application method, and artistic effect. Classic highlighting involves lightening individual strands along the entire length, which creates contrasting light accents in the hairstyle. Balayage is a softer and more blurred version, where the coloring composition is applied with a free technique to the tips or middle of the hair, which creates the effect of sun-bleached strands. Shatush is another variation of soft highlighting, which involves pre-combing the strands before applying the dye, which ensures blurred boundaries between shades.

Babylights is an ultra-fine highlighting that imitates the natural light shades characteristic of children's hair and gives the image of lightness and tenderness. The technique's versatility allows it to be adapted to different types of appearance, hair length and texture, as well as individual client preferences [8]. Given its visual appeal, relative safety, and ability to maintain aesthetic integrity even during regrowth, highlighting remains one of the most effective and popular techniques in the arsenal of modern hairdressing.

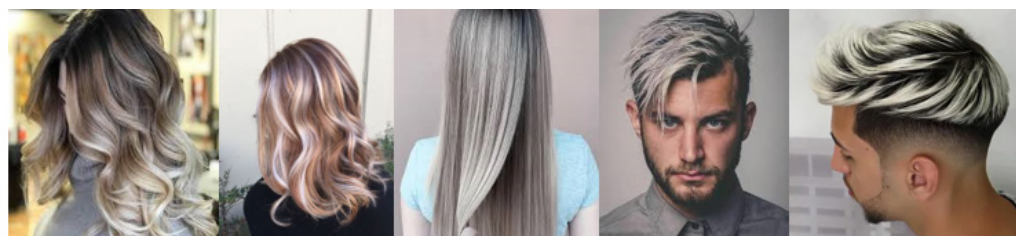


Figure 2 - Highlighting.

Hair tinting is a delicate coloring procedure that involves the use of semi-permanent dyes that do not contain any ammonia or other aggressive chemical components. The main feature of this method is a mild effect on the hair structure, since the dye

penetrates only the outer layers of the cuticle without disturbing the internal structure of the hair shaft. Thanks to this, tinting is considered one of the most gentle and safe procedures among all methods of changing hair color. This method allows you to

temporarily change or emphasize the natural shade, add shine to the hair, make the tone more saturated or, conversely, muted, and neutralize unwanted nuances after previous coloring, such as yellowness after lightening [9].

The main advantage of highlighting is its ability to gradually wash out of the hair over several weeks (usually 4-6), leaving no clear line between the colored and regrown parts, which makes it much easier to care for your hair. This is particularly true for people who do not want to regularly update their color or avoid frequent root correction. Owing to the absence of ammonia and oxidizing agents, tinting products not only do not destroy the hair structure, but can also have a caring effect: moisturize, close cuticle scales, and add softness and natural shine. That is why tinting is often used after bleaching or discoloration, as the final stage of the procedure, which allows to stabilize the color and improve the appearance of the hair [1, 10].

Toning is a universal coloring option that is suitable for both

sexes and different age groups. This method is most popular among young people and teenagers who want to experiment with style without fear of irreversible changes or hair damage. Also, toning is a great choice for people who are trying to change their hair color for the first time or want to achieve soft transitions between natural shade and colored areas. It is worth noting that, despite their softness, tinting products have a fairly wide range of color solutions, from natural nuances to bold fashionable shades, which allows you to implement creative ideas without harming the hair structure. In modern practice, toning is also actively used as part of complex coloring techniques, for example, after highlighting or balayage, to soften contrasts or to achieve a certain visual effect: warmer or cooler shade [6]. Thus, toning remains an important component of the palette of aesthetic transformation products that combines functionality, safety, temporary results and care effect, which is especially valuable for those who care about the health of their hair.



Figure 3 - Toning.

Ombre and sombre are modern techniques of multi-tonal hair coloring based on creating a gradient transition of color from a dark shade at the roots to a lighter one at the tips or vice versa. They belong to the category of contrasting but soft coloring, which allows you to achieve the effect of natural sunburn or delicate lightening of the lengths. Ombré (from French ombré - darkened) is characterized by a more pronounced, clear transition between shades, while sombré (from soft ombré - soft ombré) implies smooth, almost imperceptible boundaries between dark and light zones, creating the most natural look [11].

The main advantage of these techniques is the visual effect of lengthening the silhouette of the hair, making the hairstyle look more voluminous and textured. In addition, since it is mainly the

lengths that are colored, and the roots remain natural or close to natural tone, these methods do not require frequent touch-ups. This makes ombre and sombré convenient for those who want to keep their hair looking neat without the need for constant color renewal. This aspect is especially valuable for busy women or young mothers who are not able to visit a beauty salon regularly. These techniques also help to maintain a healthy hair structure at the roots, which has a positive effect on the overall condition of the hair.

Ombre and sombré are most often used on long hair, since it is the length that allows you to fully reveal the gradient effect and ensure a harmonious transition between colors. However, these techniques can also be adapted for medium length hair, especially

if the hairstyle has a layered haircut. The choice of palette is made individually, taking into account the color type of the appearance, stylistic wishes and the overall image. For instance, a dark chestnut color at the roots can gradually turn into a caramel, wheat, or ash tone at the tips, creating the effect of voluminous and shiny hair.

Although ombre and sombré are considered techniques with an average level of complexity, their implementation requires a professional approach, since creating a harmonious transition

without clear boundaries requires careful application of the coloring composition and a well-designed color stretching scheme. Since it is quite difficult to get a high-quality result at home, it is recommended to contact experienced colorists to achieve maximum aesthetic expressiveness. To summarize, ombre and sombré are not only trendy but also functional coloring techniques that are ideal for women and girls with long hair who want to combine naturalness of the image, visual depth of color, and practicality in care [12].



Figure 4 - Ombre.

Gray hair camouflage is a delicate and effective cosmetic procedure that involves light hair tinting to mask gray areas without drastically changing the overall color. This method is especially popular among middle-aged and older men who want to appear younger while maintaining the most natural and natural look. Camouflaging gray hair is accomplished by using special semi-permanent dyes that do not penetrate deeply into the hair structure, but only lightly cover its surface with a tinting layer that is gradually washed off over 3-5 weeks. This technology provides a natural effect of a light shadow or soft shade, without a clear impression that the hair has been colored artificially [13].

The camouflage procedure often requires no more than 20-30 minutes and does not involve complicated aftercare, making it an ideal choice for those who lead an active lifestyle or cannot spend much time visiting the salon. The use of warm, soft and rejuvenating tones, such as ash blonde, warm chestnut or dark blonde, allows not only to hide gray hair, but also to visually make the face fresher, give the hair shine and density. Due to the slight

darkening or tinting of gray hair, it begins to look thicker and more voluminous, which helps to improve the overall image. Camouflage does not create clear boundaries or overgrown roots, so it looks neat even a few weeks after the procedure [14].

This method is especially suitable for men who want to preserve their individuality and naturalness, but do not want the signs of age-related changes to affect their appearance too much. Unlike traditional coloring, camouflage allows you to preserve some of the gray hair; it seems to blur into the overall color, which creates a soft, harmonious look. Therefore, most men choose tinting or so-called natural camouflage instead of full coloring to avoid too obvious signs of cosmetic intervention. Through a combination of advantages such as speed, no harsh coloring effect, natural results, and a mild effect on the hair structure, gray hair camouflage has become an integral part of men's aesthetic practice in hairdressing. This procedure is ideal for middle-aged and older men who want to look well-groomed, confident, and modern without losing the natural authenticity of their style [2].

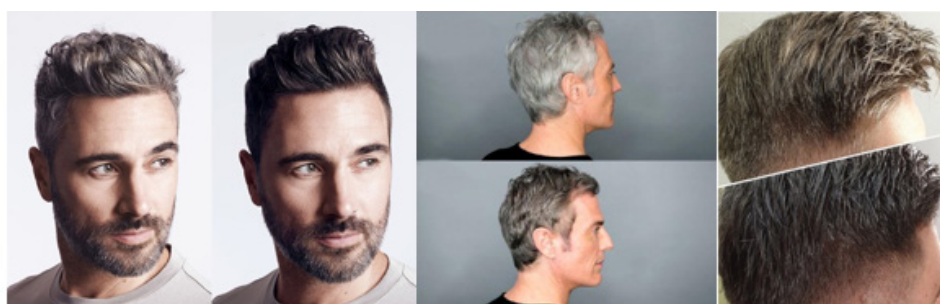


Figure 5 - Gray hair camouflage.

Creatively coloring hair, or dyeing it in fantasy colors, is one of the brightest and most expressive techniques in the arsenal of modern hairdressing. This approach to changing hair color involves the use of nontraditional, rich and eccentric shades, such as blue, pink, purple, turquoise, neon green, silver and white, as well as combinations of

several contrasting colors. Such a form of self-expression is most often associated with youth subculture, urban fashion, and individual creative vision of one's appearance. The creative coloring allows not only to change the appearance, but also to make it a kind of "field" for the realization of internal creative potential, manifestation of

personality, emotional state or artistic position.

The feature of fantasy coloring is its flexibility and variability: it can cover both the entire hair and only individual strands or zones (for example, the ends, bangs, and the lower layer of hair). This allows you to adapt the degree of expressiveness of the coloring depending on the context - for example, to make it brighter for a vacation or festival or less noticeable for everyday style using pastel or temporary dyes. Most creative coloring is performed with semi-permanent or direct pigments that do not contain ammonia and gradually wash off over several weeks, which makes it easy to change colors or return to a natural shade without harming the hair structure. In case of a more durable effect, permanent dyes are used, as well as the base is pre-lightened to ensure the purity and brightness of the tone [15].

This type of coloring is most often chosen by young people, teenagers, or representatives of creative professions, regardless of gender such as artists, musicians, designers, bloggers, actors, etc. For them, hair becomes part of a visual message, an element of image positioning, and a means of emotional expression. However, recent years have seen an expansion of the target audience: creative colors are increasingly being chosen by adult women who want to update

their appearance, break patterns, or fulfill long-held aesthetic desires. Especially popular are shades that create a metallic, chameleon, or gradient effect, as well as fashionable color application techniques such as color balayage, rainbow dyeing, pixel hair, etc. [16]

The selection of a coloring method largely depends on age, lifestyle, professional environment, and the degree of readiness for experimentation. Especially for teenagers and young adults, tinting, balayage, or creative coloring is most often recommended, as these methods allow you to realize individual stylistic ideas without long-term consequences and with the ability to quickly change your look. The physical condition of the hair is also important to consider, as some fantasy colors require preliminary bleaching, which can affect the quality and strength of the hair.

Therefore, creative coloring requires not only artistic vision, but also professional assessment and careful post-procedure care [17]. Therefore, creative coloring is not just a change of color, but a powerful means of personal identification, selfexpression, and artistic experimentation, which is becoming increasingly important in a world where individuality and visual communication are becoming integral components of social life.

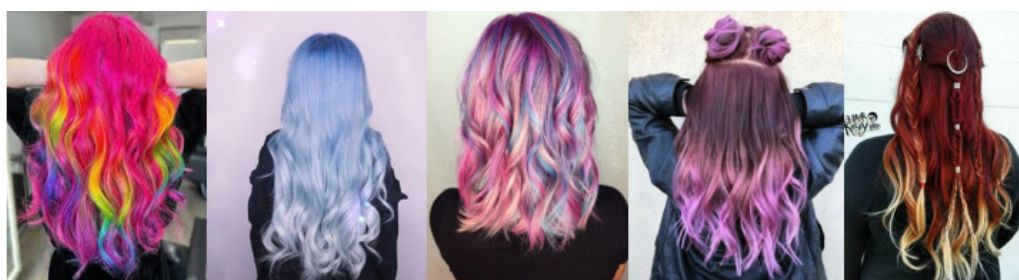


Figure 6 - Creative coloring.

In the modern practice of personalized hair care, the coloring technique is selected based on a number of factors: age, gender, physiological state of the hair, lifestyle, and aesthetic preferences. A well-chosen technique not only provides the desired visual result, but also helps to maintain hair health and self-confidence. The most appropriate techniques for adults are those that combine aesthetics and practicality, in particular: classic highlighting, full coloring in natural or deep shades, as well as ombre with smooth tone transitions. Elderly people mostly prefer to disguise gray hair with soft tinting or specialized colors that not only provide depth to the hair but also look younger and more well-groomed [18].

Taking into account gender specifics, women are usually open to a variety of coloring techniques, including modern and experimental ones: balayage, creative coloring, shatush or ombre with the effect of burnt-out hair. Men more often prefer more discreet techniques, such as gray hair camouflage, monochromatic tinting, or light highlighting, which preserves naturalness and does not create the visual effect of dyeing. In the case of weakened or damaged hair, it is recommended to use gentle products such as ammonia-free dyes, toners or semi-permanent products with additional moisturizing and protective components. This will avoid further degradation of the hair structure and at the same time give

the hair a well-groomed appearance.

For people with a dynamic lifestyle who are not able to update their coloring frequently, they should pay attention to techniques that do not require regular correction: balayage, sombré, or toning with a smooth color transition, which retain a tidy look even when hair grows back [12]. Youth, especially in the 20-30s, is often associated with a period of active self-expression, bold changes, and searching for one's own style. At this time, many girls and boys are experimenting with their appearance, in particular, with hair color. Thanks to the natural thickness and elasticity of their hair, young people have the opportunity to try a wide range of techniques: ombre, balayage, highlighting, full coloring, or even using creative, atypical colors such as pink, turquoise, platinum, or silver.

The most popular color solutions for young people include platinum blonde, rich copper, and trendy pastel colors. However, it should be borne in mind that bright pigments often require preliminary lightening, which can negatively affect the condition of the hair. Therefore, after such procedures, it is necessary to ensure proper care: regular moisturizing, the use of masks, thermal protection, and tinting agents to maintain color saturation [5]. With age, women are more frequently asking themselves the question:

what shade of hair can rejuvenate their appearance and make their face look fresh. There is no unambiguous universal answer, because the effect depends on the harmony of hair color with skin tone, eyes and overall appearance. Nevertheless, the right tone can not only rejuvenate the face, but also emphasize the natural beauty, make the features softer, the skin lighter, and the overall appearance more radiant.

Among the most popular rejuvenating colors for women over 40:

- Light blond - brings out the softness, brightens the face, ideal for a cold type of appearance.
- Dark brown - provides depth to the image, harmoniously combines with warm skin.
- Caramel blonde - perfect for women with olive skin tone, creates shine and warmth.
- Ash blonde is a choice for those with a cold color type, effectively masks gray hair and adds elegance.
- Dark gray with shine is a modern solution for the natural transition to gray hair, looks stylish and deep.

Importantly, it is necessary to remember that too cold or too gray tones can emphasize age-related changes. It is best to select soft, neutral-cool or warm tones in a professional palette. For those who seek minimal maintenance, bronze coloring is an ideal option a combination of deep roots with lightened lengths, which gives the face a bright look and allows for less frequent color updates [19]. Therefore, choosing a hair color is a tool for self-expression, harmony, and maintaining inner confidence. The right shade can emphasize natural beauty, make your face look fresh and youthful, and change your attitude towards yourself. The main thing is to listen to your own feelings, take into account individual characteristics and take care of your hair after any coloring procedure.

The needs of women for aesthetic procedures change with age: while in youth, the emphasis is on experimentation and bright self-expression, after 50, the key is to maintain harmony of appearance, emphasize natural beauty, and make the image light and fresh. A well-chosen hair shade after the age of 50 plays an extremely important role: it can visually throw off several years, revitalize facial features, make the skin lighter and the eyes brighter. Especially for women with a cold skin tone, for whom cool natural shades of chestnut, with subtle ashy or beige nuances, are considered optimal.

To naturally maintain the desired tone after dyeing, it is important not only to choose the right color, but also to ensure proper care. In particular, to maintain the purity of a cool shade, it is recommended to use specialized shampoos with blue or purple pigments once every few moments. This will help to neutralize warm undertones (for example, copper or reddish highlights) that may appear as a result of the dye washing off. Even a few weeks after dyeing, hair that has been properly cared for will continue to look well-groomed, bright and "young". Nevertheless, the general condition of the hair is no less important. No matter what color you choose, only healthy hair can look truly attractive. That is why it is extremely important to use professional dyes containing nourishing components, protective oils and complexes for reconstructing the structure. They ensure a long-lasting, even color without harming

the hair, as well as contribute to its shine, elasticity and volume.

Women over the age of sixty should focus on warm, soft shades that create the impression of radiant skin and rejuvenate facial features. Tones such as golden blonde, coppery blond, or honey add warmth to the appearance, soften facial contours, and create a freshness effect. At the same time, dark, saturated colors, especially black, can have the opposite effect - make the image harsh, accentuate wrinkles or age-related pigmentation changes. For this reason, it is recommended to avoid too dark coloring and choose more delicate, natural shades. Advanced techniques, such as ombre or balayage, are also great for older women. They allow you to lighten a part of the hair length without a sharp contrast with the roots, which adds naturalness and does not require frequent touch-ups.

Owing to soft color transitions, these techniques create visual volume, texture, and depth, which has a positive effect on the overall look of the hairstyle [16]. Specialists also recommend mixing several similar shades to achieve a complex, multifaceted color that looks vivid and natural. This gives the hair volume, visual mobility and masks individual gray strands without creating the impression of "artificial" color. Since the hair structure changes with age, it is advisable to consult a stylist or trichologist before coloring, who will help you choose not only the shade, but also the appropriate care products.

Besides color, a properly selected haircut can also provide a rejuvenating effect. Multi-layered hairstyles, medium lengths, bobs, and bangs (fringe) add dynamics to the image and mask age-related facial changes. In combination with warm or neutral coloring, they can transform a woman's look, give her confidence and emphasize her personality. Also, it is important to know which shades are best to avoid. Excessively deep black, ultra-platinum blond, or extremely intense red can make the look unnatural and accentuate skin imperfections, such as age spots or wrinkles. Therefore, you should strike a balance between a fashionable shade and harmony with one's own color type.

CONCLUSION

In the modern era, hair coloring and care transcend their purely aesthetic purpose and function as instruments of self-expression, psycho-emotional balance, and social identity. The analysis of contemporary methods demonstrates that effective practice requires an interdisciplinary approach, combining dermatocosmetology, psychology of image, cosmetic chemistry, and professional hairdressing. Adaptation of both coloring and care techniques to age, gender, physiological condition, and lifestyle is a decisive factor in achieving safe, sustainable, and aesthetically satisfying results.

For younger groups, the focus remains on experimentation and creativity, while middle-aged individuals prioritize natural tones, rejuvenating effects, and low-maintenance solutions. In older age, dermatological safety and gentle technologies come to the forefront, underscoring the importance of product quality and scalp health. At the same time, the growing popularity of gender-

neutral approaches emphasizes inclusivity, allowing individuals of any gender to freely choose styles and colors without reference to traditional stereotypes.

Overall, hair coloring and care today represent an integrated system where science and creativity converge to meet the diverse needs of all ages and genders. Personalized, evidence-based choices in both techniques and products not only enhance appearance but also strengthen psychological well-being and social integration, positioning hair care as a vital resource for personal harmony and identity in contemporary society.

REFERENCES

- [1] Friedman A.; Hudgins H.; Shi L.; Hekier A.; Dye dangers: harmful chemicals in hair coloring products and their health concerns. Environmental Working Group. 2024. Accessed June 1, 2025. <https://www.ewg.org/research/dye-dangers-harmful-chemicals-hair-coloring-products-and-their-health-concerns>
- [2] Kumar A.; Shamim H.; Nagaraju U.; Premature graying of hair: Review with updates. *Int J Trichology*. 2018;10(5):198–203. doi:10.4103/ijt.ijt_47_18.
- [3] Shahi Z.; Khajeh Mehrizi M.; Hadizadeh M.; A review of the natural resources used to hair color and hair care products. *J Pharm Sci Res*. 2017;9(7):1026–1030.
- [4] Noble, A.; The 11 Hair Color Trends That Will Dominate 2025. *Vogue*. 2024. Accessed June 1, 2025. <https://www.vogue.com/article/hair-color-trends-2025>
- [5] Kim KH.; Kabir E.; Jahan SA.; The use of personal hair dye and its implications for human health. *Environ Int*. 2016;89-90(4):222–227. doi:10.1016/j.envint.2016.01.018.
- [6] Murden, K.; The ultimate guide to caring for color-treated hair. *Vogue*. 2022. Accessed June 1, 2025. <https://www.vogue.com/article/how-to-maintain-colored-hair>
- [7] Adav SS.; Ng KW.; Recent omics advances in hair aging biology and hair biomarkers analysis. *Ageing Res Rev*. 2023;91:102041. doi:10.1016/j.arr.2023.102041
- [8] Yildirim A.; Demir NB.; Ak İzgi B.; Erkol BN.; Özsu Ç.; Eşlik Aydemir G.; Mustafaoğlu M.; Kızıl M.; Ayhan N.; Emen S.; The chemistry mechanism of hair dyes. *Middle East J Sci*. 2022;8(2):173–193. doi:10.51477/mejs.1172246
- [9] Schuttelaar ML.; Vogel TA.; Contact allergy to hair dyes. *Cosmetics*. 2016;3(21):1–6. doi:10.3390/cosmetics3030021
- [10] Turner GA.; Bhogal RK.; Hair and aging. *Skinmed*. 2016;14(5):338–343.
- [11] Obispo-Huamani RC.; Calva J.; Félix-Veliz LMV.; Chávez H.; Pari-Olarte JB.; Chavez-Espinoza JH.; Tinco-Jayo JA.; Enciso-Roca EC.; Herrera-Calderon O.; Evaluation of the antioxidant activity of three formulations of hair cosmetic products containing the essential oil of *Clinopodium bolivianum* (Benth.) Kuntze “inca muña”. *Cosmetics*. 2025;12(3):88:1–16. doi:10.3390/cosmetics12030088
- [12] He L.; Michailidou F.; Gahlon HL.; Zeng W.; Hair dye ingredients and potential health risks from exposure to hair dyeing. *Chem Res Toxicol*. 2022;35(6):901-915. doi:10.1021/acs.chemrestox.1c00427
- [13] Kwon S.; Lee S.; Jang J.; Lee JB.; Quantifying the effects of repeated dyeing: Morphological, mechanical, and chemical changes in human hair fibers. *Heliyon*. 2024;10(18):e37871. doi:10.1016/j.heliyon.2024.e37871.
- [14] Jang YN.; Seok J.; Park AY.; Lee WG.; Lee JM.; Kim YJ.; Kim SY.; Yoo KH.; Lee JO.; Kim BJ.; A comparison of dyeing efficacy between hair oxidation based and hair coating based shampoos for the treatment of gray hair. *Skin Res Technol*. 2023;29(6):e13383. doi:10.1111/srt.13383.
- [15] Wang H.; Kong L.; Xia H.; Huang JM.; Deng B.; Pan H.; Effects of age on the structure and bleaching/dyeing behaviour of hair. *Color Technol*. 2021;137(3):1–8. doi:10.1111/cote.12525
- [16] Hodes J.; Eschen B.; Kessler Becker D.; Gassenmeier T.; Neubert RHH.; Oxidative damage of human hair fiber: A comprehensive approach to determine protective effects of active ingredients. *Int Fed Soc Cosmet Chem Mag*. 2020;23(1).
- [17] Draelos ZD.; Hair care and dyeing. *Curr Probl Dermatol*. 2015;47:121-127. doi:10.1159/000369412
- [18] Goyal V.; Dev R.; Innovations in hair colouring methods: safe to safest-100% hair & scalp care for now generation, the ultimate hair colouring types- Quikhenna guide. 2025. Accessed June 30, 2025. <https://quikhenna.com/wp-content/themes/quikhenna/articles/article2.pdf>
- [19] Syed SM.; Holkar A.; Thore P.; Vaidya S.; Formulation and evaluation of herbal hair dye: A laboratory scale project. *Curr Cosmet Sci*. 2023;2:25–30. doi:10.2174/2666779702666230223121622