

Aging Differences in Ethnic Skin

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ABSTRACT

Aging is an inevitable and complex process that can be described clinically as features of wrinkles, sunspots, uneven skin color, and sagging skin. These cutaneous effects are influenced by both intrinsic and extrinsic factors and often are varied based on ethnic origin given underlying structural and functional differences. The authors sought to provide updated information on facets of aging and how it relates to ethnic variation given innate differences in skin structure and function. Publications describing structural and functional principles of ethnic and aging skin were primarily found through a PubMed literature search and supplemented with a review of textbook chapters. The most common signs of skin aging despite skin type are dark spots, loss of elasticity, loss of volume, and rhytides. Skin of color has many characteristics that make its aging process unique. Those of Asian, Hispanic, and African American descent have distinct facial structures. Differences in the concentration of epidermal melanin makes darkly pigmented persons more vulnerable to dyspigmentation, while a thicker and more compact dermis makes facial lines less noticeable. Ethnic skin comprises a large portion of the world population. Therefore, it is important to understand the unique structural and functional differences among ethnicities to adequately treat the signs of aging.

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Aging is a complex process in all human societies reflecting biological, environmental, and genetic influences. It is multidimensional, comprising physical, psychological, and social change that is also influenced by cultural and societal standards. The cutaneous effects can be described clinically as features of wrinkles, sunspots, uneven skin color, and sagging skin that are often varied based on ethnic origin.¹ In addition to inherited genetic traits, a multitude of other factors can modify the aging process, such as hormonal status and climatic, working, social, and cultural conditions.²

The association of youth and beauty is well accepted in modern day society. The human desire for homogenous skin color and texture, absence of wrinkles and sagginess, and lustrous hair has fueled the cosmetic and surgical industries. Botulinum toxin, blepharoplasty, and soft-tissue fillers are among the many popular cosmetic treatments that enable the improvement in wrinkles, eyelid sagginess, and volume loss, respectively. Women who possess a youthful appearance are consistently rated as more attractive than older-appearing women.^{3–9} In a cross-cultural study, across five populations, women were perceived as more attractive to the extent that their predicted ages were less than their actual ages.³ Even when interviewers are explicitly instructed to adjust for

age and sex of participants, looks of younger people are rated more favorably than those of older people.¹⁰ Studies on skin color and texture have demonstrated that humans have a preference for younger-appearing skin that is viewed as both healthier and more attractive.^{11–14} Skin texture studies have shown that the effects of skin color distribution can account for up to 20 years of perceived age.¹¹ Understanding the fundamentals of mature skin is important to an aging population where individuals are living longer and expected to be productive into later years, while holding the strong desire to maintain a youthful appearance.

Aging can be described clinically as features of wrinkles, sunspots, uneven skin color, and sagging skin. These cutaneous effects are influenced by both intrinsic and extrinsic factors and often are varied based on ethnic origin given underlying structural and functional differences. There are slight differences in the definitions of ethnicity and race; nonetheless, they are often used interchangeably in the medical literature. Ethnicity typically refers to broader groups of populations with a common culture and/or language, while race often represents a specific population in terms of genetic resemblance.¹⁵ In this article, the authors refer to ethnic skin as the broad range of skin phenotypes and

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TABLE 1. Key characteristics in ethnic skin and the dermatologic implications

CHARACTERISTIC	DERMATOLOGIC IMPLICATIONS
Increased tyrosinase activity leading to increased melanin content	Greater photoprotection, lower incidence of skin cancer, less pronounced photoaging, dyschromias
Larger, nonaggregated melanosomes	Greater photoprotection, lower incidence of skin cancer, less pronounced photoaging, dyschromias
Labile melanocytes and slower melanin degradation	Dyschromias
Thick dermis	Preserved skin elasticity, less pronounced photoaging
Larger, more numerous, multinucleated fibroblasts	Preserved skin elasticity, greater prevalence of hypertrophic scarring and keloids

complexions that characterize persons with darkly pigmented skin including those of African, African American, Asian, and Latino/Hispanic descent.

METHODS

Publications describing structural and functional principles of ethnic and aging skin were primarily found through a PubMed literature search and supplemented with a review of relevant textbooks and textbook chapters. Keywords included skin aging, ethnic skin, skin of color, youthful appearance, skin aging differences, and skin ethnic differences. Several articles were reviewed for relevancy from 1977 to March 2014, and 63 references were included. Literature included was of a variety of types including basic science research, randomized controlled trials, textbook articles, commentaries, and reviews.

INTRINSIC AND EXTRINSIC AGING

Aging is a biological reality with many contributing intrinsic and extrinsic factors. Similar to other organs, the human skin undergoes progressive functional decline due to the accumulation of molecular damage.¹⁶ Oxidative stress and molecular damage contribute to both chronological (intrinsic) aging and aging as a consequence of environmental factors (extrinsic). As a consequence, aged skin exhibits many differences than youthful skin and also has a marked susceptibility to dermatologic disorders

due to the structural and physiologic changes that occur with time.¹⁶ The main signs of aging can be classified into four main categories of wrinkles/texture, lack of firmness, vascular disorders, and pigmentation heterogeneities.¹⁷

Intrinsic aging reflects the genetic background of an individual and occurs with the passage of time. Intrinsically aged skin is typically smooth and unblemished.¹⁸ With chronological aging alone, elderly will exhibit thin skin with fine wrinkles, fat atrophy with soft tissue redistribution, and bone remodeling.^{16,18} People of color exhibit less severe intrinsic facial aging with signs appearing a decade later than lighter skin types.

Extrinsic aging relates to environmental exposures, health, and lifestyle that are associated with individual habits, such as sun exposure, tobacco use, diet, and exercise.¹⁸ Cumulative sun exposure is the most important extrinsic factor in aging skin. In skin types III to VI, dyspigmentation is one of the most common features of photoaging. Common clinical signs of photoaging include lentigines, rhytides, telangiectasias, dark spots, and loss of elasticity.¹⁸ Skin of color is less susceptible to sun-induced damage so these clinical manifestations of aging are less severe and typically occur 10 to 20 years later than those of age-matched white counterparts.¹⁹ Other extrinsic factors, such as smoking, excessive alcohol, and poor nutrition, can also contribute to premature skin aging.

ETHNIC STRUCTURAL AND FUNCTIONAL DIFFERENCES

Ethnic patients have natural features that are unique, and what constitutes beauty is determined by racial, cultural, and environmental influences.^{20,21} The most significant difference between people of color and Caucasians is the amount of melanin in the skin.²¹

Melanin is the major determinant of color in the skin, and the concentration of epidermal melanin in melanosomes is double in darker skin types compared to lightly pigmented skin types.²² In addition, melanosome degradation within the keratinocyte is slower in darkly pigmented skin. Overall, darker skin has singly dispersed, large melanosomes that contain more melanin compared with the smaller, aggregated, less melanin containing melanosomes that occur in lighter persons (Table 1). The melanin content and melanosomal dispersion pattern is thought to confer protection from accelerated aging induced by ultraviolet (UV) radiation.^{19,23} In fact, Kaidbey et al¹⁹ demonstrated that black epidermis, on average, provided a SPF of 13.4. Although the increased melanin provides protection from many harmful effects of UV radiation, including photodamage and skin cancers, it also makes darkly pigmented skin more vulnerable to dyspigmentation. Therefore, inconsistent pigmentation with both hypopigmentation and hyperpigmentation is a sign of photoaging in people with skin of color.

On a molecular level, there are multiple defined pigmentation genes, such as tyrosinase-related protein (TRP) family members, melanocyte-stimulating hormone (MSH), melanocyte-stimulating hormone receptor, and the

melanocortin-1-receptor, that also contribute to ethnic differences in pigmentation.²¹ TRP1 has been shown to increase tyrosinase activity, melanin synthesis, and melanosome size.²¹ This increase in tyrosinase activity and melanin synthesis can explain differential responses to UV light. Also on a molecular level, MSH increases DNA repair proteins, which protects against sun-induced DNA damage.^{21,24}

Another component of skin color is hemoglobin located at the dermal-epidermal junction in the papillary dermis. It is thought that skin color is due to the balance between hemoglobin and melanin with the redness associated with hemoglobin being concealed by melanin to different extents.²

Skin aging is also associated with progressive atrophy of the dermis and changes in the architectural organization leading to folds and wrinkles.²⁵ Asian and black skin has thicker and more compact dermis than white skin, with the thickness being proportional to the degree of pigmentation.²⁶ This likely contributes to the lower incidence of facial rhytides in Asians and blacks. In addition, darker skin types are thought to have more cornified cell layers and greater lipid content compared to white stratum corneum.^{27,28}

The major cell type of the dermis is the fibroblast, which synthesizes the main structural elements of the dermis. Black skin has been found to have more numerous, larger, and more nucleated fibroblasts, smaller collagen fiber bundles, and more macrophages than white skin.²⁹ Chronological aging reduces the life span of fibroblasts; their potential for division being lower in the elderly.²⁵ Fibroblast functionality and reactivity likely contribute to both the aging phenomena and abnormal scarring.

Structural facial aging. Aging in regards to structural changes is caused by the volumetric loss of fat, bone resorption, and redistribution of soft tissue. Superficial and deep fat has an even distribution in younger faces; however, as the face ages, fat atrophy and hypertrophy cause irregular topographic contouring.²¹ With age, atrophy develops on the temples, cheeks, and lateral chin. These gradual, yet dramatic, changes cause narrowing and elongation of the forehead with widening and shortening of the lower face.³⁰ There is also loss of lip volume and bone resorption of the mandible. Increased shadowing under the eyes and increased protrusion of the infraorbital fat pads also occur and contribute to an aged appearance. All of these underlying soft tissue changes contribute to the sagging appearance of overlying skin.³¹ These are general principles, and the aging process does have ethnocentric variability in regards to both facial structure and perceptions of beauty (Table 2). Anthropometry is the quantitative measurement and ratio of facial features to guide standards of attractiveness. A full discussion of anthropometry is beyond the scope of this article; however, a brief analysis of ethnic facial structure variation is provided (Figures 1 and 2).

The Caucasian face. Although the purpose of this article is to highlight aging in ethnic skin, the authors

ETHNIC GROUP	HIGHLIGHTED FACIAL STRUCTURE DIFFERENCES
Caucasian face	Narrower nasal base and larger tip projection, intercanthal widths identical to the African face, lips with less volume
East Asian face	Weaker facial skeletal framework, wider and rounder face, higher eyebrows, fuller upper lid, lower nasal bridge with horizontally placed flared ala, flatter malar prominence and midface, more protuberant lips, and more receded chin
Latino/Hispanic face	Increased bizygomatic distance, bimaxillary protrusion, broader nose, broad rounded face, and a more receded chin
African-American face	Broad nasal base, decreased nasal projection, bimaxillary protrusion, orbital proptosis, increased soft tissue of the midface, prominent lips, and increased facial convexity

briefly discuss the key attributes of the Caucasian face as a point of reference. The term Caucasian is commonly used to refer to the combination of physical attributes of individuals of European, Northern African, and southwest Asian ancestry.³² This group comprises those of lightly pigmented skin, demonstrated by small, aggregated melanosomes along with reduced amounts of melanin. The decreased epidermal melanin component predisposes Caucasians to develop earlier signs of photoaging than other populations. European Americans with low constitutive pigmentation have considerably higher burn response and lower tanning ability compared with Hispanics and East Asians.³³ In addition, Caucasian skin is exemplified by a thinner and less cohesive stratum corneum, reduced skin extensibility, along with loss of collagen and disorganization of the elastic fibers in the dermis with increasing age.¹⁵ These attributes result in clinically fragile skin and contribute to the aging process.

A large anthropometric study comparing different ethnic groups with North American Caucasians revealed that the most significant differences in facial proportions were in the orbital region, nasal heights, and nasal widths.³⁴ Caucasian intercanthal widths were identical to the African ethnic group, in contrast with the Middle Eastern and Asian groups that showed greater intercanthal widths with



Figure 1. Women, all over 60 years of age, with characteristic features of facial aging, from left to right: Caucasian, East Asian, Latino/Hispanic, and African.

smaller eye opening. A narrower nasal base and larger tip projection was noted in Caucasians compared to Asians and African Americans.³⁴

The Caucasian aged face has somewhat specific features and is typified by fine perioral and periorbital rhytides, skin sagging, and jowling of the neck with effacement of the cervicomental angle secondary to skin laxity.³⁵ On the upper face, the aging process presents as fine and deep rhytides in the forehead and glabella. In general, aging of the midfacial region occurs as the result of laxity of the upper and lower eyelids, pseudoherniation of the orbital fat pads, increased redundancy of soft tissue, and descent of the melolabial fat pad toward the nasolabial fold.³⁶ Bone remodeling of the superomedial and inferolateral orbital rims likely also contributes to brow ptosis and formation of crow's feet and lower lid lag, respectively.³⁷ The end result of these many changes is dermatochalasis or excessive skin of the upper lid, lengthening of the lower lid, prominence of the nasolabial folds, and a double convexity of the midface.³⁶ On the lower face and neck, the Caucasian face demonstrates sagging and jowling due to skin laxity, resulting in blurring of the cervicomental angle.^{30,37} Decreased lip volume and perioral lip lines are also more pronounced in Caucasian skin, likely due to a combination of muscle action and the deleterious effects of UV exposure on lighter skin.

The Asian face. The Asian population is quite diverse. Literature is limited and has typically focused on a particular ethnicity or a small number of outcomes in several Asian populations, mostly from East Asia. Although literature is limited and without a full, thorough comparison, there are many differences that have been noted. East Asians typically have less wide mouths, elongated intercanthal width, and wider lower nasal margins.³⁸ Studies suggest that Asians have a weaker facial skeletal framework, which results in greater gravitational soft-tissue descent of the mid-face, malar fat pad ptosis, and tear trough formation. It has also been proposed that the facial structure of Asians is similar to that of an infant,

including a wider and rounder face, higher eyebrow, fuller upper lid, lower nasal bridge with horizontally placed flared ala, flatter malar prominence and midface, fuller and more protuberant lips, and more receded chin.^{39,40}

Despite the large South East Asian population, limited studies have been conducted assessing facial structure. Overall, there is tremendous variability over such a large geographic area and diverse population. Despite this, it is generally accepted that those from the Indian subcontinent share more Caucasoid than Mongoloid anatomical traits of the skull and face. Compared to East Asians, South Asians typically possess eyelids that are on a more highly exposed platform, have well-developed nasal bridge with tip projection, and have comparatively darker and more uneven skin tones. Also, South Asians tend to have fuller lips and higher cheek bones with more buccal fat, often giving the lower cheek a more rounded contour. These features often provide physical support for the aging face more so than other Asian ethnicities.

Galzote et al⁴¹ evaluated facial skin of various Asian populations (from China, India, South Korea, Japan, and the Philippines) in different age groups. In regards to particular groups, they found that subjects from Japan generally had greater skin surface moisture across all age groups, while subjects from China had the highest average levels of transepidermal water loss (TEWL), indicating poorer stratum corneum barrier function.⁴¹ Across all Asian populations, skin surface moisture and TEWL generally decreased with increasing age (except for teenagers) with skin of subjects from the Philippines and India having the least variation with age.⁴¹ Those from Seoul, South Korea, and Calicut, India, had the highest sebum readings. Sebum content decreased with age, with the exception of subjects in the 25- to 40-year age group.⁴¹ With increasing female age, hormones such as estrogen lead to less sebum production by the sebaceous glands and reduced stratum corneum barrier function resulting in drier skin.⁴¹⁻⁴³ In regards to skin color, they found that subjects from Calicut, India, had the darkest skin while those from Sendai, Japan

had the lightest, with correlations of both melanin and erythema indices suggesting that skin color may be a reflection of both the melanin content and hemoglobin level in the skin, both higher in those with darker skin tones.⁴¹ Interestingly, with age, the melanin index increased, while the erythema index stayed the same in all Asian populations studied.⁴¹

The Latino or Hispanic face.

Akin to Asians, there is a wide variety of skin types and ethnicities comprising the term “Latinos” and/or “Hispanics.” The diversity of skin type plays a large role in skin response and facial structure differences. This group also has increased melanization, which provides enhanced protection against photoaging; however, they do develop skin mottling, jowl formation, infraorbital hollowness, and shadowing.^{21,44} Central and South American women often have similar anthropometric measurements to Caucasian women, while Caribbean

women measurements are often more similar to African American women.^{45,46} Those persons of Mexican descent often exhibit a broad face with prominent malar eminence and broad nose with widened alar base, short columella, horizontally oriented nostrils, and thick nasal skin.^{47,48} Overall, persons of Hispanic descent have increased bizygomatic distance, bimaxillary protrusion, broader nose, abbreviated nasal length, broad rounded face, and a recessed chin.^{21,49} They tend to have more sebaceous skin than Caucasian women and typically have rounder faces, with heavy eyelids and prominent midface area.^{35,50} Similar to African American facial aging, the midcheek area becomes thicker and heavier with fat pad accumulation and more prominent nasolabial folds, which is combined with eyebrow and eyelid drooping and lower lid fat herniation.³⁵

The African American face. The term African American encompasses multiple ethnicities and represents persons with a mixture of African, Caucasian, Afro-Caribbean, and Native American descent.³⁶ Generalizations on a global scale are often quite hard to make for this group as all these lineages will display unique facial structures and qualities. There are, however, some key features that do distinguish those of African ancestry from other racial groups. Those of African descent have more non-aggregated melanosomes that are more widely dispersed and carry more melanin. In addition to differences in pigmentation, the epidermis contains a thicker stratum corneum with more active fibroblasts when compared to Caucasian skin.³⁶ The increased fibroblast activity leads to collagen bundles that are compact and in a more parallel

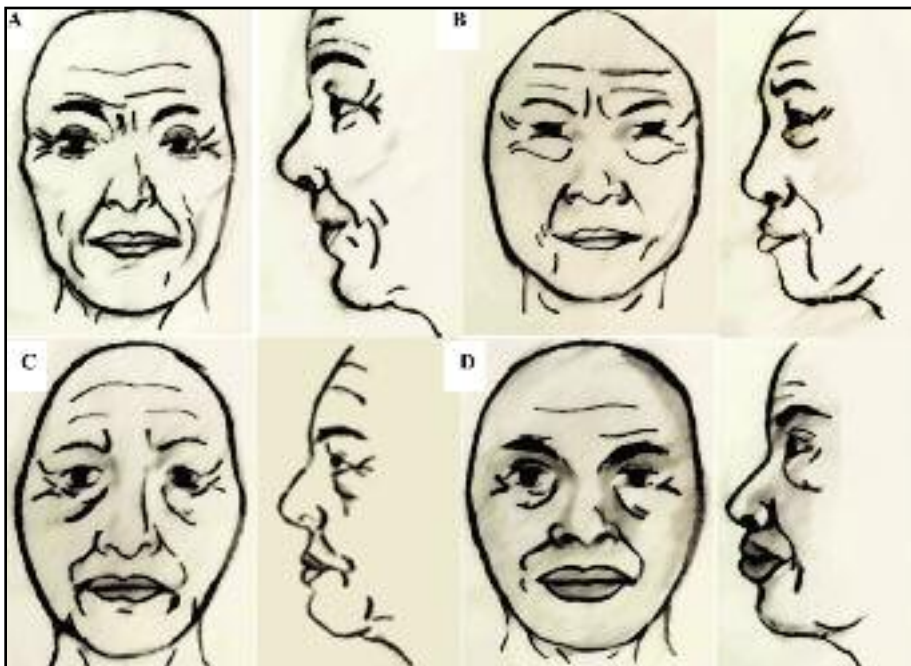


Figure 2. Features of facial aging in (A) Caucasian; (B) East Asian; (C) Latino/Hispanic; and (D) African American women.

orientation, creating skin that maintains its structural integrity and youthful appearance longer than those of lighter skin types.^{23,36}

Given the increased melanization of richly pigmented African American skin, this population does not develop as much UV-induced photoaging as those with lightly pigmented skin. However, these persons can exhibit pronounced sagging of the malar fat pads, soft-tissue laxity, and jowl formation of the mid-face.²¹ African Americans typically have a broad nasal base, decreased nasal projection, bimaxillary protrusion, orbital proptosis, increased soft tissue of the midface, prominent lips, and increased facial convexity.^{21,49} Of note, there is interethnic variability, with studies revealing two types of African American nasal structure, one with a high dorsum and one with a low dorsum.⁵¹

The unique skeletal morphology leads those of African descent to show facial aging in the periorbital region and midface more prominently than the upper face and brow.³⁶ It has been suggested that brow ptosis occurs to a lesser degree in those of African descent.⁵² The upper eyelids in African Americans are prone to soft tissue fullness, which is related to the position of the upper lid crease, being 6 to 8mm from the lid margin compared with 8 to 10mm in Caucasians.^{36,53} The relative ocular proptosis predisposes to infraorbital shadowing, which can contribute to the appearance of aging. In addition, opposed to the Caucasian face, which has a malar eminence that is in alignment with the corneal surface, the African face exhibits malar hypoplasia, created by a negative corneal surface. Soft-tissue jowling is also a sign of aging; however, as opposed

to the laxity and descent of Caucasian skin, it is the thickness and weight of African skin that contribute to jowling.^{36,53} Accumulation of submental fat and protuberant thick skin on the neck soften the cervicomental angle.³⁵ Lip aging occurs less so in African Americans as these persons have a decreased propensity to lose lip volume and form perioral rhytides.³⁶

PHOTOAGING

Extrinsic photoaging secondary to the effects of UV radiation leads to prematurely aged skin. It is characterized by coarse and fine wrinkling, mottled pigmentation, textural roughness, telangiectasia, and sallowness.²¹ Overall, ethnic persons have increased epidermal melanin and also a thicker dermis, thereby revealing less photodamage than lighter pigmented patients. In a study analyzing the heterogeneity of cheek skin color, age-related changes in melanin were detected in both Asian and Caucasian skin, and, furthermore, it was found that heterogeneity indexes of hemoglobin were significantly higher in Caucasian than Asian skin.⁵⁴

Although darker skinned persons have overall less rhytides, they do develop mottled pigmentation, rough skin, dermatosis papulosa nigra, seborrheic keratoses, and solar lentigines. In a study comparing age-matched Chinese women to Caucasian-French women, the groups did not differ in the assessment of lifelong sun exposure; however, the study revealed that although wrinkle onset was delayed by 10 years, pigmented spot intensity was much more prevalent in Chinese women as compared to French Caucasians.⁵⁵ In another study comparing 500 age-matched women from Japan and France, the groups displayed no difference with respect to smoking habits or self-reported lifetime sun exposure and revealed that solar damage and rhytidosis occurred at an earlier age and with increased severity in French than Japanese women.⁵⁶ In addition, the study revealed that pigmented spots occurred more frequently and earlier in life in Japanese women than in French women. Furthermore, Hillebrand et al. also looked at aging differences in 2 Japanese cities to evaluate geographic location and photoaging, confirming that photoaging occurred several years earlier in women from a city closer to the equator and with more UV exposure.⁵⁷ While many studies have suggested that pigment changes are the principal manifestations of photodamage in Asians, more recent studies have shown that wrinkles and laxity, followed by hyperpigmentation demonstrate the greatest change with increasing age, suggesting that these may be the best markers for clinical aging.^{41,58-60}

Intrinsic elasticity is defined as the ratio of the skin elongation to its return during exertion of negative pressure, while fatigability is defined as the difference between the return of the skin during the first and third applications of negative pressure.^{41,61} Galzote et al. found that skin elasticity consistently declined with age while fatigability increased with age across Asian populations studied, likely secondary to a combination of a decrease in

epidermal cell turnover and increase in collagen crosslinks.⁴¹ The increase in collagen crosslinks with age may be associated with advanced glycation end products (AGE), which may inhibit skin repair and cell turnover.^{41,61} The process of glycation starts quite early in life and varies according to diet and also ultraviolet exposure, which independently increases cross-linking in the skin.⁶² In addition, it has been shown that in Asian populations, differences in skincare habits correspond with variations in skin parameters; subjects with the least severe photodamage reported a generally early onset of their skincare habits related to sun exposure, facial cleansing, make-up usage, and sun protection product usage.⁴¹

CULTURAL DIFFERENCES

Irrespective of skin type, all individuals complain about dark spots and uneven skin color, but in different ways according to their ethnic origin. With age, Asian skin becomes darker and more yellow compared to Caucasian skin, which becomes darker and redder.¹² In regards to pigmentation and UV exposure, acceptable social norms also greatly differ between ethnicities. In the United States, many persons of all racial groups prefer the appearance of tanned, uniform skin and have concerns regarding uneven skin tone independent of underlying baseline pigmentation. These views differ worldwide. In South East Asia, many women prefer fair over tanned skin. Overall, uneven skin tone is a great concern and studies have shown that visible skin color distribution plays an important role in the perception of attractiveness.⁶³

SUMMARY

Across all skin types, the aging process involves photodamage, fat redistribution, bone shifting, and the loss of connective tissue. As life expectancy continues to increase, almost doubling over the past century, an aged appearance is becoming an increasing concern. Ethnic differences are clearly evident in today's society; however, as time elapses, the groups described in this article are becoming less homogenous and more heterogeneous through the intermixing of races, cultures, and ethnicities. Individuals with darker skin are overall thought to have firmer and smoother skin than individuals with lighter skin of the same age; however, aging does occur in regards to mottled pigmentation, wrinkles, and skin laxity. A comprehensive knowledge of the structural and functional principles of ethnic and aging skin is helpful to properly care for the aging skin of color population.

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