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The color of skin: psychiatric ramifications

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Abstract Skin color is one of the major attributes that defines both individual distinctiveness and differences between groups. There is a preference for lighter skin world-wide, among both light- and dark-skinned individuals, further leading to skin-color bias based upon skin-color hierarchy within certain ethnoracial groups. The psychiatric and psychosocial ramifications of skin color are important in several situations, including (1) disorders of skin discoloration (eg, vitiligo), which can significantly affect the psychosocial development of the patient especially when it has its first onset during adolescence; (2) widespread use of skin-lightening products, which are used despite knowledge about serious toxicity from inorganic mercury and potent corticosteroids that are some of their main constituents; (3) indoor tanning, which is a recognized carcinogen and practiced by over 50% of university-age adults and 20% of adolescents. Educating about photocarcinogenicity does not change tanning behaviors, which is strongly driven by peer pressure; and (4) when a psychiatric disorder, such as body dysmorphic disorder or major depressive disorder, is the primary basis for skin color dissatisfaction. Despite the role of complex sociocultural and psychiatric factors in clinical manifestations involving skin color, a supportive relation with the dermatologist can significantly aid the patient in managing their disease burden.

> "*I'm not going to spend my life being a color.*" *Michael Jackson, from lyrics to his song "Black or White"*

Introduction

In humans, variation in skin color represents one of the most noticeable genetic polymorphisms,[1] which has been associated with complex biological, psychologic, and sociopolitical ramifications[1,2] that have had a direct impact on human health. In nature, coloration plays a critical role in many functions, including social signaling, defense against predators, thermoregulation, and ultraviolet light.[3] Intense color often signifies the presence of the individual, such as during mating,[4] or may be used to display aggression and for warning.[4] Some animals can disperse their skin color or use dyes and stains for the purposes of camouflage.[4] Humans engage in conscious manipulation of color signals by the use of cultural tools, such as color cosmetics,[5] and this extended phenotype can significantly influence the perception of biologically important signals.[5]

Melanin is the main contributor of skin color in addition to hemoglobin and carotenoids.[6] Dark skin evolved in parallel with loss of body hair and is believed to represent the original

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state of the human species.[7] As a visually dominant species, interindividual differences in skin color are readily noted by humans, who use skin color as one of the major attributes to define both individual distinctiveness and differences between groups.[1,2]

The pigmentation of the human skin is believed to represent two major processes produced by natural selection, including (1) increased levels of the dark photoprotective eumelanin-rich pigmentation to protect against ultraviolet radiation near the equator and depigmented skin in the higher latitudes, and (2) low-ultraviolet B environments for sustenance of cutaneous photosynthesis of vitamin D_3.[1] Interestingly, Charles Darwin, who extensively studied the adaptations of organisms to different environments, did not make a causal association of skin pigmentation with climate and observed that the variations of skin color evolved primarily as a result of sexual selection.[1,8] Many primate species display remarkable sexual dimorphism in their pelage, anogenital, and facial skin coloration.[9]

Although sexual selection is not accepted as a major factor driving gradations in skin color, preference by men in some cultures of women with a lighter skin color, may have augmented the sexual dimorphism in skin pigmentation in some groups.[1,10] Carotenoid-based skin coloration, which is induced by fruit and vegetable consumption, may provide a cue to human health, particularly in light-skinned individuals,[11,12] and carotenoid-based skin coloration associated with increased fruit and vegetable consumption (which can affect skin color within weeks) may have a greater beneficial effect on health than melanin pigmentation.[11] The extent and intensity of carotenoid-based, yellow-red coloration of the skin, beaks, feathers, and scales in many vertebrate species, especially birds and fish, reflect the bearer's health status (such as parasitic infection-free status).[11]

In human research, participants tend to enhance the redness, yellowness, and lightness of the color of their facial images, when asked to optimize the apparent healthiness of their appearance, suggesting a role of high-carotenoid and low-melanin coloration in the healthy appearance of faces.[12,13] This overt indicator of health may have played a role in mate selection in visually dominant species, including humans.[11,12]

Earlier studies[14,15] of the relationship between skin color and attractiveness were carried out in American children of both European and African ancestry, using dolls, pictures, and scenarios in which black and white individuals were depicted. Both children of European and African ancestry demonstrated a prolight and antidark skin bias.[14,15] Initially, these findings were interpreted as representing a socioracial-based bias,[15] reflecting the children's experience in a multiracial society, where prejudice against dark-skinned persons was often encountered.[16] In subsequent studies, this socioracial interpretation was questioned, as children in countries with few white-skinned individuals demonstrated the same prolight/antidark skin bias.[16] This bias was later assessed as a visual physiologically based, possibly related to brain visual information processing and visual physiologic preferences for light colors in general.[17,18] An in-depth review of this complex topic is outside the scope of this contribution.

To assess the clinical implications of skin color, such as in the determination of race, the individual's cultural, economic, and sometimes sociopolitical backgrounds may have to be taken into consideration. Largely sociopolitical rather than biological factors have tended to play a role in determination of race.[19] For example, social scientists have observed that historically, sociopolitical and economic factors have influenced processes by which ethnic and racial boundaries have been defined in the United States.[19] Immigrant ethnic groups, such as the Italians and eastern European Jews, were initially classified as "nonwhite" and later considered "white."[19]

Historic perspective

Studies[2] of the history of the psychologic and sociocultural aspects of skin color have observed that a preference for light skin has been prevalent in diverse cultures, including cultures where individuals were already light skinned.[2] Lighter skin has been associated with various attributes, such as higher social status and greater happiness and success.[2] For example, historically ceruse or white lead was used to make the skin appear lighter in Greek and Roman times,[2] and the Egyptian queen Cleopatra is believed to have used a mercury compound to achieve lighter skin.[2] From the 8th to the 12th century in Japan, a make-up consisting of rice powder, white lead, and starch was used to achieve the appearance of pure white skin by both high-ranking men and women.[2]

Starting in the mid-16th century, the formulations of skin-lightening products, consisting of various proportions of mercury or lead compounds in addition to other ingredients, were developed independently in continental Europe and China and spread to Britain and Japan.[2] The popularity of these skin-lightening preparations and white makeup is reported to have increased despite the knowledge of the serious toxicity associated with the sustained use of these products.[2] For many this risk superseded the desire for social approval and advancement through light complexion.[2] In individuals who were already light skinned, pale and untanned skin was associated with both social privilege (signaling that the individual had the means to avoid outdoor labor and the means to be protected from the sun when outdoors, which were indications of higher social status)[2] and sexual desirability, as pale and untanned skin was associated with beauty and youth.[2]

Skin lightening took on a different role when it was adopted by individuals with darker skin, especially descendants of former slaves in the New World, and by individuals who experienced discrimination due to their darker skin color, as in these situations skin-lightening products were considered agents of social elevation and personal change.[2] "Colorism,"[2] which describes skin-color bias based upon skin-color hierarchy[2,20] within a certain ethnoracial group and systematic discrimination against the darker-skinned

individuals of the particular group, is a factor in the use of skin-lightening products by particular groups of darker-skinned individuals.

Adolescence is a developmental stage, when body image concerns are normally heightened, and studies have shown that adolescents of color can experience colorism in many aspects of their daily life and often express a desire for lighter skin tones and/or are dissatisfied with their skin color.[21] In the United States after the Civil War, individuals of African descent who were lighter-skinned enjoyed better educational opportunities and greater opportunity for social advancement,[2] and it is observed that there was a preference for lighter skin tones within the African American community.[2]

Colorism can be a factor in other potentially harmful practices, such as the use of "hair relaxers" by some black women, as a way to assimilate into Eurocentric standards of beauty and professionalism[22]; such century-old practices are only recently beginning to lose their hold in the black culture.[22] Ultimately, colorism is a complex phenomenon,[2,20] which has its roots in largely economic and sociopolitical factors; however, colorism also has important health implications, as it continues to be a central factor in the use of skin-lightening agents worldwide.

Tanning became more socially desirable in the early 20th century when women began spending more of their leisure time outdoors with their skin exposed.[2] In the late 1920s, Coco Chanel, a French designer and founder of the Chanel cosmetic brand, is credited with liberating women from the restrictions of the "corseted silhouette," promoting a sporty style, and proclaiming that tanning was fashionable.[2] As women in Europe and the Americas achieved greater social freedoms and legal rights, it became more socially acceptable to bare more skin to the sun and in public settings.[2] Soon tanning became a symbol of leisure, high status, and style, and to some degree a sign of freedom.[2] Fashion designers created styles and outfits (such as the bikini in 1946, named after the Bikini Atoll in the Pacific Ocean) that further promoted sunbathing.[2] Subsequently, men also started practicing suntanning as prominent movie stars were portrayed in suntanned skin.[2] A tanned appearance became associated with physical well-being and glamour that could be easily achieved in the backyard without spending a lot of money.[2]

Clinical ramifications

At a clinical demographic level, skin color is usually an important consideration in defining the race of the patient; however, complex factors, such as ethnoracial and social inequalities and resultants disparities in access to health care (eg, among certain African American populations[23]), can be the most important mediating factor underlying clinical differences in health status between races.[24–26] The term "ethnic skin" is generally used in the medical literature to describe skin of color, traditionally Fitzpatrick skin types III to VI, and does not define any particular race, ethnicity, or culture.[27,28] The confounding role of the sociocultural factors[19] associated with the classification of race and its impact on health outcomes requires further evaluation, as the medical literature has tended to treat race as a largely biologic variable, such as:

1. The dermatologist may encounter wide-ranging clinical situations involving skin color, where it may be important to consider associated psychiatric and psychosocial factors, including dermatologic disorders associated with hypo- or hyperpigmentation, such as vitiligo and melasma, where the skin discoloration may be associated with a psychiatric burden.
2. Use of cosmetic camouflage
3. Potentially harmful practices, such as skin lightening and skin tanning
4. Body dysmorphic disorder,[29] which most commonly is associated with body image concerns related to the skin, including dissatisfaction with skin color, and other psychiatric comorbidity, such as major depressive disorder[29]

Disorders of skin discoloration

Dermatologic disorders associated with skin discoloration, such as vitiligo and melasma, can contribute to the disease burden in dermatology, may affect the quality of life (QOL) of the patient, and can have important psychiatric ramifications.[30] A supportive relation between the dermatologist and the patient can significantly aid the patient in managing this disease burden and, therefore, it is important that the dermatologist not dismiss the disorder as merely cosmetic.[31]

Vitiligo

Vitiligo is the most common depigmenting disorder with an estimated 0.5% to 1% prevalence worldwide, which affects adults and children of both sexes equally; however, women experience more negative social effects than men.[32–34] Almost 50% of patients are reported to present before age 20 years, and childhood onset (onset at age <12 years) vitiligo has been reported to affect up to 32% to 37% of patients[32]; this has very important clinical implications, as the cosmetic effect of vitiligo can affect adolescent patients during a developmentally critical life stage, when they are dealing with the social and vocational demands of adolescence and establishing their own sense of identity and place in society at large.

In an online parental (n = 350) questionnaire-based study[35] about children with vitiligo aged 0 to 17 years, an affected body surface area of more than 25% was associated with self-consciousness, difficulty with schoolwork and friendships, teasing, and bullying[35]; children aged 15 to 17

years were reported to experience the most self-consciousness.[35] QOL impairment was greater in children whose vitiligo developed at age 10 years or older, which are developmentally critical years.[35] A meta-analysis of the literature on the QOL impact of childhood skin disorders using the Children's Dermatology Life Quality Index (CDLQI)[36] revealed that for vitiligo the QOL impact severity bandings were classified as "moderate" in 5.0% and "large or extremely large" in 7.0% of cases.[37]

Vitiligo is sometimes still confused with leprosy in certain regions, such as India, where it can be associated with considerable social stigma.[30,38] For example, in an Indian study,[39] even a small depigmented lesion in a child can be psychosocially devastating.[39]

Vitiligo, which is often perceived as a benign and mainly a cosmetic disorder, can have a significant impact upon the mental health and QOL of the patient[30,33,40,41] at any age, as patients, especially dark-skinned individual can face significant stigmatization.[30,33,42–45] Psychosocial interventions are recommended as part of the routine management of the vitiligo patient.[46] In a study of 62 vitiligo patients[31] from the Yale-New Haven Hospital (New Haven, CT, USA) who responded to a self-administered questionnaire, almost two-thirds endorsed that they were very embarrassed by their condition.[31]

In an Indian study[47] of 61 vitiligo patients, an approximately 64% prevalence of psychiatric morbidity was observed in vitiligo patients versus 25% among age- and sex-matched health controls.[47] In another Indian study of 54 vitiligo patients,[39] treatment of vitiligo with narrow-band ultraviolet B phototherapy was associated with a significant improvement in QOL ratings especially in younger patients.[39]

In a study of 1123 Korean vitiligo patients,[48] where the median duration of disease was 3 years, the involvement of visible body regions and larger body surface area affected by vitiligo were consistently associated with impairment in the clinical manifestations, function, and emotions domains of the Skindex-29 QOL instrument.[48]

Vitiligo patients are significantly more likely to suffer from depression.[49,50] Clinically, it is important to consider the psychiatric comorbidity in vitiligo, as it may directly affect the course of the disease, as major depressive disorder may also be a risk factor for vitiligo.[51] In a study using the Health Improvement Network medical records database from the United Kingdom,[51] individuals with major depressive disorder (n = 405,397) were at a 64% risk of vitiligo compared with the referent cohort (n = 5,739,048; hazard ratio = 1.64, 95% confidence interval: 1.43–1.87, $P < .0001$).[51] The risk of vitiligo was decreased in patients on antidepressant medications.[51] Individuals with vitiligo (n = 7104) had a 27% increased risk of major depressive disorder compared with those without vitiligo (hazard ratio = 1.27, 95% confidence interval 1.16–1.40, $P < .0001$),[51] with the risk of major depressive disorder being greater in the older than 30-years vitiligo group (hazard ratio = 1.31,95% confidence interval 1.14–1.50, $P < .0001$) versus the 30-years or older age group (hazard ratio = 1.22, 95% confidence interval 1.08–1.37, $P = .001$).[51]

In another study of the National Inpatient Sample[52] from 2002-2012, where each National Inpatient Sample contains an approximately 20% stratified representative sample of all inpatient hospitalizations in the United States,[52] vitiligo was associated with a higher odds of admission with 14 of 15 mental disorders examined (adjusted odds ratio = 1.69, 95% confidence interval: 1.61–1.78),[52] including anxiety, depression, schizophrenia, and suicide risk, but excluding cognitive disorders.[52] Vitiligo may be associated with complex psychiatric comorbidity, and patients with extensive vitiligo seeking depigmentation therapy should undergo a thorough psychiatric assessment.[53]

Disorders of hyperpigmentation

In a study of 419 patients[54] with disorders of hyperpigmentation/hyperchromia (38.98% melasma, 33.41% postinflammatory hyperpigmentation [PIH], 9.20% lentigo, 6.78% seborrheic keratosis, 11.62% "other") the diagnoses associated with poor QOL, as measured by the Dermatology Life Quality Index (DLQI)[55] were PIH (mean ± standard deviation [SD] DLQI score: 8.57 ± 6.14) and melasma (mean ± SD DLQI score: 7.05 ± 4.93); patients with disorders in the "other" category (mean ± SD DLQI score: 5.87 ± 5.03), lentigo (mean ± SD DLQI score: 2.83 ± 2.84), and seborrheic keratosis (mean ± SD DLQI score: 4 ± 4.74) had lower DLQI scores.[54] Overall, the results of the study were interpreted[56] as indicating that disorders of skin hyperpigmentation/hyperchromia had a severe to very severe effect on QOL in 23.8% of patients and mild-to-moderate effect among 57.1%.[54]

A study of treatment of periorbital hyperpigmentation[57] in 50 patients noted that even a mild improvement in appearance was associated with a significant improvement in the QOL, as measured by the DLQI.[57] A study of 48 patients with acne (25 with acne and PIH, 23 with acne alone)[58] revealed that acne patients with PIH reported significantly greater impact on their QOL (as measured by the Acne Quality of Life[59] scale) in contrast to acne without PIH[58]; 60% of patients with acne and PIH endorsed a severity rating of "very markedly" for at least one item of the Acne Quality of Life[59] scale versus none for the acne only group.[58]

Melasma is a common disorder of hyperpigmentation that is encountered most frequently in women with Fitzpatrick skin phototypes III, IV, and V, living in areas of high ultraviolet light exposure, with a reported prevalence ranging from 8.8% among Latino women in southern United States to 40% among South Asian populations.[60] The Melasma Quality of Life instrument (MELASQOL)[61] is most commonly used to measure QOL in melasma. One hundred two women with melasma were assessed during the development of the MELASQOL,[61] and the most affected aspects of QOL were social life, recreation/leisure, and emotional well-being; however, the MELASQOL score did not correlate with clinical measures of melasma severity,[61] which may be an indication that even a small amount of pigmentation can be associated with a significant emotional impact.[60]

In a Spanish study of 112 melasma patients,[62] scores from the Spanish language version of the MELASQOL were greater

in individuals with little or no formal education and correlated moderately[62] with the clinician measured severity of melasma using the melasma area and severity index (MASI). A Brazilian Portuguese MELASQOL validation study[63] of 300 melasma patients showed a correlation with MASI ratings and patients endorsed a significant impact upon their QOL (eg, pretreatment 69.8%) were bothered by the effect of melasma upon their appearance "all the time or most of the time," which decreased to 10.1% posttreatment.[63]

In a subsequent Brazilian study of 51 melasma patients,[64] the Brazilian Portuguese MELASQOL scores indicated a significant impact on the emotional but not social domains of QOL; the relation with melasma severity was not reported.[64] In a study of 141 Indian melasma patients,[65] clinician-rated melasma severity the did not correlate with the Hindi version[66] of the MELASQOL.[61]

In the initial validation study[66] of the Hindi version of MELASQOL, however, the MASI and MELASQOL scores were reported to be significantly positively correlated.[66] In an Australian study of 31 melasma patients, QOL ratings as measured by the MELASQOL,[61] did not correlate with the MASI ratings.[67]

In a Turkish study of 101 women with melasma[68] patients with mild versus moderate melasma, as measured by the MASI, had DLQI scores of 5.80 ± 4.72 versus 7.11 ± 5.90 (P = not significant), respectively[68]; there was no significant correlation between the MASI and DLQI scores.[68] In a study of 49 women with melasma from a tertiary dermatology center in Singapore,[69] no correlation was observed between clinical rated MASI scores and QOL ratings using both the MELASQOL and the DLQI.[69]

The lack of a significant correlation between clinician rated melasma severity and QOL rating in some studies from a diverse group of studies worldwide most likely indicates a confounding effect of nondermatologic factors. These would include psychiatric and sociocultural factors in the determination of QOL in patients with melasma.

Cosmetic camouflage

Cosmetic camouflage refers to the use of opaque cream- or wax-based cosmetic products[70] to immediately conceal cutaneous disfigurement, including color correction to obliterate cutaneous discoloration and normalize the appearance of the skin.[71–74] Color and camouflage cosmetics can have a beneficial effect in managing the changes in appearance and color associated with photodamage and aging.[75] A systematic review[71] of 18 studies using cosmetic camouflage concluded a significant improvement in QOL ratings (eg, a mean reduction the DLQI[55] scores ranging from 1.4-6.4; possible DLQI score range 0-30) after the use of cosmetic camouflage.

In a study of 38 children (mean ± SD age 13.6 ± 0.6 years) with visible vascular (n = 20, 6 telangiectasia, 14 vascular malformation) and pigmentary conditions (n = 18, 9 vitiligo, 4 nevi, 5 postinflammatory),[76] baseline CDLQI[36] scores revealed a small QOL impact of vascular anomalies (CDLQI score = 4.2) and a small to moderate effect of pigmentary anomalies (CDLQI score = 6.1); 6 months after use of cosmetic camouflage the CDLQI scores improved in the sample as a whole, from a baseline score of 5.1 to 2.1 ($P < .001$)[76]; at 6 months in patients with Fitzpatrick skin phototype I to III the mean CDLQI score improvement was 2.5 points ($P = .001$), and in patients with skin phototype IV to VI there was a mean improvement of 4.1 points ($P = .049$).[76] Cosmetic camouflage was well-tolerated and patients with pigmentary disorders were more likely to continue using the camouflage.[76]

In one study, 22 children (mean ± SD age 12 ± 3.3 years; 86% girls) with stable skin disorders (8 vitiligo, 4 morphea, 4 capillary malformations, 3 café au lait macules) completed the CDLQI and the Family Dermatology Life Quality Index[77] after 2 weeks of camouflage use.[70] The mean ± SD CDLQI score at baseline was 6.82 ± 1.28 consistent with a moderate effect of the skin disease on QOL; the mean ± SD CDLQI score decreased to 3.05 ± 0.65 ($P = .0014$) after application of the cosmetic camouflage products.[70] The mean ± SD Family Dermatology Life Quality Index score (n = 21, 95% mothers) involving primary caregivers decreased from a mean ± SD baseline score of 7.68 ± 1.15 to 4.62 ± 0.92 ($P = .0012$) postcamouflage use.[70] The results indicate an improvement in QOL post cosmetic camouflage both in the children with skin disorders and their caregiver, over a relatively short period.[70]

In certain disorders, such as vitiligo, camouflage cosmetics and sunscreens alone can be an acceptable treatment option for some patients (eg, in children with Fitzpatrick Type I and Type II skin).[78,79] Vitiligo affecting the hands may have the greatest impact upon QOL, possibly because it is difficult to camouflage hand lesions versus lesions affecting the face and neck.[80]

In a study of 202 Japanese vitiligo patients,[81] use of cosmetic camouflage over a 1-month period was associated with an improvement in DLQI scores, mainly the "clinical manifestations and feelings" subgroup of the DLQI. In a British study,[82] 135 patients with mainly pigmentary disorders (29% of sample including melasma, lentigo, café-au-lait macules, and vitiligo), scars (22%), and vascular disorders (13% of sample including thread veins, port wine stains, and telangiectasias) (mean age of 50 years, mean duration of dermatologic condition of 15 years) were invited to complete the DLQI pre- and 1-month post visit to a cosmetic camouflage clinic.[82] There was a 61% initial participation rate[82] and in all three groups there was a significant reduction in DLQI scores, with DLQI items addressing sexual impact and impact upon interpersonal relationships showing the greatest overall reduction.[82] Cosmetic camouflage can be a very important adjunctive treatment to standard dermatologic therapies in the management of skin disorders associated with hyper- or hypopigmentation.[71]

Skin lightening

Studies[28] have shown that a lighter skin color is generally preferred by individuals of European descent[83] as well as those from cultures and ethnic groups with a darker skin color.[16,27,84–88] The preference for fair or lighter-colored skin

in many cultures is quite pervasive,[28] and this can have direct clinical implications,[89] such as the use of skin-lightening products. The active ingredients[89] in skin-lightening products include hydroquinone, mercury, and highly potent steroid ointments and creams, which can be associated with serious and life-threatening complications due to percutaneous absorption when used for long periods over a large body surface area and under hot and humid conditions.[89]

Inorganic mercury is commonly used as a skin-lightening agents, and recent studies[90] indicate that mercury is still being used in many skin-lightening products found around the world, including the United States.[90,91] Some of the complications of skin-lightening products include exogenous ochronosis secondary to the use of topical hydroquinone, which manifests as grayish-brown waxy pigmentation on the sun-exposed areas of the skin, and pigmented forms of colloid millium, that can develop after only a few years of use.[89,92] The use of skin-lightening products have been associated with a range of other systemic complications, including membranous nephropathy[93] from mercury, endocrine complications of corticosteroids, including hypothalamic-pituitary-adrenal axis suppression, and rarely cutaneous squamous cell carcinoma.[89]

A spectrometric analysis of the mercury content (US Food and Drug Administration limits the amount of mercury in cosmetic products to 1 part per million or 1 ppm) in 549 skin-lightening products[94] manufactured in 32 countries revealed that 6% of products ($n = 33$) contained mercury levels over 1,000 ppm,[94] and among the mercury containing samples, 45% contained mercury in excess of 10,000 ppm.[94] In one study, the more frequently individuals used skin-bleaching agents, the more likely they were to underestimate the risk associated with these agents.[85] In some countries where their demand is high, these skin-lightening products are not regulated and can be purchased without a medical prescription.[89] The use of skin-bleaching agents has been associated with psychiatric morbidity,[28,85] such as depression, anxiety, body image disturbance, and core identity issues.

Skin-lightening products are used worldwide and reported to be one of the fastest growing segments of the beauty industry particularly in Asia and Africa.[95] Skin bleaching is a concern in the Unites States, especially among individuals of African and Afro-Caribbean ancestry.[91,96] A 2004 study of mercury concentration in spot urine samples from a representative sample of 1840 New York City residents[91] revealed that the mean urine mercury concentration was higher among Caribbean-born blacks and Dominicans versus non-Hispanic whites and other racial/ethnic groups, with the highest 95th percentile of exposure among Dominican women.[91] Mercury-containing skin-lightening products were identified as the source among the most highly exposed[91] and subsequently 12 imported products containing illegal levels of mercury were identified in New York City stores.[91]

Skin-lightening products tend to be widely used in many African nations,[85–87] India,[84,95] and by some Arab women,[88,97] as lighter skin is associated with several perceived benefits beauty and better job and marriage opportunity. Since the 1980s, the use of skin-bleaching products has become a public health concern in many African nations.[85] In a survey of 600 South African women of African and Indian descent[98] attending outpatient departments of regional university hospitals, 32.7% reported using skin-lightening products; among these, one-third reported that they were using these products for skin lightening, and two-thirds reported they were using them to treat skin disorders.[98] The authors comment that despite more than 2 decades of government regulation in South Africa aimed at prohibiting cosmetics containing hydroquinone, mercury, and corticosteroids, these product were still being used.[98]

In a study of 450 traders in Lagos, Nigeria, the prevalence of use of skin-lightening cosmetics was 77.3%, with the most commonly used products being hydroquinone based and the most common side effect was exogenous ochronosis.[99] Among the users of these products, 26.6% were men and 72.4% women, and this trend cut across all socioeconomic and demographic (age, sex, marital status) groups.[99] A 53.3% prevalence of use of skin lightening agents among men, and 71.9% prevalence among women was reported among students from a tertiary institution in Enugu, Nigeria.[89]

An epidemiologic study from 1992 to 1993 of 685 Senegalese women[100] revealed that 26% were using skin-lightening creams at the time of the study and 36% reported using them at some time.[100] The most common products were hydroquinone and corticosteroids and 75% of the women showed cutaneous adverse reactions with acne being the most common adverse reaction.[100] It is noteworthy that a study of body image disturbance among Jamaicans who bleached their skin,[101] the skin-bleaching group ($n = 80$) was not significantly different from the nonbleaching group ($n = 80$) in terms of their body image satisfaction[101] (measured by the Body Image Disturbance Questionnaire[102]). The majority of the study participants reported that they bleached their skin because of perceived personal, social, and entrepreneurial benefits and not because they suffered from anxiety, depression, or impairment in their daily functioning because of their skin color.[101]

In a survey of 318 Jordanian women who were customers at selected pharmacies, 60.7% reported the use of skin-lightening products.[88] The users represented different ages and socioeconomic groups,[88] and more than one-third of the participants were not aware of the potential adverse effects of the skin lightening products.[88] In a study of 531 women from west Saudi Arabia[97] who were attending outpatient clinics, 43.3% were current users of topical skin bleaching agents.[97]

In a survey of 1992 adults (62% women) from Mumbai, India (mean ± SD age 24.69 ± 9.06 years; age range 16–80 years), 37.6% of the sample reported that they were current users of skin-lightening products.[95] Men were more likely than women to endorse the belief that lighter skin was more attractive and beneficial for the cultural capital, defined as social and cultural assets that can enhance an individual's social mobility.[95] The

authors comment that the use of skin-lightening products is emerging as a public problem in India and further perpetuates colorism and social inequalities by reinforcing the belief that a lighter skin is beneficial for cultural capital.[95]

Tanning

Indoor tanning is a recognized carcinogen that is associated with both malignant melanoma and nonmelanoma skin cancer, with the greatest risk associated with exposure to indoor tanning in early life.[103–105] A systematic review and meta-analysis of the literature[104] between 1992 and 2013, with data from 16 Western countries, involving more than 490,000 participants found 35.7% of adults had been exposed to indoor tanning, with 14% over the previous year. There was a 55% prevalence of exposure among university students who had a 43% prevalence of exposure within the previous year, and approximately 19% of adolescents had been exposed to indoor tanning with 18% over the previous year.[104] The authors comment that indoor tanning is a major public health concern, especially given the high rates of exposure among adolescents and young adults.[104]

Studies have shown that educating adolescents about the health risks of tanning does not change tanning behaviors because of the perception invulnerability, peer pressure, and insecurities about body image.[106,107] In a survey[108] of 147 men and 342 women university students, with the majority between ages of 17 to 22 years, 47% reported that they had used a tanning lamp during the previous 12 months; more than 90% of tanning lamp users were aware that photodamage and premature aging of the skin, and skin cancer were possible complications of tanning lamp use.[108]

In a study of 155 adolescent boys (mean age 14.3 years) among several behaviors associated with appearance management (such as dietary restriction, exercising, body piercing, and tattooing) peer influence was more significantly directed toward influencing behaviors, such as sunbathing and use of a tanning booth.[109]

In a study of 140 young adults from South Australia who identified themselves as having Asian heritage (96 women and 44 men), 52.1% of the women and 31.8% of men reported deliberate outdoor tanning behavior[110]; the authors observed that although light complexion is desired in Asian cultures, peer and media norms influenced behavior, with peer norms being the strongest predictor.[110] Appearance focused interventions, including peer counseling sessions and sunless tanning promotions, are being recognized as being effective in reducing tanning associated high-risk behaviors.[105]

Reasons for the use of indoor tanning beds include perceived cosmetic benefits, improved mood and socialization.[103] Individuals with a poor body image are more likely to engage in indoor tanning versus outdoor sunbathing, as they may be more uncomfortable with wearing a bathing suit in public or exposing their bodies.[111] Sociocultural and appearance-related cutaneous body image factors have been shown to be the main reason behind the intention to engage in sunbathing and indoor tanning behaviors.[112,113]

In a web-based survey of 823 adult women in the United State,[114] indoor tanning intention and behavior were directly associated with tan dissatisfaction; tan dissatisfaction was associated with a tan ideal internalization and peer comments.[114] Women tend to experience greater body image dissatisfaction than men and several studies have reported that women engage in indoor tanning more frequently than men.[111] In a study of 277 college students[111] (53% women, mean age 19.3 years), 17% reported indoor tanning and 50% outdoor tanning at least once per year[111]; individuals with high depression scores were more likely to use indoor tanning.[111]

In contrast, a study of 421 college students,[115] among the 229 students using indoor tanning facilities, up to 39% met a standard psychiatric criterion for an addiction to indoor tanning. The students who met the diagnostic criteria for tanning addiction, reported greater anxiety and greater use of substances, including alcohol and marijuana, but not more depressive clinical manifestations than those who did not meet the criteria for a tanning addiction.[115]

Some other seriously harmful practices associated with a desire to achieve a tanned appearance include excessive use of canthaxanthin, which has been associated with retinopathy from retinal deposits of yellow pigment.[105] Unregulated use of injectable superpotent α- melanocyte stimulating hormone analogs (afamelanotide)[105] for tanning, have been associated with increased sympathetic nerve activity and hypertensive crisis due to stimulation of the hypothalamic melanocortin receptors, possibly dysplastic changes in nevi and melanoma, and transmission of blood-borne viruses associated with self-injection using contaminated needles.[105]

Body dysmorphic disorder

In body dysmorphic disorder (BDD)[29] (formerly known as dysmorphophobia), individuals are preoccupied with one or more perceived defects in their physical appearance, which is not observable or appears only slight to other individuals.[29] Body image concerns can focus on one or more body areas, most commonly the skin,[29] including a complaint that the complexion is too pale.[29] A study of 200 BDD[28,29,116] patients reported that 25% of patients engaged in BDD-related tanning that was motivated by a desire to improve a perceived appearance defect related to the underlying BDD.[116] Among the BDD tanners, 84% reported that their skin was the most important area of concern.[116] All tanners experienced functional impairment due to their BDD, and 26% had attempted suicide.[11]

Conclusions

The color of skin is one of the major attributes that defines both individual distinctiveness and differences between

groups across the animal kingdom including man. In humans, skin color can have complex biological, psychologic, and sociopolitical ramifications (such as disparities in access to health care), that can directly impact human health. A preference for lighter skin has been shown to be prevalent in diverse cultures, and this can lead to 'colorism' or skin-color bias based upon skin color hierarchy within certain ethno-racial groups. The color of the skin can have psychiatric ramifications in several situations: including disorders of skin coloration such as vitiligo, which can affect the psychosocial development of the patient especially when vitiligo occurs during a developmentally critical stage such as adolescence or melasma a common disorder of hyperpigmentation that can have a significant impact on quality of life and emotional well-being; widespread use of skin-lightening products world-wide despite knowledge about their potential for serious toxicity from some of their constituents (eg., organic mercury, potent corticosteroids); the wide-spread practice of indoor tanning despite education about photocarcinogenicity, that appears to be strongly driven by peer pressure; and in psychiatric disorders such as body dysmorphic disorder, where patients may have a disorder of cutaneous body image. In addition to the standard biological factors (such as the Fitzpatrick classification) the potential confounding role of sociocultural factors associated with skin color and their impact on health outcomes, require further evaluation.

Conflicts of interest

The authors declare no conflict of interest.

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