

# The dark side of skin lightening: A review of a public health issue affecting dermatology

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**Abstract:** Women in Pakistan are obsessed with the concept of glowing whitish complexion to get good marriage proposals, jobs and desired status in society. Most of these fairness creams contain very high amount of mercury and hydroquinone. These act by inhibiting the tyrosinase enzyme responsible for melanin production. The use of skin fairness products that frequently contain toxic ingredients is associated with significant adverse health side effects, resulting in immense challenges for dermatologists. Despite current regulations, lightening agents continue to dominate the cosmetic industry. In this review, our international team of dermatologists tackles the topic of skin lightening as a global public health issue, one of great concern for both women's health and racial implications. We aim to inspire a global discourse on how modern dermatologists can utilize scientific evidence and cultural competency to serve and protect patients of diverse skin types and backgrounds. In doing so, we hope to promote healthy skin and inclusive concepts of beauty in our patients and society.

**Key words:** Skin lightening, dermatology, cosmetic industry, health issues

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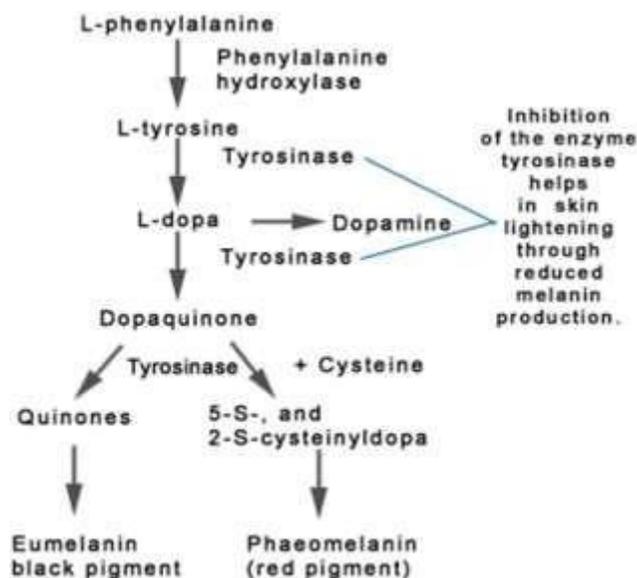
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**Introduction:** Skin the largest organ of a human body, weighing ~6 pounds in an average adult, is made up of 3 layers: epidermis, dermis and sub-cutis. The organ functions in protecting internal organs and body against external injuries through tactile sensation. It regulates body temperature, excretion of waste products and synthesizes vitamin D. It's thickness, texture and color varies throughout the body. Epidermal layer consists of melanocytes (make up to 80% of epidermis) containing melanosomes; organelles involved in synthesis of melanin pigment (that provides color to skin)(1).

These pigments protect a person against harmful U.V. radiations and thus indirectly protecting a person's genetic makeup. Some people have dark complexion due to high production of melanin pigment a condition called as hyper-pigmentation, while some are hypo-pigmented as they have low melanin concentration. Creams are recommended to patients who suffer from hyper-pigmentation, melasma, lentigines etc. to be used as drugs but not as skin whitening creams. Such drugs contain compounds like corticosteroids and hydroquinone. The composition of these compounds in creams and lotions is regulated according to the laws of FDA and their use is strictly monitored by the dermatologists (the reason for them to be highly effective)(2).

The synthesis of melanin is mainly carried out by two enzymes, phenylalanine

hydroxylase and tyrosinase that utilize two amino acids L-phenylalanine and L-tyrosine. Phenylalanine hydroxylase converts phenylalanine to tyrosine which through a series of reactions, by tyrosinase is converted to dopaquinone that in presence of different precursors and cofactors is converted to either quinones or cysteinyl-dopa. Quinones act as precursor for production of eumelanine (brown and black pigment) in skin while cysteinyl-dopa acts as a precursor for production of pheomelanine (red pigment) in hair and lips etc. The color of skin and hair is determined by the amount of melanin pigments synthesized, which is ultimately dependent on the type of genetic structure a person has (3).



**Figure 1.1.** Mechanism of Melanogenesis (3)

Due to the increasing public demand and obsession for fair and glowing skin, fairness creams are being manufactured at both small and large scales. This obsession is mainly due to the reason that dark skinned people have to struggle in getting jobs and making their place in society. Moreover they are treated as inferiors and even at the time of marriage, women with lighter tone are preferred and considered innocent, graceful and beautiful. Since ages lighter complexion has been associated with leisure classes and dark skinned people are considered as ones who are supposed to work in fields under harsh weather conditions (4).

The personal liking for white skin can be traced far back to 475-221 BC at the time of First Korean Dynasty in Gojoseon Era and Japanese Edo period where application of white powder on face was considered as a women's moral duty. In ancient Japan Geisha were known for their painted white face which reflected beauty, grace and high social status. In pursuit of having milk white complexion women in ancient Chinese Era used to swallow crushed pearls and intake arsenic powder. In Europe during Elizabethan Era women used to apply products containing toxic substances such as ammonia on their skin so as to achieve fair and white complexion (5). In sub-Asian continent the superiority and preference for milky white complexion started with the emergence of caste system when Aryans invaded India and defeated the local Indian Dravidians. Aryans were much fair than local population. This influence of considering white as symbol of richness, beauty, power and superiority did not stop here but arose further by the invasion of Mughals and British in sub-continent. As all three invaders had white complexion and were powerful so it must have increased the perception of white as sign of power and superiority (6).

The perception of preferring white is not just limited to Asian countries but has its roots deep in the society of America and Africa. During the slavery period in US slaves with lighter complexion were treated more humanely as compared to darker skinned slaves of same race. They were given opportunity to get basic education and even work indoors as compared to others who were forced to work in fields. For this reason dark skin tone was associated with backwardness and poverty. Furthermore, in early 20<sup>th</sup> century, people were paid for their labor not only on basis of their race but also on basis of their color. People from same race having different skin tones were paid differently despite the fact they had similar education and skills. In US people from Mexican and African race were paid less labor as compared to people from rest of America. Mexicans with lighter tone were paid more than those of darker complexion which were paid even more than lighter tone Africo-Americans while the darker toned Africo-Americans were paid lowest(7).

Spanish Americans associate dark complexion with ugliness and immorality while fair complexion is regarded as grace and innocence. In Asian and American countries people with darker complexion are considered less intelligence due to which they are offered less job opportunities and most of them are forced to work as manual labors to earn a living (8). This notion of dark as immoral and white as innocent is also viewed in majority of Bollywood films where the main hero (positive actor) has fair complexion while the villain is dark. Heroines are tall, smart, fair and beautiful. Even the billboards placed in African and Asian countries portray actresses and models that are smart, tall, fair and beautiful (9). The perception of considering white as beautiful is also seen at time of marriages, where men and families judge the innocence of a woman by her complexion and thus demand a fair & white bride. So to get a suitable match women indulge in obtaining fair complexion either by applying homemade products or going for laser therapy. The obsession is not just observed in young girls and women, even the teenagers snow days are also seen using skin whitening creams. Even mothers start bleaching their daughters at very young age of ~4 years (10).

The weakness of women has been exploited by manufacturers of skin whitening creams. Their advertisements aired on national T.V show fair skin as the necessity for happy and successful life (11). Advertisement agencies hire the most popular models and actresses of the time to captivate the audience and sell their product.

Young girls are already captivated and inspired by the beauty and grace of these media persons. So they consider everything told by them in commercials as correct and therefore buy these products. Only in India fairness creams comprise of market worth Rs. 700 crore, of which Fair & Lovely is the largest brand comprising over 76% of market share. Marketing forecasters predict that by 2024 global beauty industry will be estimated to be worth \$US 31.2 billion (12).

People consider that having fair complexion is a symbol of healthy skin, while healthy skin is the one that is smooth, soft, elastic, free of pimples and scars, and uniformly pigmented. According to European Council Directive 76/768/EEC, cosmetics include all those products that are manufactured solely for the purpose of cleansing and improving skin, hair, nail and lips. On basis of this definition product that come under the label of cosmetics are shampoos, skin care lotions, makeup accessories, soaps, hair color, perfumes, toothpastes and essential oils etc. But by no means skin whitening creams can be regarded as cosmetics (13).

As women now days are so much obsessed with the concept of fair, white and glowing skin number of local and international fairness cream brands can be observed in markets. Most of these brands do not have any manufacturing or expiry date mentioned. The labeling sometimes is also incomplete and in most of the imported samples the labeling is not in English or native language. One can never imagine about the number and type of ingredients present in such creams. These creams might contain up to 10,000 ingredients in them, common being steroids, arbutin, ascorbic acid, hydroquinone, and kojic acid. They also contain high levels of toxic metals (such as Pb, Hg, As, Cr, Ni etc.) in them. Hydroquinone and mercury are the two most important ingredients present in skin lightening creams as they inhibit the enzyme responsible for synthesizing melanin pigment (14).

Mercury is a volatile heavy metal existing in liquid state. It is used in thermometers; as preservative in some medicines, vaccines, paints and soaps etc. (15). The acceptable level for mercury to be present in cosmetics and other products (as impurity) is  $1\mu\text{g/g}$  according to the limit set by FDA in 1992 (16). In cosmetics mercury is present in its inorganic form i.e. either as mercuric chloride or ammoniated mercury, which act as a bleaching agent. The metal is added in cosmetics because it is a competitive inhibitor of tyrosinase. It competes the copper present in active site of sulfhydryl enzyme and thus causes its inhibition (in case of tyrosinase it attacks cysteine in active site). Presence of mercury level above the one set by FDA can be very toxic and is associated with various health issues (17). The half-life of mercury is estimated to be 42-60 days i.e. it takes 42 days by body to remove half of the mercury. But the toxic metal is continuously absorbed in body (through diet or cosmetics which contain very high level of mercury), where it starts to accumulate (18).

Mercury gets absorbed in body through sweat glands, hair follicles, sebaceous glands, and when hands come in contact with mouth. The main sights for accumulation of mercury are liver and kidney while it is least likely to be accumulated in brain due to blood-brain barrier. In presence of excessive amount of mercury in body some amount may get deposited in brain; thus causing neurological problems and nephropathy. Other problems associated with Hg poisoning are cardiovascular disorder, fetal abortion, impaired infant growth and many more. Apart from inhibiting tyrosinase mercury is also an inhibitor of digestive enzymes and acetylcholinestrace thus leading to Parkinson's disease and Alzheimer (19). Exposure of mercury to placental cells causes its accumulation in placental membrane and lowers the membrane fluidity. This ultimately damages developing fetus especially the developing brain and such children are unable to solve mental problems in their later life (20). First case of mercury poisoning after topical application was observed in 1923. Signs of mercury toxicity include metallic taste, increased thirst, abdominal pain and bloody diarrhea, skin problems, anemia, decreased urine flow, insomnia, fatigue, loss of temper, ability to think logically deteriorates, loss of appetite, sweating, cold hands and feet etc. Excessive amount of mercury also gets deposited in dermal layer of skin which on exposure to U.V. rays reoxidises and cause further pigmentation and premature aging (21).



**Figure 1.2.** Discoloration and Scarring due to Hg based SWCs (21)



**Figure 1.3.** Skin Bleaching & Hg Based SWCs Cause Severe Acne (21)

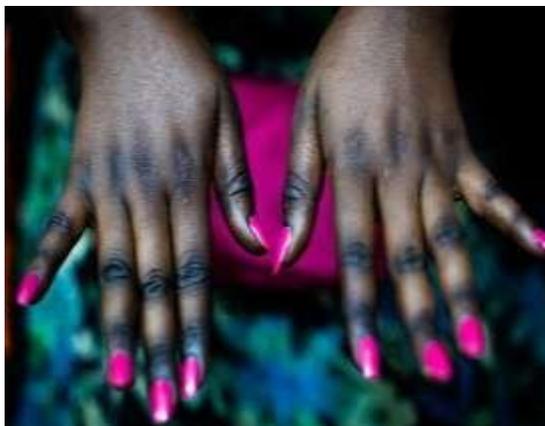


**Figure 1.4.** Excessive Hg Accumulates in Dermis & on Exposure to U.V. Rays Reoxidises Leading to Severe Pigmentation (21).

According to WHO 1.5%-2% of compound in creams is safe to use, but the level above this limit is said to be toxic and associated with health. Due to these properties on 29<sup>th</sup> August 2006 US FDA has imposed a ban on selling of hydroquinone. Only three countries UK, Indonesia and Kenya are currently implementing this ban and the product can only be bought and used under prescription and supervision of dermatologists (24). Elimination of the hydroquinone occurs rapidly through urine. Its half-life is estimated to be 9-18 minutes. Long term exposure to this compound can also lead to thyroid disorder, liver damage and neurological problems. It can indirectly also lead to DNA damage or mutation, because it causes thinning of skin and thus making us even more sensitive to U.V. radiation and cancer. The compound is found to be mutagenic and carcinogenic along with skin and respiratory irritant (25).

Excessive use of hydroquinone can even lead to allergy, bleaching and skin corrosion. According to Occupational Safety & Health Administration, it has been categorized as a mutagen and a carcinogen because it causes breaks in single strands of DNA, and inhibition of DNA/RNA synthesis. Although DNA synthesis is inhibited in other cells too, but the dose required for inhibiting DNA in these cells is much higher than that required for melanocytes (26). According to a study its excessive use has also caused permanent darkening of skin, in some patients. In bone marrow and liver hydroquinone converts into its metabolites i.e. p-benzoquinone and glutathione conjugates that lead to DNA damage and mutation and are main cancer causing agents. Long term exposure also leads to disfigurement and permanent scarring on the face. Neurological effects include headache, nausea, vomiting, dizziness, muscle twitching; these occur because hydroquinone peels off the outer protective layer and therefore has a negative effect on underlying nerves (27). Hydroquinone is also involved in excreting trimethylamine in urine, saliva, and sweat which is the main reason that why some people suffer from 'fish odor syndrome'. Exogenous ochronosis (condition characterized by permanent darkening of skin, resistant to treatment), contact dermatitis, leukoderma, and discoloration of nails are some of the most important adverse effects

caused by hydroquinone. Other effects include loss of tactile sensation, body weakness and burning sensation on face(28).



**Figure 1.5.** Exogenous Ochronosis due to Excessive use of HQ based SWCs. (28)



**Figure 1.6.** Thinning of Skin Characterized by Exposed Capillaries & Stretch Marks. (28)

Skin whitening creams work only effectively if the pigmentation is in epidermis, if pigments are in deeper layer product cannot help thus these creams only help in removing tan or discoloration present in epidermal layer, it cannot make a dark person white (29).

According to Margaret (30), colorism is defined as the process of discriminating people on basis of their color, where people of lighter skin tone are given privilege over darker toned people. In America lighter tone people are able to enjoy facilities that are not even offered to their darker toned counterparts. Main ones being; earning more money, right to higher education, live in better neighborhood or marry a person of higher social and economic status.

Rodolfo and Franz (31) explain that, at time of recruitments, employers always hire a lighter toned person before a darker toned one even if both of them belong to same race. Even at time of marriage women of lighter tone are given more preference than women with darker tone. This preference is so deeply ingrained in our culture that we are just unaware of our preference for lighter tone.

Hall *et al.* (32) suggest that the bleaching syndrome is the result of historic heritage of colorism and slavery all over the world. He claims that Asian Americans and African Americans have adopted the slavery and colonial value systems and have learned to value lighter skin tone. He exclaims that the psychological distress and socioeconomic stratification among public is mainly the result of this deeply rooted cultural value. Fears (33) a social science researcher, found that white Latinos earned \$5000 per year more than black Latinos. He also identified that white Latinos had lower unemployment rates than black Latinos.

Valbrun (34) shares two cases. One case occurred in 2002 when the owners of a Mexican restaurant, in San Antonio, Texas were sued by US EEOC (Equal

Employment Opportunity Commission) for their color based discrimination. According to the manager, the owners ordered him to recruit only light skinned staff for work in dining hall. EEOC won the case and the owner had to pay the fine of \$100,000. Another case took place in 2003, when a dark skinned African American won the case worth \$40,000 from a national restaurant chain, due to color based discrimination from his fellow lighter-skinned African American employee. According to him he was constantly taunted for his darker tone by the lighter tone coworkers.

Hughes and Hertel (35) demonstrated that the colorism plays an important role even in education. They revealed that the education gap between whites and blacks was nearly equal to the education gap between light-skinned blacks and dark-skinned blacks. While Murguia and Telles (36) found that despite having same family backgrounds, lighter skinned Mexican Americans complete more years of education as compared to darker skinned Mexican Americans.

Oakes (37) argues that principals and teachers respond more positively to parents of white students than parents of dark students in classrooms. Even the counselors more often encourage white American students to take admission in college as compared to equally talented African American students. Same discrimination can be observed between lighter skinned African American students and darker skinned African American students.

Although skin bleaching is being practiced since centuries, but according to del Giudice and Yves (38), the recent data shows that skin bleaching practice is on rise and is most common among urban educated women living in developing countries of the world. Glenn (39) proposes that although skin bleaching has its roots in European ideologies of preferring the people with lighter tone. But now days the practice is mainly on rise and can be attributed to continuous marketing of modern-day images of white beauty. He emphasizes that old ideologies have now combined with new technologies of mass media and communication to portray the message that 'white is right'. Burke (40) says that global image of white beauty is mainly portrayed by wealthy nations like America, Europe, Japan etc. this is because all these nations are house of large cosmetic companies that produce top selling skin bleaching products around the globe, like Unilever, L'Oreal etc.

Blay (41) revealed that Ghanaian women, who used bleaching products for attaining beauty, argued that light skin is a key and vehicle for women to gain social capital. He also said that, looking at a huge market of bleaching products does not necessarily show that people around the globe want to be white. But the increase in demand does show that people do want to have a lighter tone comparative to their ethnic group. He says that scholars have defined some motivating factors for skin bleaching: namely; fashion, increase in job competition, attracting one's spouse and higher self-esteem. Barnier (42) exclaims that connection between modernity and body manipulation is far from old trend of decorating bodies with jewels and is now merely about reshaping the body to present it as new and natural. According to him in an interview with US news channel a Senegalese women said that women bleach their skin to attain modernity and modify their skin tone according to their wish.

Velmurugiah (43) argues, that in present era white skin tone is not just a symbol to achieve admiration and acceptance at personal level for personal satisfaction but it has become a key to enter the professional level too. She says that the manufacturers of bleaching products have conquered the industries in Asian American and African American communities. She also added that rest of the work is

done by media that openly portrays black women as ugly, non-feminist, aggressive, unattractive and negative.

Mirza (44) interviewed a renowned Pakistani psychiatrist, Dr. Faisal Mamsa. The topic of interview was complexion obsession a problem faced by many girls in Pakistan. In his interview Dr. Faisal Mamsa told that no matter how educated we are we always prefer to marry our daughters by the age of 25. He said he personally counsel talented and well educated girls who are not happy with their complexion just for the reason that some people rejected her on basis of her outer beauty. He added that media plays an important role in sidelining these girls. He exclaimed it is the responsibility of our media to start campaigns, so that awareness can be created that we cannot change the way we look but instead be happy with what Allah has given us. Magsi (45) argues that in Asia, girls with darker pigmentation are often scorned by their peers, relatives and age fellows. Even the evidence shows that it is difficult for darker girls to find employment, equal respect and recognition and commonly girls face problems at time of their marriage. Girls are occasionally given permission to play in sun due to the fear that they might become tan. This mindset is for the reason that mothers only prefer and accept fair wives for their sons.

Shantanu (46) emphasizes that, media and advertisement business are main reasons behind fueling the demand for white brides and grooms and this results in 18% increase in skin bleaching industry every year. Advertisers and manufacturers capture the attention of audience by saying that their product is lab tested or dermatologically approved. All advertisements claim that their product is steroid free and gives the fastest results, as compared to other products. But when young girls do not achieve the desired tone that they wish, or one that is portrayed in advertisements, they go in to depression. Vonderen and Kinnally (47) suggest that people on constant basis compare themselves with others and they do it at two levels; one is downward while other is upward. In downward comparison they set some characteristics and find those lacking in other people. While in upward comparison they evaluate themselves on basis of characteristics lacking in them and thus work to attain them. So when young girls are captivated by the beauty image portrayed in media they either want to achieve it or they go in depression. Amir (48) reveals a report published in 2010 by Bahawalpur Health Department of Pakistan; stating the health consequences of using bleaching products, especially the prevalence of skin cancer among young girls. Report claims that present day girls are suffering from snow white syndrome and in order to achieve white complexion they do not take care of standard these of fairness creams. On estimation 40% of fairness product users suffer from some type of skin abnormalities which in most cases are irreversible.

In a study conducted by Ashfaq *et al.* (49) among selected population, 53% of the young girls feel normal to be sad about their looks after watching fairness ads while 42% say these ads create anxiety among them regarding their complexion. 55% think that these ads make them think twice that boys can only be attracted toward girls having fair complexion and it gives them more opportunity to get married easily. 51% girls think that these ads portray that ideal fair complexion will provide them successful career and ultimately boost their confidence.

In Pakistan a lot of women are obsessed for using skin lightening creams, and for this reason they end up with permanent dark patches on face, skin burn, and acne says Dr. Nasiruddin Khan (Head of Centralized Science Laboratory in University

of Karachi) and Dr. Sikandar A. Mahar (Head of University of Karachi) while giving an interview to Dawn News on Dec 11, 2008 (50). He has also said that poor quality creams are also available in market for just Rs. 50 and the analysis show that their Hg concentration is up to 252 $\mu$ g/g and even above. They say that for these reasons FDA has strictly banned the presence of Hg in skin lightening creams and has given its acceptable level as 1 $\mu$ g/g.

Gul *et al.* (51) conducted a survey on population of 200 women in Karachi. In their study they found that 61% women are indulge in skin bleaching practice. 31% of these were suffering from blemishes and acne, 23% indicated presence of uneven skin tone while 5% and 41% face irritation and other skin problems respectively. In terms of awareness regarding the presence of ingredients, study shows that 98% of women were unaware of the chemicals present in skin lightening products. Majority of women ~82% were unaware of the fact that such products could actually pose negative effects on their health. They say that in race of getting desired results within days or weeks women buy cheap and substandard products.

In a survey study conducted on both men and women by Shroff *et al.* (52), they reported that 54.4% of the participants were indulged in skin bleaching practice. Women were 1.7 times more likely to bleach their skin than men and they were more likely to use bleaching products on regular basis than men. In terms of side effects faced by current users of SWCs, 17% have reported to face adverse side effects while 3.1% have reported to pursue medical help. 44.6% of the participants reported that they were prompted towards by the use of these products through media and advertisements. 20.6% reported that they these products were recommended to them by their friends and family. All the users said they have indulged themselves in bleaching practice to look fair, attractive and due to social pressures.

In a study conducted in Lahore by Askari *et al.* (53), they reported the prevalence of skin bleaching to be 59% among women. 82% of total women surveyed have agreed to the fact that the main contributing factor towards the usage of bleaching products, is the notion that men find women with lighter tone more beautiful and attractive. 70.5% of total women surveyed have also agreed that lighter tone increases the chances of women to find a suitable mate.

In a study conducted by Ali and Khwaja (54) they have found that 59% of the Pakistani population uses Fair n Lovely, followed by the most frequent use of Golden Pearl Cream, Archie, Face Fresh and Faiza Beauty Cream. While purchasing the products for their Hg content, they found that six products had no information regarding their manufacturing or expiry date. After analyzing the products they discovered that mercury was present in range of 0.13-26500 ppm in different products. Skin White Whitening Cream containing the least amount of mercury and Stillman's Bleach Cream containing the highest concentration. In bleaching products studied in Bangladesh, Saudi Arabia, Sri Lanka, Nepal, Philippines and Thailand mercury concentration ranged between 3361-4643 ppm, 0-5650 ppm, 0-30167 ppm, 0-0.52 ppm, 1054-62,200 ppm and 63.53-99,070 ppm respectively.

Amponsah (55) studied the percent hydroquinone presence in different skin whitening creams sold in Ghana. Her results showed that hydroquinone content ranged in between ND-3.45%. The highest concentration was found to be present in Niuma Skin Lightening Lotion. While in another study carried out by Abere (56), percent hydroquinone ranged between ND-0.03%, with the highest concentration present in Indole Skin Lightening Cream. Of the studies conducted in various countries the level of hydroquinone found in creams sold in Taiwan, the highest recorded level was found to be of 3.96%; while in Kenya the levels recorded were found to be in range of 0.00025-0.0345%.

Udengwu and Chukwujekwu (57) studied the effect of five commonly used bleaching creams by African people on root tip mitosis of onion. Their results showed that all five creams were mito-depressive in nature and their effects were found to increase with treatment duration. The induced abnormalities were chromosome contraction, spindle breakage, chromosome stickiness, sticky bridges, endomitosis along with c-metaphase and star anaphase. They have suggested that since all eukaryotic cells are similar and work in similar function, so the same abnormalities would also be faced by human skin cells in similar manner to ones faced by plant cells after prolong usage of bleaching products. They have also suggested that these abnormalities might be the reason behind switching of mechanism of genes, as a result of which normal cells transform into malignant cells. Oliveira *et al.* (58) reported a case of 46 year old Pakistani woman living in Saudi Arabia. She was already diagnosed with nephrotic syndrome before being admitted to Hammersmith Hospital in April 1986. On examination she was found to be overweight while her all other serum and urine tests were found to be normal along with her renal ultrasound. While examining the patient history the one significant thing found was that, she was using a skin whitening cream recommended by a friend since 1984. Before her discharge, her urinary mercury level was analyzed, which was reported to be 33 µ/dL.

Sarikaya *et al.* (59) reported a case of acute mercury poisoning in a 36 year old woman. She was suffering from abdominal pain, diarrhea and fever since three days before she was admitted in hospital. It was found that a week before the incident her daughter had brought liquid mercury from school lab and had put it on heating stove to observe its vapors. Within 24 hours of this experiment, her 14 month old sister got fever and died before admission to hospital. According to the test report it was suspected that she died of cardiorespiratory collapse occurring as a result of mercury poisoning. Women's blood pressure was 134/87, temperature 40.2°C, heart rate 105 bpm and nothing else was noteworthy. After all laboratory tests (which were normal),

on 7<sup>th</sup> day she was discharged and her blood was taken for mercury analysis and the level was found to be 30µg/dL (normal 0-10µg/dL).

Copan *et al.* (60) presented two cases of mercury poisoning. First case was reported in 2010; being the participants of a health study, a 39 year old woman along with her 4 year old child was found to contain high levels of mercury in their urine. Creatinine mercury level in urine of woman was analyzed to be 482µg/g while in child it was analyzed to be 107µg/g, though no symptoms of mercury poisoning were present in both. It was found that since three years the woman was using a skin lightening cream for age spots and wrinkles. On analysis mercury concentration in cream was discovered to be 57,000ppm. Second case was reported in 2014; a two year old baby was identified with mercury poisoning after being admitted in hospital twice. He was suffering from hypertension, sleeping problem, irritability, refusal to walk and was given nasogastric feeding tube due to poor appetite. His urine mercury level was analyzed to be 52µg/g. It was found out the mother was using a skin whitening cream and the child was exposed to it through physical contact with mother. On analysis the cream was found to contain 38,000 ppm of mercury in it. Karamagi *et al.* (61) reported a case of a 30 year old woman involved in skin bleaching since 4 years. She had two skin whitening creams, both containing hydroquinone. She was suffering from burning sensation, weakness, low blood pressure, loss of tendon reflexes and impairment of sensation in her legs. But shortly after discontinuation of any bleaching product for 4 months all her symptoms disappeared.

DeCaprio (62) reported two cases of hydroquinone poisoning. In one case 544 men aboard on US Navy Ship accidentally consumed hydroquinone contaminated water, as a result they all suffered from acute gastroenteritis. In another case, during a health study, humans who had ingested less than 1g of hydroquinone experienced dizziness, convulsions, nausea, headache, muscle twitching and difficulty in respiration.

According to Brigs (63), chromosomal aberrations have been caused by intra-peritoneal injection of hydroquinone in magnitude same as that in mouse bone marrow cells. Even deaths have been reported due to ingestion of photographic developing agents containing hydroquinone. Parlak *et al.* (64) reported a case of 23 year old white man having a complaint regarding discoloration of his left hand fingernails. He had been using 4% hydroquinone cream to treat facial melasma. Discoloration occurred within 2 months of discontinuing the use of cream.

According to Lewis (65), oral ingestion of hydroquinone between doses of 5-15g causes convulsions and hemolytic anemia. Dermal application of 3% hydroquinone or less has been observed to cause abnormal kidney functioning in males while in females it has been observed to increase molecular cell leukemia.

**CONCLUSION:** This study highlights the reasons behind the usage of skin whitening creams. Genetic makeup of a person defines its body structure and features, and same is true for the color complexion. Number of melanin pigments present in skin layer define a person's complexion. People who are hyper-pigmented have dark complexion, while those who are hypo-pigmented have lighter skin tone. Liking for fair complexion can be traced back to First Korean Dynasty where application of white powder on face was considered a women's moral duty, while in sub-continent the preference started with invasion of Mughals and British and represented the concept of power and superiority. During slavery period in US slaves with lighter complexion were treated more humanely, given basic education and rights, and even paid higher as compared to their darker skinned counterparts. Same concept of considering dark as ugly can be seen at time of marriages where innocence and intelligence of women is judged by her color complexion. These weaknesses have been exploited by the manufacturers of skin whitening cream which are being manufactured at both small and large scale. Most of these products contain high levels of harmful chemicals and volatile metals, main ones being mercury and hydroquinone. Mercury is a volatile metal with a half-life of 42-60 days. It gets absorbed through sweat glands and hair follicles thus leading to its deposition in liver and kidney thus causing mercury poisoning. Hydroquinone being another harmful chemical is benzene derivative acting as a bleaching agent in fairness creams. Compound is recommended by dermatologists to treat hyperpigmentation. Long term exposure to compound can causes thinning of skin making it prone to U.V. radiations and thus leading to DNA damage and skin cancer. Keeping these things in view dermatologists and families should council the patients regarding harms of such products, while the government should impose a ban on production and marketing of all skin whitening products specially the ones containing high levels of harmful chemicals. A notion should be spread that all skin complexions are beautiful, and a person should be judged on basis of their skills, intelligence and character and not on basis of one's skin color.

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