Minireview Article

Skin Disorders: A Common Morbidity Associated with Unhealthy Lifestyles

Abstract

Skin disorders are a common cause of morbidity. Globally, the major bulk of these disorders is represented by dermatitis (atopic, contact, and seborrheic dermatitis), acne vulgaris, psoriasis, urticaria, viral skin diseases, fungal skin diseases, scabies, malignant skin melanoma, pyoderma, cellulitis, keratinocyte carcinoma, decubitus ulcer, and alopecia areata. It is not appreciated that even in high-income countries like the USA, one in four individuals have a skin disease. Since skin is the largest organ in the body, is extensively visible, and has important functions, proper care to keep it healthy is extremely important. It is not well appreciated the five major lifestyle factors play a major role in keeping the skin healthy. Since these factors are modifiable, it behooves the medical community to instill healthy behaviors in society. The role of these five factors, namely smoking, obesity, alcohol intake, exercise, and diet in the pathogenesis of skin disorders is discussed in this manuscript.

Keywords: skin diseases, smoking, lifestyles, exercise, alcohol, diet, obesity

Introduction

Skin diseases are responsible for 1.79% of the global burden of disease worldwide[1]. Common skin conditions include eczema, cold sores, dry skin, psoriasis, vitiligo, contact dermatitis, rosacea, melasma, warts, actinic keratosis, seborrheic dermatitis, moles, skin cancer (basal cell carcinoma, squamous cell carcinoma, and melanoma) and lupus[1]. Some skin disorders may occur transiently, and these include acne, moles, candidiasis, scabies, cellulitis, shingles, dermatomyositis, age spots, and impetigo. Besides the morbidity, they are also associated with a significant disability. In 2013, they were the 18th leading cause of global disability-adjusted life years (DALYs). Karimkhani et al. found that the most common skin diseases affecting DALYs were dermatitis (atopic, contact, and seborrheic dermatitis) (0.38%), acne vulgaris (0.29%), psoriasis (0.19%), urticaria (0.19%), viral skin diseases (0.16%), fungal skin diseases (0.15%), scabies (0.07%), malignant skin melanoma (0.06%), pyoderma (0.05%), cellulitis (0.04%), keratinocyte carcinoma (0.03%), decubitus ulcer (0.03%), and alopecia areata (0.01%). These disorders caused (36.4 million) more years of life disabled (YLDs) than those caused by diabetes mellitus (29.5 million) and migraines (28.9 million). According to the American Academy of Dermatology Association reports that 1 in 4 people in the United States has a skin disease[2].

Discussion

The skin is the largest organ of the human body[3-5]. It is composed of three distinct compartments: the outermost epidermal layer, the median dermal layer, and the innermost subcutaneous layer. These layers are extensively interconnected and protect the deeper tissues from several assaults, both external and internal[6]. Attacking agents include pathogenic microbes, chemical agents such as corrosive, irritating, and allergenic substances, environmental factors such as sunlight, ionizing radiation, infrared radiation, and mechanical injuries and thermal factors. Besides these protective properties, it also has several bodily functions – these include maintaining water and electrolyte balance, thermoregulation, and modulating the immune response. It also plays an active role in metabolism and homeostasis. It is also responsible for the absorption, storage of substances, and aids in the elimination of waste products[7,8]. Most of the harmful elements attacking the skin can be modulated by lifestyle changes. These changes include obesity, smoking, lack of physical activity, and alcohol consumption.

Smoking

Smoking causes many physiological and pathological adverse effects on human health which increase morbidity and mortality[9]. Its deleterious effects are also noted on the cutaneous tissues.

Accelerated skin aging is easily noticeable. A smoker's face may show atrophied skin. Smoking-related skin damage usually presents as lines or wrinkles on the face, radiating at right angles from the upper and lower lips or the corners of the eyes. Smokers may also have lines on the cheeks, and a reddish complexion[10]. They sometimes have smoker comedones (Favre-Racouchot syndrome) with furrows and nodules in the periorbital area[11]. The nails are frequently colored yellow. There may be premature graying and premature loss of hair. The gray hair may be discolored yellow **(**smoker's mustache). The oral mucosa may show pigmentation of the gingival tissues (smoker's melanosis), leukoplakia of the tongue (smoker's tongue), and inflamed salivary glands in the palate (smoker's palate/nicotine stomatitis)[12]. Oxidative stress-induced by tobacco smoking eventually results in degrading the connective tissue and altering its turnover, resulting in these accelerated aging effects. The skin changes may also occur following smoking cessation. Quitters may demonstrate Harlequin nail or quitter's nail - characterized by a sharp demarcation line between the yellow nail plate and the newly developed proximal pink nail[13].

Smokers are more likely to suffer from psoriasis[14]. Nicotine and smoking-induced activation of Th17 cells in the skin exacerbate skin inflammation in these patients. However, quitting for 20 years or more normalizes the risk when compared to non-smokers[15]. Smoking also increases the risk of atopic dermatitis[16-18]. Smokers are more likely to get staphylococcus aureus infections which may further exacerbate this dermatitis[19]. Smoking also increases the risk of contact dermatitis due to modulation of the immune response and inflammation[20,21]**.** Smoking is known to play a causal role in many other dermatological conditions such as systemic lupus, cutaneous squamous cell carcinoma, hidradenitis suppurativa, and genital warts. On the other hand, the immunomodulatory effects of smoking may benefit some skin conditions, including pemphigus vulgaris, pyoderma gangrenosum, aphthous ulcers, and Behçet's disease[22-25]. Despite these limited benefits, smoking should be completely avoided due to a plethora of other harms that it is associated with[9].

Obesity

Obesity results from a chronic excess of energy intake over energy expenditure. Obesity is responsible for several skin changes. These include effects on the barrier function, sebum production, sweat glands, lymphatics, collagen structure and function, wound healing, microcirculation and microcirculation, and subcutaneous fat. The result is an association of obesity with a wide variety of skin disorders which include acanthosis nigricans, acrochordons, cellulitis, psoriasis, hidradenitis suppurativa, acne, rosacea, hirsutism. keratosis pilaris, hyperandrogenism, striae distensae, adiposis dolorosa, and plantar hyperkeratosis[26-28]. Obese individuals also have an increased incidence of bacterial and candida skin infections. Some researchers have also found an association with atopic dermatitis[29,30] and non-melanoma skin cancer[30]. They are more prone to lymphedema, chronic venous insufficiency, and tophaceous gout[31,32]. Mechanical problems induced by excess body weight include pressure ulcers. Obesity may also aggravate diabetic foot ulcer, erythrasma, granular parakeratosis, pretibial mucinosis, and dercum disease[33,34].

Acanthosis nigricans is commonly seen in obese individuals and is especially associated with insulin resistance. Symmetrical dark patches are observed in the armpits, groin, back of the neck, elbows, knuckles, and face in these individuals. Acanthosis nigricans sometimes indicates an underlying cancer[35]. Skin tags may also accompany this disease. They usually occur as soft brown papules or growths on the neck and in the armpits and groin. Obesity is also causally associated with psoriasis and prognosticates a worse course[36]. Treatment response is often decreased in these patients, and adverse events are encountered more frequently. Symptoms of psoriasis improve if the bodyweight is reduced[37]. Hidradenitis suppurativa is a disorder of the follicular epithelium and is aggravated by obesity[38]. It is generally noted in areas of excessive skin folds, especially in the armpits and groin. The follicular plugging associated with hidradenitis suppurativa may trigger inflammation and abscess formation[39]. Obesity may increase intra-abdominal pressure and cause the failure of venous valves, resulting in dilation of the veins. This may cause leaking of the intravascular fluid into the surrounding tissue causing venous eczema, fibrosis (lipodermatosclerosis), and stasis ulcers[40]. Obesity may also cause intertrigo and cellulitis[35,41]. The increase in moisture, sweating, and body heat enhance the colonization of yeast and other bacteria[41]. Impaired lymphatic flow (due to infection and obstruction of local lymphatic circulation) in the subcutaneous tissue may lead to lymphoedema on the shins[41,42]. Plantar hyperkeratosis is the most common dermatological complaint among persons with morbid obesity[35]. Impaired collagen production in obese individuals also leads to poor wound healing[43].

The surgical problems which complicate obesity include decreased access through the skin. There is also difficulty in securing intravenous access[44]. The excessive fat in the abdominal wall and the larger number of bleeding vessels make securing hemostasis intraoperatively more difficult. There is also a delay in wound healing[45] because of hematoma, increased sweating, increased wound infection and wound dehiscence. These patients have an increased risk of deep vein thrombosis, and its associated skin repercussions, following surgery because early ambulation may be difficult[44].

Obesity may also cause striae and premature hair graying[46,47]. Striae or stretch marks may occur in areas of increased mechanical tension such as abdomen, thighs, buttocks, and breasts48. Pregnancy results in weight gain and stretching of the skin and often leaves behind striae gravidarum[49]. Although several mechanisms play a role, inflammation is a major cause[50]. Visceral adipose fat leads to excessive production of proinflammatory cytokines, including tumor necrosis factor-α, IL-6, Il-8, Il-17, Il-18, monocyte chemoattractant protein-1, and adipokines, such as chemerin, visfatin, leptin, and adiponectin[51]. Dysfunction of lymphatic vessels reduces their clearance function and prolongs inflammation[52].

Alcohol

Alcohol consumption impairs local skin barrier function, alters blood flow, induces lipid peroxidation, and results in nutritional deficiencies. The harmful consequences eventually manifest as skin diseases[53]. However, this morbid association between alcohol and skin disease is often under-reported. The most recognized manifestation of alcohol-induced liver disease is jaundice, due to deposition of bilirubin[53]. Alcohol abuse is also associated with pruritus, urticaria, hair and nail changes, and oral changes. It is a risk factor for skin cancer and skin infections. The effects on cutaneous vasculature and blood flow result in persistent facial redness and palmar erythema (liver palms). They may also exhibit spider telangiectasis, (especially over the face, neck, upper chest, and arms), pinpoint telangiectasis, ecchymoses, corkscrew scleral vessels, and caput medusae. Other disorders include nutritional deficiencies, porphyria cutanea tarda, seborrheic dermatitis, nummular dermatitis, and rosacea. The skin may also exhibit cutaneous stigmata of cirrhosis[54]. In one study, the prevalence of alcohol use disorder (AUD) was 30·6% in patients with psoriasis, 33·3% in those with eczema, 12·3% in those with cutaneous lupus, 21·8% in those with other inflammatory skin diseases and 14·3% in those with non-inflammatory diseases[55]. Further, alcohol consumption is known to worsen preexisting dermatoses, such as psoriasis, rosacea, and seborrheic dermatitis[56,57]. Some drugs prescribed for skin diseases may also be hepatotoxic and may aggravate skin conditions in alcohol abusers[58].

Patients with psoriasis consume more alcohol than the general population[59]**.** In the Nurses' Health Study, intake of non-light beer in a cohort of US nurses was associated with an increased risk of developing psoriasis[60]**.** In a study published in 2017, approximately 30% of patients with psoriasis had AUD[55]**.** Alcohol can exacerbate psoriasis by inducing keratinocyte proliferation leading to a production of inflammatory cytokines and local proliferation of lymphocytes. Psoriasis in these patients also makes it more difficult to treat**.** Rosacea causes redness and flushing on the face and neck. In a study of 82,737 women in the Nurses' Health Study II, it was found that women who drank alcohol (especially white wine and liquor) had an elevated risk of developing rosacea. This risk increased as their alcohol consumption increased[61]. Around 40% of patients with alcoholic liver disease suffer from severe generalized pruritus[62]**.** Discoid eczema is more common in alcoholics[63]. Alcohol aggravates contact dermatitis by increasing vascular permeability and inflammation[64]**.** Seborrheic dermatitis is twice as common in patients known for alcohol abuse[65]. Atopic dermatitis during pregnancy in women who drink alcohol has been noted in some studies[66]. Maternal total alcohol intake has also been associated with increased risks of atopic eczema in offspring (infants up to the age of 3 years)[67]**.**

Alcohol increases susceptibility to infections, stimulates lymphocyte and keratinocyte proliferation, and enhances the production of proinflammatory cytokines[68,69]**.** Bacterial and dermatophyte infections are more common in alcoholics. These individuals also exhibit a higher prevalence of scabies and tinea pedis[70]. They exhibit delayed wound healing after thermal burns[71] and are more likely to be infected with staph. aureus[72]. Deficiencies caused by malnutrition contribute to this diminished wound healing and frequent infections[73]. Pruritus and urticarial skin lesions are also more commonly seen[74].

Alcohol consumption has also been linked to an increased incidence of skin cancer. The US Department of Health and Human Services has declared ultraviolet radiation from the sun or indoor tanning machines as a carcinogen[75]. Alcohol consumption is higher in those getting more exposed to the sun and those using tanning booths[76-79]**.** Heavy alcohol drinkers use less sun protection than low amount drinkers[76,77]. Further, more frequent uses of indoor tanning also are more likely to consume more alcohol[78,79].

Alcohol-induced hypogonadism may manifest as vascular spiders and loss of body hair[80]**.** Alcohol-induced malnutrition is not uncommon and is related to both inadequate intake and malabsorption[81]. The result is a deficiency of several micronutrients, including vitamin A[82], vitamin D[83], folate[84], and zinc[85]. Deficiencies of protein and micronutrients lead to kwashiorkor/marasmus, phrynoderma, xerosis, angular stomatitis, cheilosis, glossitis, seborrhea-like dermatitis, pellagra, and scurvy. Terry's nails (proximal two-thirds of the nail is white and the distal 2 mm is pink) are seen in 80% of patients with alcoholic cirrhosis[86,87].

Regular alcohol intake can be a major source of unwanted 'empty' calories; for example, beer has approximately 150 kcal per 12-ounce can and a mixed drink has approximately 125 kcal per drink[88]. This contributes to obesity and the latter is also responsible for several cutaneous manifestations, as mentioned above.

Exercise

Physical activity has a complex role in skin diseases. Regular moderate physical activity exerts its beneficial effects by the increased production of antioxidants, like SOD and glutathione, and an increase in resistance of cells against free radical driven reactions. Another potential mechanism is a reduction in the amount of adipose tissue resulting in decreased generation of sex hormones, insulin, glucose, and leptin. This is associated with an increased concentration of anti-inflammatory factors, like adiponectin, and activation and up-regulation of the NF-κB signaling sites in antioxidant enzymes' gene promoter[89]. Inflammation is critical in the activation of normal cells, their growth, and progression to malignancy. The next important pathway for the improvement in the immune function is by a positive effect on monocytes, neutrophils, lymphocytes, and eosinophils. Finally, physical activity may inhibit the synthesis of prostaglandin E2[90]**.**

Exercise should confer health benefits to the skin, but the scientific data is limited. Some work has suggested that exercise may reduce skin aging. Aging is associated with the deterioration of the dermal and epidermal layers of the skin, resulting from reductions in cell proliferation, collagen synthesis, extracellular matrix remodeling, and altered epidermal morphology[91].

Exercise training can prevent the systemic mitochondrial dysfunction and progeroid symptoms in the polymerase-gamma mutator mouse, with a protective effect on skin deterioration[92]. Overall, physical activity in athletes is associated with less inflammatory, traumatic, infectious, and sebaceous skin diseases. These individuals appear to have a significantly better skin health

There are benefits associated with tailored exercise for lymphedema in patients with breast cancer[93] and venous diseases of the lower extremity affecting limb skin[94]. There are also studies showing increased foot ulcer healing in diabetics and a decrease in plantar skin disorders in those with a sedentary lifestyle[95].

Most of the data in the literature on the relationship between exercise and the skin are, however, negative. Even simple activities such as walking for exercise can expose the skin to different hazards and injuries[96]. Exercises, especially those practiced by sports enthusiasts may result in blisters, calluses, cheilitis simplex, onychocryptosis, onychomadesis, and talon noire[97,98]. Traumatic conditions faced by these individuals also include "jogger's toe" (also known as "black toenail"), characterized by bleeding in the nail matrix and periungual region, and "runner's purpura" (exercise-induced purpura), which affects the lower limbs and the face[99]. Mailler et al. conducted a review of several studies on dermatological injuries occurring on marathon day in athletes running 15 different marathons and found that the most common lesions were blisters and other injuries from repetitive friction (0.2-39%), followed by jogger's nipple (2-16.3%) and chafing and abrasions (0.4-16%)[100]. Further, the increased sweating and overheating tend to aggravate eczema, rosacea, and psoriasis. Moistness may also flair up acne and folliculitis. Even exercising in the cold may cause injuries or exacerbate diseases of the skin. These conditions include physiological livedo reticularis, chilblains (pernio), Raynaud phenomenon, cold panniculitis, frostnip, and frostbite[101]. Inflammatory conditions that may be seen in ice-skating athletes include allergic contact dermatitis, palmoplantar eccrine hidradenitis, exercise-induced purpuric eruptions and urticaria[102]. Swimmers in both fresh and saltwater may develop swimmer's itch or sea bather's eruption, respectively[103]. Swimmers with fair skin and light hair may also present with unusual green hair that results from the deposition of copper within the hair[104]. Exercise in gyms may expose individuals to skin fungal infections[105].

The UV rays in sunlight are damaging to the skin, causing sunburn, premalignant and malignant lesions[106]. Sunburn patterns vary[104], from intermittent sunburn-inducing training at peak hours to large cumulative exposures[107]. Studies have reported exposure to excess doses of sunlight radiation in cyclists and increased risk of cutaneous carcinogenesis in marathon runners[108]. Sports enthusiasts dealing with snow have more exposure to damaging sun rays[109]. Snow reflection and thinner air with less ozone mean the peak UV index can be 20–30% higher on a ski field (at 2.1 km altitude) than at sea level[110]. As a result, without sunscreen, skiers can begin to burn after only 6 min (at 3.4 km altitude)[111]. Physiological factors also come into play. Sweating can increase the skin's photosensitivity, as indicated by a decrease in the minimal erythema dose, the minimal amount of radiation required to induce erythema[112]**.** This results from a shift in the wavelengths absorbed by the stratum corneum and a decrease in reflection and refraction[113]. Skin **i**njuries can also occur due to frostbite, lesions caused by contact with salt water, and injuries caused by animals and plants[114,115].

Cholinergic urticaria may occur in response to exercise. It usually presents as small (2 to 5 mm) punctate papules, surrounded by an erythematous halo, appearing on the upper thorax and neck, and, in some cases, spreading to the entire body[116]. Single lesions usually resolve in 15-20 minutes. A rise in plasma histamine levels has been noted in symptomatic patients[117,118]**.** In extreme cases, the lesions may coalesce and resemble angioedema, but vascular collapse is hardly ever seen[119]**.** The respiratory tract is often involved, and this induces pulmonary symptoms[120,121]. Intense or endurance exercise has been shown to negatively affect the immune status[122] and the body's antioxidant capacity[123]. Intense exercise causes an increased utilization of oxygen from 10 to 20 times over the resting time, and this results in formation of reactive oxygen species in excess[124]. It also produces pro-inflammatory mediators, like IL-1, IL-8, TNF-α, and prostaglandins, resulting in acute inflammation[125].

Despite these undesirable skin effects, exercise is associated with better health[126]. Risks may be diminished by practicing protection and logic during athletic activity, and regular exercise should not be halted.

Diet

Diet has a strong relationship with skin conditions. Certain nutrients, foods, or dietary patterns may act as disease "triggers", while others may prove beneficial[127]. Penso et al. studied the dietary habits of 24,452 participants and found that acne in adults was associated with consumption of high glycemic index products like milk, sugary beverages, fatty and sugary products[128]. Cengie et al. found that whey protein supplementation was also associated with flare-ups of acne[129]. The biological mechanism is believed to be stimulation of the insulin-like growth factor 1 pathway, which ultimately leads to oxidative stress and inflammation[128].

Diet plays an important role in the development and maintenance of obesity and as mentioned before, obesity is a predisposing factor for psoriasis with weight gain tends to aggravate existing psoriasis[130]. Special diets, such as the vegetarian diet and the Mediterranean diet, have been shown to slow the progression of psoriasis[131]. Psoriasis patients also have a 3-fold increased risk for celiac disease compared to the general population, suggesting a role for gluten-free diet in psoriasis prevention and treatment[132]. Supplementation with antioxidants such as vitamin A, C, D, E, carotenoids, flavonoids, and selenium, may also help. Folic acid supplementation in persons taking methotrexate for psoriasis also appears to be beneficial[133]. Atopic dermatitis may occur in children with exposure to eggs, milk, peanuts/tree nuts, shellfish, soy, and wheat[134-136]. These products should therefore be avoided if a connection is noted. There is a notable association of vitamins & botanical extracts with vitiligo. Rosacea is triggered by hot and spicy food. Gluten should be avoided by patients with dermatitis herpetiformis[137].

An increasing body of research indicates that dietary change may also serve a therapeutic purpose in certain skin conditions. Plant flavonoids are touted to treat a variety of skin diseases, including psoriasis, atopic dermatitis, vitiligo, photodamage, cancer, chloasma, and pemphigus[138].

Conclusion

Dermatological disorders do not get the attention they deserve. They may not cause major mortality events but are responsible for considerable morbidity. As the reviewed data shows, cutaneous diseases may be preventable or controllable with simple lifestyle behavior changes. The major unhealthy lifestyle behaviors are smoking, obesity, sedentary lifestyle, an improper diet, and alcohol consumption. Smoking not only ages the skin but also aggravates psoriasis, contact dermatitis, and some skin infections. Obesity is associated with several skin disorders, including acanthosis nigricans psoriasis, bacterial cellulitis, candida infections and plantar hyperkeratosis, to mention a few. Alcoholics often demonstrate jaundice from liver damage and cutaneous manifestations of cirrhosis of the liver. They also are more prone to pruritus, pigmentary alterations, urticaria, hair and nail changes, and oral changes. Alcohol intake also increases the risk for skin cancer and dermatological infections. Vascular disturbances associated with alcohol misuse include telangiectasias, palmar erythema, caput medusae, and flushing. Although exercise has significant health effects and greatly reduces morbidity and mortality, its relationship with the skin is somewhat complex. Exercise exposes the individual to more skin trauma and damaging exposure to the external environment. The latter may cause damage such as sunburn, premalignant and malignant skin lesions, frostbite, etc. However, skin injuries and damage can be prevented with proper gear and skin protection. Overall, the net benefits of exercise far exceed the potential harm to the skin. Healthy manipulation of the dietary pattern or dietary quality can beneficially affect cutaneous disorders such as skin cancer, wound healing, atopic dermatitis, psoriasis, and dermatitis herpetiformis. Supplementation with certain micronutrients may also help. In conclusion, skin disorders impart significant morbidity, and this can be reduced by incorporating healthy lifestyles.

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