

Global warming and its effect on human skin

Introduction:

A steady increase in the temperature of the earth's atmosphere attributed to the green-house effect caused by pollutants like carbon dioxide, methane, nitrous oxide, ozone and similar gases is known as “global warming.”

These gases increasingly emitted from the earth's surface together with water vapour form a blanket around the earth and cause a heat trapping effect which makes the planet significantly warmer than what it should be. This greenhouse effect caused more specifically by gases which absorb and emit radiant energy within the thermal infrared range is increasing at an alarming pace due to burning of fossil fuels, cutting down trees and farming livestock. Increased industrialisation is another cause leading to global warming. Global temperatures have known to have risen by approximately one degree centigrade from preindustrial (1850-1900) levels. In 2018 the United Nations Intergovernmental panel on climate change has observed that an average increase of temperature over 1.5 degrees above the preindustrial threshold will make our planet inhospitable for human life.

How global warming effect on human skin:

Like every organ of our human body our skin too is not immune from the deleterious effects of global warming. But then, why should we be concerned with this phenomenon?

The skin provides an effective barrier against noxious chemical agents of the environment, physical assaults from the surrounding atmosphere including ultraviolet rays of the sun and infective microbes. It prevents unregulated loss of water and electrolytes from the body and also protects the core of the human body from temperature fluctuations.

As one knows, human skin is composed of epidermis, dermis and subcutis. The epidermis is the outer most layer and the subcutis or inner fatty layer. It is the epidermis which plays the major role in protecting our body from the noxious effects of our environment. The epidermis, in turn, is composed of four layers, namely, deep to the surface-stratum basale, stratum spinosum, stratum granulosum and stratum corneum. The fifth layer, the stratum lucidum is selectively present in certain anatomical locations of the body like the palms and soles to reinforce the epidermis. The layers of the epidermis form a 'brick and mortar' structure with the cells acting as bricks and different lipids acting as the mortar. This forms the epidermal barrier restricting water and electrolyte loss and keeping the surface of the body at an ambient temperature, protecting it from severe heat. Thus, the importance of protection from environmental damage to this first line of defence of the human body cannot be ignored.

An in- depth study would lay bare further facts. The sun emits ultraviolet-A (UVA) [320-400 nanometers(nm)], ultraviolet-B (UVB) (280-320 nm) and ultraviolet-C (UVC) rays (200- 280nm). UVB is known to cause more erythema on the skin than UVA or UVC and triggers production of reactive oxygen species which cause damage to deoxyribonucleic acid (DNA). This sets in motion certain processes which, in turn, causes immunosuppression which can have numerous harmful effects for the human. The level of UVB reaching the earth's surface is regulated by the ozone layer outlining the importance of the greenhouse gases in causing bad effects on human skin.

Sunburn:

Besides above adverse effects, sunburn is an important phenomenon affecting human skin.

What is sunburn?

Sunburn is an acute effect of the solar radiation when a person is exposed to ultraviolet rays to which his skin is not accustomed. This may manifest mildly as redness and more severely as pain, localised swelling on skin and even blister formation. The delayed effect of such ultraviolet (UV) exposure is known as tanning which is even sought after by some persons and manifests as hyperpigmentation of the exposed surfaces of the cutis. This becomes perceptible one to two days after one is exposed to sun. Sun exposure for a long period results in 'photoaging' manifesting as wrinkles on face, skin dryness, sagging of skin, mottled pigmentation and permanent visible dilatation of the capillaries of the skin known as telangiectasias.

Significantly, climate change particularly global warming influence how infectious diseases, skin diseases caused by environmental irritants and sun exposure affect the human skin. Researchers have demonstrated the increased incidence of hand foot and mouth disease as an entero-virus- associated skin disease in recent times and have shown its association with change in weather. Fungal infections like dermatophytosis affecting the superficial layers of skin commonly referred to as the ringworm has shown remarkable resilience to treatment. Coccidioidomycosis, a fungi, known to affect the immunosuppressed individuals have been reported to have shown a surge in their occurrence. Diseases like dengue, zika and chikungunya, all manifesting skin rashes of different types have also been on the rise in the last couple of decades. Certain bacteria like, staphylococci, streptococci and enteric bacteria have a predilection to colonise the skin eagerly in warmer climate and high temperatures. Similar conditions have been known to increase the frequency of gram-negative organisms.

Interestingly, climatic factors like increased global temperature have been known to lengthen the reproductive cycle of insects and shorten the incubation period of pathogens leading to a spurt in infectious diseases caused by such insect viruses. Lesser morbid conditions like acne vulgaris causing papules, pustules and nodules on face is due to blockage of overfilled sebaceous ducts, an occurrence which can easily be aggravated by increased environmental temperature causing enhanced sebum secretion. Shed keratinocytes of the epidermis clog the mouths of the pilosebaceous units together with inspissated sebum admixed with dirt to result in lesions of acne.

An interesting feature is that air pollutants are known to aggravate inflammatory dermatological diseases like pemphigus vulgaris, a serious blistering disease of the skin. Atopic dermatitis which affects children and adults is an extremely itchy, dry, debilitating skin disorder and is known to be influenced by the environmental toxins. These air particles resulting from fossil fuel burning and even expanded pollen seasons are related to climate change. Warming bodies of water due to global warming and precipitation shifts may be explanation for increase in aquatically transmitted dermatological conditions.

Skin cancer:

Then comes the most deadly disease, termed as skin cancer. It remains the world's worst common cancer. Ultraviolet rays (UVR) of the sun have been acknowledged as the primary cause of skin cancer. UVR has the unique ability to act as a mutagen without the necessity of any other cofactor. Exposure to UV radiation results in the damage of DNA as a result of formation of toxic pyrimidine dimers and reactive oxygen species. Excisional repair of DNA damage may be repaired partially but are overwhelmed when exposure to UV radiation is excessive. This leads to progression of mutagenesis, immune suppression and colonial cell expansion promoting tumour formation.

Non-melanoma skin cancers, principally basal cell cancer, squamous cell cancers are known to account for the majority of such skin cancers manifesting mostly as ulcers, nodules or disfiguring plaque like lesions on exposed parts. Every one percentage loss of total ozone layer leads to a three to five percentage increase in skin cancer cases. Cutaneous malignant melanoma too has shown strong causality with magnitude and cumulative dose of ultraviolet rays. Mention must be made here that geographic variation exists in amount of UV radiation ultimately reaching a susceptible individual and thus resulting in malignant lesion of the skin. Heat also has an indirect effect on the incidence of skin cancer. People spend greater time outdoors and with less clothing as temperatures rise thus exposing them more to the hazards of skin cancer.

Remedial measures:

Countering the effects of global warming on skin needs a comprehensive and integral approach involving not only skin specialists, physicians and community workers but health education too has a major role to play. Outdoor workers should be coaxed to wear full sleeves, use umbrellas whenever possible as shield against the sun, try to use sunscreens and seek physician's help for skin lesions. Environmental workers should try to dissipate as much knowledge as possible to industrialists in this aspect and convince them to undertake measures for the conservation of their surrounding environment. Decision makers should prioritise schemes for a greener, cleaner and cooler atmosphere. Organising regular skin camps to screen the poor outdoor labourers can be another measure for early detection of morbid skin conditions arising out of global warming. The march of the menace of global warming is inevitable but sustained and persistent efforts against it can decisively slow down the process leading to a more congenial environment leading to optimal skin health.

Conclusion:

To sum up, it may be said that the health of human skin is significantly at risk from global warming, which is being caused by the rising atmospheric concentration of greenhouse gases. Researchers have found various potential impacts that could have an influence on people all around the world, even though the subject is not as publicly publicized as other environmental issues.

Increased UV radiation exposure is one of the main effects of global warming on human skin. Thinning of ozone layer due to changes in atmospheric conditions may increase UV radiation levels that reach the earth's surface. Long-term exposure to UV radiation can cause skin damage, including sunburn, early aging (wrinkles, age spots), and a higher risk of skin cancer.

Temperature-related skin diseases can also be brought on by rising global temperatures and more frequent heatwaves. People may get heat rashes, heat stroke, and an aggravation of pre-existing skin disorders like eczema and psoriasis. In addition, the extreme heat can cause dehydration and dry, cracked skin, which makes people more prone to infections and skin irritation. Apart from affecting how allergens like pollen are distributed, changes in climate patterns may also exacerbate skin sensitivities like hives and eczema and cause allergic reactions. Additionally, as a result of global warming, disease-carrying vectors like mosquitoes and ticks may change in location and behaviour, which could result in the spread of illnesses with symptoms that are skin-related.

The implementation of climate change mitigation techniques is essential for reducing global warming's overall impact on human health, especially skin health, since it continues to be a critical environmental issue. Above all, people should practice adequate sun protection and hydration habits to prevent heat-related illnesses and damage from UV radiation on their skin.

Thank You