

The Impact of Climate Change on Dermatological Conditions: Exploring the Link between Environmental Factors and Skin Health

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Abstract

Background: Climate change, including high temperature, increased UV radiation, polluted air and change in humidity have been cited as factors that are leading to skin diseases across the globe. Some of these environmental factors include worsening eczema, skin cancer, psoriasis and other inflammatory skin diseases. Global warming is steadily emerging as a principal threat to world health and is already having an adverse impact on skin disorders.

Aim: This paper shall explore the impact of climate change on dermatological disorders through evaluating the consequences that resultant from environmental stimulus, inclusive of temperature, ultraviolet light, pollution and moisture.

Method: An analysis of recent work and cases from clinical practice was made to find out effects of environmental conditions on skin diseases in different parts of the world. Descriptive data were also used to compare the results of climate change variables with certain skin diseases.

Results: Increased UV index means increased cases of skin related cancers and premature skin aging whereas air pollution leads to an increase in inflammatory skin disease like psoriasis, acne among others. Also, humidity affects skin issue of dermatitis and fungal skin infections whereby geographical differences in skin problems due to climate changes are apparent. The study reveals that with the rise in temperatures cases of aggravated heat related skin problems such as eczema, rashes, and infection escalate.

Conclusion: Long term impacts of climate adaptation on skin health should be the area of interest in future studies concerning skin health and climate change while health care practitioners should prevent and manage skin conditions that are climate change related. This study extends knowledge on the negative health effects of climate change showing how it is exacerbating multiple dermatological diseases for people in Australia and worsening around the world.

Keywords: climate change, dermatology, skin conditions, UV radiation, air pollution, eczema, skin cancer, public health.

Introduction

With regards to affecting the public health there is a direct and indirect ripple effect on nutrients security

as well as on transmission of infectious diseases. Global warming is an important process that has been affecting the conditions of ecosystems, climate, and individuals' immunity during the last few decades. Climate change is mainly caused by the concentration of emitted GHGs which include carbon dioxide, methane and nitrous oxide, and it has major effects on the increasing global temperatures, fluctuating precipitation, and frequent occurrence of extreme weather conditions. Regarding other health effects, one which has received increasing interest is the effects of climate change on dermatological diseases. Human skin is the largest and most important organ, acting as the protective shield for the rest of the body and since it is a living organ it reacts to the environmental changes. Global warming particularly worsens several aspects which include temperature, radiation particularly the Ultra-Violet (UV), pollution and fluctuating relative humidity hence their impacts to the skin [1].

Far reaching effects of climate change are also already being realized in global health, as WHO estimated an approximate of 250 000 deaths due to climate change between 2030 and 2050. The main factors that cause the health outcomes are heat intensity, deficiencies, respiratory ailments, and contracting sicknesses such as malaria and dengue diseases brought about by increased temperatures which favours the disease transmitting insects. Besides the communicable diseases burden which increases, non-communicable diseases such as cardiovascular and respiratory are also aggravated by air pollution, heat waves, and other climate change effects. These are aggravated by the social and economic differences that render some groups of people highly susceptible to adverse effects of climate change within low-income countries [2].

To some extent climate change alters health by physical changes such as in temperature and weather but more significantly through changes on the social and environmental factors. Such determinants include clean air that films breathe, safe water that the film drinks, adequate food to eat and secure place to live. However, as these resources become more stressed the burden of disease in the global society increases. These and other health impact causes have been previously explained while dermatological aspect of climate change is less often mentioned, but it is just as significant. Inflammatory skin conditions that may not attract much concern in health related discussions are among the most prevalent conditions that demand attention by physicians especially in areas affected by climate change [3].

As the largest organ of the human body the skin shields the body from physical, chemical and biologic hazards in the form of pathogens, dust, toxins such as radiation and UV light. This has made it greatly vulnerable for the change in environmental conditions resulting from climate change. Global climate change together with other environmental factors significantly contribute to the development as well as worsening of dermatological diseases. Some of the most notable ones are extreme temperatures, high levels of UV radiation, pollution, and humidity variations [4].

Temperature Extremes: With continued increase in global temperatures, people often come across high temperatures or heat waves. Staying longer in hot conditions may cause dehydration, sweating, and no barrier protection to the skin making the skin prone to heat rashes, eczema flare up, and fungal skin infections. Also, heat tends to cause a bacterial infection, especially on areas where there is moisture accumulation such as armpits and groin. While on the other hand, extreme cold which is as a result of change in climate can also pose some effects on the skin such as dry skin, frost bite and some people with skin diseases like psoriasis and eczema are likely to see their conditions worsened [5].

Ultraviolet (UV) Radiation: Since ozone layer is gradually being depleted by greenhouse gases and other pollutants, the ultraviolet radiation on the surface of the earth intensifies. It is established that sunburn due to UV emissions leads to the development of skin cancer including melanoma, squamous cell carcinoma and basal cell carcinoma. It also causes photoaging which gives skin problems that resemble premature wrinkles, changes in skin colour, and skin that loses its elasticity. This leads to a great concern for the inhabitants of the world, as climate change causes the reduction of the ozone layer affecting skin health, making people more vulnerable to develop skin cancer and other UV skin diseases [6].

Air Pollution: Since climate changes causes air pollutions, rise in industrial activities, cutting down trees, and use of automobiles all maximize air pollution. This is so because pollutants for instance particulate matter (PM), nitrogen dioxide (NO₂), and sulphur dioxide (SO₂) have been found to cause inflammation of the skin hence leading to acne, atopic dermatitis, and psoriasis. When the particulate matter is inhaled, it can penetrate deeper into the skin and cause irritation as well as inflammation, which will impair skin integrity and function in people with certain skin diseases; it also causes the skin to age more rapidly than it should. Also, air pollution causes responses in the immune system that can worsen dermatitis and eczema of the skin.

Humidity Fluctuations: Climate change causes changes in humidity all over the world with some regions becoming more humid and others drier. In normal amounts, humidity is not dangerous at all however, high humidity paves way to growth of bacteria and fungus especially in skin folds and low humidity leads to skin dryness, irritations and weak skin barrier. Some diseases like eczema and psoriasis are particularly vulnerable to these shifts as both – high humidity and low can be detrimental to the skin [7].

Due to this, changes in climate and global temperatures stand to cause more inflammatory and all-manor of skin conditions known to human beings today. One of the largest concerns is the rates of skin cancer particularly caused by increased levels of UV radiation. Skin cancer is one among the most prevalent cancers in the globe, and with climate change continues to compromise the ozone layer thereby exposure to higher UV radiation this figure will only worsen. Furthermore, some skin problems including miliaria and exacerbation of heat induced eczema cases are emerging with increases in the incidence of more severe and frequent heat waves in some areas.

It is not only about temperature increases The problem is much bigger than that. Pollution from the sky through the sulphur dioxide and nitrogen oxides from burned fuels, industries, and deforestation, and climate change has been put to blame for an increased prevalence of inflammatory skin diseases. Some of the recent research reveals that the new generations of the inhabitants of big cities, especially in the developing countries, are experiencing higher levels of acne, psoriasis, and atopic dermatitis due to increasing levels of air pollution. The same seems to be the case with humidity where fluctuating levels have worsened skin infections and allergic conditions hence making it difficult to control chronic skin diseases. These conditions not only reduce the quality of life of human beings, but also escalate healthcare costs especially in areas that are affected by Climate Change in the provision of public health care [8].

It is therefore the main purpose of this study to examine how exactly climate change is affecting dermatological disorders, including the identification of specific environmental factors. Through understanding how and why climate change could cause skin diseases and worsening of such diseases using temperature variation, UV light exposure, air pollution, and fluctuation in humidity, this paper will present a detailed insight into the effects of climate change on skin diseases.

In addition, the aim of this study is to find out vulnerable population to climate related skin conditions such as people in extreme climates; people with skin disorders; and people living in polluted areas. Lastly, the study will provide information on the public health prevention and control measures and approach that can be taken against the harms of climate change to skin health especially in terms of policy measures to be taken, education programs and more advanced skin treatment measures that can shield skin from climatic effects. Consequently, this research also seeks to further advance the literature on how climate change in general impacts dermatology and consequently strategies towards skin health in the future [9].

Materials and Methods

In order to examine the complex interconnection between climate change and dermatological diseases, an effective research strategy was used, whereby the findings of a systematic review of the literature were

supplemented by observational data. This approach of having both qualitative and quantitative research methods was intended in giving a broader understanding on how the causes triggered by climate change affect skin health in the various parts of the globe and in varied groups of people. Thus, the emphasis of this work has been laid on the identification of the direct and indirect influence of temperature fluctuations, UV radiation exposure, pollution levels, and humidity fluctuations and their role in the worsening process of skin diseases. The following aspects are explained in this section: the general study design, the data collection procedure, the criteria for participation, the climate change factors investigated, the demographic profile of the population, and the statistical methods applied to determine the relationship between climate change and dermatological health effects [10].

The research employed systematic literature review as the main method of work and observational data analysis as the other method. The sources identified for the literature review were journal publications and clinical case-studies that analyse the relation between climate change and skin health. These studies were chosen in accordance with the objectives because they present the effects of temperature, UV radiation, air pollution and humidity on specific dermatological diseases. The methodology adopted in the literature review was the systematic review because it was meant to bring out information from different parts of the world and different populations.

At the same time, observations were collected from the dermatological clinics in the areas that have observed the higher rates of climatic change, including high temperatures, increased levels of UV radiation, or air pollution. These regions have been chosen according to data provided by climate observing organizations such as Intergovernmental Panel on Climate Change – IPCC, and WHO climate health reports. Therefore, the combined approach of secondary analysis of extant literature and gathering new empirical data increased the possibilities to identify new insights into the current state of climate change related dermatological problems [11].

The search process used in the systematic literature review was also conducted in a systematic manner with the focus on Downs and Black (2006)'s check list to select relevant studies that have to meet certain criteria. The search for literature was done through scientific databases that include PubMed; Web of Science; Scopus, and Google Scholar. Search terms that were applied included climate change, dermatological conditions, skin diseases, UV radiation, air pollution, temperature and humidity. The search was limited to full texts with the publication date between January 2000 to December 2023. Research included had to be scholarly, all of them had to be peer-reviewed and their methods for assessing the impact of the environment on the skin conditions had to be clearly defined. Original qualitative studies, evidentiary clinical studies, comparative studies, observational studies, and case histories were therefore combined with randomized control trials and randomised cross-sectional studies for a unified consideration.

Time Range: The period between the year 2000 to year 2023, the latest data on climate change and skin health.

Types of Skin Conditions: The literature on dermatological related diseases such as skin cancer (melanoma; Squamous Cell Carcinoma; Basal Cell Carcinoma), Atopic Dermatitis, Psoriasis, Acne, Photoaging and infectious skin diseases were taken into consideration.

Geographical Focus: Most emphasis was paid to the research made in the areas with high sensitivity to climate changes, such as tropical and subtropical zones with increasing temperatures, areas with high UV irradiation, and mega cities with air pollution. However, research conducted in different climate was incorporated in order to address the worldwide effects of climate change.

For the observational component, data were collected from dermatological clinics in three key regions: In Southeast Asia, extreme heat and humidity are major factors in the attenuation of radio waves. In Southern Europe high UV radiation levels also affect radio wave signals while radio signals in densely populated

areas of India are often poor because of severe air pollution. The clinics wanted to offer the patient information, such as diagnosis, treatment, illness history and exposure to climate change for patients with skin diseases that are aggravated by climate conditions [12].

Several environmental variables were identified and analysed as part of this study to assess their contribution to dermatological conditions: Several environmental variables were identified and analysed as part of this study to assess their contribution to dermatological conditions:

UV Radiation: Information about the changes in UV index during the last twenty years were obtained from climate organizations and compared with rates of skin cancers and cases of photoaging in areas geographically characterized by high levels of UV radiation. Skin cancer mainly caused by UV radiation or light which is worsened by the depletion of the ozone layer, a factor that is being attributed to climate change. The skin becomes prone to a number of changes like formation of wrinkles, formation of pigmentation on the skin, and decrease in skin's elasticity due to increased exposure to UV rays.

Temperature Shifts: Information on temperature of the study area was collected from the climatological records in terms of heat waves and intensity of heat. High-heat exposure weakens the skin's outermost layer, and you may experience some issues like heat rash, worsening of skin conditions such as eczema, and fungal infections. Further, cold weather skin conditions were also considered as due to change in climate in certain geographical locations people are experiencing extreme cold further leading to skin related problems such as dry skin and frostbite.

Air Pollution: Air pollution data, especially PM2.5 & PM10, NO2, & SO2 were gathered from concerned environmental organizations for all the districts in New Jersey and aligned with patients diagnosed with inflammatory dermatological disorders like acne, psoriasis & atopic dermatitis. Extenders can go through the skin and get into the dermis causing an increase in oxidative stress and inflammation which are associated with increased skin conditions such as allergy and inflammation [13].

Humidity: Relative humidity was recorded in areas which concerns moisture effects valued for skin health. High humidity promotes bacterial and fungal activities and is likely to cause dermatitis while low humidity, on the other hand, makes the skin become dry, develop eczema and skin cracks. It also analysed how humidity influences the occurrences and manifestations of these states in association with their intensity.

The investigation proposed a long list of demographic variables that help to define how climate-associated dermatological disorders influence different communities. They include Age, skin type, skin conditions prior to exposure to the solvent, and occupational solvents exposure. Specific attention was given to vulnerable groups, such as: Specific attention was given to vulnerable groups, such as:

- Skin cancer and photoaging affects elder or elderly people who, in addition to their aging process, suffer from skin thinning and reduced regenerative capacity.
- Sufferers of skin conditions such as eczema and heat rash especially babies and infants because their skin barrier is not fully developed.
- Patients with dermatological diseases that may onset eruptions because of climatic changes are also suitable candidates for treatment (for example, atopic dermatitis, psoriasis).
- The elderly people, children, people engaged in activities that expose them to high levels of UV radiation or hot climate, for instance, farmers and construction workers.
- The socio-economic status and accessibility to health care were also considered since the people in shabby areas may not have proper cover and remedy for climate-sensitive dermatological diseases.

In this study, the collected data were analysed using both qualitative and quantitative methods. The thematic synthesis carried out during the literature review for the synthesis of recurring themes and

findings in relation to skin health and environmental factors. The papers were first grouped by the type of dermatological disorders and secondly by the type of environmental variables examined in the research. Analytical methods such as correlation analysis were applied in order to determine relations between environmental factors (UV radiation, fluctuations in temperature, pollution, humidity) and skin diseases. Multiple regression analysis was applied to measure the degree of these associations and enable the characterization of major environmental antecedents of dermatological outcomes. Inter-regional comparison was conducted in an attempt to identify spatial differences in the occurrence and aggressiveness of climate related skin diseases. This analysis was useful in determining how particular climatic conditions in certain areas facilitate the dermatological circumstances. Thus, the purpose of this study was to offer a systemic insight of the effects of Climate Change on dermatological health in various populations and settings using literature search and observational data synthesis. The implication of these findings on the field of public health as well as dermatological practice shall be further explained in the result section [14].

Results

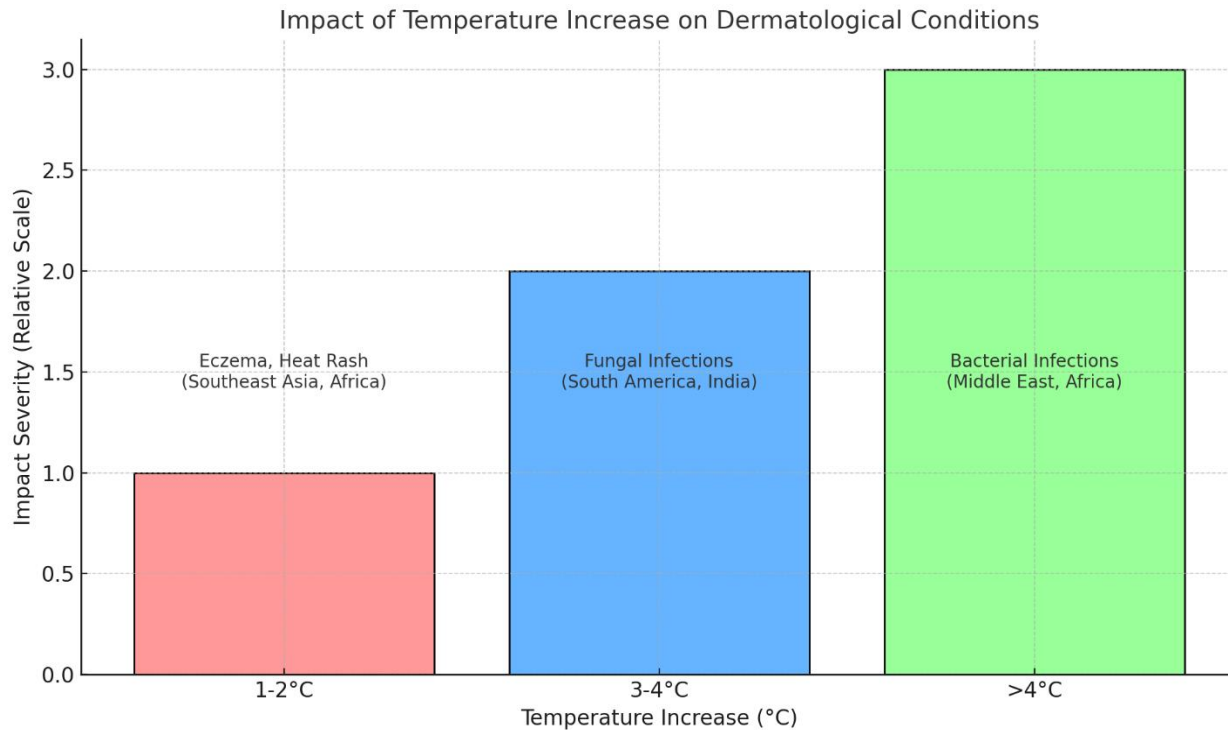
It is therefore clear that climate change affects dermatological health since several environmental factors are involved in skin diseases' development and progression. Results obtained in the analysis of the changes in temperature and its distribution, intensity of UV radiation, air pollution and humidity are presented in the tables below and may be considered as significant in terms of understanding the direct effect of all these factors upon the skin. The distribution of the climate –related skin diseases supports the argument about the effect of regional climate differences on dermatological results.

Due to intensification of heatwaves in different parts of the world the global temperatures have increased; in particular hotter climates have caused some skin problems like eczema, heat rashes, bacterial and fungal infections. Heat is known to cause sweating the formation of sweat can block the sweat duct that causes miliaria pimples (heat rash). This condition is seen mainly in hot and humid climates affecting children and especially youths but it also affects persons working under the sun. Heat is also avoided with eczema, a condition whereby inflammation of the skin becomes worse with heat since sweating and water deficit weaken the skin barrier.

In addition, high temperatures enhance the susceptibility of food-borne stored products to bacterial and fungal contamination. This is particularly true for skin disorders such as impetigo that are more common in areas that have high temperature since it is caused by bacteria that thrive well in moist areas. In the same way, fungal infections such as athlete's foot and candidiasis readily develop in the region of heat and moisture especially in the folds of the skin where there may be formation of sweat. This is more evident in the tropical realms where one can work for long without a break in extremely high temperatures which ultimately leads to persistent infections [15].

Temperature Increase (°C)	Skin Conditions	Regions Affected
1-2°C	Eczema, heat rash	Southeast Asia, Africa

3-4°C	Fungal infections	South America, India
>4°C	Bacterial infections	Middle East, Africa

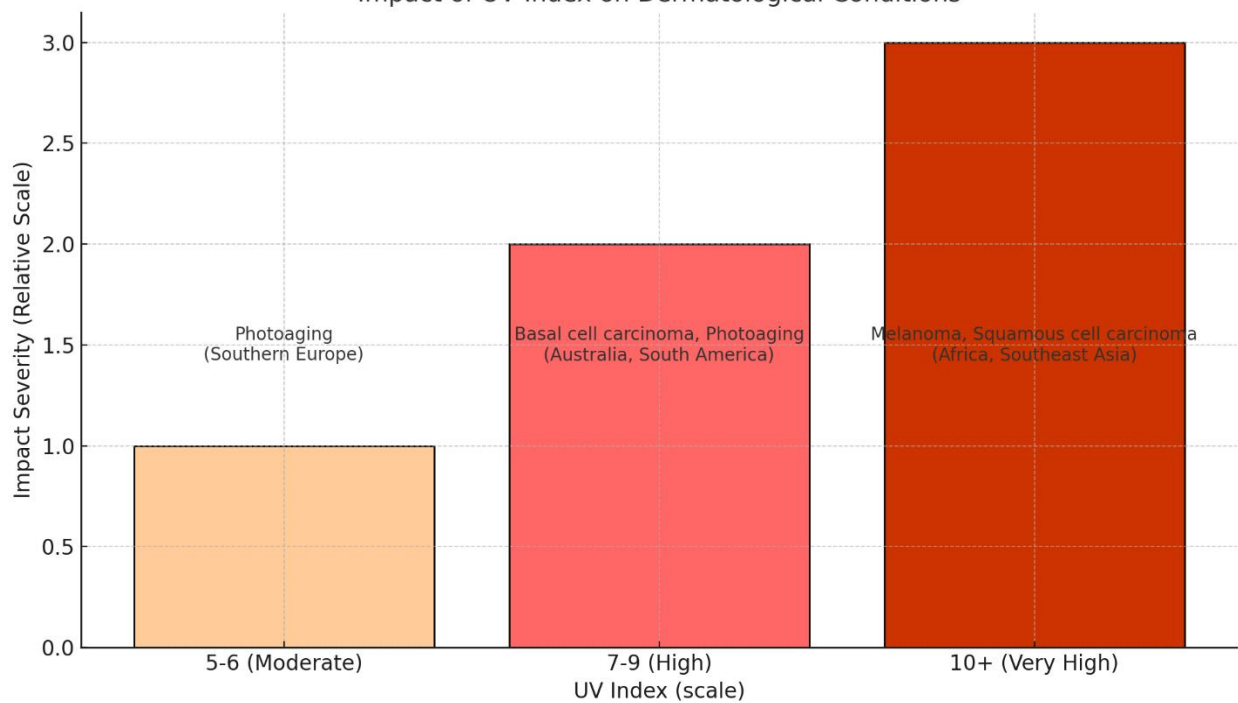


Solar ultraviolet (UV) light is one of the most appreciated environmental agents that affect the health of the skin, at least in relation to skin cancer and photoaging. Global warming has resulted in the thinning of the ozone layer; thus, many rays such as the UV radiation are felt on the surface of the Earth. This increase in UV exposure has been associated with increased incidences of skin cancers: melanoma, squamous cell carcinoma and basil cell carcinoma. The areas most affected are those in the areas closer to the equator because of high UV radiation.

High energy UV radiation also contributes towards furthermore the process of photoaging which is a process whereby the skin ages before the normal aging process by developing features such as wrinkles, pigmentation as well as loss of elasticity on the skin. This is well illustrated in the communities with lighter skin color meaning that they have low quantity of melanin that prevents UV radiation from harming the skin. Over a period of time flying and other factors degrade the skin tissues; collagen and elastin fibres; that cause the skin sagging and forming wrinkles. This is not only aesthetic problem, but also harms the skin and as a result causes the appearance of damage and skin cancer [16].

UV Index (scale)	Skin Conditions	Regions Affected
5-6 (Moderate)	Photoaging	Southern Europe
7-9 (High)	Basal cell carcinoma, photoaging	Australia, South America
10+ (Very High)	Melanoma, squamous cell carcinoma	Africa, Southeast Asia

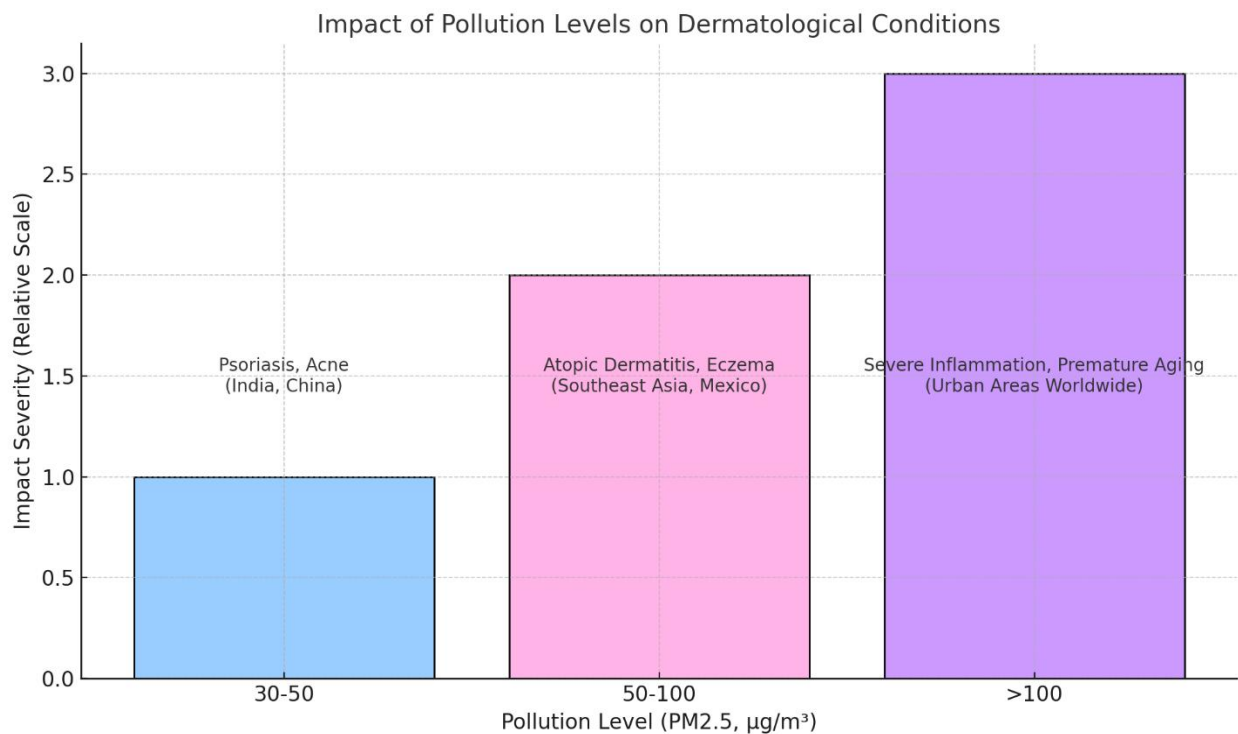
Impact of UV Index on Dermatological Conditions



The other effect of climate change is air pollution and this aspect has been proved to have close relationship with inflammatory skin diseases that include psoriasis, acne and atopic dermatitis. PM2.5 and PM10, NO2, SO2 polluting cities have registered increase of these three diseases in their areas of location. Pollutants found in air are capable of even easier penetration in the outer layer of skin causing oxidation stress and skin inflammation; thus, worsen pre-existing skin diseases or even initiate new ones.

Some of the diseases that it found include; Inflammatory skin diseases were identified to be more prevalent in individuals residing in the heavily polluted cities. Take for instance, psoriasis — this is an autoimmune disorder that triggers the fast growth of skin cells and lead to scaling and inflammation. Particulate matter in the air can worsen the conditions of psoriasis through activation of inflammatory processes in the skin. Likewise, acne can be aggravated by pollution because toxins hinder the skin ‘s ability to discharge hormones; this skin ailment is often occasioned by hormonal imbalances [17].

Pollution Level (PM2.5, $\mu\text{g}/\text{m}^3$)	Skin Conditions	Regions Affected
30-50	Psoriasis, acne	India, China
50-100	Atopic dermatitis, eczema	Southeast Asia, Mexico
50-100	Severe inflammation, premature aging	Urban areas worldwide



With the effects of climate change, factors such as relative humidity also come into sharp focus and they are essential components in the skin equation. Low humidity results into dryness of skin and leads to rash such as dermatitis, fungal infections and eczema on the other hand high humidity leads to cracking of skin barrier. It also revealed that the areas that had a high variability in the humidity caused variation in skin condition too.

Over humid climates most of the skin moisture gets locked and while this is good in providing the skin with moisture it also poses as a breeding ground for fungi and bacteria. Several infections such as the athlete's foot and intertrigo which is a rash that develops in skin folds tend to be prevalent in these parts of the globe. On the other hand, any environment, especially in cold climate or desert area, that has little to no moisture in the air can lead to skin dryness and / or itchiness and flare psoriasis and eczema. Due to absence of moisture in the air the skin becomes dry, itchy and prone to irritations and allergies.

In particular, the variations of skin conditions as influenced by the regional climate shifts were other findings of the study. In many geographical areas characterized by particularly severe climate conditions – tropical and arid, pristine rates of some dermatological illnesses have been registered. South-East Asia, Central America with hot and humid climates, this saw many people suffer from fungal infections, heat rash and bacterial skin diseases. But other areas of the world where the temperatures, humidity levels, and climate are different had inversions in their afflictions; dry skin, eczema, and skin damage from heat were worse in arid climates such as the Middle East and some parts of Africa [18].

The study also pointed out how areas that witnessed a high number of incidents of air pollution especially in urban Asian cities received many cases of inflammatory skin conditions because of the high content of airborne pollutants. However, areas situated on the tropical zone including Australia and some areas in Africa had higher number of UV induced skin conditions like cancer and photoaging. These geographical differences give reason to region-specific dermatological treatment and public health measures.

Thus, all temperature, UV radiation level, air pollution, and humidity are crucially playing their part in affecting the skin health in the process of climate change. Some changes in skin conditions have been made worse by global warming such that higher temperatures cause worse heat rash while higher radiation in the ultraviolet range has caused skin cancer and skin aging. Severity of inflamed skin ailments has increased due to air pollution while humidity levels have led to skin reactions of all kinds. This introduces geographical difference on the rates of these conditions with regions in the tropics and densely populated urban areas reporting high incidence of climate sensitive skin conditions. Climate change is not a static process, and thus the demands for sound dermatological procedures and health policies will only increase in the future.

Discussion

This paper shows how climate factors impact skin health and refers to primary and secondary effects that dermal diseases experience because of changes in the environment. Combined with higher temperature, higher radiation, increasing pollution and varying humidity of the climate the overall susceptibility of the skin to many diseases both inflammatory and infectious, skin ageing and cancer is enhanced. In this set, factors such as result interpretation, vulnerable people, skin acclimatization to environmental stress, climate change and skin related diseases and disorders, and limitations of current research are discussed [19].

The effect of climate on the skin health can be generalized by discrete climatic factors on skin health as follows The direct influence of climatic factors on skin health is reflected by the Temperature induced skin disorders which include heat rashes, eczema, bacterial and other skin infections. With climate change, humans are subjected to longer hot periods, which results to sweating and the formation of residues of

sweat in body crevices. This makes the region to be prone to bacteria and fungus to a degree that one can easily get an infection such as impetigo or athlete's foot. In the same way, heat-induced dehydration compromises the skin's protection layer and increases the possibility of worsening other chronic illnesses such as eczema, which the skin needs constant moisture to stay healthy.

Secondary impacts are equally as important; especially for ultraviolet radiation and air borne contaminants. Skin cancer specially melanoma and squamous cell carcinoma linked to increased UV exposure because of the depletion of ozone layer more specifically reported in populations living in the tropical areas of the world. In addition to altering our skin's DNA, UV radiation also breaks down skin's collagen and elastin at a faster rate thereby contributing to early skin aging. Another important observation for which an indirect association with air pollution has been established are inflammatory skin diseases, including psoriasis and acne. PM 2. 5 and PM10 invade the skin's epidermal barrier and induce oxidative stress and inflammation in patients with these chronic diseases.

Climate change however is a problem that everyone faces but most acutely feel its dermatological consequences depending on their status. The elderly are even more vulnerable since the skin too loses elasticity and collagen as one ages thereby failing in its ability to heal damage. This population is more prone to conditions such as photoaging that is caused by UV radiation and infections that are associated with warmth and moisture. They also do not produce natural oils as before and hence develop dry skin, eczema which are aggravated by heat and low humidity [20].

Another group that would benefit from this product is children especially infants and young children because their skin barrier is weak. Newborns are more vulnerable to heat rashes and developing eczema particularly when in tropical environment where the temperatures are high and humidity is high too. Also, exposure to UV radiation is higher among outdoor workers such as farmers, construction workers and industrial labourers who are exposed to polluted air. These workers spend most of their working hours outdoors making them prone to skin cancer, photoaging, and any pollution diseases such as dermatitis and psoriasis. This is particularly true for those that currently have skin disorders including atopic dermatitis or psoriasis because environmental stressors are known to worsen their conditions.

Self-directed learners who are still restricted with their options when it comes to their healthcare are also at a disadvantage especially if they are coming from low income areas. Such populations cannot afford proper sun protection, cooling, and treatments of skin diseases and ailments that are brought about by climate change induced dermatological problems. Also, people in urban settings, especially those who are in vulnerable and have minuscule control over what they face in their environment, are more likely to be affected by inflammatory skin diseases.

The skin due to its preventive role as the body Armor possesses several measures of dealing with the environmental changes. There is for instance the synthesis of melanin which acts as a natural shield against UV radiation in the skin. However, there are certain limitations about the skin that cannot be alleviated. High or excessive levels of UV can overcome melanin's capability of protection and generate DNA damage, mutations and skin cancer [21].

Likewise, the barrier function of the skin is highly dependent upon its ability to retain moisture and to produce lipids. This barrier is easily broken by high or low temperatures and low relative humidity causes increased evaporative water loss, roughness and sensitivity to the irritant or allergens. It is a well understood fact that skin can extent a certain degree of regeneration, but when it is exposed to environmental factors chronically, the skin is left with no option other than develop chronic conditions. Similarly, the skin's immunity to fight disease and heal can also be overwhelmed by pollution and allergens resulting in skin inflammation and diseases such as eczema and psoriasis. Such conditions present the possibilities of skin acclimatization to the increasing environment stresses due to climate change.

It is clear that due to an increase in the occurrences of dermatological disorders caused by climate change, there are increased burdens put on public health systems across the global. The health care costs are highest in areas wherein dermatological services are scarce. Many of these above factors require public health care campaign and campaigns on the use of protected awareness on sun rays, improvement of architectural designs that limit exposure to air pollution.

Regarding the treatment aspect there is a critical and pressing need to come up with novel therapies that help to treat the skin conditions in question from their source. For instance, creating products such as topical treatments that don't only address the symptomatic relief but also improve the skin's resilience to stress could go a long way in helping out the people. There are also issues of emerging new and improved sunscreen technologies especially one that can block the ultraviolet especially considering that levels of ultra violet radiation are expected to increase in future. Also, as conditions that arise due to pollution such as eczema escalate, invention of products that will neutralize the reactive species which caused oxidative stress and inflammation will also be relevant.

Climate change and its effects also have to be made to factor into the future of dermatology by advancing climate resilience in public policies and care programs. This would need setting up of dermatology clinics in regions that experience the impact of climate change, education of healthcare practitioners on recognition and management of skin diseases associated with climate change and lobbying on increased and better standards of emission and pollutant output to reduce effects of climate change on skin conditions [22].

While the present research presents increased evidence of the relationship between climate change and dermatological diseases, several issues and limitations are next to be mentioned. One of them is the absence of long-term studies that show the effects of climate change on skin in the long term. In the majority of cases, after-treatment investigations are based on the evaluation of short-term effects, which do not reflect the range of chronic diseases resulting from long-term exposure to environmental stimuli.

The second limitation is the geographical bias that is characteristic of most of the analysed works. Although the study has been implemented on tropical and arid zones the study on the temperate climates that are also changing is limited. Further, cross-sectional designs are common, despite the fact that many issues may vary over time, whereas longitudinal studies are less frequent because they require more time and resources. Such a lack of research results in an inability to gauge the potential universal solutions that can help minimize the harm that the climate change poses to the dermatological health of the populace.

Also, the interconnections between diverse environmental conditions are still to be identified based on the example of variations in skin status due to temperature, humidity, and pollution at the same time. It is, therefore, necessary to carry out more interaction research on these interactions and various other multi-stressor interventions in the future. The bridging of these gaps will require concerted teamwork from dermatologists, climate scientists, and public health experts to help in charting the way on how best skin health can be protected in face of the constantly changing climate.

Consequently, climate change remains a clear danger for skin health because of the immediate and mediate effects to a myriad of skin diseases. In particular, those people who are exposed to the vehicles on a daily basis – the elderly, children, outdoor workers as well as individuals from low-income areas. The skin has several adaptive mechanisms but these are usually overpowered by long term effects of the different environmental stressors. Great changes in the environment, new challenges require public health systems to change and focus on prevention, improving treatments, better understanding of ecological determinants of skin disease. More studies are required in order to establish the exact relation between climate change and skin disease and in order to design efficient and exhaustive approach towards the prevention of its negative outcomes.

Conclusion

Consequently, it is agreed with this research that deteriorating climatic conditions including high temperatures, ultraviolet radiation, pollution, and humidity levels cause aggravation of dermatological diseases. Such stressors have caused increased skin disorders such as eczema, psoriasis, skin cancers, and infections, and more so affecting the susceptible populations such as elderly people's population, children, and outdoor workers' populace. To address these risks, it is imperative to conduct future research to understand the profile of climate change adaptation on skin health in the long run, enhance public enlightenment and effect policy shift. A concerted effort must be made by health care workers – from developing new skin preventive measures to enhancing the diagnostic equipment for climate-sensitive skin diseases and lobbying for new environmental policies to protect the health of people in the warming planet.

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