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Climate change and health: Hidden threats and sustainable prospects

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***Abstract*---Background**: Climate change is becoming a bigger problem around the world that has big effects on people's health. Direct effects on health, like heatwaves and worsening air quality, are well known. But hidden threats, like the rise of vector-borne diseases, food shortages, and mental health problems, have not been fully studied.

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These threats affect vulnerable groups more than others, making health disparities worse. To deal with these problems, we need long-term, diverse solutions that boost robustness and lower risks. **Aim**: The point of this study is to look into the hidden health risks that climate change poses and to look at long-term ways to lower these risks, with a focus on improving global health equality and resilience. **Methods**: Findings from peer-reviewed journals, world health records, and climate change reports are put together in this study. Case studies of areas that have been impacted and data breakdowns are used to show how climate change and health are connected in a complicated way. Green healthcare systems, neighborhood resilience programs, and global policies are some of the sustainable solutions that are looked at in detail. **Results**: Climate change makes secret health risks worse, like diseases spread by insects, not having enough food and water, and mental health problems. Sustainable solutions, such as using green energy in healthcare and global agreements like the Paris Agreement, have a lot of potential, but they need more people to work together and more money to really make a difference. **Conclusion**: To deal with the many ways that climate change affects health, we need unified plans that put fairness, new ideas, and long-term success first. To lower long-term risks, it is important to strengthen global health services and make susceptible groups more resilient.

***Keywords*---**climate change, public health, sustainable development, health equity, vector-borne diseases, mental health, food security, resilience.

Introduction

Climate change, which is happening all over the world and has many causes, is one of the biggest problems of the 21st century. It has huge effects on both people and nature. Climate change is the long-term change in temperature, rainfall patterns, and the makeup of the atmosphere that is mostly caused by human-made greenhouse gas emissions. It shows up in many ways that are harmful to public health. Aside from the obvious effects on the environment, like rising sea levels and extreme weather, the link between climate change and human health has become an important area of study. This changing connection includes both direct and secondary effects on health, such as illnesses caused by the heat, changes in disease trends, not having enough food, and mental health problems. We still don't fully understand the secret aspects of these health effects, but they have huge effects on healthcare systems, especially in areas that are already weak [1, 2].

Looking at climate change through the lens of health is important because it can help connect the fields of environmental science and public health, which can lead to more thorough policy development. Theories like the "climate-health nexus" show how these areas are linked and how environmental stresses can have a domino effect on both physical and mental health [3]. New global health

models, like the Lancet Countdown on Health and Climate Change, show how important this overlap is by keeping track of yearly trends and what they mean for long-term growth. Also, ideas like the Planetary Health Framework offer a systems-based view that calls for a fresh look at how climate adaptation can support people's health security [4].

Recent changes in this area show how complicated health threats linked to climate change are becoming. First, the spread of diseases carried by vectors, like malaria and dengue fever, shows how changing weather trends and rising temperatures make it possible for vectors to grow in new areas, putting millions of people at risk [5, 6]. Second, changing weather trends and lower crop outputs have made food instability worse because of climate change. This has made malnutrition and hunger worse, especially in low-income countries [7]. Third, the effects of climate change on mental health, such as migration and ecological grief, are becoming more widely recognized as a major global issue that has big impacts for public health systems [8]. These events show how important it is to use a broad method that includes biological, economic, and social aspects to fully address the health effects of climate change.

The purpose of this study is to look into the secret health risks that climate change poses and to review long-term solutions that can lessen its effects. The first part talks about the many health risks that come with climate change, focusing on areas that haven't been looked into much, like vector-borne diseases, not having enough food and water, and mental health. The second part talks about how minority groups are more likely to be hurt and how unfair conditions make these risks worse. The next parts look at the effects' processes, covering biological, economic, and behavioral aspects. They then move on to long-term answers like green healthcare systems and global policy frameworks. In the last parts, suggestions for improving global health resilience are spelled out, with a focus on new studies and ethics issues. This paper wants to add to the conversation about the link between climate change and health and what that means for long-term development by putting together new research and suggesting ways to make it all work together.

Heat-related illnesses are one of the hidden health risks of climate change.

There is no doubt that climate change is causing world temperatures to rise, which has serious health effects on people. Heat-related sicknesses, such as heat fatigue, heatstroke, and dehydration, are some of the most immediate and direct effects. Average world temperatures are going up, and so are the number, length, and severity of heatwaves. This is putting a lot of physical stress on people. These problems get worse because of people moving to cities, differences in income, and not taking enough steps to change. This has very bad health effects, especially for older people, kids, people who work outside, and people who already have health problems [9, 10].

More heat and the chance of getting heatstroke and dehydration

Too much heat can cause heatstroke and dehydration, which are the worst health effects. Long-term exposure to high temperatures can overwhelm the body's

thermoregulatory system, raising core body temperatures above 40°C. This can damage nerves and organs and, in the worst cases, kill the person. Dehydration makes things even more difficult because it makes it harder for the body to sweat away heat, which raises the risk of heatstroke. A lot of deaths from heat are caused by heatwaves, according to research. One study says that between 37% and 50% of all heat-related deaths around the world are directly caused by human activity on the climate [11, 12].

The effects of higher temperatures can also be seen in the rise in hospital admissions during heatwaves. For example, a full study of European heatwaves from 2003 to 2014 showed a shocking rise in heart and kidney problems caused by the heat [13]. This shows how physically demanding high heat is. Also, research from tropical and subtropical areas shows that even small changes in temperature can cause dehydration and heat stress, especially in people who don't have easy access to cooling systems [14].

People Who Are Vulnerable

Because of their physical, work, and social economic weaknesses, some groups are more likely to get sick from the heat than others. The old are the most at risk of these groups. The body's thermoregulatory systems get less effective with age, and long-term conditions like heart and lung diseases make people more sensitive to heat. Studies show that more than 80% of heat-related deaths happen to people over the age of 65 during high heat events [15]. Also, older people have trouble getting to cooling measures or medical help quickly because they are less mobile and socially isolated.

Other high-risk groups include people who work outside, like delivery people, building workers, and farm laborers. They are more likely to get heat stress and dehydration if they work hard in hot conditions and are in full sunlight for long periods of time. A 2017 meta-analysis found that low-income outdoor workers have up to 10 times the risk of heat-related illness compared to the general population. This is mostly because their workplaces aren't set up properly and they can't get enough water [16].

A susceptible group is also made up of children and babies. They are more likely to get dehydrated and overheated because their thermoregulatory systems are not fully developed yet and they have more surface area compared to body weight. Also, kids who live in places with few resources often can't get the medical care they need, which makes the risks of high heat even greater [17]. Deep effects on brain growth and long-term health results mean that specific actions are needed to protect these groups.

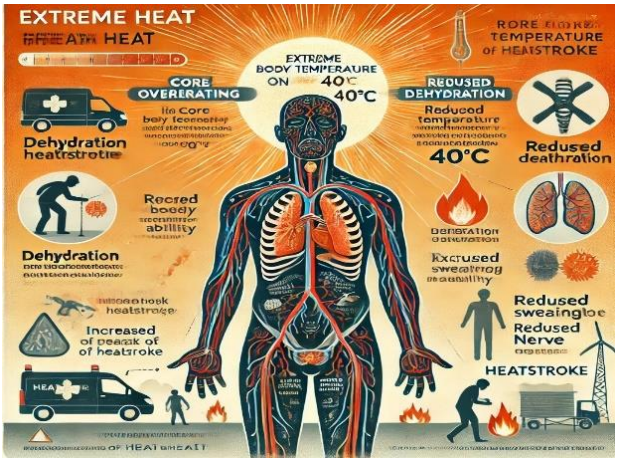

Figure 1 Extreme heat raises the risks of heatstroke and dehydration, disproportionately impacting vulnerable populations such as the elderly and outdoor workers

Social and economic factors in cities

Through the "urban heat island" effect, towns with lots of people and lots of concrete and asphalt surfaces keep heat in better than country places. This makes the risk of heat-related illnesses much higher. This problem mostly affects low-income neighborhoods where people live in homes that don't have good ventilation and can't get air conditioning. A study from 2013 showed that during heatwaves, cities in low- and middle-income countries can be up to 7°C hotter than the countryside areas around them [18]. This makes it worse for people from lower-income families who are already struggling with the heat.

The ability to adapt to higher temperatures is also affected by socioeconomic factors. People in low-income countries often don't have access to medical care, cooling devices, or teaching materials that could help them avoid heat-related problems. Also, informal workers, who make up a big part of the labor force in these areas, have trouble making changes to their workplaces like limiting their hours or adding shaded rest areas [19]. Getting rid of these differences is important for lowering the number of heat-related illnesses around the world.

Strategies for Adaptation and Mitigation

To fight the rising health risks that come with rising temperatures, we need effective methods for both reducing their effects and adapting to them. Putting in place climate-resilient health infrastructure, like early notice systems for heatwaves and community cooling centers, can greatly lower the number of illnesses and deaths. The urban heat island effect can also be lessened by planning cities so that green areas and building materials that reflect heat are given more attention [20].

At the individual level, programs that teach people how to stay hydrated, dress appropriately for the heat, and spot the early signs of heat-related illnesses can give weak groups the power to take preventative actions. For outdoor workers to

be safe from heat stress, workplace measures like required breaks to drink water and workspaces with shade are very important [21].

climate change is causing temperatures to rise, which is a big and growing threat to world health. Heat-related illnesses are becoming a major worry. The fact that the effects are worse for vulnerable groups like the old, people who work outside, and children shows how important it is to target treatments and fair response methods. To deal with these problems, we need to change policies, plan cities better, and start public health programs. This way, we can lower the number of illnesses caused by the heat and make communities stronger.

Vulnerable groups and unfair treatment

Climate change isn't having the same effects on everyone's health. This creates big differences that make people even more vulnerable than they already are. Geography, social status, and population all play a role in these differences, which affect how vulnerable people are to climate risks and how well they can adapt to them. People who are weak, like those who live in low-lying coastal areas, small island states, marginalized groups, children, and the old, are more likely to be affected by climate change than others. This is because of structural hurdles and limited access to resources that can help them adjust. Understanding and solving these weaknesses is important for making fair and useful plans for adapting to climate change [22, 23].

Potential Risks in Certain Areas

People who live in low-lying coastal places and small island states are being hit the hardest by climate change. Millions of people's jobs and health are in danger because the sea level is rising and storm waves are getting bigger. For example, a study on small island developing states (SIDS) found that extreme weather events and rising sea levels have made it more likely for water to become contaminated, vector-borne diseases to spread, and people to have to move, especially in the Pacific and Caribbean [24]. The Intergovernmental Panel on Climate Change (IPCC) predicts that by 2100, many coastal areas will have floods every year. This will make it much more likely for people to get diseases that are spread by water and have mental health problems [25].

Different groups in rural and urban areas are more or less vulnerable because they can't change as well. Droughts, high heat, and floods are just a few of the climate-related disasters that hurt rural areas the most. These areas often have poor infrastructure and limited access to health care. These situations make food instability and poor nutrition worse, especially in farming areas with low incomes [26]. People who live in cities, especially those in low- and middle-income countries, are more likely to get sick from the heat because of the "urban heat island" effect. This happens when places with lots of people keep more heat in, which raises the risk of heat-related diseases. A study from 2013 found that people living in informal areas in cities are especially at risk because they are overcrowded, don't have good housing, and can't get to cooling systems [27].

Uneven Incomes and Societies

The health effects of climate change depend a lot on a person's socioeconomic position. Communities with low incomes and people who are already on the outside often don't have the tools they need to prepare for, deal with, and recover from health problems caused by climate change. These groups are more likely to live in places with bad environmental conditions, like flood-prone areas or places with a lot of pollution, which makes them more vulnerable to climate risks [28]. For instance, people who live in informal areas often face more risks, such as poor cleanliness, limited access to clean water, and a higher risk of getting diseases spread by insects [29].

Access to health care is another important thing that needs to be done to fix health disparities caused by climate change. People from marginalized groups often have trouble getting health care because they can't afford it, live in remote areas, or are discriminated against in the system. This makes it harder for them to get care quickly for illnesses caused by the heat, infectious diseases, or mental health problems made worse by climate change [30]. A study from 2017 found that only 10% of healthcare facilities in sub-Saharan Africa have consistent access to power [31]. This makes it harder for them to handle health crises caused by climate change.

Richer communities have easier access to adaptive resources like early warning systems, schooling, and infrastructure that can withstand climate change. This makes the climate resilience gap even bigger. A study of efforts to adapt in South Asia found that richer households were more likely to take protective steps like building homes that wouldn't flood and installing air conditioning, while low-income families were still very exposed to repeated climate changes [32]. To fix these problems, we need to put money into facilities and laws that put the needs of disadvantaged groups first.

Young people and old people

Children and older people are more likely to get sick from climate change because their bodies are more vulnerable and they can't adapt as well. These groups are at a lot of risk during extreme weather events like heatwaves, floods, and storms. Children, for example, are more likely to get dehydrated, heat stress, and lung diseases during heatwaves because their bodies aren't fully developed yet and they have more surface area than weight [33]. A 2015 study found that during heatwaves in the US, 25% more children went to the emergency room [34]. This shows that healthcare services are getting more and more stressed.

Long-term effects on children's growth make it even more important to address their weaknesses right away. Food shortages caused by climate change can make malnutrition worse, which can hurt cognitive and physical growth and have long-lasting effects on health and the economy. Also, children who are exposed to stressful events like natural disasters may have long-lasting effects on their mental health, making anxiety, sadness, and post-traumatic stress disorder (PTSD) more common [35]. These problems are especially bad in areas with low

incomes, where kids often can't get the food, medical care, or emotional help they need.

Because their health and movement get worse with age, older people are more likely to be hurt by climate change. People who have long-term illnesses like heart and lung problems are more likely to get sick from the heat and bad air quality. For example, a study of the 2003 heatwave in Europe found that 90% of the extra deaths were in people over the age of 65, which shows how vulnerable this age group is [36]. These risks are made worse by being alone or not having access to tools that can help you change, especially for older people who live alone or in low-income areas [37].

Getting rid of unfair treatment of vulnerable groups

To help these groups who are vulnerable, we need a diverse approach that includes tailored programs, policy changes, and working together with other countries. To get rid of health inequalities, we need to put money into social safety nets, community-based adaption programs, and healthcare systems that can handle changes in temperature. Early warning systems that are adapted to the needs of susceptible groups, like the old and children, can greatly reduce illness and death during extreme weather events [38].

Giving people more power through education and letting them make their own decisions can also make them more resistant to climate change. To close the climate resilience gap, policies must value fair access to flexible resources like cheap cooling devices and reasonable health care. International guidelines, like the Sendai Framework for Disaster Risk Reduction, stress how important it is to make sure that no community is left behind when planning how to respond to climate change [39].

the health effects of climate change are greatly affected by geographical, socioeconomic, and social factors, which creates big differences between susceptible groups. Getting rid of these unfair situations is both the right thing to do and the only way to make sure that climate resilience is sustainable and includes everyone. Policymakers and practitioners can lower the global health cost of climate change and make all populations more resilient by putting the needs of children, the old, and underrepresented groups first.

Ways that effects happen

Climate change has many effects on health that are spread out in many ways that affect environments, businesses, and how people act. These paths show how environmental, social, and personal processes all affect health results and are linked to each other. Changes in the economy, changes in behavior, and changes in the environment all combine in complicated ways that have long-lasting effects on health and well-being. To create successful strategies that lessen the health effects of climate change and make societies more resilient [40, 41], we need to fully understand these processes.

Changes in the environment

An important part of protecting human health is the ecological benefits they provide, like clean air, water, food, and natural disease control. These systems are being thrown off balance by climate change, which is destroying species and making ecological services less useful. As an example, changing weather patterns and rising temps are causing habitats to move and species to go extinct. This makes the natural controls that stop the spread of infectious diseases less effective. Malaria and dengue are spreading again in places where they were under control before because of changes in the environment of the vectors that spread them [42, 43].

Loss of biodiversity also threatens food security by making farms less able to handle natural disasters like storms and droughts. A new study showed that the loss of space for insect species caused by climate change has already had an effect on food output around the world, which has major health and nutrition effects [44]. Also, destroying marine environments like mangroves and coral reefs makes floods and polluted water more likely, which makes it easier for people in affected areas to get diseases that are spread by water [45].

Ecological damage also makes mental health problems worse, which is sometimes called "eco-anxiety" or "solastalgia," especially in places where people depend on natural resources for their survival. Indigenous people, whose culture is closely linked to the environment, are more likely to be affected by the mental effects of environmental problems [46].

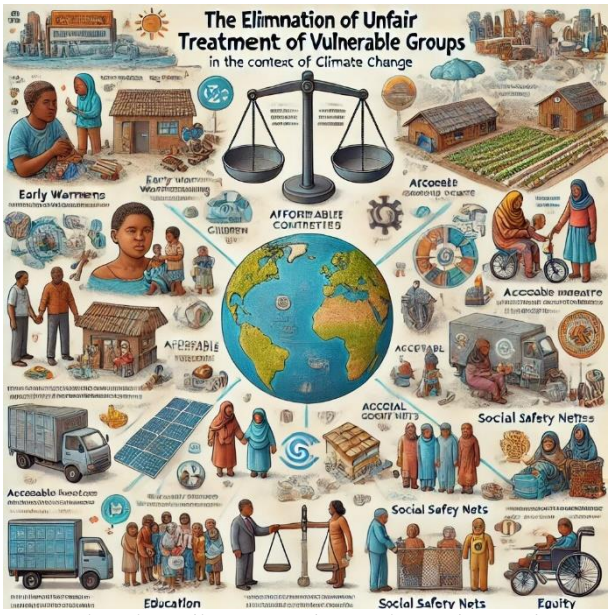

Figure 2 Ensuring equity in climate adaptation through targeted support for vulnerable groups, including children and the elderly, via tailored programs, social safety nets, and international collaboration.

Routes for the economy

Another important way that climate change affects health is through the financial burdens that come with health problems caused by climate change. These problems show up as higher healthcare costs, less work getting done, and overall economic uncertainty. Extreme weather events like storms, floods, and wildfires cause a lot of injuries, deaths, and disease spreads, which puts a huge load on healthcare systems. As an example, Hurricane Harvey in 2013 caused over $125 billion in damage, with a big chunk of that going to medical bills for treatment accidents, water-borne diseases, and mental health problems [47].

The effects on hospital facilities and staff are very bad. In many places, hospitals and other medical facilities aren't ready for the more frequent and severe natural disasters that are happening. Over 60% of healthcare facilities in sub-Saharan Africa don't have stable power, according to a study from 2013 [48]. This makes it harder for them to provide critical care in situations. In the same way, when unusual weather events mess up supply lines, it means that there aren't enough of certain medicinal products, which raises health risks even more. Healthcare workers are also affected by climate-related problems because they have to deal with more work, mental stress, and dangers at work [49].

Climate change is making the economy less stable, which has a secondary effect on health by making it harder to get the resources needed to adjust. Economic changes caused by failed crops, lost infrastructure, and lower worker output hurt low-income groups more than others, making health gaps worse. In countries that rely on agriculture, for example, long droughts have caused crop yields to drop, forcing many families to cut back on calories or eat less healthy food, which can lead to hunger and health problems [50].

Pathways of Behavior

People's behavior changes a lot because of climate change, which in turn has an effect on health. One very clear way that animals have changed their behavior in response to climate stresses is by migrating. Millions of people have already been forced to move because of rising sea levels, harsh weather, and a lack of resources. In the coming decades, the number of climate migrants is expected to rise greatly. A 2014 study from the World Bank said that climate change could force up to 143 million people to move within their own countries in Sub-Saharan Africa, South Asia, and Latin America by 2050 [51]. Migrant groups are often more likely to get infectious diseases, live in bad conditions, and have trouble getting medical care, all of which make them even more vulnerable [52].

Changing what you eat is another way that people react to climate stresses. Changes in eating trends around the world are being caused by changes in food supply caused by climate change. For example, a drop in the production of basic crops like wheat and rice has caused many communities to eat foods that are lower in nutrients and higher in calories. This has made obesity and diet-related noncommunicable diseases more common [53]. In areas with serious food poverty, on the other hand, people are often malnourished because they don't eat enough calories, especially children and pregnant women [54].

As people and groups deal with the grave threat that climate change poses, changes in behavior also happen in mental health. More people are getting anxiety, sadness, and post-traumatic stress disorder (PTSD) because of the mental stress that comes with bad weather, being forced to move, and not having enough resources. A study from 2017 found that stresses related to climate change are a major cause of mental health problems, especially among young people and people who are already at a disadvantage [55]. These behavioral routes show how important it is for climate response techniques to take a whole-person approach that includes both physical and mental health.

Taking a Look at Impact Pathways

In order to lessen the negative effects of climate change on health, we need to fully understand how these effects happen. Protecting ecosystems should be a top priority for policymakers and practitioners to ensure the services they provide, like keeping diseases in check and making sure there is enough food. To make the economy and institutions less vulnerable to climate-related disasters, we need to invest in healthcare facilities that can withstand extreme weather and training for healthcare workers. Climate stresses can also cause mental problems, but they can be fixed by helping people who have been forced to move and making sure they have enough food.

Climate change affects people all over the world, so working together across borders is important for finding solutions to these problems. Frameworks like the Paris Agreement and the Sendai Framework for Disaster Risk Reduction are helpful for getting everyone to work together, and they stress how important it is for climate resilience efforts to be fair and long-lasting. Stakeholders can make health policies more resilient and less harmful to future generations' health by taking natural, economic, and behavioral factors into account.

Ways that effects happen

Climate change has many different effects on people's health. These effects happen in complicated ways that affect ecosystems, the economy, and how people act. These paths set off a chain of events that makes people more vulnerable, messes up healthcare systems, and changes the way people normally behave. Taking care of these linked routes is important for reducing the health effects of climate change and making communities stronger. This part looks at how changes in the environment, the economy, and people's actions are some of the main ways that climate change affects health results.

Changes in the environment

Ecological systems are important for human health because they provide important ecological benefits like clean air and water, food production, and natural disease control. These systems are being thrown off balance by climate change, which is causing species to go extinct and ecosystems to work less well. These problems make public health risks worse by spreading infectious diseases, making farms less productive, and putting more people at risk from natural dangers.

Loss of biodiversity due to habitat damage, changes in temperature, and extreme weather events makes ecosystems less able to handle and adjust to climate stresses. For instance, changes in the ecology of vectors have made it possible for malaria, dengue, and the Zika virus to spread again in places where they weren't present before. A study in Nature Climate Change showed that rising temperatures are making it possible for disease-carrying mosquitoes to live in more places, putting millions of people at risk [56, 57].

Also, when environments get worse, water quality and access get worse, especially in places that are having droughts or floods. Coastal environments like mangroves and coral reefs, which naturally protect against storm waves, are being worn away. This makes people in those areas more likely to get diseases and injuries from the water. This damage to the environment also makes mental health problems worse, which is often called "eco-anxiety," especially for people whose culture and economic lives depend on the land [58, 59].

Agricultural systems, which depend on calm weather, are also subject to changes in the environment. Loss of grain output and changes in growing seasons have a direct effect on food security, leading to stunting and hunger, especially in areas with low income. A study from 2017 said that climate change could cause food production to drop, putting over 50 million people at risk of severe hunger by 2030 [60].

Routes for the economy

Another important way that climate change affects health is through the financial burdens that come with health problems caused by climate change. These expenses show up as direct costs for healthcare systems, secondary loses from less work getting done, and long-term instability in the economy. The economic effects of these health problems hurt low-income groups more than others, making health disparities worse.

Extreme weather events like storms, floods, and wildfires cost healthcare systems a lot of money. A lot of people die in these kinds of events, and diseases spread and cause long-term health problems. For example, Hurricane Maria (2013) caused $94 billion in damage in Puerto Rico. This included a lot of money spent on emergency medical care, fixing up infrastructure, and public health programs [61]. The cost to the economy goes beyond instant reactions; healthcare systems also have to deal with more people getting chronic diseases, like lung diseases caused by burning smoke and mental health problems caused by moving [62].

The effects of climate change are especially likely to hurt healthcare infrastructure, which is already weak in many places. Flooding and rising sea levels damage buildings, mess up medical supply lines, and make it harder to get basic services to people who need them. The World Health Organization said in a study from 2013 that more than 60% of healthcare facilities in low-income countries are not climate-resilient. This means that they can't handle the higher demand for services during climate disasters [63]. The healthcare workforce is also affected, with workers facing burnout, dangers on the job, and mental stress during long crises [64].

Climate change's effects on the economy have a secondary effect on health by making it harder to get tools that can help people cope. In rural areas, families have to cut back on spending on things like food, medicine, and school because crops fail and there isn't enough water. A 2015 study showed that economic changes in sub-Saharan Africa have caused child mortality and hunger to rise, showing how the health and economic systems are linked [65].

Pathways of Behavior

People's behavior changes a lot because of climate change, and many of these changes have big effects on health. Migration, changes in food, and changes in living situations are some of these behavioral routes that affect health risks at both the individual and community levels.

One of the most obvious ways that people react to climate stresses is by moving. Already, rising sea levels, extreme weather, and a lack of resources have forced millions of people to move. In the next few decades, that number is expected to rise even more. The World Bank thinks that climate change will force more than 140 million people to move by 2050 in Sub-Saharan Africa, South Asia, and Latin America [66]. Because of cramped living situations and limited access to health care services in host areas, migrants are more likely to get infectious diseases, be malnourished, and have mental health problems [67].

Changes in food supply caused by climate change can also cause changes in diet. Because basic foods like rice and wheat aren't producing as much, many communities have had to switch to less healthy meals. This has made obesity, diabetes, and heart disease more common in richer areas. On the other hand, not having enough food makes hunger worse in low-income places, especially among children and pregnant women. The Food and Agriculture Organization's 2014 study showed that climate change could undo decades of success in lowering hunger and malnutrition around the world [68].

Another important part of how climate factors change people's behavior is their mental health. Extreme weather, being forced to move, and not having enough resources can all have mental effects that show up as worry, sadness, and post-traumatic stress disorder (PTSD). Studies have found a link between climate-related stresses and a rise in suicide rates and other serious mental health problems. Young people and towns that are already struggling are especially at risk. A review from 2017 stressed how important it is to include mental health services in plans for adapting to climate change in order to fully deal with these issues [69].

Ecological changes, economic problems, and changes in behavior are all ways that climate change affects health, and they are all highly linked and complicated. To deal with these routes, we need a diverse approach that includes methods for protecting the environment, making the economy more stable, and improving mental health. To lessen the health effects of climate change, we need to invest in healthcare systems that can handle extreme weather, work together with other countries, and help groups that are already struggling. Taking a more complete

look at things can help lawmakers and practitioners lessen the damaging effects of climate stresses and create a healthy, more stable future.

Policies and actions on a global scale

To deal with the many ways that climate change affects health, we need strong global laws and coordinated actions. The goal of these activities is to lower health threats, make people more resilient, and make sure that susceptible groups have fair ways to change. This part talks about the international structures, state plans, and joint funding systems that support the worldwide effort to deal with health problems caused by climate change.

Frameworks for International
The Agreement in Paris

The Paris Agreement, which was signed in 2015, is a historic promise by all countries to keep global warming well below 2°C, with goals of keeping it at 1.5°C above pre-industrial levels. The Agreement clearly recognizes the link between climate change and public health, even though its main goal is to lower greenhouse gas pollution. Article 2 of the Agreement talks about how important it is to improve people's ability to adjust and make them more resistant to threats linked to climate change, such as those that affect health [70]. Countries have to send in what are called "Nationally Determined Contributions" (NDCs), which are plans for how they will deal with and adjust to climate change. Over 80% of NDCs now include health concerns, according to a review from 2013 [71]. This shows that the link between climate change and health is becoming more and more clear.

Through the Green Climate Fund (GCF), which helps poor countries build health systems that can handle climate change, the Paris Agreement also encourages countries to work together. For example, GCF-funded projects in Sub-Saharan Africa have worked on making healthcare systems stronger so they can handle harsh weather and adding early warning systems for disease outbreaks [72].

The Climate and Health Action Plan from WHO

Aligning global health goals with climate action has been made possible in large part by the World Health Organization (WHO). Its Climate and Health Action Plan stresses the importance of putting health into climate policies and supporting healthcare systems that can handle changes in climate. The Plan lists four main areas of action: lobbying, gathering data, making sure policies are consistent, and building up people's skills [73]. The Health in National Adaptation Plans (H-NAPs) program is an important part of this system because it helps countries include health issues in their climate adaptation plans. As of 2017, more than 40 countries had made H-NAPs to deal with problems like mental health, heat-related illnesses, and diseases spread by insects [74].

WHO is also in charge of the Global Climate and Health Observatory, which was set up in 2013 to keep an eye on how climate change affects health and how well

climate-health policies are being put into place. The Observatory's huge collection is now an important tool for academics and lawmakers [75].

Plans for the country

Different countries have used different approaches to deal with the health risks that come from climate change, often ones that are specific to their own environments and economies. Sweden's green healthcare programs show how a good national method can work. The Swedish government wants healthcare systems to be carbon neutral by implementing steps like making hospitals more energy-efficient, cutting down on waste, and using more green energy [76]. A study from 2017 said that between 2005 and 2014, Sweden's healthcare sector cut its greenhouse gas emissions by 34% while also making things better for patients [77].

Fiji is one of the countries in the Pacific that has taken an open and democratic approach to adapting to climate change. Its National Adaptation Plan stresses actions that can be taken by the community, like setting up early warning systems for storms and disease breakouts. Fiji has also worked hard to combine traditional knowledge with modern medical methods in order to make adaptation measures more culturally relevant and build trust in the community [78].

Bangladesh, on the other hand, has come up with creative ways to deal with health risks caused by climate change through its Climate Change Strategy and Action Plan. The country has made it easier for people in remote areas who have been affected by floods and watery diseases to get medical care by using low-cost technologies like mobile health (mHealth) services [79].

How NGOs and global coalitions work together and how they get money

Global alliances and non-governmental organizations (NGOs) are very important to climate-health efforts. When tragedies happen because of climate change, groups like the International Red Cross and Red Crescent Movement help on the ground, taking care of both pressing health needs and building long-term resilience. The Global Climate and Health Alliance (GCHA) works to make sure that health is better considered in climate policies and helps people share what they know [80].

Nations, NGOs, and private businesses working together have come up with new ways to solve problems. For example, the United Nations Development Programme (UNDP) runs the Solar for Health program, which gives low-income countries' hospitals solar power systems so they can keep running even during harsh weather. More than 300 hospitals in Sub-Saharan Africa had gotten help from this project by 2013 [81].

Problems and chances with funding

Funding is still a big problem for putting climate-health solutions into action, especially in countries with low and medium incomes. A 2015 study showed that even though climate change causes a lot of health problems, less than 5% of

foreign climate cash goes to projects that help people stay healthy [82]. The Green Climate Fund and the Adaptation Fund are very helpful, but they don't have enough money to meet the growing need.

There are chances to get more money by using new methods. For example, price carbon and climate bonds can bring in money for resilience projects that focus on health. The Lancet Countdown 2017 study suggested that public-private partnerships should grow so that corporate social responsibility programs can be used to help climate-health projects [83]. Adding health measures to current climate finance models can also help make sure that health results get enough attention and money.

International guidelines, new national strategies, and joint funding efforts are speeding up the development of global policies and actions to deal with the health effects of climate change. The Paris Agreement and the WHO's Climate and Health Action Plan are very important for making sure that climate measures take health into account. At the national level, Sweden, Fiji, and Bangladesh show that methods that are tailored to the local situation can help build resilience. There are, however, still big problems, especially when it comes to getting enough money and making sure everyone has equal access to resources. To achieve global health equality in the face of climate change, we need stronger international cooperation and new ways to pay for health care.

Conclusion

One of the most important problems of the 21st century is how climate change affects people's health. This needs immediate and long-term action in the areas of ecology, economics, and behavior. This essay has talked about the complicated ways that climate change affects health. It has focused on natural changes like species loss, economic stresses like weak healthcare systems, and changes in behavior like moving and eating differently. People who are weakest, like those living in low-income areas, along the coast, or in groups that are already feeling left out, are hit the hardest by these effects. This shows how important it is for policies to be fair and focused.

Global platforms like the Paris Agreement and the WHO's Climate and Health Action Plan are very important for making sure that climate policies take health into account. Sweden's "green healthcare model" and Fiji's "participatory adaptation plans" are two examples of national strategies that show how localized methods can help deal with health risks caused by climate change. However, the success of these projects depends on strong international cooperation and the use of creative funding methods.

To reduce health risks linked to climate change in the future, we need a diverse approach that includes science, politics, and community involvement. To make the world's health system more immune to climate change, it is important to protect wildlife, fix social problems, and make healthcare systems stronger. Not taking quick action could make health inequalities worse and hurt sustainable development goals, showing how important it is to act on a moral and practical level.

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"التغير المناخي والصحة: تهديدات خفية و آفاق مستدامة"

الملخص:

الخلفية : يمثل التغير المناخي تحدياً عالمياً متزايداً له تأثيرات عميقة على الصحة العامة. ورغم الاعتراف الواسع بالتأثيرات المباشرة مثل موجات الحرارة وتدهور جودة الهواء، فإن التهديدات الخفية مثل انتشار الأمراض المنقولة، وانعدام الأمن الغذائي، والتحديات النفسية لا تزال غير مفهومة بشكل كافٍ. كما أن هذه التهديدات تؤثر بشكل خاص على الفئات السكانية الأكثر ضعفاً، مما يفاقم التفاوتات الصحية.

الهدف : يهدف هذا البحث إلى استكشاف التهديدات الصحية الخفية الناتجة عن التغير المناخي، وتقييم الاستراتيجيات المستدامة للتخفيف من تأثيراتها، مع التركيز على تعزيز العدالة الصحية العالمية

الطرق : اعتمد البحث على مراجعة الأدبيات العلمية الحديثة، والتقارير المناخية العالمية، ودراسة حالات من المناطق المتأثرة. كما تم استخدام التحليل الإحصائي للبيانات المناخية والصحية لتوضيح العلاقة بين التغير المناخي والصحة.

النتائج : يساهم التغير المناخي في تفاقم التهديدات الصحية مثل انتشار الأمراض المنقولة بالنواقل، وانعدام الأمن الغذائي والمائي، واضطرابات الصحة النفسية. كما أظهرت الاستراتيجيات المستدامة، مثل اعتماد الطاقة المتجددة وتعزيز نظم الرعاية الصحية المتكيفة مع المناخ، إمكانيات كبيرة في الحد من هذه التهديدات، ولكنها تتطلب تعاوناً دولياً وتمويلاً مستداماً.

الخلاصة : يتطلب التصدي للتأثيرات الصحية المتعددة للتغير المناخي نهجاً متكاملاً يدمج الاستراتيجيات البيئية والاقتصادية والاجتماعية. إن تعزيز نظم الرعاية الصحية المرنة، وحماية التنوع البيولوجي، وتقليل التفاوتات الصحية هي خطوات أساسية نحو تحقيق العدالة الصحية في مواجهة التغير المناخي.

الكلمات المفتاحية: التغير المناخي، الصحة العامة، التنمية المستدامة، الأمراض المنقولة بالنواقل، الأمن الغذائي، الصحة النفسية، العدالة الصحية.