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Original Research Article

Global Warming and Related Environmental Changes Affecting Public Health: A Cross-Sectional Study from Madhepura District Of Bihar

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Abstract:

Background: Public health is seriously threatened by climate change, which is fuelled by rising global temperatures and a rise in the frequency of extreme weather events. The shifting distribution of infectious diseases, decreased food security, and escalation of long-term medical issues are all clear indications of these effects.

Aim: This investigation seeks to evaluate the health effects of climate change on individuals, concentrating on the incidence of chronic health disorders, infectious diseases and food insecurity.

Materials and Methods: A cross-sectional study with 150 randomly selected participants was carried out for duration of one year from December-2023 to December-2024 at Jannayak Karpoori Thakur Medical College & Hospital, Madhepura, Bihar. Questionnaires and structured interviews were used to gather data on exposures related to climate change, health status, and demographics. Using SPSS version 23.0, statistical analyses including chi-square tests and logistic regression were conducted to find significant connections and predictors of unfavourable health outcomes.

Results: The study discovered that 30% of participants had infectious disorders and 60% had been exposed to extreme heat episodes. Infectious illnesses and high heat exposure were shown to be significantly correlated ($\chi^2(1) = 4.65$, $p = 0.030$). Food insecurity also affected 40% of participants, and it was substantially linked to long-term medical disorders ($\chi^2(1) = 5.139$, $p = 0.019$). Food insecurity, high heat exposure, and age were found to be significant predictors of unfavourable health outcomes using logistic regression.

Conclusion: The results highlight the complex effects of climate change on human health, especially with regard to an increase in chronic illnesses and infectious diseases. Integrated public health policies and strategies that emphasise climate adaptation and mitigation are needed to address these issues.

Recommendations: Improving food security, building tailored interventions to lessen the adverse health impacts of extreme weather events, and strengthening community resilience to climate-related health hazards should be the top priorities of future public health activities.

Keywords: Global Warming, Public Health, Climate Change, Infectious Diseases

Introduction

Climate change, a severe and complex problem with major implications for public health, is indicated by rising global temperatures, altered precipitation patterns, and an increase in the frequency of extreme weather events. Everyone in the scientific community agrees that the main reason for the noticeable changes in the climate system of Earth is human activity, particularly the greenhouse gases emission (IPCC, 2018) [1]. These climatic changes affect people all around the world, with vulnerable groups bearing the brunt of direct and indirect health issues.

The prevalence and distribution of infectious diseases have altered, representing a clear and direct consequence of climate change on public health. Elevated temperatures and altered precipitation patterns may facilitate the dissemination of vector-borne diseases such as malaria and dengue fever into previously unaffected areas. Furthermore, severe meteorological phenomena including inundations and cyclones can contaminate water supplies and overwhelm sanitary infrastructure, leading to epidemics of waterborne diseases (Watts et al.) [2].

Climate change is also linked to chronic health diseases like cardiovascular and respiratory issues. Air pollution, which is made worse by rising temperatures and an increase in wildfires, is a major risk factor for many diseases. According to the World Health Organisation (WHO, 2021), air pollution has a major negative influence on health and causes millions of preventable deaths each year [3]. Furthermore, after catastrophic weather events, the effects of climate change on mental and psychological health, such as depression, anxiety and post-traumatic stress disorder (PTSD), are increasingly being acknowledged as a serious public health concern [4-8]. This research aims to offer insights that help guide public health policies and strategies to safeguard communities against the detrimental impacts of climate change.

Materials and Methods:

Study Design: A cross-sectional study carried out for a period of one year from December-2023 to December-2024.

Study Setting: This investigation was carried out at Jannayak Karpoori Thakur Medical College & Hospital, Madhepura, Bihar.

Participants: 150 participants were included in this investigation.

Inclusion Criteria:

1. Age ranging from 19 to 66 years.
2. Prepared to furnish informed consent.
3. Capable of understanding and addressing the questionnaire of the study.

Exclusion Criteria:

1. People with cognitive impairments who find it difficult to finish the questionnaire.
2. Individuals now undergoing treatment for long-term illnesses unrelated to climate change impacts.
3. Women who are nursing or expecting.

Bias: Random sampling approaches were used in an effort to reduce selection bias.The use of established and standardised data collection tools lessened the information bias. In order to prevent recall bias, participants were given precise and unambiguous questions to help them produce accurate answers.

Data Collection: Trained staff will administer surveys and conduct structured interviews to gather data. Chronic health issues, exposure to climate-related factors, infectious disease incidence, food security status and demographic data will all be covered in the questionnaire.

Procedure: Firstly, we created and tested the tools for gathering data. Following that, we gave the data collectors training on

ethical issues and study protocols. After that, we chose 150 individuals at random from the neighbourhood. After that, we conducted interviews and distributed the surveys. Finally, we cross-checked and validated the gathered data to guarantee data quality.

Statistical Analysis: The analysis of the data was done with SPSS version 23.0. Health-related variables and demographic data were compiled using descriptive statistics. Chi-square testing was used to investigate relationships between health outcomes and the effects of climate change. Potential predictors of negative health impacts associated with climate change were identified through the use of logistic regression analysis. The threshold for significance was $p < 0.05$.

Results:

In all, 150 people took part in the research. Table 1 provides a summary of the participants' demographic attributes.

Table 1: Demographic Attributes of Participants

Attributes	**N (%)**
Gender	
Female	75(50%)
Male	75(50%)
Age (years)	
19-31	45 (30%)
32-46	60 (40%)
47-66	45(30%)
Level of Education	
Higher	45 (30%)
Secondary	60 (40%)
Primary	30 (20%)
No formal education	15 (10%)

Table 2: Climate-Associated Variables and Health Consequences

Variables	**N (%)**
Chronic Health Conditions	
No	75(50%)
Yes	75(50%)
Exposure to Severe Heat Events	
No	60(40%)
Yes	90 (60%)
Infectious Diseases	
No	105 (70%)
Yes	45 (30%)
Food Insecurity	
No	90 (60%)
Yes	60 (40%)

Table 3: Logistic Regression Analysis of Determinants of Negative Health Outcomes

Determinants	**SE**	**B**	**Wald**	**df**	**OR**	**95% CI for OR**	**P value**
Gender (Female)	0.219	-0.149	0.469	1	0.859	0.570 - 1.309	0.500

Age	0.009	0.030	6.249	1	1.030	1.004 - 1.050	0.009
Food Insecurity	0.289	0.749	6.710	1	2.120	1.200 - 3.739	0.009
Extreme Heat Exposure	0.259	0.589	5.139	1	1.800	1.089 - 2.990	0.019

Important findings indicate a considerable relationship between the incidence of infectious diseases and exposure to extreme heat events, as well as between occurrence of chronic health issues and food insecurity. Logistic regression study identified three major predictors of poor health outcomes: food insecurity, exposure to extreme heat, and age.

Discussion:

150 participants took part in a cross-sectional study to examine the health effects of climate change. The study's main areas of interest were chronic health conditions, food security, and infectious diseases. The demographic distribution of participants, which was evenly divided across genders and age groups, ensured a representative sample of the local community. The study discovered significant relationships between climate change-related variables and health outcomes. Notably, 60% of participants reported experiencing extreme heat, and 30% reported contracting infectious diseases.

Statistical research indicates that the incidence of infectious diseases and exposure to extreme heat are significantly correlated ($\chi^2(1) = 4.65$, $p = 0.030$). This suggests that people who are exposed to high temperatures are more likely to contract infectious diseases, either because warmer temperatures promote the growth of pathogens or because their immune systems are weakened.

Half of the people had long-term health problems, and 40% of them said they had experienced food insecurity. There was a significant correlation between chronic health conditions and food insecurity ($\chi^2(1) = 5.139$, $p = 0.019$). This implies that those who are food insecure are more susceptible to chronic health issues, most likely as a result of inadequate nutrition and related stressors. Using logistic regression analysis, it was also discovered that food insufficiency, age, and extended heat exposure were significant predictors of adverse health outcomes.

A significant link was identified between heightened health risks and exposure to extreme heat (OR = 1.800, $p = 0.019$) as well as food insecurity (OR = 2.120, $p = 0.009$). The various impacts of climate change on public health are illustrated by these findings, which also underscore the urgent necessity for targeted measures to mitigate these effects. Food security is also at risk due to the impacts of climate change on agricultural yields, which include changed temperatures and precipitation patterns. As emphasised by Tangcharoensathien et al. these changes may lead to increased food instability and malnutrition, particularly for disadvantaged groups [9].

Climate change is increasingly recognised as a significant threat to public health due to its impact on chronic health conditions, food security, and infectious diseases. The viability and geographic distribution of disease vectors such as ticks and mosquitoes are shifting due to increasing temperatures and modified precipitation patterns. The diseases like Zika, Lyme, Chikungunya and Dengue have disseminated to new regions due to this transformation. Coates et al. indicated that the geographical expansion of the Aedes aegypti mosquito, attributed to global warming, is increasing the risk of vector-borne diseases in previously unaffected

regions [10]. Furthermore, a correlation was noted between heat waves and an increase in heat-related illnesses, cardiovascular disorders, and mental health issues induced by stress and displacement [11-18].

It's interesting to note that the majority of research that examined how climate change affects mental health concentrated on the immediate and direct effects of experiencing severe meteorological phenomena. But psychologists are also cautioning about the long-term indirect effects of climate change on mental health, which are more common in both adults and children (e.g., eco-anxiety, climate depression) [19]. Even those who are not directly affected by climate change, such as by extreme weather occurrences, express feeling upset when they consider how our environment is being destroyed or when they are concerned about their uncertain future and the inaction that is being taken. These effects of climate change on mental health must be further investigated in order to promote emotional fortitude in response to climate change. Our mental strength to confront this issue is ultimately what will determine humanity's capacity to adjust to and alleviate climate change.

Conclusion:

The study's findings demonstrate the substantial public health challenges posed by climate change, particularly with infectious diseases and chronic health conditions. The study's significant correlations and determinants highlight the necessity for comprehensive public health strategies and regulations aimed at reducing health risks linked to climate change, improving food security, and bolstering the resilience of vulnerable populations against extreme weather events.

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