



Impact of Climate Change on Public Health in India: Action to Tackle Climate Crisis, a Systematic Review

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Article History	Abstract
Received: 06 June 2023 Revised: 09 September 2023 Accepted: 28 September 2023	<p>Climate change as 'a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (UNFCCC). The main aim is to Studying about the climate change will help us to know about how the climate change create impact on public health and how to tackle climate crisis. Online data-based PubMed Central (PMC), Science Direct, GoogleScholar, Shodhganga, ResearchGate, etc. were systemically searched for articles has been published within the last 10 years (after 2012). The study screened 1632 articles, excluding 813 that were not relevant or did not meet inclusion criteria. The remaining 201 articles were assessed for eligibility and quality, excluding 189. We are then included 12 studies in the qualitative synthesis based on relevance, appropriateness, eligibility, and quality, ensuring they met the criteria of the study. Climate change impacts human health and disease, leading to increased respiratory and cardiovascular diseases, injuries, and early deaths. It also affects food- and water-borne illnesses, infectious diseases, and mental health. The air quality worsens due to climate change, and children are impacted by natural disasters. Under nutrition, diarrheal diseases, low birth weight, and early mortality are the main health effects. Flood victims experience physical and psychological effects, and 72% of respondents believe climate change affects the general public's health. The literature review reveals that climate change is associated with various adverse health outcomes, including increased frequency and severity of extreme weather events, air pollution, waterborne diseases, food insecurity, and vector-borne diseases.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Climate, Climate Change, Public Health, Systematic Review, Crisis

1. Introduction

Climate change as 'a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (UNFCCC) (HCC, 2023). Climate change is threatening access to clean air, safe drinking water, nutritious food, and secure shelter, with an estimated 2,50,000 additional deaths per year between 2030 and 2050 due to malnutrition, malaria, diarrhoea, and heat stress (Climate, 2023). Lower and middle-income countries are particularly affected by rising sea levels, extreme weather events, heatwaves, droughts, forest fires, and mosquito-borne diseases. The World

Health Organization supports countries in building climate-resilient health systems and tracking national progress. India has drafted a policy on climate change, focusing on adaptation and mitigation in health systems. Climate change has significant health impacts in India, including increased heat-related illnesses, air pollution-related diseases, malnutrition due to decreased crop yields, mental health, and the spread of infectious diseases.

Climate change in India is causing increased average temperatures, frequent heatwaves, and extreme weather events, exposing populations to health issues (Tabari, 2020). Changes in rainfall patterns affect water availability and risk of waterborne diseases. This study aims to understand health risks, identify vulnerable populations, develop adaptation strategies, evaluate intervention effectiveness, inform policy, raise awareness, and advocate for change (Narayan, 2022). Addressing the Impact of climate change on health in India will require a multi-faceted approach that includes both mitigation and adaptation strategies. Here are some ways: Reduce greenhouse gas emissions, improve public health infrastructure, enhance disaster preparedness, promote sustainable agriculture, Increase public awareness. The government of India has implemented a range of strategies and policies to address climate change: National action plan on climate change (NAPCC), international solar alliance (ISA), clean energy and energy efficiency, sustainable transport, forest and biodiversity conservation, national adaptation fund for climate change (United, 2023).

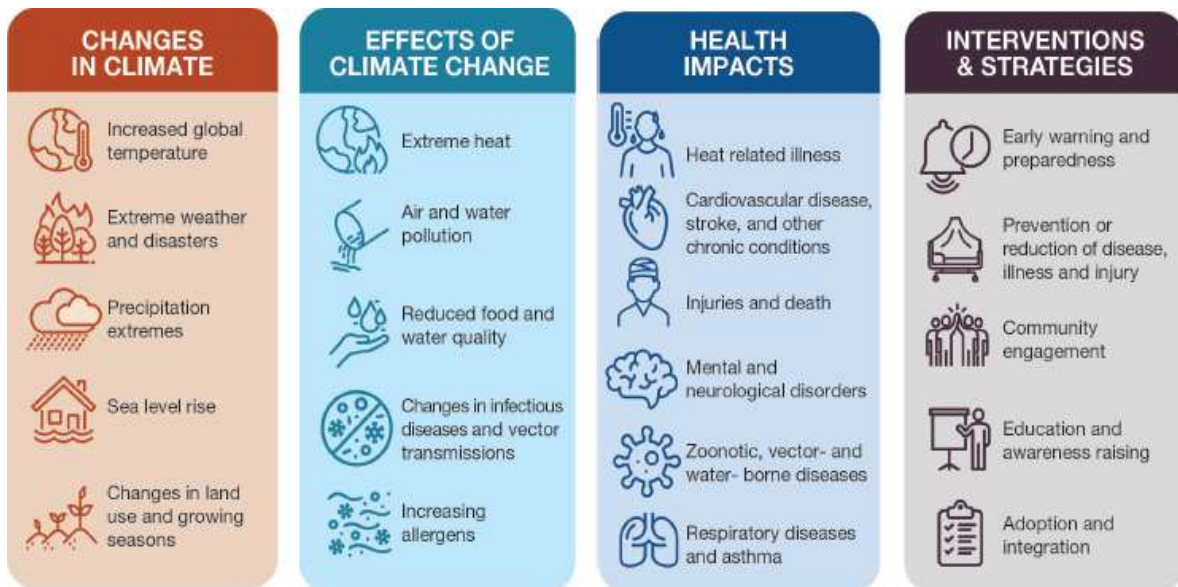


Figure 1: Human Health Impacts of Climate Change. Source: National Institute of Environmental Health Science (Human, 2023)

AIM

The main aim is to Studying about the climate change will help us to know about how the climate change create impact on public health and how to tackle climate crisis.

Objectives

1. To Review existing evidence related to climate change in India.
2. To summaries current estimates of the Impact of climate change.
3. To explore the factor responsible for climate change.
4. To search prevalence rate of disease because of climate change.
5. To Review steps taken by Government to overcome climate change in India.
6. To find out possible solution and how to tackle it.

2. Materials And Methods

Current study based on the systematic literature review (SLR) design.

Search Strategy

In order to identify relevant research literature, the following keywords were derived from the research objectives to search such databases, as well as academic search engines: Climate, Climate Change, Climate Crisis, Impact of Climate change, Health problems, Impact of climate on health, Factors of climate change, action to tackle climate crisis etc. Such formulation of keywords from research objectives will be used in systematic literature review studies. With the help of the PICO framework, a straight forward, logical, and searchable research topic will emerge.

ROL Search Strategy

The reference lists of the included research articles were also manually searched for potentially relevant literature: PubMed Central (PMC), MEDLINE database, Science Direct, Cochrane Library, EMBASE, Up to Date, Google Scholar, CINAHL, Open Grey, Social Science Research Network, ProQuest, Shodhganga, Research Gate etc.

Literature Screening Strategy

The study screened 1632 articles, excluding 813 that were not relevant or did not meet inclusion criteria. The remaining 201 articles were assessed for eligibility and quality, excluding 189. We are then included 12 studies in the qualitative synthesis based on relevance, appropriateness, eligibility, and quality, ensuring they met the criteria of the study.

Data Extraction

This step is important part of systematic literature review it involve finally included titles in the study after primary screening.

Quality Appraisal

After data extraction the quality of collected, data was appraised using with Critical Appraisal Skills Programme (CASP) Checklist. Systematic Literature Review (SLR) based on the Critical Appraisal of a Cohort or Panel (CASP) checklists. Prospective cohort studies will be included in this review.

Description of Critical Appraisal Process

A critical appraisal was conducted for the observational studies included in the Critical Appraisal Skills Programme checklist, assessing the validity of the results from each study on a scale of high, medium, and satisfactory.

Data Analysis

The extracted data has been analyzed with the help of predefine themes, the thematic analysis based on Research question and objectives as per the current study the mail focus of the study is impact of climate change on the public health in India. Description of the critical appraisal process A critical appraisal was conducted for the observational studies included in the critical appraisal skills programme checklists , assessing the validity of the result from each study on scale of high, medium and satisfactory: high quality the study was prospective and score where on main quality parameters such as study method, result validity, precision of outcome, and generalizability; medium quality, study method was sound and results were presented with precision; satisfactory quality , the study did not score well or did not contain an information on the main quality parameters such as study method result validity, precision of outcomes or generalizability. PubMed = (n-481), Google Scholar = (n-459), Research Gat = (n-341), Science Direct = (n-175)SSRN = (n-177).

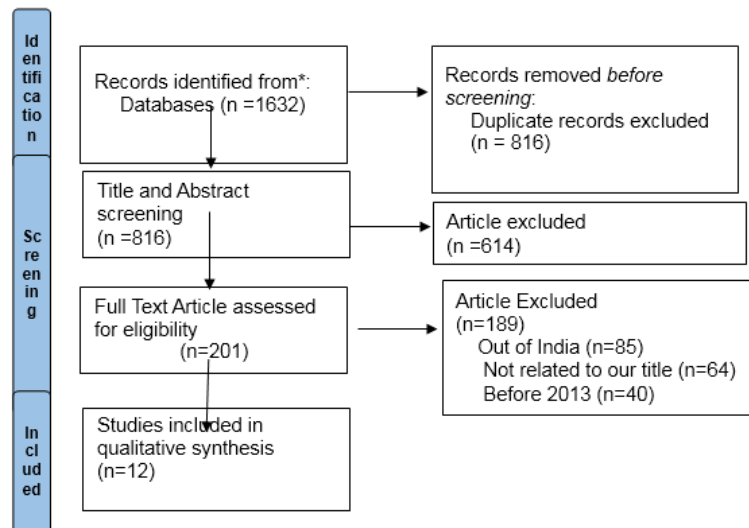


Figure2: PRISMA Flow Chart

Study selection criteria

Research study include Indian climate change how to effect on the public health like mentally and physically both. Pre-defined selected filters were applied to search the studies. The studies do not conduct on animals, agriculture and technology the studies conducted on only public health it may include the children, women, and any old age peoples. The following studies are excluded if the studies are do not conducted in India. If the article is published more than 10 years ago are also excluded. The article is available in English and also full text article are included in study and all article is based on the primary and secondary study.

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Ethical Statement

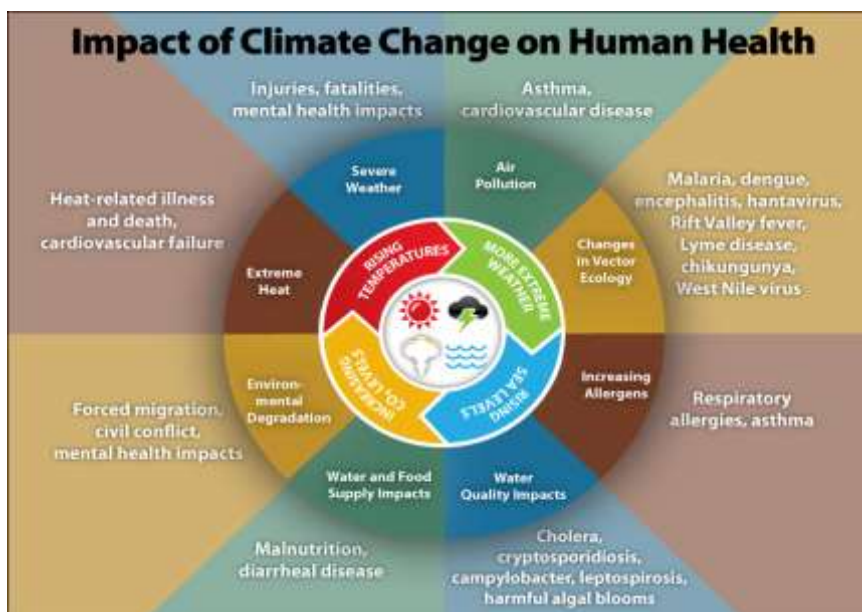
This study did not involve human participation or animal subjects.

Patient Involvement

No patients were involved nor was any patient input included at any stage in this paper.

3. Result and Discussion

Twelve studies were included in a review after excluding some due to unavailability of full text, unclear methodology, or conducted outside India. The studies were categorized into cross-sectional surveys, community-based studies, mixed methods, and SLR types. Six studies explored factors affecting climate change in India, two focused on its impact and two assessed evidence-related climate change. Two studies focused on possible government solutions to overcome climate change. Tables summarizing the studies are provided. Table no 1 provide study aim, sampling strategy and size, method, a brief description of study.



Climate change impacts a wide range of health outcomes. This figure shows the most significant impacts of climate change, including rising temperatures, more extreme weather events, rising sea levels, and increasing carbon dioxide levels. It also illustrates how these impacts can affect exposures and subsequently lead to various health outcomes.

Table 1: provide study aim, sampling strategy and size, method, a brief description of study

Title	Authors And Year Of Publication	Aim	Sample	Design/ Methods	Title	Authors And Year Of Publication
The impact of natural disasters on child health and investments in rural India.	Ashlesha Datar a, et al, (2013)	There is growing concern that climate change will lead to more frequent natural disasters that may adversely affect short- and long-term health outcomes in developing countries.	Researcher use data on over 80,000 children from three waves of India's National Family and Health Surveys (NFHS; 1992–93, 1998–99, 2005–06) linked to EM-DAT, an international database of natural disaster occurrences	The econometric model used to estimate the effect of natural disasters in the month or year leading up to the survey on our outcome	According to research, children under the age of five are 9-18% more likely	The impact of natural disasters on child health and investments in rural India.

			containing information on all disasters affecting India during and around the period covered by the NFHS.		
Impact of Repeated Flooding on Mental Health and Resilience of Adolescents in Kerala, India		Impact of Repeated Flooding on Mental Health and Resilience of Adolescents in Kerala, India		Impact of Repeated Flooding on Mental Health and Resilience of Adolescents in Kerala, India	Impact of Repeated Flooding on Mental Health and Resilience of Adolescents in Kerala, India
Association between climate and infectious diseases among children in Varanasi city, India: A prospective cohort study.	- Nidhi Singh et al. Sci Total Environ. 2021	To know the effects of climate on infectious diseases could influence the health impact, particularly in children in countries with the unfair socioeconomic conditions	461 under 16 years of age group	Prospective cohort study	The results showed that each unit (1 °C) increase in Tmax was linked to an increase in cases
Air pollution in Delhi, India: It's status and association with respiratory disease	2022; Wanida Jinsart, Abhishek Dutta	the policy makers need research studies indicating the role of different pollutants with morbidity for polluted cities to install a strategic air quality	The data were of a total of 1096 days and included daily average temperature (T), daily average relative humidity (RH), daily average wind speed	quasi-poison regression model	Air pollution in Delhi, India: It's status and association with respiratory disease

		management system	(WS), and daily rainfall (RF).		
				Press information bureau (research unit)	
National Action Plan on Climate Change (NAPCC)	Press information bureau (research unit) ministry of information and broadcasting government of India. Ministry of environment, forest and climate change		National Action Plan on Climate Change (NAPCC)	Press information bureau (research unit) ministry of information and broadcasting government of India. Ministry of environment, forest and climate change	National Action Plan on Climate Change (NAPCC)
Knowledge, attitudes and practices related to climate change and its health aspects among the healthcare workforce in India	Vishvaja Sambath a, Shweta Narayana, Punita Kumar b, Pooja Kumar a, Adithya Pradyumna c			Knowledge, attitudes and practices related to climate change and its health aspects among the healthcare workforce in India	Vishvaja Sambath a, Shweta Narayana, Punita Kumar b, Pooja Kumar a, Adithya Pradyumna c

Climate change has a variety of effects on human health and disease, in addition to other natural and man-made health stresses. Increased respiratory and cardiovascular disease, injuries and early deaths from extreme weather events, changes in the prevalence and geographic distribution of food- and water-borne illnesses and other infectious diseases, and threats to mental health are some of the health effects of these disruptions. The air we breathe is getting worse due to climate change. Children are impacted by natural disasters to the extent of 9 to 18%. the acute illness, including acute respiratory illness, fever, and diarrhea. Undernutrition, ARI (acute respiratory infection), diarrheal diseases, low birth weight, and early mortality in children and women were the main health effects of extreme weather events, meteorological conditions, and air pollution exposure in the area. 50%of the population was not immediately impacted by the flood, whilst the other 50% was.

Flood victims experience both physical and psychological effects. Extreme heat causes diarrhea and skin infections, and when the temperature drops, air pollution linked to respiratory tract infections such as the flu and cold also occurs. The health of children is also impacted by climate change. According to a perception survey on climate change, 72% of respondents believed that the actual climate change has an impact on the general public's health. A systematic review of climate change impacts public health in India, revealing increased heatwave frequency, heat-related illnesses, and fatalities, especially among vulnerable populations. Changes in rainfall patterns and extreme weather events increase waterborne and vector-borne diseases, posing additional health risks. The review also highlights uneven distribution

of health impacts, with marginalized communities experiencing disproportionate adverse effects. The studies highlight the urgent need to address climate change in India and provide appropriate interventions. They reveal the causes of climate change fluctuations, including greenhouse gas release, and its significant impact on public health. Deforestation and land-use change also contribute to climate change. The studies suggest suggestions for improving climate change and public health in India.

4. Conclusion

The literature review reveals that climate change is associated with various adverse health outcomes, including increased frequency and severity of extreme weather events, air pollution, waterborne diseases, food insecurity, and vector-borne diseases. These health impacts pose significant challenges to the population's well-being, particularly for vulnerable groups such as children, the elderly, and those with pre-existing health conditions. Recognizing the urgency and severity of the situation, the government of India must adopt a comprehensive and multi-faceted approach to address climate change and its impact on health. In conclusion, the systematic review provides valuable insights into the health impact of climate change in India. The findings underscore the need for urgent action and targeted interventions to protect public health from the adverse effects of a changing climate. Acknowledging the study's limitations, the recommendations for future research aim to foster a deeper understanding of this critical intersection between climate change and public health, guiding evidence-based strategies to promote resilience and well-being in the face of ongoing environmental challenges.

Future Recommendation

The recommendations for future research aim to foster a deeper understanding of this critical intersection between climate change and public health, guiding evidence-based strategies to promote resilience and well-being in the face of ongoing environmental challenges.

Nursing Implications

The investigator has drawn the following implications from the studies, which are of vital concern to the field of nursing service, nursing education, nursing administration and nursing research.

Nursing Practice

- In contemporary time, climate change is the biggest issue so we have to create awareness in nursing field along with the public in India to know the exact cause of climate change and how to tackle it.

Nursing Education

1. The nurse ought to equip themselves by reading more books, recent advances and current weather issues.
2. The content should be integrated in the curriculum about the impact of climate change in public health.
3. Nursing curriculum is responsible for preparing future nurses with emphasis on providing curative, preventive and promotive health services.
4. The nurse educator can provide in-service education to the public in India to update their knowledge about causes of climate change and how to tackle it.

Nursing research

1. The essence of research is to build a body of knowledge in public of India regarding climate change.
2. This study was served as a valuable reference material for future investigators.
3. Nurse researcher can conduct periodic review of research findings through online data.

Nursing administration

1. The nurse administrator can arrange in-service education and special education programme regarding climate change and its impact on human health in India.

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