DISSERATION

At

TARU Leading Edge

New Delhi

Project Title

Assess the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review

By

Mr. Harshit Bhardwaj

PG/22/036

UNDER THE GUIDANCE OF

Dr. Sumant Swain

PGDM (Hospital and Health Management)

2022-2024

International Institute of Health Management Research New Delhi

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Harshit Bhardwaj** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **Taru Leading Edge** from **1st April 2024** to **31st July 2024**

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical.

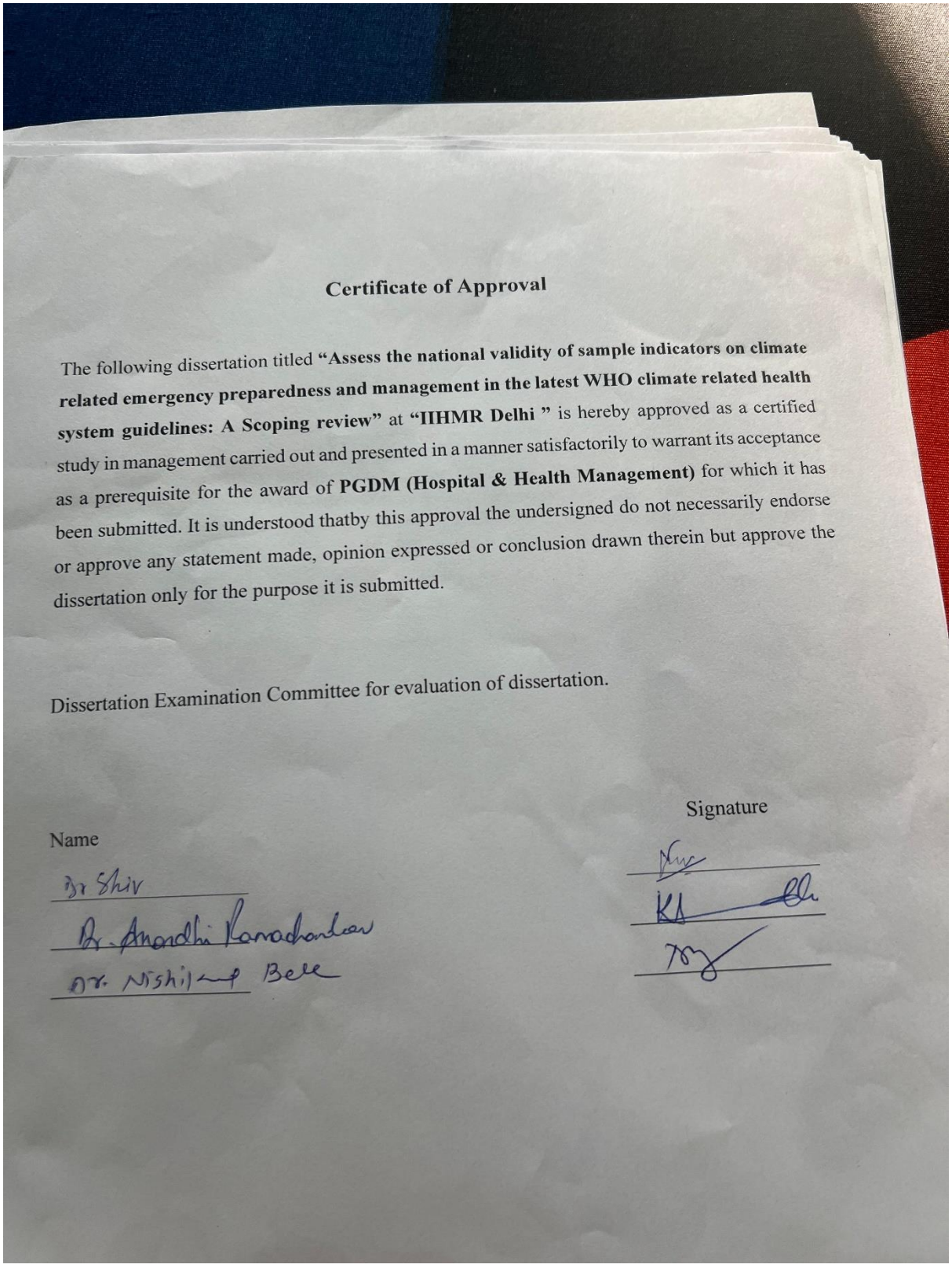
The Internship is in fulfillment of the course requirements.

I wish him all success in all his/her future endeavors.

Dr. Sumesh Kumar

Associate Dean, Academic and Student Affairs
IIHMR, New Delhi

Dr. Sumant Swain
Associate Professor
IIHMR, Delhi



Certificate of Approval

The following dissertation titled **"Assess the national validity of sample indicators on climate related emergency preparedness and management in the latest WHO climate related health system guidelines: A Scoping review"** at **"IIHMR Delhi "** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood thatby this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name	Signature
Dr Shiv	
Dr. Anandhi Ramachandran	
Dr. Nishikant Bele	

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Certificate from Dissertation Advisory Committee

This is to certify that **Mr. Harshit Bhardwaj,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He/ She is submitting this dissertation titled "Assess **the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review**" at "Taru Leading Edge" in partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health Management).**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Dr. Sumant Swain
Associate Professor

IIHMR, Delhi

Dr. Nitish Dogra
Senior Advisor

Taru Leading Edge, New Delhi

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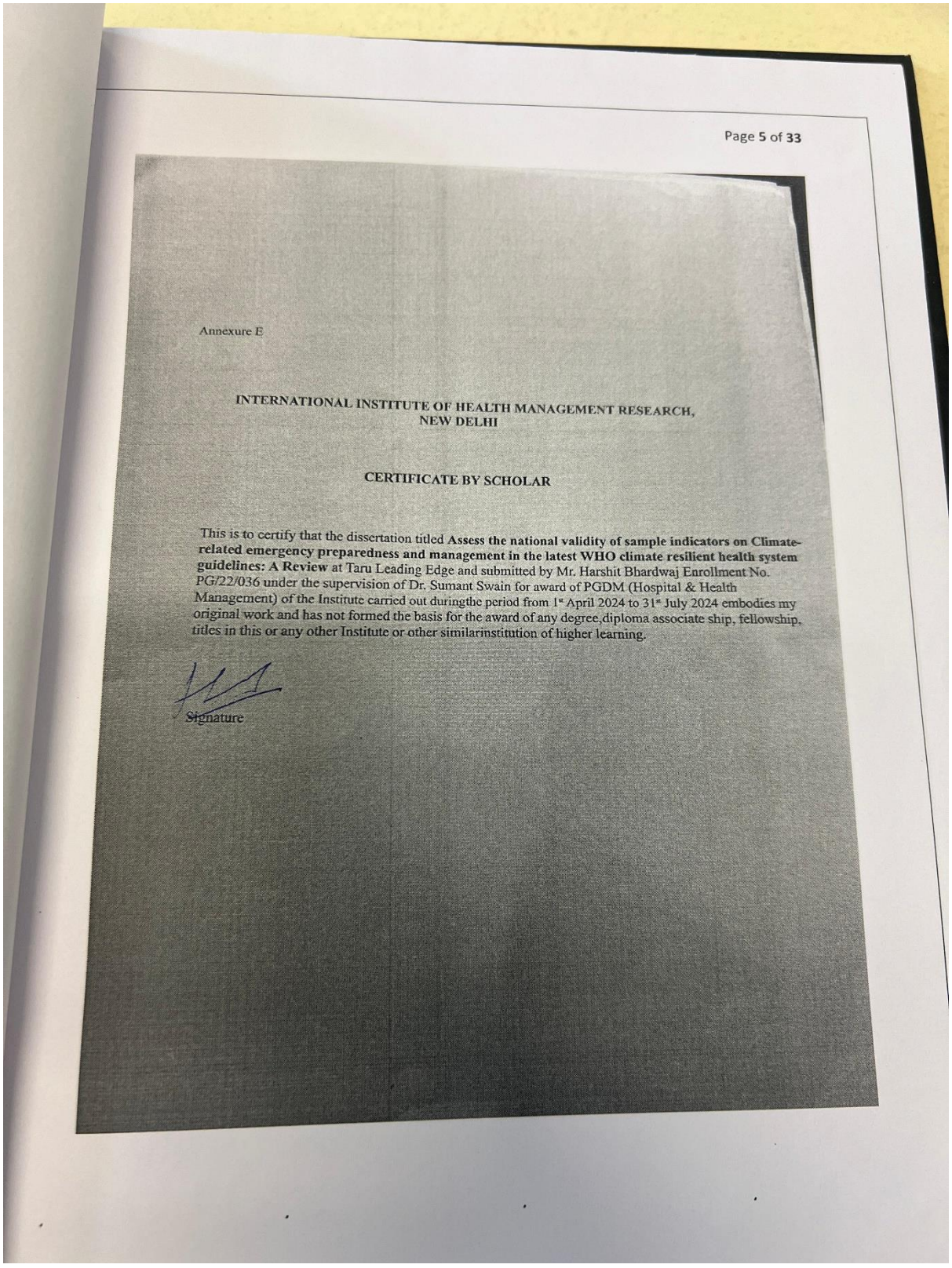

Annexure E

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Assess the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review** at Taru Leading Edge and submitted by Mr. Harshit Bhardwaj Enrollment No. PG/22/036 under the supervision of Dr. Sumant Swain for award of PGDM (Hospital & Health Management) of the Institute carried out duringthe period from 1st April 2024 to 31st July 2024 embodies my original work and has not formed the basis for the award of any degree,diploma associate ship, fellowship, titles in this or any other Institute or other similarinstitution of higher learning.

Signature

FEEDBACK FORM

Name of the Student: Mr Harshit Bhardwaj

Name of the Organisation : Taru Leading Edge

Area of Dissertation: Climate Change and Health

Attendance: Adequate

Objectives achieved: Yes

Deliverables: Dissertation Report

Strengths:
- Hard work
- Expresses gaps in understanding

Suggestions for Improvement:
- Systematic effort
- Understanding of theory

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

Dr.Nitish Dogra
Senior Advisor
Taru Leading Edge, New Delhi

Date 15/07/2024
Place NEW DELHI

TARU Leading Edge Pvt. Ltd. New Delhi

IIHMR DELHI

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH
(IIHMR)
Plot No. 3, Sector 18A, Phase- II, Dwarka, New Delhi- 110075
Ph. +91-11-30418900, www.iihmrdelhi.edu.in

CERTIFICATE ON PLAGIARISM CHECK

Name of Student (in block letter)	**Mr. Harshit Bhardwaj**		
Enrolment/Roll No.	PG/22/036	**Batch Year**	2022-2024
Course Specialization (Choose one)	Healthcare IT		
Name of Guide/Supervisor	Dr/ Prof.: Sumant Swain		
Title of the Dissertation/Summer Assignment	Assess the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review		
Plagiarism detects software used	**"TURNITIN"**		
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Total words and % of similar contents Identified	**6%**		
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Signature:

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Name: Harshit Bhardwaj

Signature:

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Date:

Dean (Academics and Student

1/8/2024

Signature:

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ABBREIVIATIONS

WHO - World Health Organization

CRHS - Climate-Resilient Health System

H-EDRM - Health Emergency and Disaster Risk Management

NAPCCHH - National Action Plan on Climate Change and Human Health

EWS - Early Warning Systems

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

About the organisation

About Taru Leading Edge

Taru Leading Edge is a leading development advisory and think tank delivering innovative transformative solutions and insights in the development space. Incorporated as a private limited company, Taru's mission is to `bridge the Science-Institutions-Society interface with a core agenda of providing transformative solutions to the development challenges.
Established in 1996 by eminent development professionals, it caters to a diverse range of bilateral and multi-lateral agencies, government departments, corporate and development organizations through research, technology, solution innovations and implementation support.

Taru's Core values

Creativity and innovation by using multi-disciplinary knowledge, skills and technology to step beyond simple interpretation and build strategies and provide optimal solutions
Excellence with results through our professional commitment to quality, accuracy, and impact.
Collaboration and building ownership through our work in different practices, across different geographies and multi-dimensional stakeholders.
Positive Transformation is the ultimate aim to help the stakeholders towards better society, economies, institutions and planet.

Taru's Uniqueness

Taru brings to the fore, a professional commitment to quality, accuracy and efficiency in consulting and think-tank services. Our team of professionals comes with an extensive national and international experience along with a network of advisors, consultants and partner institutions from India, South Asia, Europe and the United States of America. We also have alliances with Indian research, management and training institutions and NGOs to enable us deliver effectively and with

expertise. Our philosophy is based on our commitment and approach to use innovative tools, multi-disciplinary knowledge, technologies and skills that enable us to step beyond simple interpretation and integrate solutions to build strategies and catalyzing results for our clients.
Taru thinks ahead helped by its future-readiness, innovations and ideas that not only make us unique but also our clients in their operations with cutting edge insights.

Taru's Approach

The approach at Taru revolves around creating effective optimal solutions that enables sustainable impacts through interventions that begin with investing in learning and reflecting. This helps us and our clients move towards informed actions improving the implementation and performance of the programmes and business. Our work enables constant growth across scales, through delivery of excellence with results aptly supported by our professional commitment to quality and accuracy.
Taru constantly adapts along with the changing scenario of the world, ambitions of our governments and the needs of our growing society and communities for a better quality of life.
As we translate our work and strategy into policy recommendations, we continue to focus on our vision of being a leading development advisory and think tank.

Key Facts & Presence

Our work over the last two and half decades:

- Over 400 projects across India and in countries like **Nepal, Bangladesh, Afghanistan, Estwatini, Maldives, Indonesia, Bhutan, Myanmar, and others**
- Covered almost all key development sectors- urban development, water, climate, disaster, sanitation, health, livelihood, CSR, governance, gender, inclusion, etc.
- Unique leading space in knowledge, strategic advisory, implementation, innovative solution development, policy, and advocacy
- Cutting-edge presence in sectors like urban resilience, climate, and disaster risk mapping, climate and health, sanitation innovations, CSR, urban services, livelihood, decentralization, etc.
- Served 60+ clients ranging from Multilaterals, Governments, Industries, International NGOs, National NGOs, Networks, and Academic Institutions.
- 50+Partnership & Collaborations with leading institutions and organizations both in India and abroad

- 100+ Staff, Consultants, and Advisors on board

Board of Directors

Taru has a diverse and multitalented board of directors who provide strategic direction to Taru's work. They also provide inputs into key business decisions and company policies ensuring strategic growth of the company.

Board of Advisors

Taru over the last few years has strategically worked towards creating a think tank and development advisory around the issues and sectors we work in. In keeping with this, we have in place a board of advisors. This team comprises of eminent spokespersons and experts in fields of Disaster Risk Management, Climate Change, Risk Advisory, Technology for Development, Water, Sanitation and Hygiene, Sustainability, Social Business, Health, Nutrition and Population, Labour and Livelihood, Inclusion, Social and environmental security, Governance & Institutions, Education and Skill Development.

Recognition & Affiliations

Taru over the 25 years has been appreciated and acknowledged for its exemplary and path breaking work in the field of research, sectoral innovation, and policy advocacy.
For example, the Urban Services Monitoring System (UrSMS) in Surat has been selected as a "Project to Watch" in the Big Data Climate Challenge competition at the United Nations. Similarly, Taru's lake conservation initiative in Indore has received much appreciation for showcasing innovative technology and community ownership by respective governments and media. Taru's contribution in sanitation innovation accelerator has won praises from sector and industry professionals for successfully piloting such initiatives. Taru's cutting edge contribution in building the climate change and health sector in India has been recognized both nationally and globally.
Taru is regularly invited to various forums, conferences and policy discussions. It supports many network; and is also affiliated with many networks and coalitions including with India Water Partnership, FICCI supported India Sanitation Coalition, Understanding Climate and Health Associations in India (UCHAI) and Heat Resilience Network (HRN) and others.

In addition, Taru, an ISO certified company, has also been named in '**Top 10 promising project management consultants of 2020'** by Consultant Review Magazine (https://www.consultantsreview.com/vendor/article116/taru-leading-edge)

Clients & Partners

Over the last two decades Taru has had the privilege of work working with a wide range of clients and partners across India, South Asia and other countries. It has enabled us to provide a wide range of cutting edge solutions and strategic direction in the practice and sector areas we work in. Our clients and partners include governments, grassroots institutions, INGOs, bilateral and multilateral organizations, corporates, as well as academics institutions, think tanks, CSR foundations.

Some of our main clients and partners are:

ACKNOWLEDGEMENTS

A successful project is a combination of our efforts, encouragement, and guidance from experienced people. I would like to thank **Dr. Nitish Dogra, Senior Advisor, Taru Leading Edge, New Delhi**, for his guidance to complete my project title, "**Assess the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review**." I will always be grateful for her encouragement and invaluable assistance which helped me gain so much knowledge about the organization. I am also highly obliged to the Human Resources (HR) for giving me the platform to undergo my 3 months Dissertation at Taru leading Edge. I'm also very thankful to all the other members **Dr. Diksha Vijay,** without whom, I would not be able to complete my project. I would also like to thank my mentor, **Dr. Sumant Swain** for their continued support and guidance during my Dissertation period.

Declaration: I hereby declare that all the information furnished in this project is my original work done without using the data from the organization, to maintain confidentiality. This work is only being submitted to the INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT AND RESEARCH, DELHI.

Mr Harshit Bhardwaj

"Assess the national validity of sample indicators on Climate-related emergency preparedness and management in the latest WHO climate resilient health system guidelines: A Review"

ABSTRACT

Objectives:

- To understand the implementation of WHO Indicators through NAPCCHH.

Research Questions:

1. How effectively are climate-related emergency preparedness indicators implemented across different regions in India?
2. What are the critical gaps in policy development and implementation?
3. How do local healthcare systems, climatic vulnerabilities, and resource allocations impact these indicators?

Introduction:

Climate change poses significant challenges to health systems globally. In India, diverse climatic conditions and varying healthcare infrastructure necessitate a tailored approach to implementing WHO guidelines for climate-resilient health systems. This review investigates the application and effectiveness of these guidelines across different Indian regions.

Methods:

A review methodology was employed, analysing articles on climate change impacts in India, including topics such as policy development in disaster preparedness, occupational heat stress, population heat exposure, climate extremes projections, and the vulnerability of coastal wetlands. Sources included peer-reviewed journals, government reports, and WHO guidelines.

Results:

The review reveals significant progress in risk management policy formulation and community empowerment. However, inconsistencies were found in the application of indicators due to regional differences in healthcare systems, climatic vulnerabilities, and resource allocations. Specific gaps in policy inclusivity and tailored approaches were identified.

Conclusion:

Addressing the identified gaps through policy enhancements, standardized risk management procedures, and community empowerment is crucial. Strengthening training programs for healthcare professionals and fostering cooperation between national and local authorities will improve India's climate-resilient health system. A unified and inclusive approach is essential for better health outcomes amid climate challenges.

Keywords: Climate change, emergency preparedness, health systems, policy development, India, WHO guidelines, occupational heat stress, coastal wetlands, climate resilience.

Introduction

Health System

A health system includes all organizations, institutions, people, resources, and behaviours that are primarily intended to promote, restore, or sustain health. It operates at numerous levels, from local communities to global networks, and involves a wide range of enterprises such as hospitals, clinics, public health agencies, health insurance providers, and regulatory bodies. The integration and coordination of these components are critical for providing effective health care and achieving health-related objectives.

Goals of a Health System

Ensuring health equity and improving health outcomes are the main objectives of a health system. This entails developing financially equitable, responsive, and effective processes. Health systems work to ensure that people have access to high-quality medical care without putting them in a difficult financial situation. Achieving these objectives in a sustainable manner requires making the best use of the resources at hand in order to address the population's varied health requirements.

Health System Building Blocks

The World Health Organization (WHO) states that a complete health system is composed of six essential components:

1. Health Service Delivery: Giving individuals in need access to efficient, secure, and high-quality medical care.
2. Health Workforce: Making certain that there is an adequate, skilled, and driven health workforce.
3. Health Information Systems: Producing, evaluating, and using accurate and timely data on health-related factors, the operation of the healthcare system, and individual health.
4. Medical Technologies: Guaranteeing equal access to necessary pharmaceuticals, immunizations, and technologies with guaranteed efficacy, safety, and affordability.

5. Health Financing: Creating a system of funding for healthcare that guarantees people may get necessary services without facing financial hardship.
6. Leadership and Governance: Making sure the health system is effectively supervised, governed, and has appropriate frameworks for policies.

Climate-Resilient Health Systems

Health systems that can anticipate, react to, manage, recover from, and adapt to shocks and pressures associated to climate change are said to be climate-resilient. Despite an unpredictable climate, these systems seek to maintain and enhance population health outcomes. As climate-related catastrophes like heatwaves, floods, storms, and vector-borne diseases become more often and severe, the resilience of health systems to climate change is becoming more and more important.

Background

The effects of climate change on health are complex, influencing not only the physical well-being of populations directly but also more broadly defined health variables like socioeconomic status, food security, water availability, and air quality. Large populations and a variety of temperature zones make nations like India especially sensitive to the negative effects of climate change on human health. Planning and management of the health system must incorporate climate resilience as part of a comprehensive strategy to address these effects.

Key challenges include:

Extreme weather events include heatwaves, floods, and storms that occur more frequently and intensely, which can have a direct negative impact on health by causing injuries, heat stress, and vector-borne illnesses.
- Food and Water Security: Reduced agricultural output and diminished water availability due to climate change result in food scarcity and malnourishment.
- Air Quality: Increasing temperatures and shifting weather patterns cause pollution in the air, which aggravates heart and respiratory conditions.
- Health Infrastructure: Severe weather events have the potential to wreak havoc on the system, impose resource constraints, and interrupt services.

Objectives

This report aims to assess the national validity of sample indicators on climate-related emergency preparedness and management as outlined in the latest WHO climate-resilient health system guidelines. It will review the current state of India's health system resilience to climate change, identify gaps, and provide recommendations for strengthening climate-resilient health systems.

Through the analysis of pertinent facts and literature, the paper aims to:

1. Assess how well the current approaches and policies are working to strengthen the health system's resistance to climate change.
2. List the finest practices and lessons discovered from various Indian situations and areas.
3. Make doable suggestions for strengthening the planning and administration of the health system that take climate resilience into account.

Importance of Assessing National Validity

It is crucial to evaluate the national validity of sample indicators for multiple reasons.

1. Contextual Relevance: Within the framework of the country, indicators should represent the unique weaknesses and strengths of the health system.
2. Policy Development: Reliable indicators are used to guide the creation of strategies and policies that are suited to the goals and problems of the country.
3. Resource Allocation: To improve climate resilience, resources are allocated to places where they are most needed based on accurate indications.
4. Monitoring and Evaluation: To track developments and assess the success of initiatives meant to create health systems that are climate resilient, reliable indicators are necessary.

Methodology

Study Type

To guarantee a methodical and transparent process, this secondary data analysis adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria. PRISMA offers a systematic approach to conducting and reporting systematic reviews with an emphasis on finding, sifting, and assessing pertinent research. The study intends to synthesise previous research on emergency management and climate resilience in health systems, particularly in the context of India, by following these recommendations. Without doing fresh primary research, the emphasis on secondary data enables a thorough study of previously published studies, guidelines, policies, and frameworks.

Time Frames

The analysis provides a current summary of the literature and spans the years 2015 through 2024. The chosen time range aims to encompass the latest advancements and patterns in emergency management and climate resilience within healthcare systems. It covers ten years of research, which is enough to see advancements, modifications, and continuing difficulties in this field. Additionally, the chosen time frame guarantees that the analysis incorporates the most recent recommendations and laws pertaining to emergency preparedness and climate resilience.

Information Sources

The literature review consults a number of extensive databases and grey literature sources. PubMed, ResearchGate, and Google Scholar are the main databases. These resources were picked because they include significant collections of academic papers, articles subject to peer review, and grey literature. A wide variety of biomedical literature is accessible through PubMed, but ResearchGate and Google Scholar offer a more comprehensive view, encompassing a number of fields pertinent to health systems and climate change. Through the use of these resources, the review guarantees a comprehensive and inclusive search of pertinent literature.

Inclusion Criteria

The inclusion criteria centre on frameworks, guidelines, regulations, and literature that address emergency management and climate resilience in health systems, particularly in the Indian setting. Only research that has been published in English is taken into account, guaranteeing readability and accessibility. This criterion makes sure that the literature that is chosen has a direct bearing on the goals of the study as well as the particular indicators of WHO recommendations Component 9. The objective of the review is to present a thorough and precise synthesis of the current state of knowledge by concentrating on pertinent and recent literature.

Exclusion Criteria

Excluded from the review are studies that don't concentrate on India or aren't related to the Component 9 indicators. This criterion guarantees that the analysis stays within the context of India and directly tackles the goals of evaluating the national validity of sample indicators on disaster preparedness and management connected to climate change. By removing unneeded data that does not advance the objectives of the study, extraneous studies can be excluded from the review, maintaining its quality and focus.

Search Strategy

A combination of Medical Subject Headings (MeSH) phrases and keywords pertaining to emergency management and climate resilience in health systems are used in the search approach. MeSH phrases that offer an organised approach to the search include "Climate Change," "Emergency Preparedness," "Health Systems," "Disaster Planning," and "Public Health." To retrieve a wider variety of pertinent material, keywords such as "disaster management," "national validity," "WHO health system guidelines," and "climate-related emergency preparedness" are employed. Boolean connectors (AND/OR) are used to hone the search and guarantee thorough topic coverage.

Selection Process

Titles and abstracts are first screened in accordance with the inclusion criteria as part of the selection process. Finding research that might be pertinent to the evaluation is made easier with the aid of this preliminary screening. After that, a full-text screening is carried out to make sure the chosen studies are highly relevant and fulfil all inclusion requirements. To make sure no pertinent material is missed, the references to the included research are cross-checked. The integrity and comprehensiveness of the evaluation are preserved in part by this rigorous and methodical selection process.

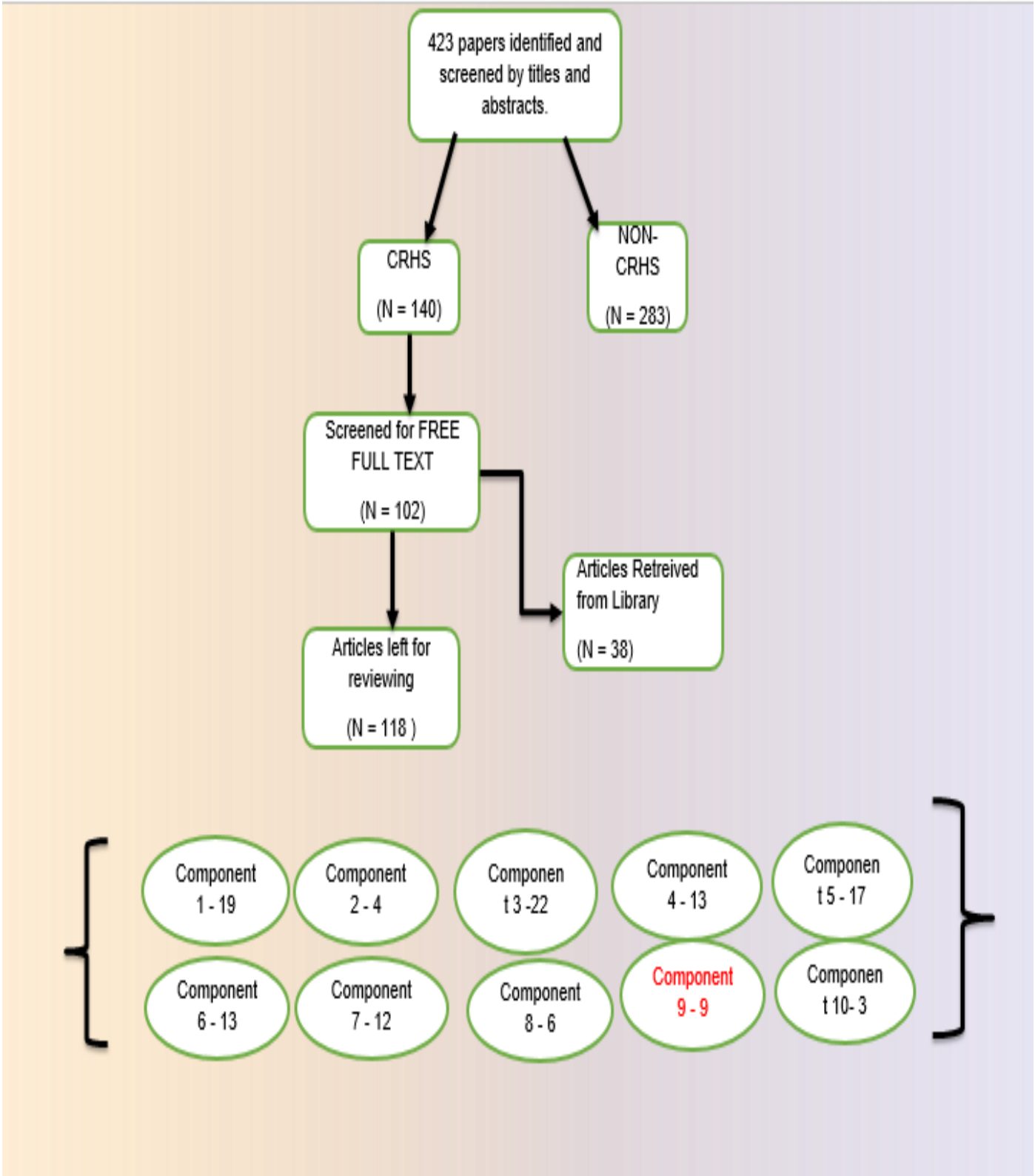
Data Management

The process of data management include gathering pertinent data from the chosen studies and entering it into an Excel spreadsheet. By using a methodical approach, it is ensured that all relevant data are arranged and readily available for analysis. Information about the study's goals, methods,

conclusions, and applicability to the Component 9 indicators are all included in the retrieved data. The assessment guarantees accurate and effective treatment of the substantial amount of data gathered by utilising Excel for data management.

Data Analysis

The gathered material is analysed using thematic content analysis. The steps in this qualitative analysis method are finding, examining, and summarising any patterns or themes found in the data. The results of the included research are synthesised through the use of thematic analysis, which offers a thorough grasp of the present state of knowledge on emergency management and climate resilience in health systems. By identifying important themes, patterns, and gaps in the literature, this method provides insightful information that will guide future studies and the formulation of public policy.


423 papers identified and screened by titles and abstracts.
CRHS
(N = 140)
NON-CRHS
(N = 283)
Screened for FREE FULL TEXT
(N = 102)
Articles Retreived from Library
(N = 38)
Articles left for reviewing
(N = 118)
Component 1 - 19
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Results

In order to start the literature review, 423 articles were extracted from a variety of sources, including ResearchGate (60), PubMed (100), Google Scholar (223), and 40 more publications from other sources. After a preliminary screening, 87 papers that were irrelevant based just on their titles and abstracts were eliminated, along with 14 duplicate articles. 102 items were still up for full-text screening as a result. After more examination, 93 publications were eliminated, mostly because the entire text was unavailable or they didn't fit the study's goals. Nine papers were thus chosen for in-depth analysis once they satisfied the inclusion requirements. After then, these nine papers underwent a full-text review to address the scoping review question and make sure they were thorough and pertinent to the goal of the study. The main grounds for exclusion were lack of full text availability and mismatch with the goals of the research.

Articles	Type of Study	Location	Population/Setting	Exposure	Outcome	Findings
Exploring the vulnerability of the coastal wetlands of India to the changing climate and their adaptation strategies(6)	Review study	Coastal wetlands in India	Coastal ecosystems	Climate change	Vulnerability and adaptation strategies	The review explored the vulnerability of coastal wetlands to climate change and discussed various adaptation strategies to mitigate these impacts.
Climate change and seasonal floods: potential long-term nutritional consequences for children in Kerala, India(7)	Cross-sectional study	Kerala, India	Children affected by seasonal floods	Seasonal floods	Long-term nutritional consequences	The study found that seasonal floods have potential long-term nutritional consequences for children, highlighting the need for targeted interventions.
Characteristics of Households' Vulnerability to Extreme Heat: An Analytical Cross-Sectional Study from India(8)	Review Study	Coastal and transitional ecosystems in India	Coastal and transitional ecosystems	Climate change	Current status, future projections, solutions, and policies	The review provided an overview of the impacts of climate change on coastal and transitional ecosystems, including current status, future projections, and recommended solutions and policies.
Long-term impacts of climate change on coastal and transitional eco-systems in India: an overview of its current status, future projections, solutions, and policies (9)	Review study	Coastal and transitional ecosystems in India	Coastal and transitional ecosystems in India	Climate change	Current status, future projections, solutions, and policies	The study projects that climate change will exacerbate existing issues, such as sea-level rise, increased frequency of extreme weather events, and changes in biodiversity. **Solutions**: Suggested solutions include the implementation of nature-based solutions (NbS), such as mangrove restoration, and the adoption of sustainable coastal management practices. **Policies**: The article emphasizes the need for comprehensive policy frameworks that integrate climate change adaptation and mitigation strategies to protect and preserve coastal ecosystems.

Articles	Type of Study	Location	Population/Setting	Exposure	Outcome	Findings
Policy development in disaster preparedness and management: lessons learned from the January 2001 earthquake in Gujarat, India (1)	Case study	Gujarat, India	General population affected by the January 2001 earthquake	Earthquake and its aftermath	Policy development in disaster preparedness and management	The study highlighted the importance of policy development and lessons learned from the disaster response to improve future disaster preparedness and management.
Occupational heat stress profiles in selected workplaces in India(2)	Cross-sectional study	Selected workplaces in India	Workers in various occupational settings	Occupational heat stress	Profiles of heat stress and its impacts on workers	The study identified high levels of heat stress in several workplaces and recommended interventions to mitigate health risks for workers.
Estimating population heat exposure and impacts on working people in conjunction with climate change(3)	Quantitative analysis	Global, with implications for India	Working population	Heat exposure due to climate change	Impacts on working people, including productivity loss and health risks	The study projected increased heat exposure for working populations, leading to significant health and economic impacts if no adaptation measures are taken.
Future projection of climate extremes across contiguous northeast India and Bangladesh(4)	Projection study	Northeast India and Bangladesh	General population	Climate extremes	Future projections of climate extremes	The study predicted an increase in climate extremes in the region, emphasizing the need for enhanced adaptive measures and policy interventions
Climate disasters challenge health infrastructures in India(5)	Review Study	India	Health infrastructure and general population	Climate disasters	Challenges to health infrastructures	The Review highlighted the significant challenges that climate disasters pose to India's health infrastructure, calling for urgent improvements in preparedness and response.

INDICATOR	Description from NAPCCHH	STATUS
Capacity development programs implemented for local communities	Integration of climate-sensitive health risks(2)(8)(6)	GREEN
Stakeholder mechanism to support participation and information exchange established	Health sector contingency plans for extreme weather events developed and implemented(3)(5)()7	GREEN
Mechanisms in place to ensure information reaches communities and triggers preventive action	Approaches included in H-EDRM(1)	RED
Policies, protocols, plans, and strategies for H-EDRM integrated with climate-sensitive health risks	Integration of climate-sensitive health risks (2)(4)	GREEN
Health sector contingency plans for extreme weather events developed and implemented	Health sector contingency plans for extreme weather events developed and implemented(5)(6)(8)	GREEN
Gender sensitivity and equity approaches included in H-EDRM	Approaches included in H-EDRM(9)	RED
Health sector contingency plans aligned with WHO H-EDRM framework	Plans aligned with WHO H-EDRM(4)(1)	YELLOW
Protocols for H-EDRM integrate low carbon and environmentally sustainable practices	Protocols for H-EDRM integrate low carbon and environmentally sustainable practices(7)(3)	GREEN
Risk assessments for exposure to extreme weather events inform health sector strategic plans	Risk assessments inform strategic plans (6)(9)	GREEN
Climate change-related emergency and disaster response plans for individual health facilities developed and implemented	Emergency response plans developed (2)(7)	GREEN
Geographical and seasonal distribution of climate health risks used to inform plans	Distribution of risks used to inform plans(1)	GREEN
Early warning systems (EWS) for extreme weather events and climate-sensitive diseases used	EWS used for H-EDRM planning(9)	GREEN

WHO Indicator with NAPCCHH status

RESULTS

The adoption of all WHO indicators is essential for a fully climate-resilient health system (CRHS). But other indicators still need to be addressed, especially the ones that deal with health equity, health sensitivity, and community engagement. Nine indicators are totally operational as of right now. These include the creation and execution of health sector emergency plans for extreme weather events, the integration of low-carbon and environmentally sustainable practices into health sector protocols, and the integration of health hazards related to climate change into policies and protocols.

Furthermore, strategies are being effectively informed by risk assessments for exposure to extreme weather events, and emergency and disaster response plans relating to climate change have been produced. Health Emergency and Disaster Risk Management (H-EDRM) planning makes use of early warning systems (EWS) for extreme weather events and diseases that are susceptible to climate change, as well as the geographical and seasonal distribution of climate health risks. Programs for local communities' capacity building have also been successfully implemented.

The integration of health sector contingency plans with the WHO H-EDRM framework is one indicator that is still being worked on. This shows that attempts are still being made to completely incorporate WHO principles into national health sector policies.

Two crucial signs, meanwhile, have not been put into practice. These are the creation and execution of community-based health sector emergency plans for severe weather disasters, as well as the incorporation of gender sensitivity and equality initiatives within H-EDRM.

A major gap in guaranteeing that health emergency responses are inclusive and equitable is highlighted by the absence of gender sensitivity and equity measures. In a similar vein, the lack of community-level health sector contingency planning highlights the necessity of grassroots, localised involvement and readiness in order to construct a health system that is really climate resilient. To improve the health system's overall resilience and reactivity to climate-related catastrophes, these deficiencies must be filled.

DISCUSSION

The World Health Organization's 10 indicators offer a comprehensive framework for evaluating and improving health systems' resilience to climate change, and they are used as standard standards for creating climate-resilient health systems (CRHS). Many nations in Europe, America, the USA, and Latin America have embraced these indicators, indicating their dedication to developing strong health systems that are adaptable to climate change. As they pursue comparable objectives, other countries—including India—can benefit greatly from the experiences of these others by using them as a benchmark. India is actively working to put these indicators into practice, demonstrating its understanding of the vital role that climate resilience plays in the health sector and its dedication to enhancing health outcomes in the face of climate change's obstacles.

India has made notable progress, having successfully implemented nine of the ten WHO indicators. The development and implementation of health sector contingency plans for extreme weather events, the integration of low carbon and environmentally sustainable practices into health sector protocols, and the integration of climate-sensitive health risks into policies and protocols are just a few of the crucial areas covered by these fully implemented indicators. Furthermore, plans for responding to emergencies and disasters related to climate change have been developed, and risk assessments for exposure to extreme weather occurrences inform strategic plans. Health Emergency and Disaster Risk Management (H-EDRM) planning makes use of early warning systems (EWS) for extreme weather events and diseases that are susceptible to climate change, as well as the geographical and seasonal distribution of climate health risks. Programs for local communities' capacity building have also been successfully implemented.

Three indicators are, however, at varying phases of implementation. One indicator is presently being worked on; it focusses on harmonising health sector backup plans with the WHO H-EDRM framework. The implementation of the final two indicators—gender sensitivity and health equity as well as the creation and execution of community-level health sector emergency plans for severe weather events—has not yet taken place. To ensure inclusion and readiness at all levels of the health sector, India must address these remaining indicators in order to attain a completely climate-resilient health system.

Recommendations'

Three main recommendations must be prioritised in order to move closer to a completely climate-resilient health system (CRHS): enhancing community involvement, placing a strong emphasis on equality, and quickening the rollout of health sector backup plans that are compliant with the WHO H-EDRM framework.

Strengthen Community Engagement:

It is imperative to improve methods for information dissemination, community engagement, and preventive measures. This entails building strong lines of communication to guarantee that everyone in the community—especially those living in isolated and vulnerable areas—gets timely and accurate information. Involving communities in participatory planning procedures can help them develop a feeling of accountability and ownership, which will enable them to take preventative action when it comes to health hazards associated with climate change. To increase local capacity and give community members the knowledge and abilities they need to handle health emergencies, training sessions and seminars can be arranged. Furthermore, the utilisation of local leaders and influencers can augment the legitimacy and acclaim of health programs, guaranteeing that preventive measures are culturally suitable and extensively embraced.

Focus on Equity:

It is critical to create and implement equitable, gender-sensitive health emergency policies in order to guarantee that every population segment receives the necessary protection and assistance. This means that in order to pinpoint the unique requirements and vulnerabilities of various gender groups during health emergencies, in-depth gender assessments must be performed. To ensure that women, children, the elderly, and other marginalised groups receive resources and support that is specifically tailored to their needs, policies should be created to address these inequities. Health professionals who receive training on gender equity and sensitivity will be better able to identify and address the particular difficulties these groups encounter. In addition, encouraging women to participate in health emergency planning and response decision-making processes can guarantee that their needs and opinions are appropriately represented.

Accelerate Implementation:

Enhancing the overall resilience of the health system requires accelerating the harmonisation of health sector contingency plans with the WHO H-EDRM framework. This necessitates a concerted effort to update and examine current backup plans, making sure they are thorough and completely compliant with WHO requirements. In this process, collaborating with global organisations and professionals might yield insightful information and helpful technical assistance. Setting precise deadlines and accountability frameworks can also make it easier to monitor development and guarantee on-time execution. Frequent simulations and drills can evaluate these plans' efficacy and point out any weaknesses or potential areas for development.

Ensuring that contingency plans can be successfully implemented during real health emergencies also requires investing in critical infrastructure and resources, such as emergency medical supplies and durable healthcare facilities.

By putting these suggestions into practice, India will make great strides towards developing a completely climate-resilient healthcare system and guarantee that all communities are safeguarded and ready to address health issues related to climate change.

Limitations

Regional variations in healthcare systems can have a major impact on the generalisability of research findings on climate-resilient health systems. Responses to climate-related health hazards may differ depending on a region's unique healthcare infrastructure, resource availability, and public health challenges. Because of this variety, tactics that work well in one area could not work as well or at all in another, which restricts the study's overall applicability.

Inconsistencies in research methodology can provide a challenge. Differences in data collection methods, analytical strategies, and research designs might make it challenging to compare the findings of several studies. The real patterns and trends may be obscured by such methodological differences, making it difficult to reach solid, broadly applicable conclusions. To provide comparable and trustworthy results, methodological rigour and standardisation across research are crucial.

Further limiting the degree of analysis possible is restricted access to full-text articles. Researchers may overlook important details about study design, outcomes, and context if they are unable to access the full text of pertinent papers. This could result in incomplete or biassed interpretations of the findings. This restriction may make it more difficult to conduct thorough literature reviews and meta-analyses, which could eventually compromise the reliability and calibre of the study findings. Improving library resources and promoting open-access publishing are two ways to address these access concerns and help lessen the impact, enabling more complete and accurate assessments.

Conclusion

The national validity of the WHO's low-carbon sustainability and climate resilience indicators in emergency and disaster management is highlighted in this scoping review. Even while there has been a lot of progress in areas like risk management, policy formulation, and community empowerment, there are still noticeable disparities in how these indicators are applied consistently and practically across various regions.

. These discrepancies are frequently caused by the inclusivity of enacted policies and practices as well as the diversity of local healthcare systems. The applicability and efficacy of these indicators may vary depending on local climatic vulnerability, resource allocation, and healthcare infrastructure.

To close these disparities, specific policy changes that support inclusivity and take into account local differences are needed. The flexibility and relevance of policies to the particular requirements of each region must be guaranteed by policymakers. Further crucial are improved risk management procedures, such as standardised approaches to risk evaluation and uniform regional application of contingency planning. In addition, it is imperative to fortify community empowerment endeavours to guarantee that the nearby populace is knowledgeable, involved, and equipped to adopt preemptive actions against health hazards associated with climate change.

A more unified and all-encompassing climate-resilient health system can be created by concentrating on these areas. This would entail strengthening training programs for healthcare professionals on climate resilience, encouraging community-based approaches to health emergency preparedness, and boosting cooperation between national and local authorities. In the end, closing these gaps will result in a stronger healthcare system that is better equipped to handle the problems brought on by climate change and improve health outcomes for all populations.

References:

Bremer R. Policy development in disaster preparedness and management: lessons learned from the January 2001 earthquake in Gujarat, India. Prehospital and disaster medicine. 2003 Dec;18(4):372-84.

Venugopal V, Chinnadurai JS, Lucas RA, Kjellstrom T. Occupational heat stress profiles in selected workplaces in India. International journal of environmental research and public health. 2016 Jan;13(1):89.

Kjellstrom T, Freyberg C, Lemke B, Otto M, Briggs D. Estimating population heat exposure and impacts on working people in conjunction with climate change. International journal of biometeorology. 2018 Mar;62(3):291-306.

Paul AR, Maity R. Future projection of climate extremes across contiguous northeast India and Bangladesh. Scientific Reports. 2023 Sep 20;13(1):15616.

Sharma DC. Climate disasters challenge health infrastructures in India. The Lancet. 2023 Jul 22;402(10398):279-80.

Debnath S, Sarkar UK, Kumari S, Karnatak G, Puthiyottil M, Das BK, Das A, Ghosh BD, Roy A. Exploring the vulnerability of the coastal wetlands of India to the changing climate and their adaptation strategies. International Journal of Biometeorology. 2024 Jan 20:1-2.

Muttarak R, Dimitrova A. Climate change and seasonal floods: potential long-term nutritional consequences for children in Kerala, India. BMJ Global Health. 2019 Apr 1;4(2):e001215.

Subramanian A, Nagarajan AM, Vinod S, Chakraborty S, Sivagami K, Theodore T, Sathyanarayanan SS, Tamizhdurai P, Mangesh VL. Long-term impacts of climate change on coastal and transitional eco-systems in India: an overview of its current status, future projections, solutions, and policies. RSC advances. 2023;13(18):12204-28.

Harshit Bhardwaj D

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