DISSERTATION INTERNSHIP
AT
INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT AND RESEARCH, NEW DELHI

Community-Based Management of health impact due to Heat Stress: Exploring Adaptation Strategies in peri-urban areas in Delhi, India

BY

RITIKA

PG/22/094

UNDER THE GUIDANCE OF

Dr. SUMANT SWAIN

PGDM (Hospital & Health Management)
2022-24

International Institute of Health Management And Research, New Delhi

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Completion of Dissertation

The certificate is awarded to

Name RITIKA

in recognition of having successfully completed her
Internship in the department of

PUBLIC HEALTH

and has successfully completed his/her Project on

Community-Based Management of health impact due to Heat Stress:

Exploring Adaptation Strategies in peri-urban areas in Delhi, India

Date: 3 June 2024

Organization IIHMR Delhi

She comes across as a committed, sincere & diligent person who hasa
strong drive & zeal for learning.

We wish her all the best for future endeavors.

Institution Mentor
Dr. SUMANT SWAIN
ASSISTANT PROFESSOR
IIHMR DELHI

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. RITIKA** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **International Institute of Health Management Research, Delhi** from **MARCH 2024** to **MAY 2024**.

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

The Internship is in fulfillment of the course requirements.

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

Dr. Sumesh Kumar

Associate Dean, Academic and Student Affairs
IIHMR, New Delhi

Dr. Sumant Swain,

Assistant Professor,
IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Community-Based Management of health impact due to Heat Stress: Exploring Adaptation Strategies in peri-urban areas in Delhi, India"** 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.

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Name	Signature
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Dr Pijush Kanti Khan	
Dr. Aman Raj Gupta	

Certificate from Dissertation Advisory Committee

This is to certify that **Ms. RITIKA ,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. She is submitting this dissertation titled " **Community-Based Management of health impact due to Heat Stress: Exploring Adaptation Strategies in peri-urban areas in Delhi, India** " at " **IIHMR Delhi**" 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,
Assistant Professor,

IIHMR Delhi

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

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...**Dr. SUMANT SWAIN**... for award of PGDM (Hospital & Health Management) of the Institute carried out duringthe period from ...**MARCH 2024**... to ...**APRIL 2024**...

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FEEDBACK FORM

Name of the Student: RITIKA

Name of the Organization in Which Dissertation Has Been Completed: IIHMR Delhi

Area of Dissertation: PUBLIC HEALTH

Attendance: 100%

Objectives achieved: She has completed all the given tasks

Deliverables: Formed Questionnaire, pretesting of questionnaire, Data collection, Data analysis, project related work, making dissertation report

Strengths: Good communication and technical skills, dedication towards work

Suggestions for Improvement: keep up the good work

Signature of the Officer-in-Charge/ Organization Mentor (Dissertation)

Date: 03/07/24
Place: 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)	Dr/Mr./Ms.: RITIKA		
Enrolment/Roll No.	PG/22/094	**Batch Year**	2022-2024
Course Specialization (Choose one)	Hospital Management ✓	Health Management	Healthcare IT
Name of Guide/Supervisor	Dr/ Prof.: SUMANT SWAIN		
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LIST OF ABBREVIATIONS:

1. **FGDs - Focus Group Discussions**
2. **MAS - Mahila Arogya Samiti**
3. **IDIs - In-Depth Interviews**
4. **ASHA - Accredited Social Health Activist**
5. **ANM – Auxiliary Nursing Midwifery**
6. **NCD - Non-communicable diseases**
7. **NIHFW - National Institute of Health and family Welfare**
8. **NHSRC- National Health Systems Resource centre**
9. **WHO - World Health Organization**
10. **HAPs - Heat Action Plans**
11. **NFHS - National Family Health Survey**
12. **CBM – Community Based Management**
13. **UNDRR- United Nations Disaster Risk Reduction**

OVERVIEW ABOUT THE ORGANIZATION

The International Institute of Health management Research, New Delhi was setup in the year 2008. The institute mainly provides post graduate programs in health, hospital and information technology in health care and management development programs. The institute also focus on the research projects which help in policy analysis, policy formulation and also help in the implementation of the policies for the health care sectors. It has emerged as a reputed institute for providing good health care management professionals nationally as well as globally. It is an autonomous institute performing well for several years to improve health care by training the students and making them good professionals for future. The institute also made an effort to promote the success for the 17 sustainable Development Goals. The IIHMR is involved in various research projects which act as a support for health policy and planning.

MISSION AND VISSION OF IIHMR:

- **MISSION:** this institution is dedicated in the improvement of standards of health through proper and better management of health care and its programs with the help of management research, training, education and proper networking of the institute at global level
- **VISION:** the main objective and vision of the institute is to give its contribution in health care sector for social equity with the help of its commitment to support health programs for improving healthcare sectors

CAPABILITIES AND THRUST AREAS:

- AICTE approved two-year PGDHM
- Management development programs
- Research projects
- Quality assurance and accreditation
- Insurance related to healthcare
- E-learning

CORE ACTIVITIES:

- Research
- Training
- Teaching

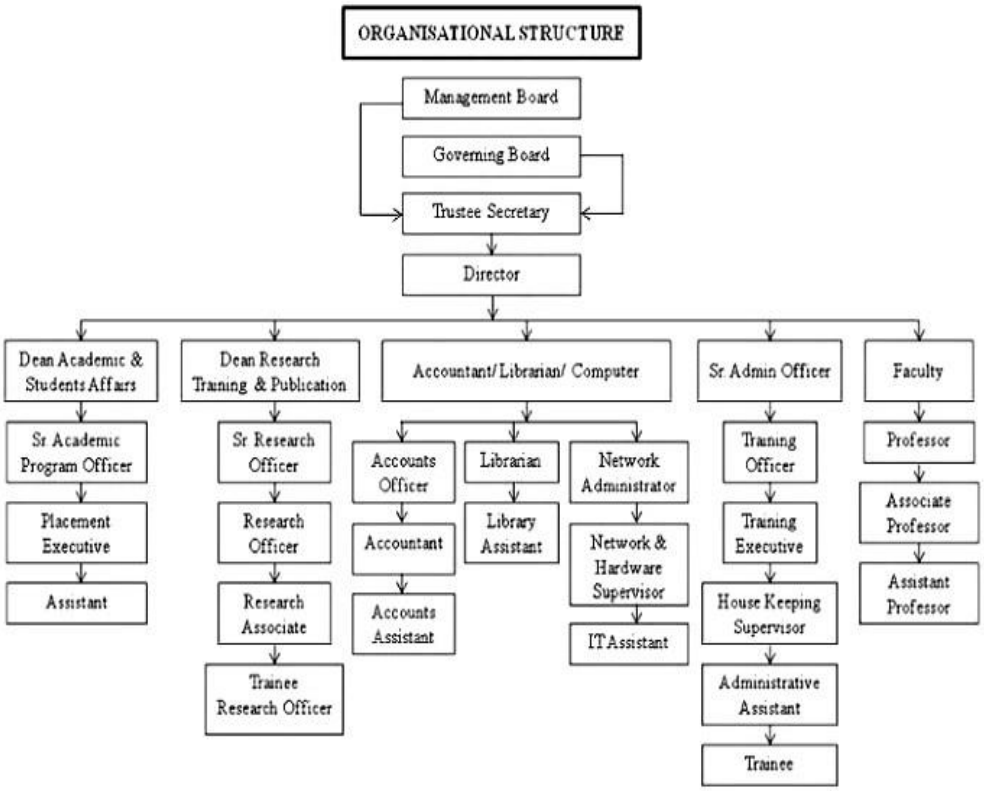
GLOBAL NETWORKING:

IIHMR, Delhi has collaborations with various reputed institutions and organizations.

Some of them are given below:

- World Health organization (WHO)
- South-east Asia Public Education Institution network (SEAPHEIN)
- National Institute of Health and family Welfare (NIHFW)
- SAARC Tuberculosis and HIV/AIDS centre (STAC)
- National Health Systems Resource centre (NHSRC)
- The union South East Asia (USEA)

ORGANIZATION STRUCTURE:



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ABSTRACT

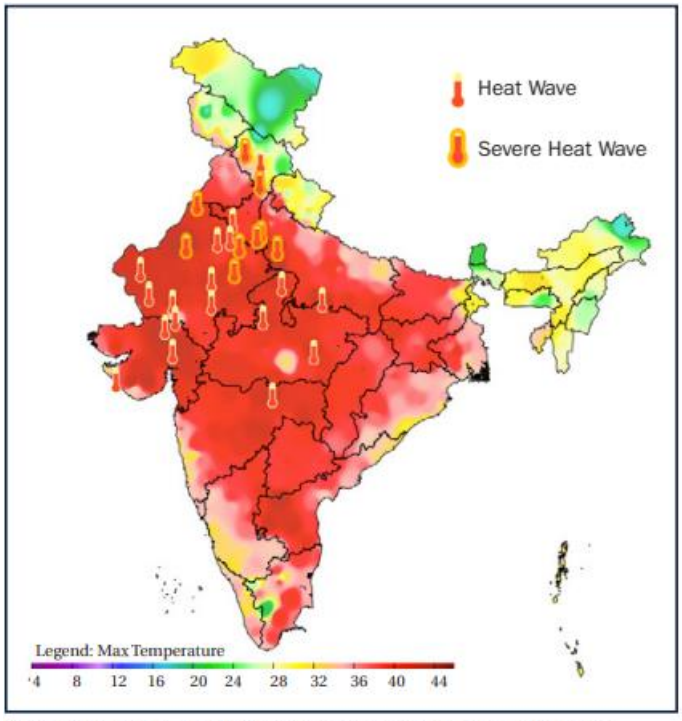
This study investigates heat stress management strategies adopted by peri-urban communities in Delhi, India, in response to increasingly frequent and severe heat waves caused by climate change. It scrutinizes the health repercussions of heat stress and the defensive tactics utilized by the inhabitants to alleviate these impacts. The study's pivotal discoveries reveal that heat stress poses a considerable threat to public health in the peri-urban regions of Delhi, with common symptoms such as excessive sweating, exhaustion, and dehydration. The level of education appears to play a crucial role in the awareness of heat stress, with individuals possessing higher educational qualifications tending to have a better understanding of the risks associated with heat. It examines the health impacts of heat stress and the measures residents take to alleviate its effects. The study reveals that heat stress is a critical public health issue in these areas, with common symptoms including sweating, fatigue, and dehydration. To combat heat stress, residents utilize a variety of personal strategies such as using herbal remedies, altering their diets to include more cooling foods, wearing protective clothing, and making behavioural changes like increasing fluid intake and bathing more frequently. While the use of fans and air conditioners is on the rise, their adoption is hindered by high electricity costs and frequent power outages. Some residents have also made modifications to their homes to improve heat management, such as installing bamboo curtains and watering their rooftops. The significance of this research lies in its identification of the urgent need for interventions that are both culturally relevant and tailored to the specific context of these communities. It underscores the necessity of educating residents about heat stress and its prevention, enhancing community resilience through capacity-building, developing sustainable and affordable cooling solutions, and creating effective heat action plans with a particular focus on peri-urban regions.

PROJECT REPORT

"Community-Based Management of health impact due to Heat Stress: Exploring Adaptation Strategies in peri-urban areas in Delhi, India"

BACKGROUND

Heat waves, periods of abnormally high temperatures, pose a significant threat to public health in India. These events, becoming increasingly frequent and severe due to climate change, cause a range of health problems, from dehydration to heatstroke. A significant portion of India's landmass (90%) is increasingly susceptible to intense heatwaves, a phenomenon exacerbated by the ongoing changes in global climate patterns. Research spearheaded by Ramit Debnath and his team at the University of Cambridge highlights this trend, emphasizing the acute risks faced by regions such as Delhi. These findings underscore the urgent need for adaptive measures to mitigate the adverse effects of these climatic extremes on densely populated areas. The study serves as a crucial call to action for policymakers and communities to prioritize and implement strategies that safeguard against the escalating threat of heat-related events (1,2) and millions of workers experiencing heat-related stress, effective strategies are urgently needed. This study highlights the impacts of heat waves in

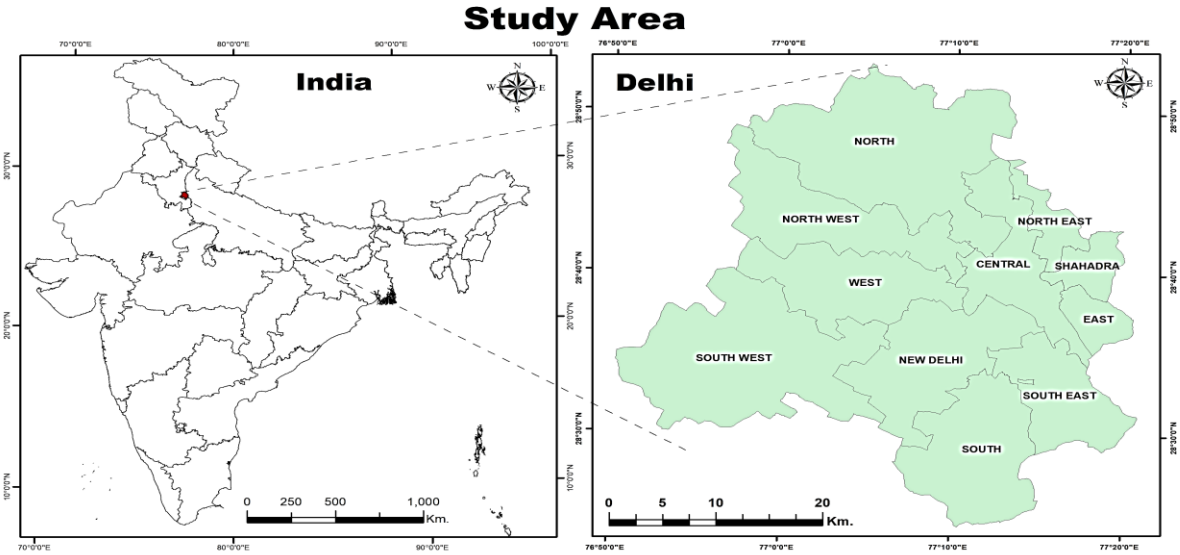


Note: IMD declares a heat wave when the maximum temperature exceeds 40°C in a region with low elevation or when temperatures reach at least 4.5°C above the normal average temperature. IMD declares a severe heat wave if the departure from normal temperature exceeds 6.4°C (Source: India Meteorological Department, 2022).

India's capital, Delhi with adoption and explores the need for community-based solutions. A significant study conducted by the Ministry of Earth Sciences in collaboration with the India Meteorological Department in 2021 revealed that, over the span of nearly five decades from 1970 to 2019, extreme heat conditions were responsible for a substantial number of fatalities. The research highlighted the severe impact of heat waves on public health, underscoring the need for effective strategies to mitigate the risks associated with rising temperatures. This information is crucial for developing policies and preventive measures to safeguard populations against the adverse effects of heat waves. The fatalities increased significantly over the decades, rising from 1,505 deaths from heatwaves in the 1980s to 6,494 deaths in the 2010s.(3) Additionally, in 2015, India experienced one of the world's five deadliest heat waves on record, resulting in approximately 2,300 deaths. Most of these fatalities were concentrated in the southeast states of Andhra Pradesh and Telangana. This particular heat wave is considered the fifth deadliest in world history according to the International Disaster Database (EM-DAT)(4)

The Problem of Heat Waves in Delhi

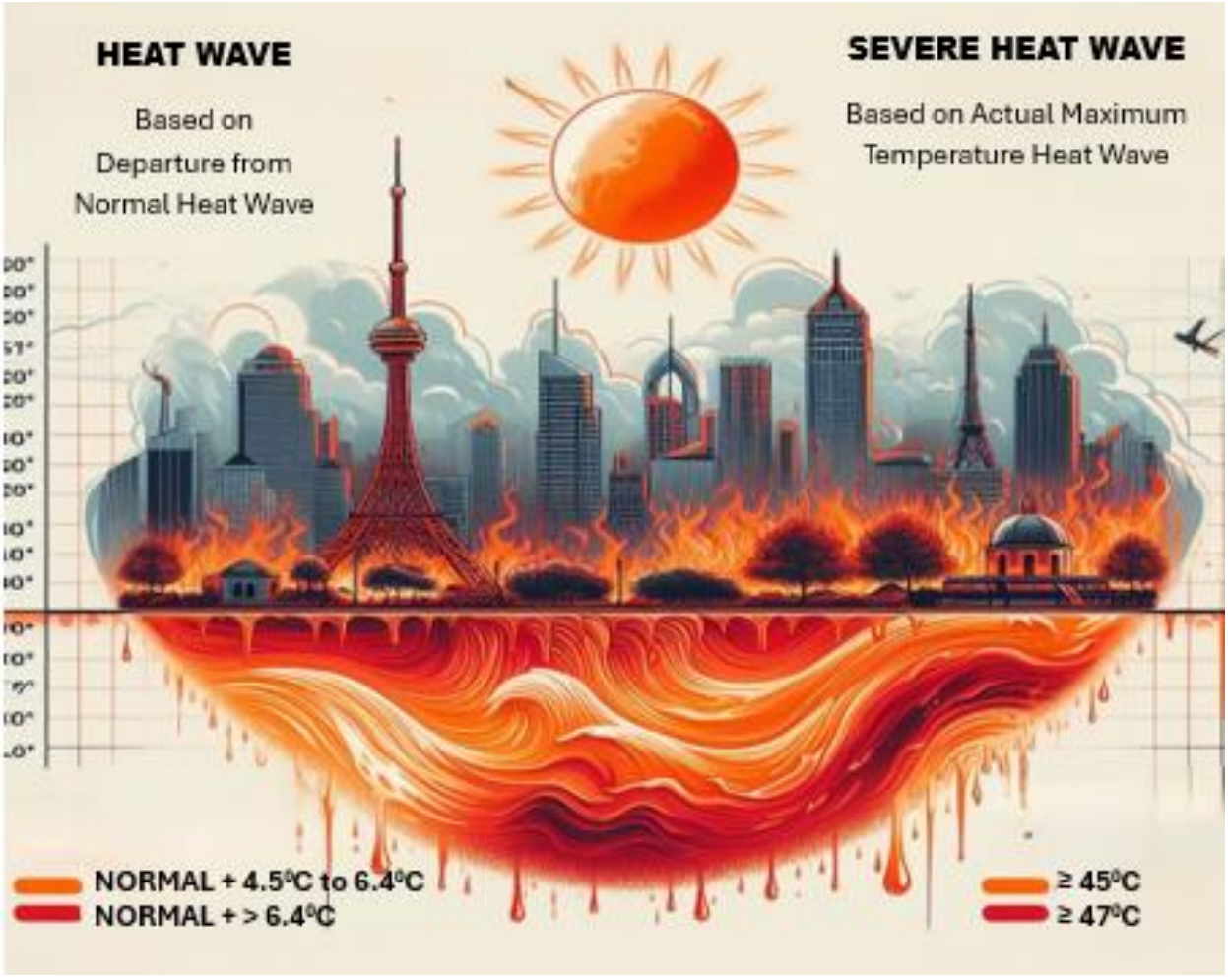
Delhi, a sprawling metropolis, is particularly vulnerable to heat waves. The high population density and urban heat island effect exacerbate the already scorching temperatures. A large portion of Delhi's residents live in urban areas, further amplifying the heat's impact. Studies indicate that over 75% (around 380 million people) of India's workforce experiences heat stress, putting a strain on their health and productivity(5).



This study investigated community-based management strategies for heat stress in Delhi. Delhi, the capital city of India, is experiencing rapid urbanization, which has led to the expansion of peri-urban areas. Peri-urban areas represent the transition zone between urban and rural environments. These areas often face unique challenges, including limited access to healthcare, inadequate infrastructure, and a lack of policy focus(6). Understanding the specific needs and vulnerabilities of peri-urban communities is essential for developing targeted adaptation strategies that can effectively address the health impacts of heat stress. It explores how different communities develop and utilize coping mechanisms to mitigate the adverse effects of heat waves. The research focuses on the growing public health concern of heat stress in urban populations, particularly in light of the urban heat island effect.

The Indian Meteorological Department (IMD) has given the following criteria for Heat Wave:

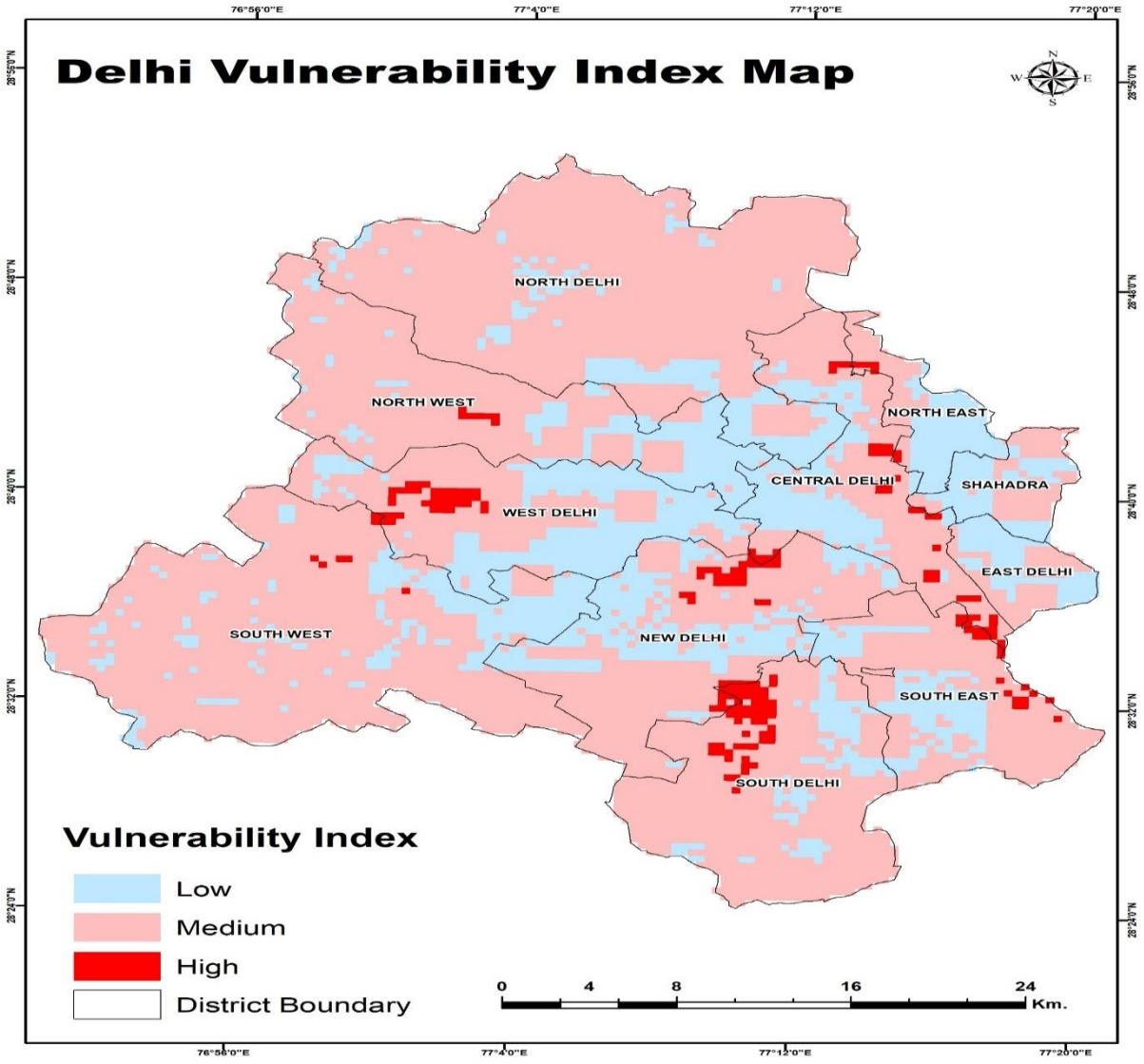
Heat wave is considered if maximum temperature of a station reaches at least 40^0C or more for Plains and at least 30^0C or more for Hilly regions.



Health Impacts of Heat Waves

Heat waves pose a significant health risk, leading to conditions such as dehydration, muscle cramps, and in severe cases, heat stroke. Symptoms of heat-related illnesses can range from swelling and fainting associated with heat cramps, often with a fever of less than 39°C (102°F), to the more severe heat exhaustion, which can cause fatigue, dizziness, headaches, and nausea. The most serious condition, heat stroke, can result in body temperatures exceeding 40°C (104°F), potentially causing delirium, seizures, or coma, and may be life-threatening. With the increasing frequency and intensity of heat waves in India, largely attributed to climate change, a significant portion of the population is at risk. It's crucial for public awareness and preventive measures to be emphasized, especially in areas classified within the high-risk zones, to mitigate the adverse health effects of these extreme temperature events. Over the past five decades, extreme heat events have had a significant impact in India, resulting in over 17,000 fatalities. This statistic is highlighted in a study conducted by a team of researchers including M Rajeevan, who previously served as the secretary for the Ministry of Earth Sciences. The collaborative effort with scientists Kamaljit Ray, S S Ray, R K Giri, and A P Dimri sheds light on the severe consequences of heatwaves and underscores the urgent need for strategies to mitigate their effects on the population. The findings of this research contribute to a deeper understanding of the climatic challenges faced by the region and the importance of developing adaptive measures.In an effort to understand India's susceptibility to climate-related challenges and its influence on Sustainable Development Goals (SDGs), scholars from the University of Cambridge have performed a detailed analysis correlating the nation's heat index and climate vulnerability index. The heat index is a crucial metric that quantifies the perceived temperature by factoring in humidity along with the actual temperature. Meanwhile, the climate vulnerability index integrates a range of indicators to gauge the socio-economic, livelihood, and environmental aspects that could be affected by extreme heat events. This comprehensive study aims to shed light on the potential risks and adaptive capacities required to mitigate climate change impacts.

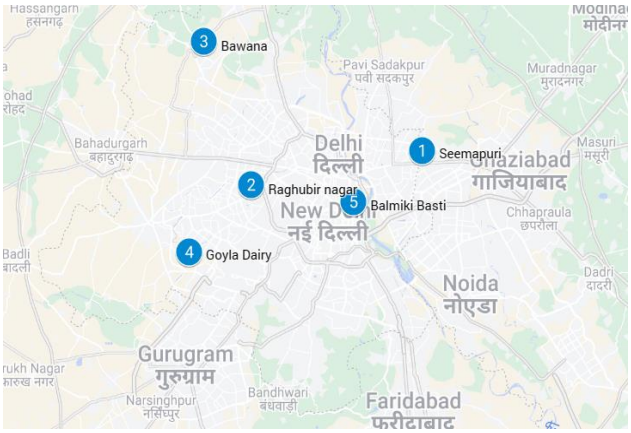
Delhi Vulnerability index map



This vulnerability index is a Heat wave hazard and vulnerability map of NCT prepared using remote sensing and GIS techniques, this map highlights that South-Delhi has highest concentration of vulnerability pockets. Some other pockets were also found in New Delhi and West Delhi districts. Some scattered pockets were also located in North-West Delhi and Eastern Delhi while no venerability pockets were found in North Delhi district. More than 70% area of NCT was located in the vulnerability index which implies that the population density and built-up concentration are above the limit and hence increases the risk of heat wave in NCT. The low vulnerability area is scattered in pockets of each district, but maximum concentration was observed in Central Delhi, which has comparatively lower population density and following some environmental conditions of green belts.

Based on these pockets identified 5 study areas were decided namely :

S.No.	Study Area	Part of Delhi
1.	Seemapuri	North East
2.	Raghubir Nagar	West Delhi
3.	Bawana	North West
4.	Goyla Dairy	South West
5.	Balmiki Basti	South Delhi



The core of the research lies in understanding the coping capacity of communities. This refers to a community's ability to manage heat stress through behavioural and environmental modifications. Existing research highlights the effectiveness of community-based interventions, such as cooling centers and social support networks, in reducing heat-related illnesses.

Adaptation strategies are crucial in these scenarios. Lessons can be drawn from the Heat Action Plans (HAPs) implemented in various Indian cities, such as the pioneering plan in Ahmedabad, which has been credited with preventing heat-related deaths(7). These plans emphasize the importance of early warning systems, public awareness, interagency coordination, and capacity building among healthcare professionals(7). This study aims to develop a comprehensive framework for community-based management of heat stress which will integrate insights from past research with innovative approaches to enhance community coping capacity and establish effective mechanisms to safeguard public health from the escalating threat of heatwaves.

REVIEW OF LITERATURE

In recent years, a significant body of research has been dedicated to understanding the phenomenon of heat waves in India. These studies have focused on various aspects, such as the meteorological conditions leading to heat waves, their socio-economic impact, and strategies for mitigation and adaptation. Researchers have analyzed patterns and trends of temperature variations, while also considering the influence of climate change on the frequency and intensity of these events. Public health implications have been a major concern, prompting investigations into heat-related illnesses and mortality rates. Additionally, policy-oriented studies have examined the effectiveness of early warning systems and heat action plans to protect vulnerable populations. This collective body of work contributes to a deeper comprehension of heat waves and informs the development of more resilient communities in the face of rising temperatures:

A study titled as “On the Variability and Increasing Trends of Heat Waves over India” has focused on heat waves variability over India for a period of 1961-2013. It indicated substantial rise in frequency, duration and maximum length of heat waves(8). Another study titled “Extreme heat in India and anthropogenic climate change”, The study highlighted a significant human influence on the frequency and intensity of heat waves in the regions of Andhra Pradesh, Telangana, and Rajasthan during the years 2015 and 2016. It was observed that there was a notable escalation in air pollution due to aerosols, and a rise in evaporation rates because of extensive irrigation practices. These factors contributed to the exacerbation of health hazards linked to the occurrence of heat waves. This analysis underscores the complex interplay between human activities and climatic extremes, emphasizing the need for sustainable practices to mitigate adverse health outcomes.(9). In another study “Increasing probability of mortality during Indian heat waves” From 1960 to 2009, researchers observed a notable shift in temperature patterns, alongside an escalation in the intensity, occurrence, and length of heatwaves. Concurrently, there was an upward trend in related fatalities. The data indicates a significant surge in average temperatures throughout India during this timeframe, exceeding a 0.50°C increase, which correlates with a marked rise in heatwave incidents. This period's climatic changes underscore the pressing need for comprehensive studies on the impact of rising temperatures on public health (10). “The role of local heating in the 2015 Indian Heat Wave”, A study was undertaken to analyze the spatial and temporal aspects of heat waves in

India, with a focus on understanding the role of terrestrial conditions in exacerbating the extreme temperatures. It was observed that the heat waves, which typically occur in late May and early June, coincide with periods of scant rainfall, leading to increased heat emanation from the ground. This phenomenon underscores the intricate relationship between precipitation patterns and land surface states in the emergence and intensity of heat waves (11,12). “Changes in regional heatwave characteristics as a function of increasing global temperature”, The research examined the variation in heatwave patterns, including their occurrence, severity, and length, and its connection to the rise in global temperatures. Findings highlighted the benefits of capping the increase in global temperatures to 1.5 °C, particularly concerning the alteration of heatwave phenomena on a local scale. Additionally, the study offered a perspective on how escalating temperatures beyond 2 °C could influence heatwave transformations.(13).

The impact of high temperatures on mortality is significant, with studies indicating an 11% increase when the mean daily temperature exceeds 40°C(14). The most pronounced effects are observed on the second day following the peak temperatures(14). Non-communicable diseases see a substantial rise in mortality rates, up to 1.57 times higher during heatwaves(15). Interestingly, the data suggests that men experience a higher increase in mortality (1.38 times) compared to women during such extreme temperature events.

This study aims to build upon this existing research by exploring the specific coping mechanisms and capacities within Indian communities. The research has drawn on relevant studies that have examined:

- *Community-driven interventions***:** This research area explores how communities can implement localized solutions to address heat stress. It emphasizes the importance of community engagement in developing sustainable plans to combat heatwaves(6,16).
- *Effectiveness of interventions***:** Studies in this area provide evidence on the positive impact of community-based initiatives in reducing heat-related illnesses. They highlight the value of community involvement throughout the entire process, from planning to execution.(16)
- *Mortality reduction***:** This research explores how community-based strategies can reduce heat-related deaths. It identifies critical components of successful interventions, including early warning systems, public education campaigns, and the mobilization of healthcare resources.(15,17)

- *Preventive measures:* This area of research delves into preventive measures and management techniques for heat-related illnesses. It advocates for a proactive public health approach with comprehensive strategies encompassing awareness, education, and emergency response planning.(18)
- *Nature-based solutions:* Innovative projects like the Nature's Cooling Systems Project showcase the effectiveness of green infrastructure in mitigating heat challenges. Planting trees and creating urban gardens can enhance thermal comfort and resilience in vulnerable communities.(19)
- *Cooling technologies*: Research in this area evaluates the use of cooling garments for outdoor workers. It explores the benefits of personal cooling technologies in maintaining worker productivity and safety during extreme heat events.(20)

STUDY OBJECTIVES

General Objectives

To identify and analyze the adoption strategies employed by peri-urban communities in Delhi to manage heat stress-related health outcomes during hot weather conditions due to climate change.

Secondary Objectives

1. To identify key health outcomes due to heat stress at the community level.
2. To investigate the coping strategy /mechanisms through which peri-urban communities in Delhi adapt and manage key health outcomes related to heat stress.
3. To document the community-based interventions in enhancing community resilience to heat stress in urban settings, with a focus on the outcomes and challenges faced by people,
4. To provide recommendations and insights for policymakers, public health officials, and community leaders in Delhi to develop evidence-based strategies for sustainable heat stress management at the community level to minimize adverse health impacts.

RESEARCH QUESTION

- How do peri-urban communities in Delhi adapt and manage the increased risk of heatstroke during extreme heat events, and what are the facilitators and barriers to effective coping mechanisms?
- What strategies do peri-urban communities in Delhi employ to enhance their resilience to heat stress-related health outcomes in the context of climate change?

- How do peri-urban communities in Delhi adapt and manage the increased risk of heatstroke during extreme heat events?
- What strategies do peri-urban communities in Delhi employ to enhance their resilience to heat stress-related health outcomes in the context of climate change?

METHODOLOGY

Study Design: This population-based cross-sectional study and will be followed by a mixed-method approach. A population-based cross-sectional study is a type of observational research that analyses data from a subset of the population at a specific point in time. It can provide a snapshot of the population's health or behaviour. Following this, a mixed-method approach combines qualitative and quantitative research methods to gain broader insights. This approach allows researchers to explore a research question from various angles, enhancing the depth and breadth of the study.

Study Area: Delhi.

Study Population: Head of the households for a quantitative survey and ASHA, ANM, MAS members, local self-government members, and healthcare providers for IDI and FGD.

Sample Size: 200 households and six frontline health workers and provides for IDI and 3 FGD among Mahila Arogya Samiti (MAS) members.

Study Period: March to June 2024

Samling Technique: Convenient sampling technique will be used to cover the sample size.

Study Tools:

Quantitative Survey

- A household survey will be conducted to collect data on health outcomes related to heat stress and existing coping mechanisms, socio-economic status, access to resources, and demographics.

Qualitative Interviews

- IDI and FGD checklists will be developed for this study to explore in-depth experiences with heat stress related health outcome, coping strategies, community support systems, and perceived effectiveness of existing interventions.

Ethical Consideration: This study will be submitted for ethical review to the IIHMR student research review board. The tool and study protocol will be cleared through this committee. All the participants would be explained the objectives of the study if they are being surveyed through a questionnaire. Throughout the course of study, the core principles of research ethics

such as respect for respondents, beneficence and justice will be considered and applied as required. Informed consent will be taken from each participant, after explaining the background and other details of the study. The respondent will be assured of anonymity, confidentiality of the information they share with me as well as the rights to voluntary participate and withdraw from the study at any point of time without any consequences.

Data Analysis: The data will be analysed using Statistical software statistical package for the social sciences (SPSS).

Data Integration: Quantitative and qualitative findings will be triangulated to provide a richer and more nuanced understanding of the research questions.

Dissemination: Findings will be disseminated through research reports, presentations to policymakers and community leaders, and peer-reviewed publications.

Significance

This study aims to shed light on the strengths and limitations of existing community-based heat stress management strategies of health outcomes. By understanding diverse coping mechanisms and their effectiveness, the research can inform:

1. The development of culturally appropriate and context-specific interventions.
2. Capacity building for communities to enhance their coping capacity for heat waves-related health outcomes.
3. Policy recommendations for improving access to resources and infrastructure to combat heat stress.

RESULT

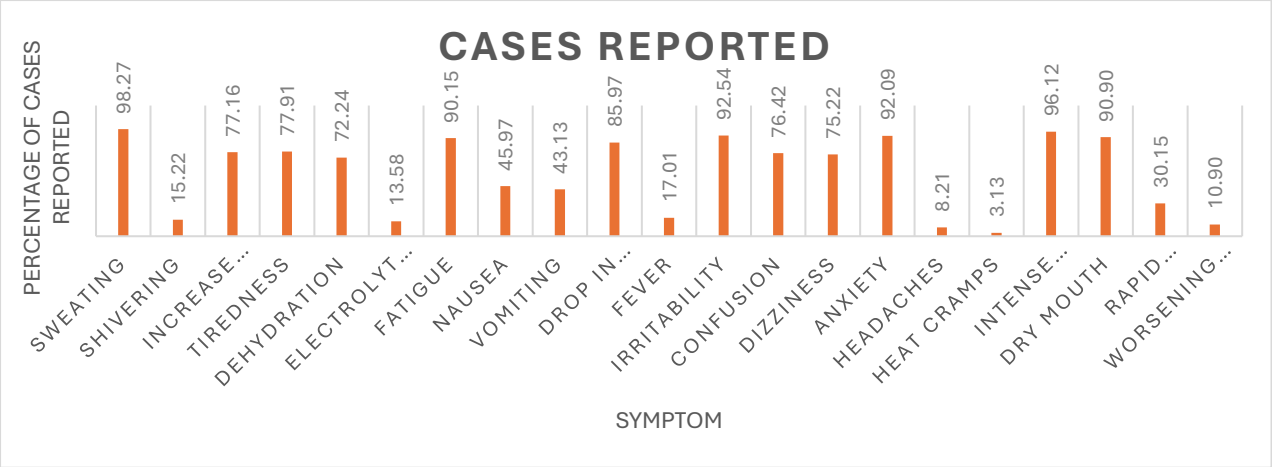
- **Demographic composition of pilot neighborhoods.**

Table :1 Demographic composition of pilot neighborhoods.

S.No.	Background characteristics	Number	Percentage
	HOUSEHOLDS		
1.	Number of House-holds covered	206	
2.	Median income	25000	
3.	Total Population covered	679	
	SEX		
1.	No. of males	368	54.19 %
2.	No. of females	311	45.80%
	RESIDENCE		
1.	Kutcha	8	3.88%
2.	Pucca	198	96.11%
	AGE		
1.	0-4	44	6.48%
2.	5- 10	87	12.81%
3.	11-20	96	14.13%
4.	21-35	117	17.23%
5.	36-65	300	44.18%
6.	65 Above	35	5.15%
	EDUCATION LEVEL		
1.	Illiterate	5	2.4%
2.	Primary	89	43.2%
3.	Secondary	69	33.5%
4.	And above	43	20.9%

Table: 2. Symptoms of Heat stress observed	
SYMPTOMS	**CASES REPORTED PERCENTAGE**
Sweating	**98.27**
Shivering	**15.22**
Increase and decrease in appetite	**77.16**
Tiredness	**77.91**
Dehydration	**72.24**
Electrolyte imbalance	**13.58**
Fatigue	**90.15**
Nausea	**45.97**
Vomiting	**43.13**
Drop in blood pressure	**85.97**
Fever	**17.01**
Irritability	**92.54**
Confusion	**76.42**
Dizziness	**75.22**
Anxiety	**92.09**
Headaches	**8.21**
Heat cramps	**3.13**
Intense thirst	**96.12**
Dry mouth	**90.90**
Rapid heartbeat	**30.15**
Worsening of allergies and asthma	**10.90**

Figure : 1 showing cases reported for various heat stress symptoms



The data shows that heat stress is a major concern in the community. Sweating, intense thirst, irritability, anxiety, and dry mouth are the most prevalent symptoms, affecting over 90% of the cases, while Shivering, electrolyte imbalance, and worsening allergies/asthma are less frequent but still noteworthy symptoms, affecting more than 10% of the cases.

Table: 3. Association of various risk factors to heat stress

Risk factors	**Experienced Heat stress**		**Not Experienced Heat stress**	
AGE	**N (679)**	**%**	**N (679)**	**%**
0-4	15	34.09%	29	65.91%
5-10	24	27.59%	63	72.41%
11-20	28	29.17%	68	70.83%
21-35	42	35.90%	75	64.10%
36-65	74	24.67%	226	75.33%
65 Above	27	77.14%	8	22.86%
GENDER				
Male	171	46.47%	197	53.53%
Female	39	12.54%	269	86.50%
ALCOHOL				
YES	24	80.00%	6	20.00%
NO	186	28.66%	463	71.34%

TOBACCO				
YES	57	77.03%	17	22.97%
NO	153	25.29%	452	74.71%
BMI				
Underweight	45	21.03%	169	78.97%
Normal	143	32.50%	297	67.50%
Overweight	15	88.24%	2	11.76%
Obese	7	87.50%	1	12.50%
Physical Activity				
Sternous	172	45.74%	204	54.26%
Sedentary	38	12.54%	265	87.46%
Pre - existing conditions				
Heart diseases	13	25.00%	1	1.92%
Hypertension	18	34.62%	0	0.00%
Diabetes	10	19.23%	2	3.85%
Respiratory disorders	8	15.38%	0	0.00%

The study analysis suggests a statistically significant association between the following factors.

Signifying that overweight and obese males above 65 years consuming alcohol or tobacco having pre-existing conditions and performing sternous activities are more prone to heat stress.

Also according to review of literature , an article published by my.clevelandclinic.org

Who gets heatstroke?

Anyone can get heatstroke. But infants and the elderly are at especially high risk because their bodies may not be able to regulate temperature effectively. Athletes, soldiers and people with occupations that require physical labor in hot environments are also susceptible to heatstroke.

Other factors that increase your risk of heatstroke include:

- Drinking alcohol.
- Being male.
- Being dehydrated.
- Drugs that affect your body's ability to regulate temperature, such as diuretics, sedatives, tranquilizers, or heart and blood pressure medications.
- Having certain diseases that affect your ability to sweat, such as cystic fibrosis.
- Having certain medical conditions, such as a sleep disorder or problems with your heart, lungs, kidneys, liver, thyroid or blood vessels.
- Wearing heavy or tight clothing, such as protective gear.
- Having a high fever.
- Having obesity.
- A past history of heatstroke.
- Poor physical conditioning or not being used to hot conditions.

Table: 4. Association between educational status and awareness of heat stress (Pearson Chi-Square, Likelihood Ratio, and Linear-by-Linear Association)

awareness about heat stress * Educational Status/शैक्षणिक स्थिति" Crosstabulation

			Educational Status/शैक्षणिक स्थिति"				
			Illiterate	Primary/ प्राथमिक	Secondary/ गौण	And above/ और ऊपर	Total
awareness about heat stress	No	Count	4	30	15	4	53
		% within awareness about heat stress	7.5%	56.6%	28.3%	7.5%	100.0%
		% within Educational Status/शैक्षणिक स्थिति"	80.0%	33.7%	21.7%	9.3%	25.7%
	Yes	Count	1	59	54	39	153
		% within awareness about heat stress	0.7%	38.6%	35.3%	25.5%	100.0%
		% within Educational Status/शैक्षणिक स्थिति"	20.0%	66.3%	78.3%	90.7%	74.3%
Total		Count	5	89	69	43	206
		% within awareness about heat stress	2.4%	43.2%	33.5%	20.9%	100.0%
		% within Educational Status/शैक्षणिक स्थिति"	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.319[a]	3	.001
Likelihood Ratio	17.290	3	.001
Linear-by-Linear Association	14.615	1	.000
N of Valid Cases	206		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.29.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.267	.062	3.957	.000[c]
Ordinal by Ordinal	Spearman Correlation	.260	.063	3.839	.000[c]
N of Valid Cases		206			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

All three tests (Pearson Chi-Square, Likelihood Ratio, and Linear-by-Linear Association) have a p-value of 0.000, indicating a very strong association

Both coefficients are Positive (around 0.27) indicating a positive correlation. This means as educational status increases (higher education levels), awareness of heat stress also tends to increase.

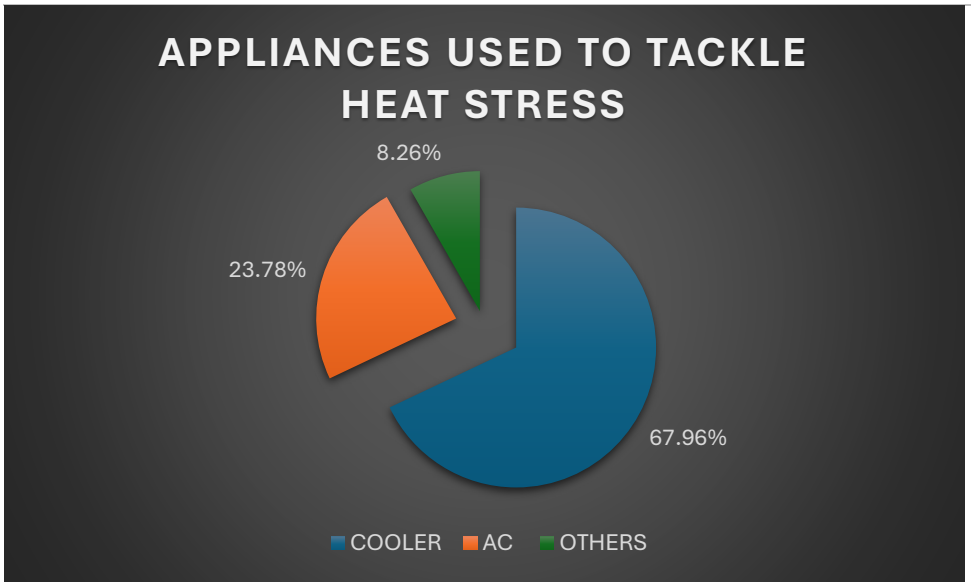
The study analysis suggests a statistically significant association between educational status and awareness of heat stress. People with higher levels of education are more likely to be aware of heat stress compared to those with lower education levels.

Table:5. Showing availability of cooling devices irrespective of income

APPLIANCES IN HOUSEHOLD	Count of House
TV / टीवी/ cooler	19
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler	13
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, scooter / स्कूटर	6
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, scooter / स्कूटर, car/ कार	4
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, VCR / वीसीआर, scooter / स्कूटर	1
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन	5

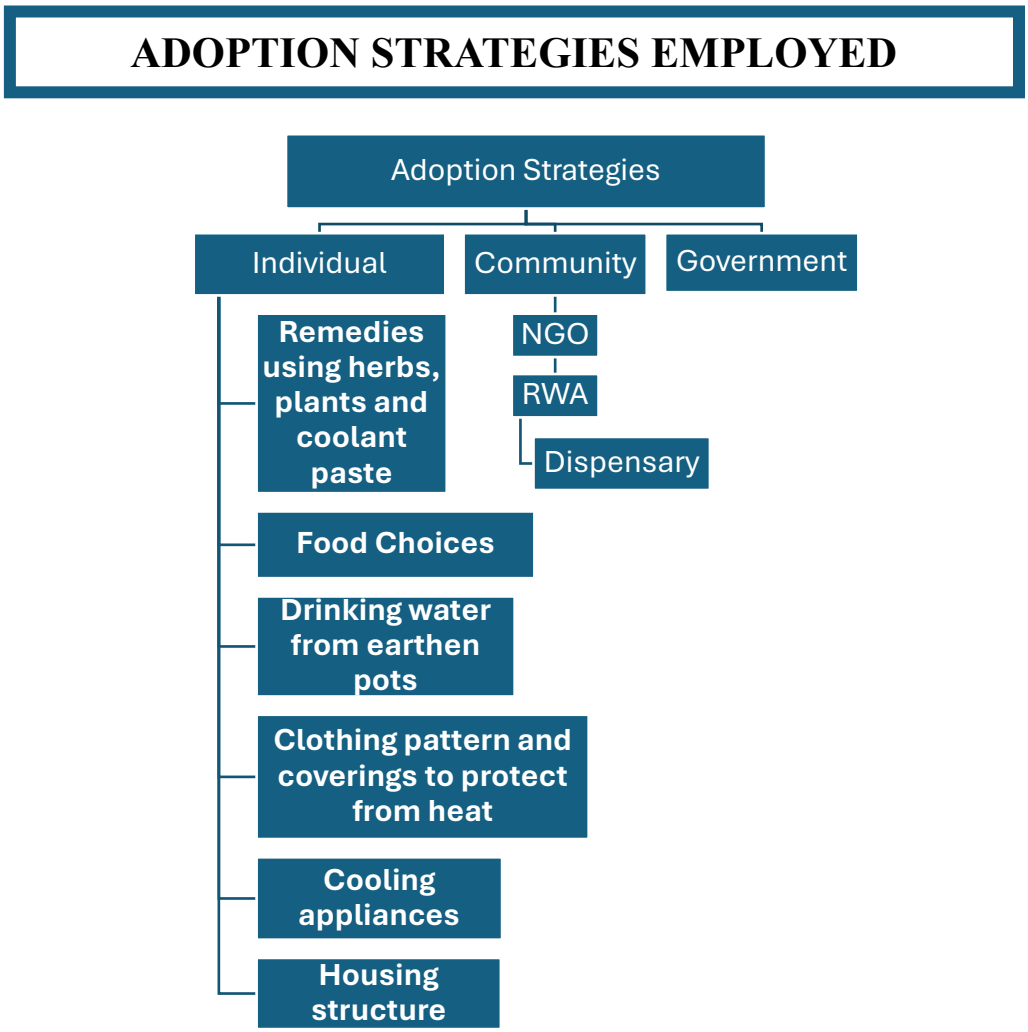
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन, scooter / स्कूटर	9
A.C. / ए.सी., refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन, scooter / स्कूटर, car/ कार	11
refrigerator/ रेफ्रिजरेटर TV / टीवी/ cooler	2
refrigerator/ रेफ्रिजरेटर TV / टीवी/ cooler	17
refrigerator/ रेफ्रिजरेटर, scooter / स्कूटर	3
refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler	28
refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, scooter / स्कूटर	17
refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन	20
refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन, scooter / स्कूटर	36
refrigerator/ रेफ्रिजरेटर, TV / टीवी/ cooler, washing machine/ वॉशिंग मशीन, scooter / स्कूटर, car/ कार	1
refrigerator/ रेफ्रिजरेटर, VCR / वीसीआर, washing machine/ वॉशिंग मशीन, scooter / स्कूटर	1
refrigerator/ रेफ्रिजरेटर, washing machine/ वॉशिंग मशीन	4
refrigerator/ रेफ्रिजरेटर, washing machine/ वॉशिंग मशीन, scooter / स्कूटर	6
TV / टीवी, scooter / स्कूटर	3
Grand Total	206

Figure : 2. Showing type of cooling devices possessed by the community



The data and observations clearly show that irrespective of the house type or income the household possess a cooling device as a measure

Figure : 3 showing the various categories of adoption strategies employed to manage heat stress



Individual level interventions:

Remedies using herbs, plants and coolant paste:

- Applying a paste by blending raw mangos, tamarind and 'palash flower' (Butea monosperma) and apply it on their body or drink it.
- People take a bath with water containing 'palash flower' extracts. Neem leaves are also used by boiling them in water for a few minutes, after which, people take a bath with the neem water. The water helps in reducing fever after exposure to heat or cooling the body in general.
- People apply coolant paste made of 'multanimitti' (bentonite clay) on their bodies to get relief from heatwaves.

Food choices:

- People stated that they mash red onion and apply it on their head or hands and feet as it helps the body to cool down.
- The workers, eat onions with bread as they go out for work in the afternoon. In addition to onions, lemonade, buttermilk and other sour vegetables and fruit like tamarind, raw mangos etc.
- 'pudina drink' (mint juice), shikanji' (lemon based drink) and lemon water or lemonade when they come from outside and lemonade is especially beneficial after vomiting.
- Other juices like amrud (guava) juice, cool drinks made from sattu (roasted lentils and cereals), saffron, sugar, etc. are also popular drinks during summer.
- The farmers while going to the farm carry drinking water along with them for keeping their body hydrated while working under the sun..
- They also intake beverages like ORS (Oral Rehydration Solution) and Glucon-D (Glucose solution) at times of excessive sweating to replenish their osmolyte balance.
- The people follow a healthy diet and eat light food with less chillies and spices during excessive heat, like dal (lentil curry) and rice, coarse grains, curd, 'dalia' (broken wheat), 'sabu dana' (sago), etc.
- They prefer consuming more seasonal fruits and green leafy vegetables like melon,banana, cucumber. Even the children take lemon to school.
- Sauff mishri water and chia seeds water are also used
- The people drink neem juice and eat jaggery as it helps them to deal with itching and boils caused by excessive heat.
- Thin gruels prepared from corn, syrups which are sweet in taste, milk, ghee, grapes, coconut water should be included in the diet. Alcoholic drinks should be avoided. Spicy, salty, hot and sour ingredients is used in moderation.
- Drinks like paanajalam ((the water boiled with jaggery, lemon juice, dried ginger powder, green cardamom powder, edible camphor, black pepper powder), Guluchyathy choornam (coarse powder of neem, coriander, guduchi stem(tinospora cordifolia), raktachandra (pterocarpus santalinus), padmaka (purunus cerasoides).

Drinking water from earthen pots:

Clothing pattern and coverings to protect from heat:

- Cotton as a clothing material is very useful during summers as it absorbs excess perspiration from the body and helps prevent bacteria and fungus accumulation.
- carry umbrellas while going out in the summer.
- carrying wet handkerchiefs or putting clothes on their heads during the day. Even they wear elbow length cotton gloves, sunglasses, and wear masks to protect themselves from sunburn.

Cooling appliances:

- "The increasing amount of Air conditions and cooling appliances due to frequent heat episodes is further causing heating up of the earth also increasing the electricity demand leading to shortage and power cut offs."
- There is an increase in use of cooling appliances like fans, coolers or AC during the summer season. At temperatures above 30°C, cities like Delhi have seen an increase in energy demand by 30% or more (Magotra et al.2022)

Housing structure:

- design elements (such as landscaping, orientation, external shading and eaves) and building components (such as coating and color of roof, insulation, windows and type of glass) (Miller, 2017).
- Khus curtains (bamboo) on their windows and doors which helps to prevent the penetration of direct sunlight.
- houses made of cloth and bamboo.
- Flooding terrace with water in evening
- Drenching bed sheets
- Using DIY air conditioners: shallow pan filled ice cubes
- Freezing the sheet
- they cover their porch and windows with a wet 'chaddar' (long piece of cloth) in mornings and afternoons.
- during power cuts atnight, they sleep by laying their beds outside of their house. They even take cold water and sprinkle it on the top of the roof to get some relief.

- making a paste consisting of a mixture of soil, water and cow dung. The mixture is then applied on the walls of houses which are 'kaccha' or made of mud and straw.

Community level interventions:

- Gathering under the shade and visiting gardens in villages and moving to parks in cities
- "Strong social networks" is observed in the area
- Placing water jars and distribution of fruits, water and tree plantation
- Conserving wildlife : placing water containers at different places for birds and animals
- NGO : various NGOs are involved in the process of dealing with heatwaves such as RWA (Residential Welfare Association), Action India etc. The people mentioned that there are dispensaries and NGOs from where one can get ORS. There are medicines provided by them that help individuals to protect themselves from hot winds. Even medical camps are held by NGOs. RWA has started a program of tree plantation inside the park and in the surrounding areas. The NGOs also have constructed some resting rooms where people can take rest and get relief from the discomforting environment outside. They also create awareness by doing door-to-door campaigns.
- In Anganwadi and dispensaries children are given ORS solution mixed with water when they had diarrhea. The Anganwadi workers are also provided training so that they can create awareness among people and provide them with a preliminary health facility.
- "Due to high temperature and extreme hot weather conditions, water level in the body drops making people more vulnerable to heat stress and strokes. People report symptoms of anaemia and loss of appetite in summers
- Shelter homes: The Delhi Government has set up shelter homes and they provide relief during excessive heat. People can relax and take rest in shelter homes/ small hospices that have fans and coolers provided by the government. At noon they can relax in shelter homes and at night when it's cooler they can pull rickshaws or do other work.
- In Delhi, the Government sends water tankers in different localities to spray water on roads in the early morning. From the hot surface of the roads, the water evaporates rapidly there and takes the heat away from the roads. Thus, the roads and the surroundings cool down. Government tankers also supply water in the localities where there is water shortage or rise in water problem. Drinking booths/water kiosks have been installed by the Government at different intervals in the area.

- People are engaged mostly in unorganized sectors or agricultural sector. In normal times, the households earn livelihood and are susceptible to “unsafe conditions”. However due to change in weather conditions as most of them have to work under extreme heat condition . The “unsafe condition” is posed by lack of access to proper physical infrastructure, financial sources, proper health conditions and even natural resources.

DISCUSSION

- The findings of this study reveal the various strategies adopted by peri-urban communities in Delhi to manage heat stress-related health outcomes during hot weather conditions are well in place and effective.
- The study identified a range of individual-level interventions, including remedies using herbs, plants, and coolant paste, food choices, drinking water from earthen pots, and clothing patterns and coverings to protect from heat. Community-level interventions included gathering under shade, visiting parks, placing water jars, distributing fruits and water, tree plantation, conserving wildlife, and utilizing services provided by NGOs and the government.
- The study also highlighted the challenges faced by these communities, such as lack of access to proper physical infrastructure, financial resources, proper health conditions, and even natural resources. Additionally, the study found a statistically significant association between educational status and awareness of heat stress. People with higher levels of education were more likely to be aware of heat stress compared to those with lower education levels.
- The study was also able to find association of risk factors with heatwaves

CONCLUSION

To effectively mitigate heat stress in peri-urban areas, a comprehensive strategy is essential. It is imperative to empower local communities by providing education and resources. This empowerment is a critical step in fostering self-sufficiency and preparedness. Additionally, it is the responsibility of policymakers and public health authorities to enhance the availability of cooling facilities, verdant areas, and reliable sources of potable water. These measures are not only preventive but also improve the overall quality of life. Furthermore, forging partnerships among local communities, non-governmental organizations, and governmental bodies is vital for strengthening community resilience. Such collaborative endeavors are increasingly necessary to confront the intensifying challenges of global warming and extreme temperature events. This collective approach is the cornerstone of sustainable adaptation strategies in the face of climate change.

RECOMMENDATIONS

To enhance community resilience to heat stress in Delhi, several interventions could be considered:

- **Cool Roofing Solutions**: A project in Delhi is exploring the use of heat-reflective paint on roofs to lower indoor temperatures. This passive cooling method could make households less vulnerable to extreme heat and improve their resilience against climate change risks.
- **Conversion of Community Centres into Cooling Stations**: Another recommendation is to convert community centres and baraat ghars into cooling stations with supply of water and cooling options like fans and air coolers. This could provide relief for outdoor workers who are at major risk of heat stress.
- **Heat Action Plan**: Implementing a Heat Action Plan that includes strategies such as establishing an early warning system, inter-agency coordination, capacity building/training programs, and public awareness and community outreach.
- **Addressing Vulnerable Groups:** Special attention should be given to vulnerable groups such as outdoor workers, who are at a higher risk of heat stress. Measures could include adjusting work hours to avoid peak heat times.

- **Public Awareness and Community Outreach:** Building public awareness about the risks of heat stress and ways to mitigate it is crucial. This could involve education campaigns and community outreach programs.

Suggestions for managing heat stress in urban settings:

- **Urban Planning**: Careful city layout design is essential to address urban climate challenges. This includes considering the orientation and spacing of buildings to maximize shade and airflow.
- **Green Spaces**: Incorporating more vegetation in urban areas can help reduce the urban heat island effect. This could include creating green roofs, vertical gardens, and city parks.
- **Building Materials**: Optimizing building materials and colors can also help reduce heat absorption. For example, using light-colored concrete and white roofs can reflect more sunlight and keep buildings cooler.
- **Human-Nature Interactions**: Promoting human-nature interactions is crucial for sustainable city climate management. This could involve creating more accessible green spaces and encouraging outdoor activities.
- **Shared Visibility of Climate Risk:** Creating shared visibility of climate risk is important for effective heat stress management. This could involve using data and technology to map heat susceptibility and enhance heat resilience.
- **Community-Based Solutions:** Implementing community-based solutions can help address heat stress at the neighborhood level. This could involve local-level adaptation strategies that reduce heat-related risk.

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ANNEXURE:

Informed Consent Form and Introduction

Namaste. My name is RITIKA. I am working with the International Institute of Health Management (IIHMR) Delhi. As a part of my study titled "Community-Based Management of health impact due to Heat Stress: Exploring Adaptation Strategies in peri-urban areas in Delhi, India", I would like to interact with you as an experienced person to manage health related to heat stress.

We are trying to assess the Community-Based Management Techniques of Heat Stress-related health outcomes living in peri-urban areas in Delhi. The interaction will take approximately 20-25 minutes. I will ask you questions about some personal details, your lifestyle activities including diet and physical activity that you generally carry out, and some stress and health-related questions.

The information you provide is confidential and will not be disclosed to anyone. It will only be used for research purposes. Your name, address, and other personal information will be removed from the questionnaire, and only a code will be used to connect your name and your answers without identifying you.

Your participation in the survey is voluntary. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

We will not be recording this interview or taking any photographs without your permission.

If you have any questions about this survey, you may ask me or If you have any further questions about this survey, you may contact me.

Do you agree to participate in this survey? Signing this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

Read by the Respondent [ ] Read by the Interviewer [ ]

Agreed [ ] Refused [ ]

Respondent _____

Interviewer _____

Name: _____

Date _____

If the Respondent Agrees, then begin the Interview

If the Respondent Refuses, Thank the Respondent and end the Interview.

Survey Questionnaire for Community-Based Management of Heat Stress in Urban Settings: Delhi

Section 1: Demographic Information

1. Age:
    a) Under 18
    b) 18-30
    c) 31-45
    d) 46-60
    e) Over 60

2. Gender:
    a) Male
    b) Female
    c) Other

3. Education Level:
    a) Primary School
    b) High School
    c) College/University
    d) Postgraduate

4. Occupation:
    a) Student
    b) Office Worker
    c) Outdoor Worker
    d) Homemaker
    e) Other (please specify)

Section 2: Heat Stress Awareness and Experience

1. Do you have an air conditioner in your home?
    a) -Yes
    b) -No

2. During a heat wave, how often do you experience discomfort from heat in your home?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often
    e) Always

3. During a heat wave, how often do you experience discomfort from heat outdoors?
    a) Never
    b) Rarely
    c) Sometimes
    d) Often
    e) Always

4. Have you ever been diagnosed with a heat-related illness (heat exhaustion or heatstroke)?
    a) Yes
    b) No

    If yes, please specify: _____

5. Are you aware of the health risks associated with heat stress?
    a) Yes
    b) No

6. Have someone in your household experienced heat-related illnesses in the past?
    a) Yes
    b) No

7. How do you currently cope with heat stress during hot weather conditions?
    a) Air conditioning
    b) Fans
    c) Drinking water
    d) Staying indoors

e) Other (please specify)

Section 3: Community-Based Coping Strategies

8. Are you part of any community-based initiatives or programs aimed at managing heat stress?
    a. Yes
    b. No

9. Do you think community engagement is important in addressing heat stress in urban areas?
    a) Strongly Agree
    b) Agree
    c) Neutral
    d) Disagree
    e) Strongly Disagree

10. What community resources or support systems do you rely on during extreme heat events?
    a) Community centers
    b) Local government services
    c) Neighbors
    d) Non-profit organizations
    e) Other (please specify)

11. During a heat wave, what strategies do you use to stay cool (select all that apply)?
    a) Staying indoors with air conditioning
    b) Taking cool showers or baths
    c) Drinking plenty of fluids
    d) Wearing loose-fitting, lightweight clothing
    e) Limiting strenuous activity outdoors
    f) Visiting air-conditioned public spaces (libraries, malls)
    g) Other (please specify): _____

12. Does your community have a cooling center (a public place with air conditioning open during heat waves)?
    a) Yes
    b) No

13. If yes, have you ever used the cooling center?
    a) Yes
    b) No

14. How easy is it for you to access cool spaces (air-conditioned buildings, shaded areas) during a heat wave?
    a) Very easy
    b) Somewhat easy
    c) Neutral
    d) Somewhat difficult
    e) Very difficult

15. Do you feel prepared to manage extremely hot weather events?
    a) Very prepared
    b) Somewhat prepared
    c) Neutral
    d) Somewhat unprepared
    e) Very unprepared

16. Does your community provide any resources or information about heat safety during heat waves? (Yes / No)
    If yes, what types of resources or information? (select all that apply)
    a) Public service announcements
    b) Information handouts or flyers
    c) Social media updates
    d) Community outreach programs
    e) Other (please specify): _____

17. How well-informed do you feel about the health risks associated with heat waves?
    a) Very well-informed
    b) Somewhat informed
    c) Neutral
    d) Somewhat uninformed
    e) Very uninformed

Section 4: Adaptation and Resilience

18. How do you think urban communities can better adapt to increasing heat stress due to climate change?
    a. Green spaces
    b. Urban planning initiatives
    c. Public awareness campaigns
    d. Improved infrastructure
    e. Other (please specify)

19. Have you participated in any heat stress management workshops or training sessions?
    a) Yes
    b) No

Section 5: Health Outcomes

20. Does difficulty sleeping increase during periods of extreme heat in your community?
    a) Yes
    b) No

    If yes, please elaborate on how heat disrupts sleep patterns (e.g., trouble falling asleep, frequent waking).

21. During heatwaves, do you experience any of the following changes in mood or behaviour?
    (a) Increased irritability
    (b) Heightened anxiety
    (c) Both (a) and (b)

(d) None of the above

22. I have a pre-existing health condition (heart disease, respiratory problems).
    (a) Yes
    (b) No

If yes to question 24 :

23. Do you experience worsening symptoms of your pre-existing condition during hot weather?
    (a) Yes
    (b) No

24. Exacerbation of Pre-existing Conditions (Open Ended):
25. For those with pre-existing health conditions (heart disease, respiratory problems), are there specific challenges you face when dealing with heat stress? (Please elaborate)

Section 6: Feedback and Suggestions

26. What improvements or interventions do you think are needed to enhance community resilience to heat stress in Delhi?

_____
_____
_____
_____
_____

27. Any additional comments or suggestions related to heat stress management in urban settings?

_____
_____
_____
_____
_____

Section 7: Contact Information (Optional)

28. Would you be willing to participate in follow-up interviews or focus group discussions on heat stress management?
    a) Yes
    b) No

Thank you for your participation in this survey. Your feedback is valuable in understanding and improving community-based management of heat stress in urban settings.

Epidemiological Profile Questionner

S. No.	Mohalla/Location मुहल्ला/स्थान	Unique ID

A. HOUSEHOLD COMPOSITION OF RESPONDENT
बी. प्रतिवादी की पारिवारिक संरचना

Type of Family (joint/ nuclear):
परिवार का प्रकार (संयुक्त/एकल):

Sl. No.	Sex लिंग	Age (Year/ Month/ Days) आयु (वर्ष/ महीना/ दिन)	Relationship with ego संबंध अहंकार के साथ	Present Marital Status उप स्थित वैवाहिक स्थिति	Educational Status 1. Primary 2. Secondary 3. And above शैक्षणिक स्थिति 1. प्राथमिक 2. गौण 3. और ऊपर	Occupational Status व्यावसायिक स्थिति	Monthly income from all sources महीने के आय सभी से सूत्रों का कहना है	Total monthly income of household कुल महीने के की आय परिवार	Monthly household expense on Kitchen महीने के परिवार व्यय रसोई पर	Any kind of Illness? Name and duration किसी तरह का बीमारी? नाम एवं अवधि	Any treatment Given? If yes, what? कोई इलाज दिया गया? अगर हाँ क्या?
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

B. ALCOHOL/ TOBACCO/ DRUG CONSUMPTION BY EGO/FAMILY MEMBER:
सी. अहंकार/परिवार के सदस्य द्वारा शराब/तंबाकू/नशीले पदार्थों का सेवन:

	You/Family member/ Both आप/परिवार के सदस्य/ दोनों	Yes / No ? हां / नहीं ?	Regular/ Occasional नियमित/ प्रासंगिक	Age at which you started to take जिस उम्र में आप ने लेना शुरू किया	Frequency per day प्रति दिन आवृत्ति	Quantity per day (average in ml) प्रति दिन मात्रा (एमएल में औसत)	Do you take during pregnancy? क्या आप गर्भावस्था के दौरान लेते हैं?	Frequency per day during Pregnancy के दौरान प्रति दिन आवृत्ति गर्भावस्था
Alcohol/locally fermented beer* अल्कोहल/स्थानीय रूप से किण्वित बियर*								
Tobacco/Pan** तम्बाकू/पान**								
Other drugs (specify) *** अन्य औषधियाँ (निर्दिष्ट करें) ***								

* Mahua; Whisky; Rum; any other
** Chewing; Smoking; direct tobacco; beedi; cigarette; zarda; any other
*** Charas; Ganja; Bhang; Opium; L.S.D; Brown Sugar; any other
*महुआ; व्हिस्की; रम; कोई और
** चबाना; धूम्रपान; प्रत्यक्ष तम्बाकू; बीड़ी; सिगरेट; ज़र्दा; कोई और
*** चरस; गांजा; भांग; अफ़ीम; एल.एस.डी.; ब्राउन शुगर; कोई और

C. Nutritional Status
डी. पोषण संबंधी स्थिति

Dietary Habit (Veg/Non-Veg) आहार संबंधी आदत (शाकाहारी/गैर-शाकाहारी)	
Source of Water (Tap / tank / tube-well / hand or motor pump / pond / well/river) जल का स्रोत (नल/टैंक/ट्यूबवेल/हाथ या मोटर पंप/तालाब/कुआं/नदी)	

Kind of Milk (Domestic source / milkman / mother dairy/ Cow/ buffalo / goat): दूध का प्रकार (घरेलू स्रोत/दूधवाला/मदर डेयरी/गाय/भैंस/बकरी):	
Amount Consumed (L/day): उपभोग की गई राशि (एल/दिन):	
No of Full Meals: पूर्ण भोजन की संख्या:	
Frequency of Non-Vegetarian Food: मांसाहारी भोजन की आवृत्ति:	
Frequency of Vegetarian Food: शाकाहारी भोजन की आवृत्ति:	
Frequency of Milk Products: दुग्ध उत्पादों की आवृत्ति:	
Frequency of Pulses: दालों की आवृत्ति:	
Frequency of Fruits: फलों की आवृत्ति:	
Any other specific diet कोई अन्य विशिष्ट आहार	
History of Any Nutritional Deficiency: किसी भी पोषण संबंधी कमी का इतिहास:	

D. House Type

ई. मकान का प्रकार

House Type (Kuccha / Jhopri / Pucca): मकान का प्रकार (कच्चा/झोपड़ी/पक्का):	
Property Owned (Y/N): Residential/ Agricultural/ Commercial/ Others स्वामित्व वाली संपत्ति (Y/N): आवासीय/कृषि/वाणिज्यिक/अन्य	
Locality (Rural / Semi urban / urban / urban slum / urban planned): इलाका (ग्रामीण/अर्धशहरी/शहरी/शहरी स्लम/शहरी नियोजित):	
Household Assets: (A.C. / refrigerator/ TV / VCR / washing machine/ scooter / car) घरेलू संपत्ति: (ए.सी./रेफ्रिजरेटर/टीवी/वीसीआर/वॉशिंग मशीन/स्कूटर/कार)	
Domestic Animals (Cows / buffalos / pigs / horses / goats): घरेलू पशु (गाय/भैंस/सूअर/घोड़े/बकरी):	
Kitchen Garden (Y/N) किचन गार्डन (Y/N)	

Domestic Servants: M- F- घरेलू नौकर: एम- एफ-	

E. Any Illness
एफ. कोई बीमारी

	Type प्रकार	Age आयु	Duration अवधि
Nutritional Deficiency पोषण की कमी			
Physical Disability शारीरिक अपंगता			
Emotional Impairment भावनात्मक क्षति			
Major Therapeutic Irradiation Exposure प्रमुख चिकित्सीय विकिरण एक्सपोजर			
Long Illness लंबी बीमारी			

G. Have you ever been diagnosed by a doctor for any of the following conditions?
जी. क्या आपको कभी किसी डॉक्टर द्वारा निम्नलिखित में से किसी भी स्थिति का निदान किया गया है?

	Type प्रकार	Age आयु
Heart failure/disease हृदय विफलता/बीमारी		
Irritable Bowel Disease चिड़चिड़ा आंत्र रोग		
Chronic Bronchitis क्रोनिक ब्रोंकाइटिस		
Hernia हरनिया		
Emphysema वातस्फीति		
Endometriosis अन्तर्गर्भाशय-अस्थानता		
Arthritis वात रोग		
Inflammatory bowel disease सूजा आंत्र रोग		
Depression		

अवसाद		
Cancer कैंसर		

H. Have you or your family member suffered from any of the listed illness in last 1 year?

क्या आप पिछले 1 वर्ष में किसी सूचीबद्ध बीमारी से पीड़ित हैं?

	When & how many times कब और कितनी बार	Age आयु
Typhoid आंत्र ज्वर		
Diarrhoea दस्त		
Amoebic Dysentery अमीबी पेचिश		
Hair fall बाल झड़ना		
Skin Allergy त्वचा रोग		
Migraine माइग्रेन		
Eye pain आँख का दर्द		

FGD and IDI Questions:

Focus Group Discussions (FGDs) with Mahila Arogya Samiti (MAS) Members:

- **Icebreaker:** Can you share a story about a time when you or someone you know experienced negative health effects due to heat?
- **Coping Mechanisms:** What strategies do you and your families use to stay cool during hot weather?
- **Community Support:** How do you support each other within the community to manage heat stress?
- **Challenges and Needs:** What are the biggest challenges you face in dealing with heat stress in your community?
- **Interventions:** Are there any existing community-based interventions aimed at reducing heat stress? If so, how effective are they and how can they be improved?

In-Depth Interviews (IDIs) with Stakeholders:

- **ASHA/ANM Workers:**
    - What are the most common heat-related health issues you observe in the community?
    - How do you advise residents on managing heat stress?
    - What resources or support do you need to better assist the community during heatwaves?
- **Local Self-Government Members:**
    - Are there any initiatives currently in place to address heat stress?
    - What are the biggest barriers to implementing heat stress management strategies?
    - How can policymakers better support communities in preparing for and responding to heatwaves?
- **Healthcare Providers:**
    - Have you seen an increase in heat-related illnesses in recent years?
    - What are the biggest challenges in treating heatstroke and other heat-related conditions?
    - How can public health awareness campaigns be improved to educate residents about heat stress?

Ritika D

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