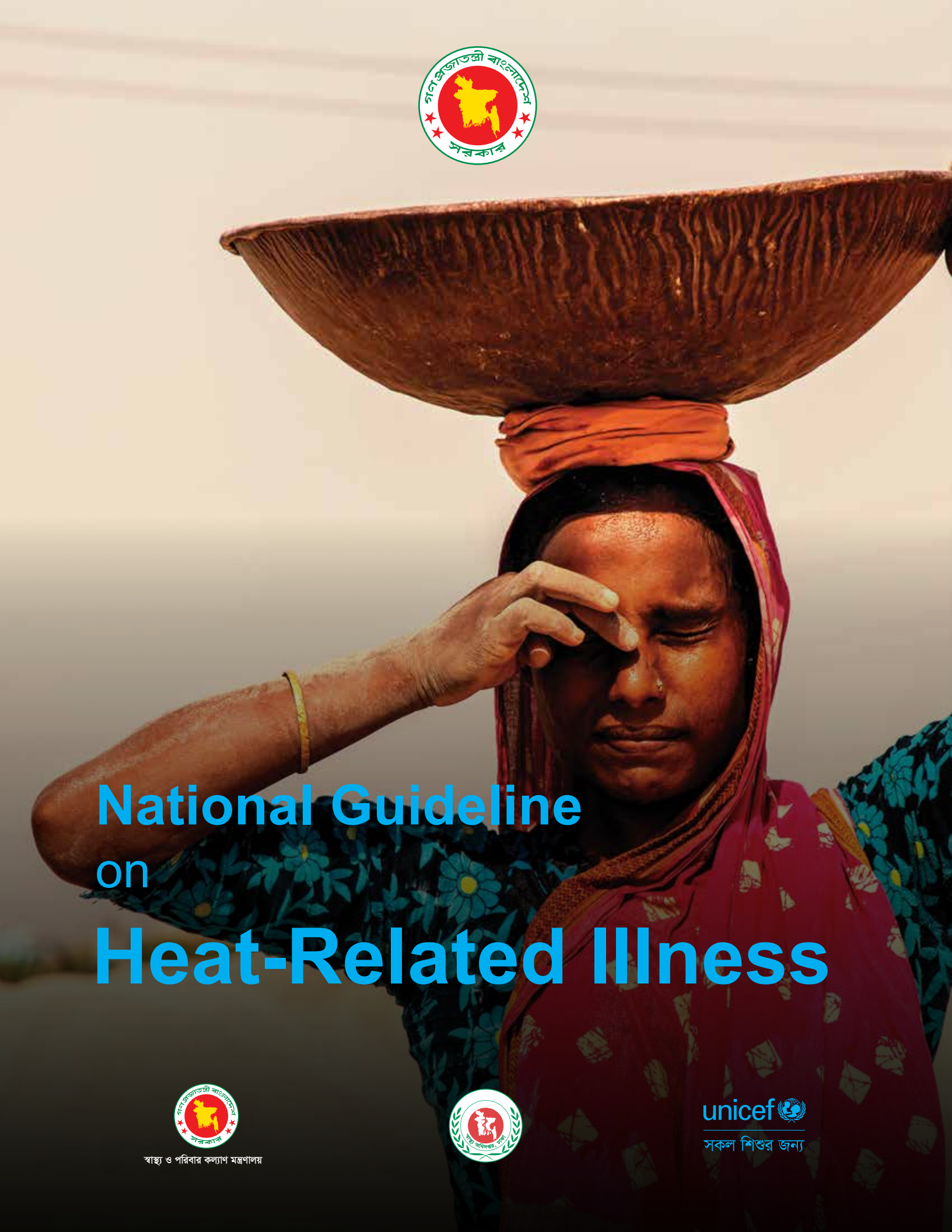
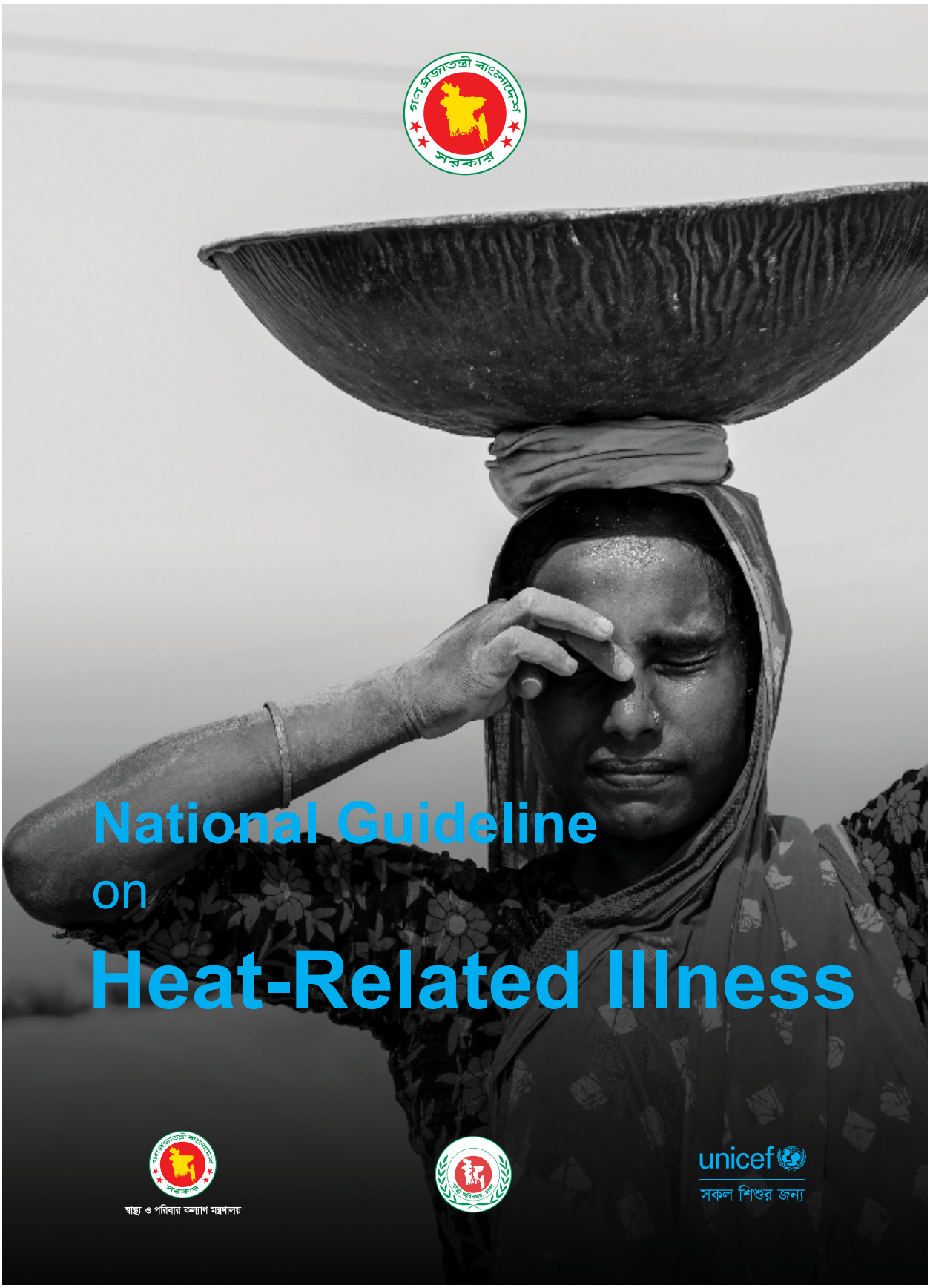


National Guideline on Heat-Related Illness

স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

unicef
সকল শিশুর জন্য



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National Guideline on Heat-Related Illness

1st Edition, 2024

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Government of the People's Republic of Bangladesh

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Message

Dr. Samanta Lal Sen
Hon'ble Minister
Ministry of Health & Family Welfare
Govt. of the People's Republic of Bangladesh

I am pleased to introduce the National Guideline on Heat-Related Illness, a resource for safeguarding the health and well-being of our citizens during periods of extreme heat, especially during this crucial period.

Bangladesh, like many other South-Asian countries, is experiencing a rise in extreme temperatures due to effects in climate change, which puts our people at risk of heat-related illnesses. Increase mean annual temperature and the intensity and frequency of heat waves resulting in a greater number of people at risk of heat-related medical conditions. The elderly, children, pregnant mothers, outdoor workers, those with pre-existing health conditions, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions as key implications for health. The combination of high heat and humidity compromises the human body's main cooling mechanism: sweating. The evaporation of sweat from skin cools our bodies, but higher humidity levels limit evaporative cooling. As a result, we can suffer heat stress and illness, and the consequences can even be fatal. However, with proper knowledge and preventative measures, these illnesses are largely preventable.

This National Guideline is a comprehensive resource that equips individuals, communities, and healthcare professionals with the information they need to stay safe during hot weather. Especially for healthcare professionals, it reinforces their knowledge and provides direction to manage and mitigate cases and fatalities of heat-related illnesses. It outlines the signs and symptoms of heat-related illnesses, along with effective prevention strategies for different settings, with an emphasis on vulnerable populations. In addition to immediate response plans, this guideline also includes long-term strategies for facility preparedness and capacity building to tackle future health issues related to heat waves.

I pay my appreciation to the efforts of the Director General of Health Services and UNICEF for this necessary action. I congratulate them for the timely action in developing the guideline. The Ministry of Health and Family Welfare is committed to protecting the health of all citizens of our country. We urge everyone to familiarize themselves with the contents of this document and take necessary precautions during hot weather. I believe, our dedicated health workforce will be immensely benefited by the information here provided. By working together, we can mitigate the risks associated with extreme heat and ensure a healthier future for all.

Joy Bangla, Joy Bangabandhu
Long live Bangladesh.

Dr. Samanta Lal Sen

Message

Dr. Rokeya Sultana
State Minister
Ministry of Health & Family Welfare
Government of the People's Republic of Bangladesh

As we confront the escalating challenges posed by climate change, the specter of extreme heatwaves looms ever larger, casting a shadow over the health and well-being of our citizens. In the face of this looming threat the Directorate General of Health Services and UNICEF Bangladesh, under the vigilant supervision of the Health Services Division of the Ministry of Health and Family Welfare, has undertaken a vital initiative to develop the National Guideline on Heat-Related Illness.

The collaboration between the Directorate General of Health Services and UNICEF Bangladesh represents a pivotal milestone in our ongoing efforts to safeguard the health of our nation. Drawing upon the expertise of health professionals, researchers, and stakeholders, this guideline consolidates best practices, evidence-based strategies, and practical recommendations to mitigate the impact of heatwaves on our population.

By disseminating this comprehensive guideline and developing capacity of our service providers, we empower healthcare providers, policymakers, community leaders, and individuals with the necessary tools and knowledge to prevent, recognize, and manage heat-related illnesses effectively. Moreover, it underscores our collective responsibility to foster resilience and protect the most vulnerable members of our society from the adverse effects of extreme heat.

I extend my sincere gratitude to all those who contributed to the development of this guideline, whose dedication and expertise have culminated in this invaluable resource. Let us embrace the principles outlined within and work collaboratively to build a healthier, more resilient Bangladesh, prepared to confront the challenges of a changing climate. I urge all stakeholders to utilize this guideline as an asset in our collective efforts to build a healthier, more resilient Bangladesh.

Together, let us embrace the principles outlined in this guideline and work tirelessly to prepare and manage heat-related illnesses, ensuring the well-being of our communities and the prosperity of our nation.

Joy Bangla, Joy Bangabandhu.
May Bangladesh live forever.

Dr. Rokeya Sultana

Message

Md. Jahangir Alam
Secretary
Health Services Division
Ministry of Health & Family Welfare
Government of the People's
Republic of Bangladesh

The development of the "National Guideline on Heat-Related Illness" marks a significant step forward in addressing health crisis related to climate change. I appreciate Directorate General of Health Services for the timely initiative and UNICEF for its valuable technical support.

Bangladesh has made significant progresses in public health in recent years. Emerging challenges, like the current heatwave and forecasts of rising temperatures suggest an even greater future threat. Heat-related illnesses pose a very real threat, particularly to vulnerable populations who work outdoors, children, pregnant women and people with pre-existing health problems.

The development of a strategic response for Bangladesh's health system prioritizing heat safety marks a significant step forward in addressing heat-related illnesses. I appreciate the timely initiative of the Directorate General of Health Services and the valuable technical support of UNICEF. This national guideline equips healthcare professionals with the knowledge and tools to effectively prevent, diagnose, and treat these conditions.

MoHFW is committed to ensure health and wellbeing for all. This guideline will be an example of that commitment. It will empower communities and individuals to take necessary precautions and recognize early warning signs. It will also help health managers to prepare and clinicians to act. By following this technical guideline and working collaboratively, we can effectively mitigate the impact of heatwaves, securing a healthier tomorrow for every citizen of Bangladesh.

I would urge all senior level managers of Health Services Division as well as of Directorate General of Health Services to make proper use of the guideline and take immediate measures towards development of a sustainable resilient health system.

My sincere thanks to UNICEF and particularly to the team engaged in developing this guideline in the shortest possible way for the national benefit.

Md. Jahangir Alam

Message

Prof. Dr. Abul Bashar Mohammad Khurshid Alam
Director General
Directorate General of Health Services
Ministry of Health and Family Welfare
Govt. of the People's Republic of Bangladesh

Climate change is exposing populations everywhere to heat stress, with significant negative health outcomes for infants, children, pregnant women, the elderly, outdoor workers and other vulnerable people. However, infants, young children, and pregnant women face greater heat stress which increases the risk of adverse birth outcomes, chronic health issues and infant deaths.

Between 1901 and 2020, average temperatures in Bangladesh ranged from 15 to 35 degrees Celsius. The warmest months are typically from April through July, with an average temperature of 28 degrees Celsius, and reaching a high of 36 degrees Celsius. However, the year 2023 was the warmest year on record, with temperatures regularly going above 35 degrees Celsius and occasionally going past 40 degrees Celsius. Many individuals tend to be susceptible to extreme heat because they have pre-existing medical and health conditions that exacerbates the effects of heat stress; this could be due to infections or diseases triggering biological reactions that weaken the body's response to heat stress.

Prior to predictable months of extreme heat, health facility staff such as clinicians, nurses, community health workers and midwives, should be trained to prevent, diagnose, and treat heat-related illnesses, especially in vulnerable populations. In addition, health facilities will need to prepare for higher admission rates to emergency wards during extreme heat periods and adapt spaces appropriately. It is, therefore, important for health facilities to have contingency plans in place to effectively manage heat stress in the vulnerable populations, and during disease outbreaks, and be aware of the comorbidities that might complicate the treatment of and recovery from heat-related illness.

As observed during the COVID-19 pandemic, the health system has played a major role in protecting populations from emerging threats, including from the impacts of changing and variable climate conditions. It is crucial that the health system continues to deliver essential health services before, during, and after extreme weather events and heatwaves and respond in a timely, coordinated, and multisectoral manner. Furthermore, risk communication, community engagement, and awareness-raising campaigns are central to prevention and management of heat-related illnesses in the general population and needs to be started weeks before the heatwave period.

I express my sincere thanks to UNICEF in stepping forward to support DGHS in this regard.

Prof. Dr. Abul Bashar Mohammad Khurshid Alam

Message

Sheldon Yett
Representative
UNICEF Bangladesh

Evidence has shown that pregnant and lactating women, newborns, children, and adolescents are particularly vulnerable to climate change due to their unique stages in the life course, besides elderly and people with cardio-vascular conditions.

Climate change affects people's physical and psychological health through direct exposure to extreme weather events such as heatwaves, storms, and floods, air pollution, food-, water- and vector-borne diseases, and disruptions to food systems and water security.

This situation is likely to worsen as global average temperatures increase and weather patterns become more erratic. According to the Institute of Health Metrics and Evaluation, in 2019 alone, 308,000 deaths were attributable to exposure to high temperatures globally. Heatwaves are among the most dangerous of natural hazards, but rarely receive adequate attention. Approximately 820 million children globally are currently highly exposed to heatwaves. Heat stress can manifest as heat-related illnesses in pregnant women and affect the development of the fetus.

UNICEF's Children's Climate Risk Index (CCRI 2021) found that children in Bangladesh are among the world's most vulnerable to climate change. The Index ranked Bangladesh as the 15th country globally in terms of climate change risks and impacts on children. UNICEF has also estimated that one in three children in Bangladesh, nearly 20 million children, bear the brunt of climate change every day. Recent studies in Bangladesh reported that the country experienced 22 percent higher mortality rates on heatwave days and between 2003 and 2007, heat effects increased all-cause mortality by 1–3 percent.

To protect children's health, development and well-being from heat-related illnesses and other environmental challenges, UNICEF launched the Healthy Environments for Healthy Children global programme framework in 2021, under the broader umbrella of Universal Health Coverage and primary health care, to serve as a guide for countries and partners in developing policies, strategies, guidelines and action plans for children's environmental health.

A primary health care approach is key to protect children, pregnant women and other vulnerable populations from the impact of heat stress due to exposure to extreme heat. This approach includes ensuring essential public health services, empowering people and communities, and multisectoral policy and action. The development of this guideline on management of Heat-Related illnesses is in-line with the goal to achieve Universal Health Coverage through Primary Health Care.

I congratulate the Directorate General of Health Services for this timely action. This guideline will contribute to building capacity of healthcare professionals and improve their understanding of the signs of heat stress, interventions for prevention, diagnosis, care and treatment to protect health and well-being. It identifies health system readiness actions, and actions that community members can take to prevent impact of heat stress.

Every child has the right to a healthy environment, and we all have a role to play. By addressing Heat-Related illnesses and prioritizing skills for healthcare professionals, Bangladesh can pave the way for a healthier and brighter future for its children.

Mr. Sheldon Yett

Editorial

Prof. Dr. Meerjady Sabrina Flora
Additional Director General (Planning and Development)
Directorate General of Health Services
Ministry of Health and Family Welfare,

Bangladesh is amongst the most vulnerable countries to the impact of climate change. Recent reports signal escalating climate change indicators and their worsening impacts on health. Prevention and mitigation of climate sensitive illnesses with incorporation of environment friendly practices will contribute significantly to Sustainable Development Goals on health and climate action by 2030.

Heatwaves may be localized or even national. There are also likely to be different severity of heat waves across different geographic locations. Thus, it makes it challenging to respond to the medical needs of affected locations. To address such challenges, Bangladesh National Guideline on Heat-Related Illness has been developed that outlines the basics of heat wave, Heat-Related illnesses and their management from community clinic to tertiary level hospitals along with preparedness plan.

Development and implementation of the ***National Guideline on Heat-Related Illness*** is an appreciable step in this direction. The guideline developed with inputs from various experts is intended to be used by government and private health care facilities, heath departments and policy makers tasked with strengthening health facilities and emergency response.

I take this opportunity to acknowledge the contributions from the technical group, health experts and UNICEF in shaping the document and express my gratitude for their hard work.

Prof. Dr. Meerjady Sabrina Flora

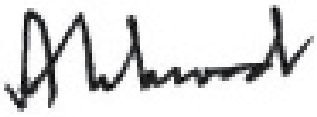
Foreword

Dr. Afreena Mahmood
Director (Planning & Research)
Directorate General of Health Services

The Directorate General of Health Services under the guidance of Ministry of Health and Family welfare is committed to safeguarding the health and well-being of all citizens of Bangladesh. This National Guideline on Heat related illness represents a significant milestone forward to minimize and mitigate the risks associated with extreme heat. As the Director of Planning and Research at the DGHS, I am honored to introduce this valuable resource on heat-related illness.

The development of this National Guideline is a testament to the collaborative efforts of the DGHS team and our valued partners, UNICEF. Upon request from DGHS, UNICEF, Bangladesh provided overall support and its consultant, Dr. S.M. Asib Nasim, prepared this technical guidance note with overall support from Planning and Research Unit of DGHS. A dedicated team, including clinicians, professors from various specialties, health managers, medical officers, technical personnel, institutes, and academicians, provided their valuable insights and efforts. I extend my sincere gratitude to their technical expertise and unwavering dedication throughout this process.

To build a better future appropriate and timely planning is necessary. This guideline isn't just a manual for the immediate action; it is also an outline for building a heat-resilient healthcare system. By outlining the strategies for capacity building of health workforce and health facility preparedness, we're ensuring our infrastructure isn't just equipped to handle the current situation, but strategically prepare to manage future heat related emergencies. This proactive approach ensures the long-term sustainability of our healthcare system and strengthens our ability to safeguard the health of our people in the face of a changing climate.



Dr. Afreena Mahmood

Contents

Abbreviation

AA	Anticipatory Action
ABC	Awareness Raising and Behavior Change Communication
BBC	British Broadcasting Corporation
BBS	Bangladesh Bureau of Statistics
BDRCS	Bangladesh Red Crescent Society
BMD	Bangladesh Meteorological Organization
BT	Brightness Temperature
°C	Degree Celsius
EAP	Early Action Protocol
ECMWF	European Centre for Medium-Range Weather Forecasts
Em	Emissivity
ETM	Enhanced Thematic Mapper
°F	Degree Fahrenheit
FAR	False Alarm Ratio
FbF	Forecast-based Financing
FbA	Forecast-based Action
GFS	Global Forecast System
ICDDR,B	International Centre for Diarrheal Disease Research, Bangladesh
IMD	India Meteorological Department
IPCC	Intergovernmental Panel on Climate Change
LST	Land Surface Temperature
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
NWP	Numerical Weather Prediction
OLI-TIRS	Operational Land Imager Thermal Infrared Sensor
Pv	Percent of Vegetation
RCP	Representative Concentration Pathway
SSP	Shared Socioeconomic Pathways
SVRS	Sample Vital Registration System
TM	Thematic Mapper
TOA	Top of Atmosphere
TWmax	Maximum Wet Bulb Temperature
UHI	Urban Heat Island
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting

Part A
INTRODUCTION

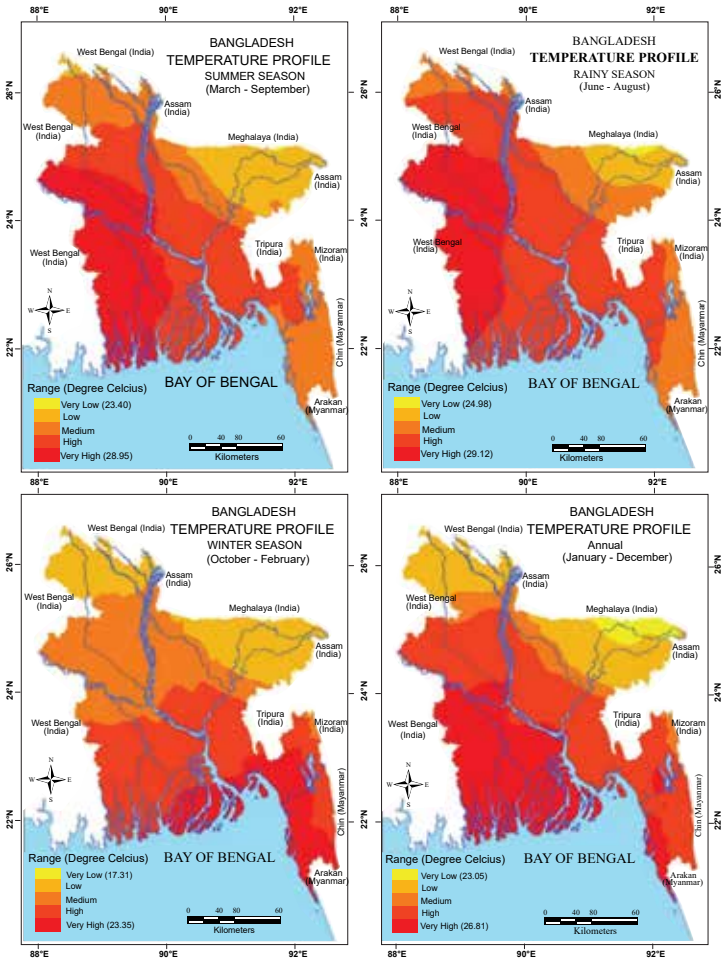
1 Background

Population exposure to heat is increasing due to climate change, and this trend would continue. Globally, extreme temperature events are observed to be increasing in their frequency, duration, and magnitude, and Bangladesh is no exception.

World Health Organisation (WHO) and the United Nations Framework Convention on Climate Change (2015) project mean annual temperature to rise between 1.4°C and 4.8°C over the period 1990–2100 in Bangladesh. Temperature is predicted to rise by 2°C in the next 25 years[1]. A continuation of rising greenhouse gas emissions, doubling of carbon dioxide concentrations, and significant utilization of fossil fuels by countries, resulting in a global temperature increase of 4°C by 2110 according to assumptions given by Shared Socioeconomic Pathways (SSP3): Representative Concentration Pathway (RCP): & Intergovernmental Panel on Climate Change (IPCC), 2023.

Globally Asia-Pacific is at high risk of impact from climate change – storms, floods, heatwaves – and from health effects of climate change.

Figure 1: Temperature Profile of Bangladesh[2]



[1]SSP3:RCP7 scenario assumes
[2]Source: https://www.researchgate.net/figure/2-Average-Temperature-Profile-of-Bangladesh_fig3_354381452

Figure-1 reflects the average temperature profile of Bangladesh in 2023. It shows except Rangpur and Sylhet divisions remaining six divisions of the country were under high temperature spell during the summer season (April- June).

During 2023 the highest temperature recorded in the country was at Rajshahi 45.1 °C (113.2 °F). Ishwardi of Pabna recorded 43°C, Jashore and Chuadanga recorded at 42.2 °C. The temperature in Dhaka was recorded at 40.6°C. In 2024, the highest maximum temperature recorded was 38.5°C at Chuadanga and Ishurdi on 03 April 2024. On 6th April 2024, Chuadanga recorded 42.2°C.

Bangladesh is among the countries that is most susceptible to extremes of climate change including heatwaves. The combination of frequent natural disasters, high population density and low resilience to economic shocks, make Bangladesh very vulnerable to climate and environmental hazards and shocks. Frenzied urbanization, with little space for air passage, continues to reach its extremes. The unbridled rise in population, ill planned urbanization and air thick with noxious pollutants makes way for conditions where heat is trapped.

Two recent studies published in 2022 and 2023, showed that between 1989 and 2011, the country experienced 22 percent higher mortality rates on heatwave days[3] and between 2003 and 2007, heat effects increased all-cause mortality by 1–3 percent[4].

According to the World Bank Group, temperatures in Bangladesh ranged from 15 to 35 degrees Celsius on average between 1901 and 2020. The warmest months are April through July, with an average temperature of 28 degrees Celsius and highs ranging from 30 to 35 or 36 degrees Celsius. However, in 2023, that figure has risen, regularly going above 35 degrees and occasionally going past 40 degrees.

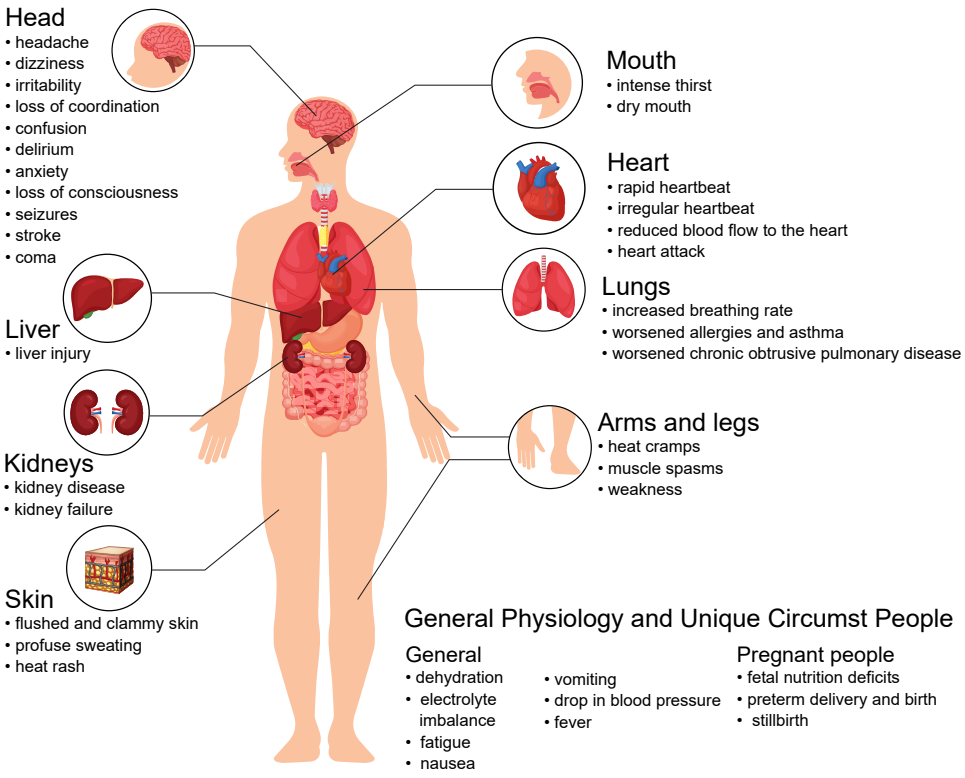
Bangladesh often has some of the warmest day highs in all of Asia, with an average monthly high of roughly 30°C and an average April high of 33°C, according to the UN International Strategy for Disaster Reduction (UNISDR) technical report (2015)[5]. The report stated that Bangladesh would soon face "emerging hot and humid seasons, in which the heat index exceeds 35°C." In the last six decades, the average temperature has risen by 0.7–1^0 Celsius in Bangladesh. It may rise by 1.4^0 Celsius in the next three decades[6].

Hot ambient conditions and associated heat stress can lead to:

- Increase mortality and morbidity
- Increase adverse pregnancy outcomes
- Effect on mental health
- Reduce physical work capacity and motor-cognitive performances
- Increase the risk of occupational health problems

[3]Rahman, M.A., Afridi, S., Hossain, M., et al. 2023. Nexus between heatwave, food security and human health (HFH): Developing a framework for livelihood resilience in Bangladesh. Environmental Challenges 14 (2024) 100802.
[4]Sharma, Ayushi & Andhikaputra, Gerry & Wang, Yu. (2022). Heatwaves in South Asia: Characterization, Consequences on Human Health, and Adaptation Strategies. Atmosphere. 13. 734. 10.3390/atmos13050734.
[5]UNISDR Science and Technical Advisory Group Report 2015, 42848_stag2015.pdf (unisdr.org)
[6]Adnan, Mohammed Sarfaraz Gani & Kabir, Irfat & Hossain, Md & Enan, Muhammad Esmat & Chakma, Salit & Tasneem, Syeda Nazifa & Hassan, Quazi & Dewan, Ashraf. (2023). Heatwave vulnerability of large metropolitans in Bangladesh: an evaluation. 10.21203/rs.3.rs-3093933/v1.

Figure 2: Impact of Heat Effect on Health[7]



2 Heatwave Classification

The Intergovernmental Panel for Climate Change (IPCC) defines a heatwave as 'a period of abnormally hot weather, often defined with reference to a relative temperature threshold, lasting from two days to months.

The World Meteorological Organization (WMO) defines a heat wave as a period during which the daily maximum temperature exceeds for more than five consecutive days the maximum normal temperature (normal period being defined as 1961-1990) by 9 degrees Fahrenheit (5 degrees Celsius).

Bangladesh Meteorological Department (BMD) has classified heatwaves into four categories based on maximum temperature – types of the heatwaves are captured in the table below:

Table 1: Heatwave Classification by BMD[8]

Temperature range	Type of heatwave
36-38 °C	Mild heatwave
38-40 °C	Moderate heatwave
40-42 °C	Severe heatwave
> 42 °C	Extreme heatwave

[7]Source: Killer Heat in the United States, UCS, 2019, p.9
[8]Mallik, M. A. K., et al. (2020), Study on Heatwave and its Thermodynamic Features over Bangladesh using Numerical Weather Prediction Model, International Journal of Science and Business

In terms of the heatwave in Bangladesh, the threshold for heatwave starts at 36°C. This directly links with the adaptability of the human body to the temperature of ambient air, i.e., Wet Bulb Temperature (TW) 35°C, which is considered the threshold beyond which the human body stops cooling itself.

Table 2: Heat Wave Thresholds

	Daily maximum air temperature at 2 meters above the surface < 38° C
	38° C <= Daily maximum temperature at 2 meters above the surface < 40° C
	40° C <= Daily maximum temperature at 2 meters above the surface < 42° C
	Daily maximum temperature at 2 meters above the surface >= 42° C

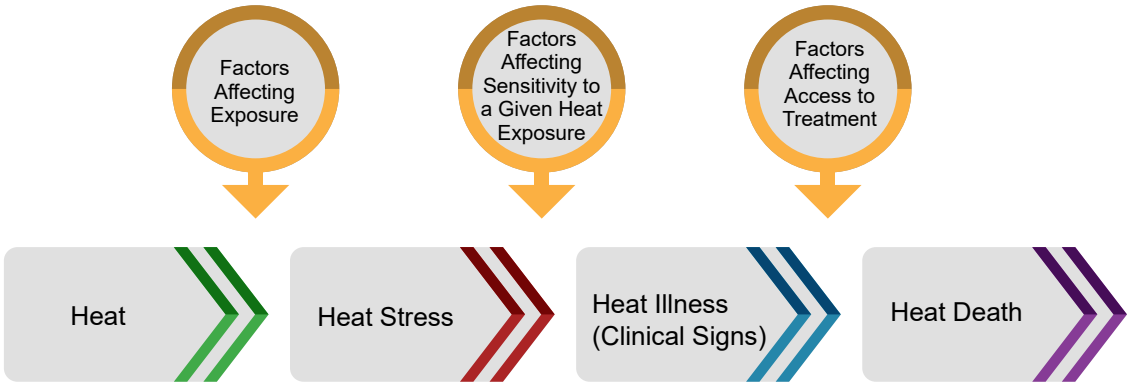
2.1 Definitions

- ***Pre-heat season*** denotes the period when the daily maximum air temperature at 2 meters above the surface exceeds 32^0 C but remains below 35^0 C
- ***Heat season*** denotes the period when the daily maximum air temperature at 2 meters above the surface reaches 36^0 C and continues to exceed 42^0 C
- ***Post-heat season*** denotes the period when the daily maximum air temperature at 2 meters above the surface comes down to pre-heat season air surface temperature after passing through the heat season

3 Heat Stress and Its Pathophysiology

Heat stress occurs when the body is unable to remove excess heat, resulting in adding stress to the body. This can lead to the body experiencing Heat Related Illness (HRIs) and can also make it harder for the body to respond to existing vulnerabilities.

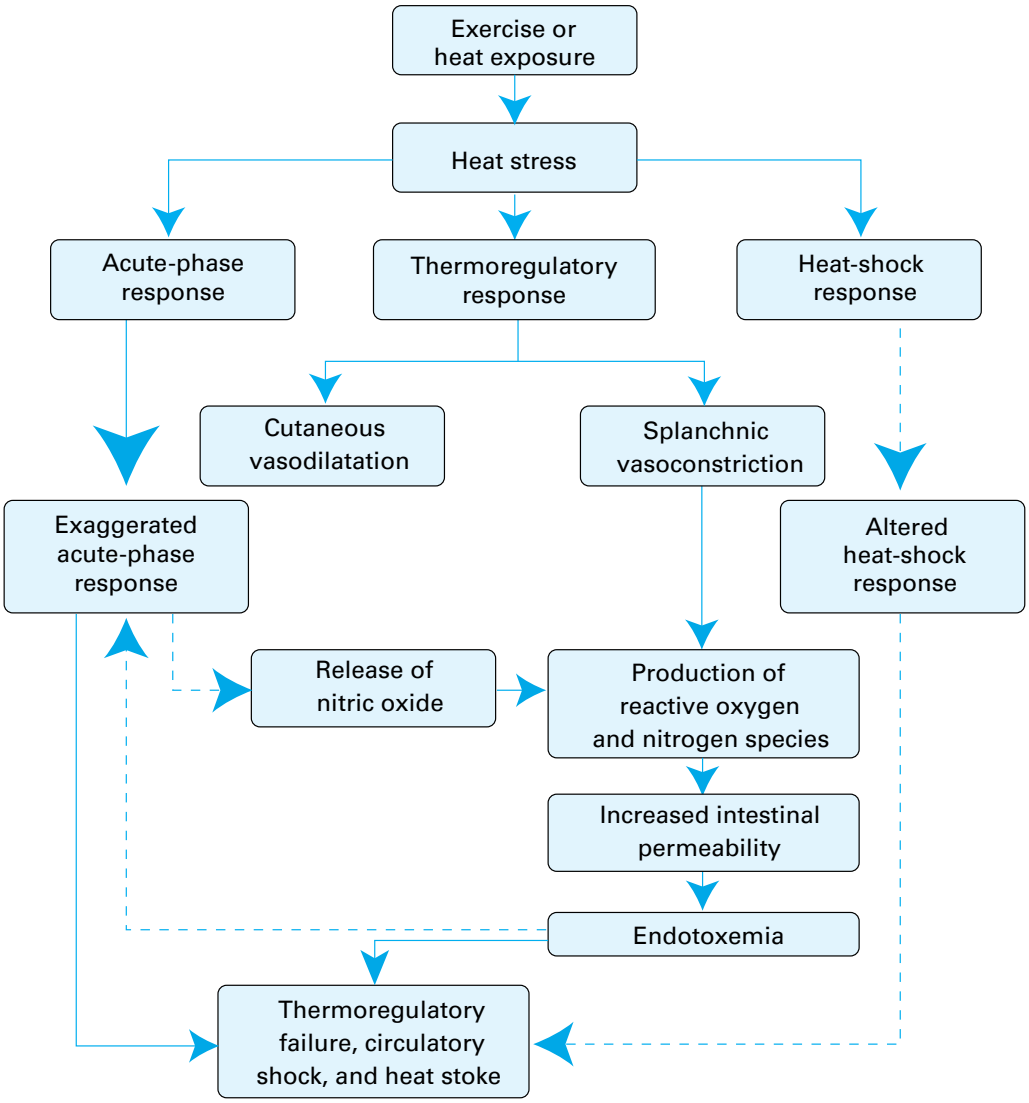
Figure 3: Flow Chart of Heat Stress[9]



[9]Source: Kovats and Hajat 2008

3.1 Pathophysiology

Figure 4: Pathophysiology of Heat Stroke



Several research studies have shown that all-cause cardiovascular illness is the primary cause of death during heatwaves, and as almost half a billion people are estimated to have cardiovascular disease globally, any densely populated area affected by a heat extreme will be at risk for increased cardio-vascular-related mortality.

The human body responds to heat stress in two primary ways: redistributing blood flow towards the skin (vasodilation) to improve heat transfer from muscles to skin and subsequently to the environment, and secreting sweat onto the skin, which subsequently evaporates and removes body heat. The brain regulates these physiological heat loss responses, with additional thermal input from temperature-sensitive nerve cells in the skin and throughout the body. This regulation can also be affected by non-thermal signals, such as from dehydration, metaboreceptors (a type of chemoreceptor that responds to metabolic products

generated by exercising muscles), and cytokines. These physiological heat stress responses are necessary to limit elevations in core temperature, and can affect people differently based on, for example, pre-existing medical conditions, with the possibility for negative effects on the body. The redistribution and increased blood flow to the skin, due to cutaneous vasodilation, increases cardiac demand while decreasing the heart's filling pressure. These responses require the heart to pump harder and faster, increasing the local (coronary tissue) oxygen demand (figure-5).

Figure 5: Illustration of the Physiological Pathways of Human Heat Strain[10]

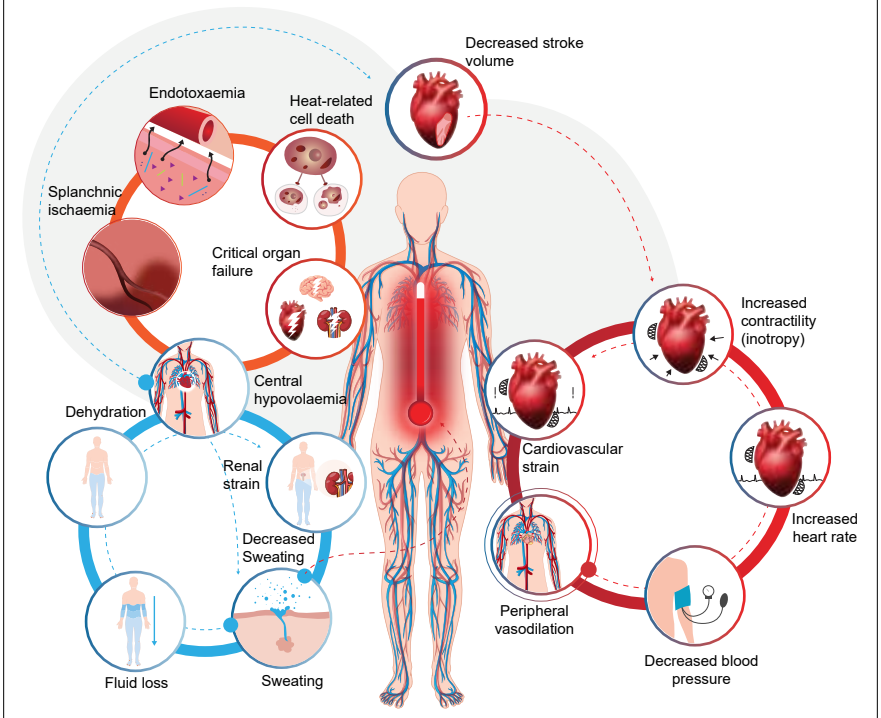
Elevated temperatures severely affect cardiovascular systems by causing accelerated blood circulation and heart rate, and decreased blood pressure levels.

↓

Resulting cardiac output insufficient to fulfill thermoregulatory needs of human body

↓

Heat exhaustion, dehydration, and heat stroke.



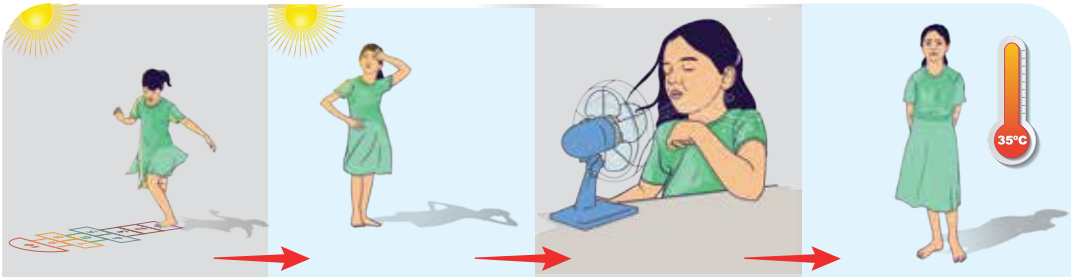
Heat-derived lung damage, in the form of pulmonary oedema and acute respiratory distress syndrome, combined with the high rates of people with pre-existing respiratory conditions, and increased pulmonary stress because of heat-related hyperventilation and elevated air pollution during heatwaves, is responsible for the second greatest source of mortality and morbidity during heatwaves, after cardiovascular disease.

Additionally, sweat production can lead to dehydration if the resultant body water deficits are not adequately replenished. Dehydration decreases blood volume that can eventually exacerbate cardiovascular strain and also lead to acute kidney injury and failure. Chronic dehydration can lead to kidney fibrosis and chronic kidney disease. This condition worsens cardiovascular disease and is more regularly reported during or following hot weather events. Under conditions of extreme heat stress, the thermoregulatory capacity of the body can be exceeded, resulting in illness due to overheating that can progress to heat stroke, which if untreated, can be fatal. High internal temperatures (39–40°C), combined with ischemia and increased oxidative stress after blood redistribution, can cause cell, tissue, or organ damage, with the brain, heart, kidneys, intestines, liver, and lungs at the greatest risk. Due to the multifaceted source of damage, heat-

[10]Hot weather and heat extremes: health risks; Kristie L Ebi et al; Lancet 2021; 398: 698–708

derived injuries can remain hazardous even after cooling the body to normothermic temperatures. Similarly, although most heat-related hospital admissions occur within 24 hours of the onset of these events, cognitive and organ dysfunction can persist for years following injury and render the injured individual at two to three times greater risk of death for decades after injury.

Figure 6: How the Body Can Become Overheated



The body's heat load results from metabolic processes and absorption of heat from the environment. Environmental heat is determined by ambient and radiant temperatures, humidity levels and airflow.	Heat in the body travels from the tissues to the skin surface blood cells that are vasodilated to then react to the temperature difference between the skin and the surrounding air.	The body maintains optimal temperature through different heat dissipation methods: convection (e.g., sitting under a fan), conduction (e.g., taking a cool shower), radiation (e.g., natural heat loss by the body) and evaporation (c.g., drying of sweat).	In high ambient temperature settings (typically 35°C/95°F or above), evaporation is the main mechanism for cooling the body. Evaporation, however, becomes less effective as temperature and humidity reach uncomfortable levels.

Apart from heat-related illness, increased heat/temperature is responsible for:

- Increase transmission of food and water-borne diseases such as enteric fever, cholera, malaria, dengue fever, dehydration, and electrolyte imbalance. Anyone with chronic respiratory illnesses like asthma, or chronic obstructive pulmonary disease (COPD) can be aggravated due to heat.
- Autoimmune conditions, such as lupus, can be aggravated by exposure to direct heat. Spending time in the heat can also cause increased fatigue and dehydration, which can worsen joint pain like rheumatoid arthritis. Other diseases like multiple sclerosis, skin disease like rosacea, muscle disease rhabdomyolysis can increase due to hot and humid weather.

3.2 Heat Acclimatization

It is a process of adjusting to the outside environment to improve heat tolerance and preventing heat illness.

3.2.1 Initial physiological changes that take place with heat acclimation

- Increased plasma volume
- Earlier onset of sweating
- Higher sweat rate
- Reduced salt loss in sweat
- Reduced skin blood flow
- Increased synthesis of heat shock proteins

3.2.2 Importance

- Reduces the risk of serious heat illness
- Reduces physiological strain
- Improves sweating, fluid balance, comfort and exercise capacities
- Heat exposure causes less strain to the heart and other vital organs
    - Sweating improves (higher volume, earlier onset), which cools the body more quickly. Acclimatized workers need more water—not less— due to increased sweating
    - Workers increase their ability to comfortably perform physical tasks in the heat

3.2.3 Steps of Heat Acclimatization

Best results will come from gradually increasing work time in hot conditions over a period of 7 to 14 days, and cooling off and fully rehydrating between shifts.

- Pushing to the point of heat exhaustion will hurt, not help heat tolerance
- Typically, acclimatization requires at least two hours of heat exposure per day (which can be broken into two, 1-hour periods)
- The body will acclimatize to the level of work demanded of it. Simply being in a hot place is not sufficient. Doing light or brief physical work in the heat will acclimatize ONLY to light, brief work. More strenuous or longer tasks require more acclimatization
- Stay hydrated! Dehydration reduces the benefits of heat acclimatization
- Eating regular meals aids acclimatization. Food replaces electrolytes lost in sweat, especially during the first few days of acclimatization, when you lose the most salt in sweat
- Physical fitness aids acclimatization

4 Role of Humidity in Heat-Related Health Outcomes

Warm air can possess more water vapor (moisture) than cold air, so with the same amount of absolute/ specific humidity, air will have a HIGHER relative humidity if the air is cooler, and a LOWER relative humidity if the air is warmer.

To the extent that higher humidity reduces the human body's ability to cool itself through sweat evaporation, increasing humidity would aggravate heat strain and the risk of adverse health outcomes.

Increasing temperatures and humidity with climate change thus pose a potential compound risk for human health. The combination of high heat and humidity can compromise the human body's main cooling mechanism: sweating. The evaporation of sweat from skin cools our bodies, but higher humidity levels limit evaporative cooling. As a result, we can suffer heat stress and illness, and the consequences can even be fatal.

The recognition that humidity, as well as temperature extremes, may determine health outcomes led to the concept of "moist heat stress"

Figure 7: Heat Index Chart in - Degrees of Celsius and Fahrenheit

National Oceanic and Atmospheric Administration (NOAA) national weather service: heat index

Tempera-ture / Relative humidity	80 °F (27 °C)	82 °F (28 °C)	84 °F (29 °C)	86°F (30°C)	88°F (31°C)	90°F (32°C)	92°F (33°C)	94 °F (34°C)	96 °F (36 °C)	98 °F (37 °C)	100 °F (38°C)	102 °F (39°C)	104 °F (40 °C)	106 °F (41 °C)	108 °F (42 °C)	110 °F (43 °C)
40%	80 °F (27 °C	81 °F (27 °C)	83 °F (28 °C)	85 °F (29 °C)	81 °F (27 °C)	91°F (33 °C)	94 °F (34°C)	97 °F (36°C)	101 °F (38°C)	105°F (41 °C)	109 °F (43°C)	114 °F (46°C)	119°F (48 °C)	124 °F (51 °C)	130 °F (54 °C)	136 °F (58 °C)
45%	80 °F (27 °C)	82 °F (28 °C)	84 °F (29 °C)	87 °F (31 °C)	82 °F (28 °C)	93°F (34 °C)	96 °F (36 °C)	100 °F (38°C)	104 °F (40°C)	109°F (43°C)	114 °F (46°C)	119 °F (48°C)	124 °F (51°C)	130 °F (54°C)	137 °F (58 °C)	
50%	81 °F (27 °C)	83 °F (28 °C)	85 °F (29 °C)	88 °F (31 °C)	83 °F (28 °C)	95 °F (35 °C)	99 °F (37 °C)	103 °F (39°C)	108 °F (42°C)	113°F (45°C)	118 °F (48°C)	124 °F (51 °C)	131 °F (55 °C)	137 °F (58 °C)		
55%	81 °F (27 °C)	84 °F (29 °C)	86 °F (30 °C)	89 °F (32 °C)	84 °F (29 °C)	97 °F (36 °C)	101 °F (38°C)	106 °F (41 °C)	112°F (44 °C)	117 °F (47°C)	124 °F (51 °C)	130 °F (54°C)	137 °F (58 °C)			
60%	82 °F (28 °C)	84 °F (29 °C)	88 °F (31 °C)	91 °F (33°C)	84 °F (29 °C)	100 °F (38 °C)	105°F (41 °C)	110 °F (43°C)	116 °F (47°C)	123°F (51 °C)	129 °F (54 °C)	137 °F (58 °C)				
65%	82 °F (28 °C)	85 °F (29 °C)	89 °F (32 °C)	93 °F (34°C)	85 °F (29 °C)	103°F (39 °C)	108 °F (42°C)	114 °F (46°C)	121 °F (49°C)	128 °F (53°C)	136 °F (58 °C)					
70%	83 °F (28 °C)	86 °F (30 °C)	90 °F (32 °C)	95 °F (35 °C)	86 °F (30 °C)	105°F (41°C	112 °F (44°C)	119 °F (48°C)	126 °F (52°C)	134 °F (57 °C)						
75%	84 °F (29 °C)	88 °F (31 °C	92 °F (33 °C)	97 °F (36°C)	88 °F (31 °C	109°F (43 °C)	116°F (47 °C)	124 °F (51°C)	132 °F (56°C)							
80%	84 °F (29 °C)	89 °F (32 °C)	94 °F (34 °C)	100 °F (38°C)	89 °F (32 °C)	113°F (45°C)	121 °F (49°C)	129 °F (54°C)								
85%	85 °F (29 °C)	90 °F (32 °C)	96 °F (36 °C)	102 °F (39 °C)	90 °F (32 °C)	117°F (47°C	126 °F (52°C)	135 °F (57 °C)								
90%	86 °F (30 °C)	91 °F (33 °C)	98 °F (37 °C)	105 °F (41 °C)	91 °F (33 °C)	122°F (50°C)	131 °F (55°C)									
95%	86 °F (30 °C)	93 °F (34 °C)	100 °F (38 °C)	108 °F (42°C)	93 °F (34 °C)	127°F (53°C)										
100%	86 °F (30 °C)	95 °F (35 °C)	103 °F (39 °C)	121 °F (49°C)	95 °F (35 °C)	132 °F (56 °C)										

Key to colors Caution Extreme caution Danger Extreme danger

For example, if the air temperature is 96 °F (36 °C) and the relative humidity is 65%, the heat index is 121 °F/49 °C.

5 Vulnerability[11]

Rising global ambient temperatures affect all populations. However, some populations are more exposed to, or more physiologically or socio-economically vulnerable to physiological stress, exacerbated illness, and an increased risk of death from exposure to excess heat. These include the elderly, infants and children, pregnant women, outdoor and manual workers, athletes, and the poor. Gender can play an important role in determining heat exposure.

Figure 8: Vulnerable Populations[12]

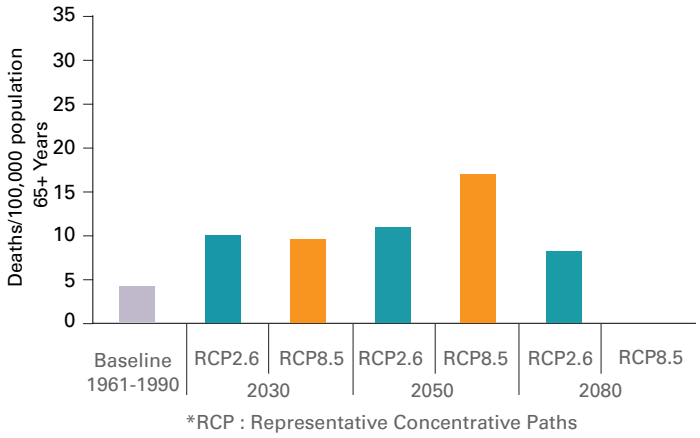
5.1 Adult Population

The World Health Organisation (WHO) in its "Climate and Health Country Profile – 2015 Bangladesh"[13] reported that climate change is expected to increase mean annual temperature and the intensity and frequency of heat waves resulting in a greater number of people at risk of heat-related medical conditions. The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions as key implications for health.

People aged 60 years or older are prone to heat-related illness, with nearly 80 to 90 percent of excess mortality occurring in this age group[14]. The risk for heat-related illness or injuries are also compounded for people with obesity, cardiovascular disease, acute kidney injury, respiratory disease, and diabetes mellitus. This leads to an increase in all-cause mortality with people aged over 65 years who are particularly vulnerable[15]. These conditions decrease the body's ability to adapt to changes in environmental conditions. When people work outdoors and must perform physical work in the heat, the occurrence of heat-related morbidity and mortality is likely to be more frequent.

[11]Protecting Children from Heat Stress: A technical note; © United Nations Children's Fund, May 2023
[12]Reference: WHO Heat & Health 2018
[13]https://www.who.int/teams/environment-climate-change-and-health/climate-change-and-health/evidence-monitoring/country-profiles
[14]Belmin J, Auffray JC, Berbezier C, et al. Level of dependency: a simple marker associated with mortality during the 2003 heatwave among French dependent elderly people living in the community or in institutions. Age Ageing. 2007;36:298–303
[15]https://www.lancetcountdown.org/data-platform/health-hazards-exposures-and-impacts/1-1-health-and-heat/1-1-5-heat-and-sentiment

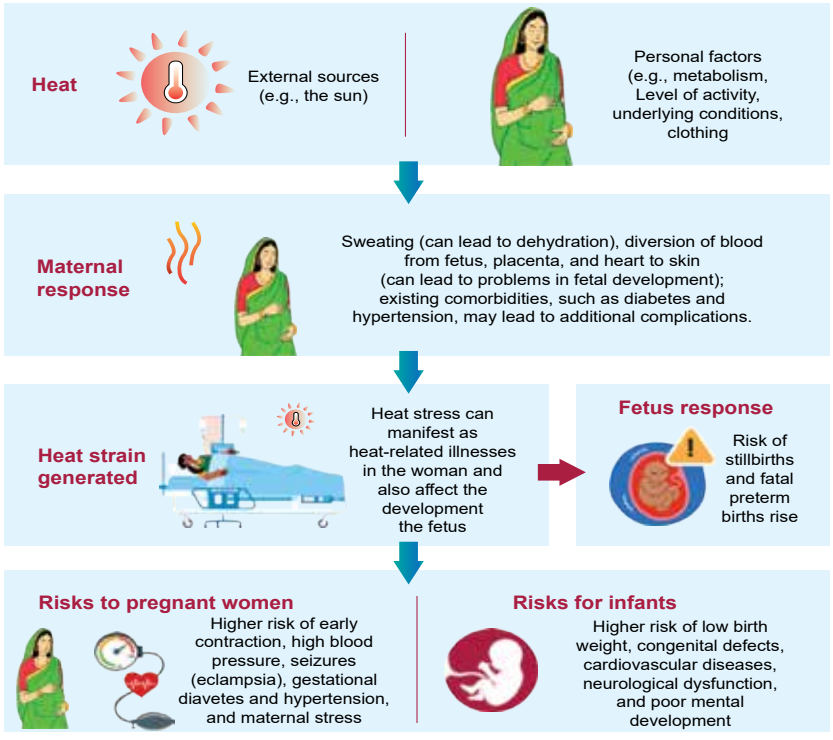
Figure 9: Heat-Related Mortality in Population 65 Years or Over, Bangladesh (Deaths/100,000 Population 65+ Years)[16]



5.2 Pregnant Women: Vulnerability and Impact of Exposure

Pregnant women and fetuses are particularly vulnerable to the effects of extreme heat. Pregnant women – those in their second and third trimesters – are considered vulnerable to extreme heat due to physiological changes that occur during pregnancy. Exposure to extreme heat has been linked to, maternal stress, high blood pressure and eclampsia, labour complications as well as preterm birth.

Figure 10: Maternal Physiological Responses to Heat Stress and Effects on Fetal Development[17]



[16]Source: Honda et al., 2015. Country-level analysis, completed in 2015, was based on health models outlined in the Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014.
[17]Source: Adapted from Bonell et al., 'Environmental Heat Stress on Maternal Physiology

The energy demands of a growing fetus are likely to generate heat within the body of the pregnant woman, thereby slightly increasing her own core body temperature. In addition, dehydration from increased sweating was found to trigger early labour. Exposure to extreme heat while pregnant was also found to affect the genetic and protein make-up of the fetus, leaving it less capable of fighting off the effects of heat stress. This has been observed to be more likely during the first trimester of pregnancy, when the fetus is most sensitive to changes in heat. In addition, increases in temperature during labour have been associated with fetal distress.

Therefore, unaddressed heat stress, including when the mother is asymptomatic, is a likely contributory factor to increased mortality and morbidity rates in infants, as well as the mothers.

Significant findings have been made on the impacts of heat stress on pregnancies and fetal development, including:

- The odds of a preterm birth rose by 5 per cent per 1°C increase in temperature, and by 16 per cent during heatwave vs. non-heatwave days, demonstrating that the odds are sensitive to dose response – i.e., greater exposure and severity result in greater risk
- A meta-analysis showed associations between temperature exposure during pregnancy and stillbirth, with odds of stillbirth rising 5 per cent per 1°C increase in temperature
- Women who give birth during extreme heat periods may be more likely to have neonates with illnesses. In Bangladesh, women were 14 per cent more likely to have newborns with neonatal illnesses when giving birth on hot days, compared to those giving birth on cooler days
- Heat stress can trigger fetal tachycardia, development of congenital defects, and fetal distress during fetal development
- Dehydration, which is more likely to occur during high-heat periods, can lead to serious complications during pregnancy and the postpartum period, including reduction of the levels of amniotic fluid and poor production of breast milk. Dehydration may also represent a trigger for preterm birth
- A 2019 study found that pregnant women were more likely to be hospitalized when exposed to extreme heat during their second and third trimesters
- Exposure to extreme heat during the first half of pregnancy has been associated with greater risk of pre-eclampsia and gestational hypertension, as well as gestational diabetes

5.3 Infants, Children and Adolescents: Vulnerability and Impact of Exposure

Compared to adults, infants and children are uniquely affected by heat stress, leaving them more vulnerable to its short- and long-term effects. This is due to particular physiological characteristics:

- **Higher heat production:** Because they have more internal heat to begin with and move less economically per given activity, children produce more heat per kilogram of weight than adults do.
- **Greater body surface area:** Younger children have a higher surface-area-to-mass ratio. This can lead them to absorb more heat from the environment, depending on their body and fitness levels. Conversely, this may be useful for heat dissipation in other environments.
- **Lower levels of sweat production:** Children have a lower rate of sweating than adults do because of a lower sweat rate per gland, and they begin sweating at a higher body temperature.

- **Under-developed bodily systems:** Infants experiencing heat stress are likely less capable of fighting off the symptoms, as they have under-developed sweat glands and less capacity for regulating their temperature independently. They also have a developing immune system, which potentially further diminishes their capability. In addition, heat stress in pregnant mammals was observed in recent studies to impair the immunological function of the offspring, further hindering the offspring's ability to regulate extra heat.
- **Cellular modification:** When pregnant women experience heat stress, the stress placed on the fetus could affect its ability to synthesize proteins properly, through affecting heat shock protein development, thereby leaving the child more vulnerable to developing physical defects and illnesses.
- **Slower adjustment to changes in weather:** Infants and young children adapt to changes in temperature more slowly than adults, thus making them more vulnerable to extreme shifts such as heatwaves, in part because they have poorer blood circulation and lower proportional cardiac output compared to adults. Infants and young children adapt to a hot environment more slowly than adults do, typically requiring 10–14 days to achieve adequate acclimatization. Similarly, when exercising, children and adolescents require 10–14 days to become acclimated, compared to 7 for adults with comparable activity per day.
- **Poorer practice of fluid replenishment:** If not appropriately supervised, children are more likely to inadequately replenish fluid losses during prolonged exercise.

5.3.1 Newborns and Infants

- In meta-analysis, exposure of pregnant women to higher temperatures was associated with reduced birth weight of neonates
- Newborns have a greater risk of being born with various congenital defects, including congenital heart defect, spina bifida and cranio-facial defects
- Heat can lead to jaundice, neurological dysfunction and dehydration in infants
- Some studies and reviews have suggested a link between exposure to heat stress and an increased risk of sudden infant death syndrome
- Infants are breastfed for shorter periods of time during the hottest days of the year compared to the coldest, which can affect the nutritional status of the infant. In addition, studies are finding that heat exposure, stunting and wasting are likely linked directly

5.3.2 Children and Adolescents

- According to a 58-country assessment, each additional day above 26.7°C (80°F) during the three years preceding an exam lowered scores by 0.18 per cent of a standard deviation, with the effect larger for lower-income populations. Another study found that, without air conditioning, each 0.56°C (1°F) increase in school-year temperature reduces the amount learned that year by 1 per cent.
- Every additional day with mean temperatures above 32°C (89.6°F) in utero and in the first year after birth is associated with a 0.1 per cent reduction in adult annual earnings at age 30.

Heat action plans that incorporate early warning and response systems are essential for reducing vulnerability.[18]

[18]Hess JJ, Lm S, Knowlton K, et al. Building resilience to climate change: pilot evaluation of the impact of India's first heat action plan on all-cause mortality. J Environ Public Health 2018; 2018: 7973519.

Part B

RESPONSE AND PREPAREDNESS PLAN

6 Call for Action

The impact of climate change on Maternal, Neonatal, Child and Adolescent Health (MNCAH) demands an overall call for action. In addition to a wide range of immediate health risks, climate change threatens to lead to many long-term consequences that affect the health and well-being of women, newborns and children throughout their lives.

The health of pregnant women, mothers, newborns and children reflects the stability and robustness of a community's resilience to potential health disruptions. The evidence linking global warming with adverse outcomes is mounting and is cause for alarm. While climate change will affect all populations, it is critical to remember that women, newborns and children are impacted disproportionately. The 2015 Paris Agreement called "for Parties taking action to address climate change to respect and promote the right to health." Yet actions have thus far been insufficient. Few Nationally Determined Contributions even mention maternal and child health – a glaring omission and emblematic of the status of women, newborns and children in the climate change discourse.

6.1 Actions

In the run-up to COP28, the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the United Nations Population Fund (UNFPA) together with the global health community, raised its voice to ensure that the impact of climate change on health takes centre stage in the negotiations. They collectively called on Member States, partners, collaborators and stakeholders to protect the health of women, newborns and children from the impacts of climate change. Adapted from the "Call for Action" without delay, the following urgent actions must be taken to achieve a healthy, sustainable and equitable future for all.

i). Address the needs of adult populations, women, newborns and children in the global climate response

Existing global commitments, frameworks and policies for climate adaptation inadequately address or neglect the risks of climate change on MNCH. Climate response polices should prioritize adult populations, women, newborns and children. These policies need to recognize and address climate risks to health, including policies to reduce carbon emissions and protect health. The needs of adult population, women, newborns and children should be integrated into climate mitigation, adaptation and disaster risk reduction strategies, to address their unique needs, including access to essential sexual, reproductive, maternal, newborn and child health services.

There is a need to take adequate actions (i.e. health promotion and awareness) to protect risk groups such as rickshaw puller, traffic police, field workers and menopausal women from Heat-Related health issues.

To provide first aid for heat stress management there is need to provide training to the traffic police, school teachers & community health workers. Primary management of heat stress needs to be incorporated in School Health Program, Little Doctors Program and Adolescent Health Program.

ii). Frame climate change as a health and human rights issue with a human capital approach

Inequalities in power structures influence the causes and consequences of climate change on the health of women, girls and gender-diverse people, especially those facing multiple and intersecting forms of

discrimination.

Considering the impact of intersectional factors such as gender, age, culture and equity when addressing the impact of climate change supports the achievement of the Sustainable Development Goals. By amplifying underrepresented voices and ensuring meaningful participation, gender responsive and equitable climate action under the Paris Agreement can be created, leading to creative solutions that are context-appropriate and aim to ensure high-quality MNCH care that is available, accessible and acceptable to all in need. This approach must be holistic and built over time, acknowledging the cumulative effect that access to services offers over a lifetime. Human rights must be prioritized in climate change preparedness, adaptation and mitigation planning.

Consideration should be given to existing inequities in access to and quality of MNCH care. The needs of women, newborns, children and adolescents are essential in decision making, from local to national levels.

iii). Institute robust monitoring frameworks

There is an urgent need to better understand the links between climate-related exposures and MNCH and well-being. Countries need to strengthen existing monitoring frameworks and agree on indicators to track health outcomes with disaggregated, spatially-referenced population data, including the location, characteristics and mobility of populations in areas exposed to current and projected climate hazards. This will improve the quality of services provided and help target resources to populations and areas with the most needs, as well as allow countries to track progress over time.

iv). Accelerate research and share information on the impact of climate change and MNCH

Significant data gaps remain in our understanding of the potential health risks of climate change, including a lack of studies from low and middle-income countries. As the available evidence on the impact of climate risks on MNCH is synthesized, research on potential strategies and interventions to reduce the negative health effects from the impacts of climate change during the critical periods of pregnancy, infancy and childhood is paramount. High-quality data are necessary to estimate the global burden of climate-related impacts on MNCH and quantify the strength of these associations. All actors should contribute to building knowledge on the effect of climate change on health risks for MNCH. Education on the concepts of climate change should be available for all individuals, at community level and within health worker training programmes.

Understanding the effects of climate change on health will enhance willingness to act on climate change and to ensure that high-quality data are available to strengthen knowledge of its impacts. Research is also needed to identify the effectiveness of interventions to address these climate-related health outcomes, as well as to articulate the relationship between climate change, social determinants of health and their corresponding risks to MNCH. Understanding the context and conditions needed to implement effective interventions will be critical to scaling sustainable actions.

v). Strengthen resilient health systems sustainably

Action is needed to reduce carbon emissions in the health sector to improve health. The health sector is responsible for up to 4.4% of all greenhouse gas emissions, although these emissions are not experienced or emitted equally.

Climate-resilient, low-carbon and environmentally sustainable health-care facilities protect MNCH from water scarcity and food insecurity, as well as unsafe structural environments. Health facilities guarantee the availability, quality and accessibility of health services for women and children. These facilities are vulnerable to climate change and other environmental stresses. It is essential that climate and health programmes reflect the voices and needs of women, children, adolescents and youth, communities and health workers, with MNCH services integrated into ongoing activities to mitigate climate change. A health sector that is fit for the future is able to increase the capacity for protecting health in an unstable and changing climate by building climate resilience and contributing to mitigation through reduced greenhouse gas emissions, becoming low-carbon or net-zero systems and reducing all other negative impacts on the environment, without forgetting how to address the health and needs of health workers while keeping person-centred care at the forefront.

vi). Promote greater collaboration between sectors to jointly define long-term, sustainable policies that outline MNCH targets in climate financing policy

Climate change and climate hazards have serious economic and fiscal impacts. Increases in government expenditures due to additional demands resulting from exposure to climate hazards reduce the availability of funding, which in turn can impact the availability of resources for MNCH.

There is a need to strategically mobilize funds to enhance and expand the climate resilience of the health sector with specific allocation to MNCH needs. At the microeconomic level, the negative consequences include increases in out-of-pocket payments for health care and reductions in household livelihoods and income, which can affect the affordability of MNCH services and reduce access to health care. Investments in primary health care within universal health coverage are needed to ensure that MNCH services are available and affordable to all who need them.

Multilateral climate funds and climate-related assistance can jointly promote MNCH goals, with a particular focus on distributional effects for the populations most affected by climate events.

Similarly, financing mechanisms for MNCH can incorporate or improve service provision across multiple sectors, including financing global health-responsive climate action. Commitment is needed to ensure that adaptation programmes allocate resources to the health sector, including ensuring an equal split in adaptation and mitigation financing.

vii). Prioritize an "all of society", multisectoral approach to take sustained and impactful action on MNCH in the climate change response

Communities, social sectors, private sector actors and governments need to come together around shared goals and responsibilities to institute the necessary enabling environments to protect MNCH from the direct and indirect impacts of climate change. A coordinated response to the climate change and health crisis requires integrated, multisectoral programming.

This approach will be key to providing comprehensive solutions that promote resilience and sustainable growth, particularly in heavily affected areas. It is crucial to promote collective action outside the health sector, such as the energy, agriculture, housing, education and priv ate sectors. Economic stability is mandatory for addressing and mitigating the effects of climate change on populations at risk. Private sector actors have a responsibility to contribute to maintaining this stability, sustainably, as it is key to managing business risks and ensuring long-term returns on investment. The private sector will be a critical partner in delivering effective solutions that reduce the risk of adverse MNCH outcomes.

The health of pregnant women, mothers, newborns and children reflects the stability and robustness of a community's resilience to potential health disruptions. The evidence linking global warming with adverse outcomes is mounting and is cause for alarm. Climate change is indeed a growing threat to maternal, newborn and child health that can no longer be ignored. While climate change will affect all populations, it is critical to remember that women, newborns and children are impacted disproportionately. With progress stalling on many fronts, immediate action is needed to meet the Sustainable Development Goals, with increased focus on women, newborns, and children. Hard-won advances of the past decades for maternal, newborn and child survival and well-being must be protected to ensure the right to health for all.

Yet actions have thus far been insufficient. Few Nationally Determined Contributions even mention maternal and child health – a glaring omission and emblematic of the status of women, newborns and children in the climate change discourse.

Many governments are taking the lead in developing and implementing policies and action plans to address heat stress. Even so, there is limited attention to the specific vulnerabilities of pregnant women and children, and the measures that should be taken to support them. The 2015 Paris Agreement called "for Parties taking action to address climate change to respect and promote the right to health." With the UN Climate Change Conference of 2023 held in Dubai last November, there is an increased focus on the impacts of climate change on maternal, newborn and child health.

People are unnecessarily suffering and dying during hot weather and heat extremes. Heat-related morbidity and mortality are expected to increase as climate change continues, with each additional unit of warming projected to further increase the risks. Robust evidence of the relationships between hot weather and morbidity and mortality is being augmented with growing evidence of other effects, including on occupational workers and professional and recreational athletes. Particularly in tropical regions, increased warming means that physiological limits could be reached regularly and more often in coming decades. Higher means and extremes of temperature will lead to future summers characterized by higher morbidity and mortality, and important limitations and changes to what are today considered normal activities.

A national monitoring framework will be useful for efficiently monitoring Heat-Related illnesses (HRIs) registered at individual health facilities. This can be implemented in collaboration with local or regional governments and the national agency overseeing the heat response. The indicators should ideally capture cases of HRIs by age group, gender and whether the patient is pregnant or not, in addition to other general indicators. Efforts are underway to establish global indicators for monitoring heat stress.

7 Facility Preparedness Plan

The facility preparedness plan aims to provide a baseline framework for preparing, implementing, coordinating, and evaluating extreme heat response activities in health facilities.

Facility preparedness is mainly related to the patient management guideline as specified in Part C: Management Plan. Facility preparedness must be designed according to geographical risk areas.

7.1 Components of Facility Preparedness

a) Facility readiness

b) Logistic & equipment availability: Seasonal (Pre-heat, Heat, Post-Heat) & Geographical area wise

c) Capacity Development

There are three tables for planned activities during three different seasons, i.e., pre-heat season, during heat season and post-heat season.

The activities are divided into three broad categories, i.e., Facility Readiness, Logistics & Equipment Supply and Capacity Development (Training Module & In-house Training) for four different levels of health facilities, i.e., Community Clinic, Union Sub-Centre (USC), Upazilla Health Complex (UzHC) and District Hospital (DH)/ Medical College Hospital (MCH)/ Specialized Hospital.

Basic equipment and medicines required as a part of hospital preparedness for heat season is at Section 7.2 below.

7.1.1 Hospital Preparedness — Pre-Heat Season

A) Community Clinic

» **Facility Readiness**

- Keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply – install tubewell and if possible, store water in pitcher

» **Logistics & Equipment Supply**

- Check inventories for applicable basic equipment and medicines required as listed in section 7.2 below and ensure availability

» **Capacity Development**

- Map susceptible locations (identify areas/ population that are vulnerable)
- Community involvement to create awareness through Community Groups/Community Support Groups

B) Union Sub Centres

» **Facility Readiness**

- Keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply – install tubewell and if possible, store water in pitcher

» **Logistics & Equipment Supply**

- Check inventories for basic equipment and medicines required as listed in section 7.2 below and ensure availability
- Ensure adequate arrangement of staff
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Map susceptible locations (identify areas/ population that are vulnerable)
- Community involvement to create awareness

C) Upazila Health Complex

» **Facility Readiness**

- If possible, install Air Conditioner (AC), Cooler Fan
- Where AC is not available, keep air passage clear with windows and door wide open.
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement.
- Keep in stock some Hand Fans for use during any electrical failure
- Ensure availability of safe drinking water supply in water purifier
- Activate fully functional One Stop Emergency Centre (OSEC)

- Prepare the emergency room and the indoor as detailed in Part C: Management Plan
- Make functional the referral system

» **Logistics & Equipment Supply**

- Check inventories for basic equipment and medicines required as listed in section 7.2 below and ensure availability
- Ensure adequate arrangement of staff
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Prepare a detailed action plan to tackle HRI starting from communities, community clinics, union sub centres, UzHC, private sector clinics and hospitals. The plan should be developed with full engagement of the community leaders, Community Group Members, Union Parishad Chairman and members, Upazila Parishad Chairman and members, where applicable Chairman of City Corporation/Municipalities and ward commissioners. The plan should be updated annually
- Organize fresher/refresher targeted training course on the National Guideline on the Management of Heat-Related Illness for doctors, nurses, SACMO's, Ward Boys, Health Inspectors, HAs, CHCPs etc
- Initiate recording and reporting on the Spectrum of HRIs, updating and maintaining hospital records
- Improve recording of heat illness examination procedures and cause of death
- Map susceptible locations (identify areas/ population that are vulnerable)

D) Civil Surgeon

- Prepare a detailed action plan to tackle HRI starting from wards, Urban dispensaries, School Health Clinics, Private sector clinics and hospitals. The plan should be developed with full engagement of the community leaders, Chairman of City Corporation/ Municipalities and ward commissioners. The plan should be updated annually
- Create awareness through engaging communities by trained staff
- Map susceptible locations (identify areas/ population that are vulnerable)

E) District Hospitals/Medical College Hospitals/Specialized Hospitals

» **Facility Readiness**

- If possible, install Air Conditioner (AC), Cooler Fan
- Where AC is not available, keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply in water purifier
- Activate fully functional One Stop Emergency Centre (OSEC)
- Prepapre the emergency room and the indoor wards as detailed in Part C: Management Plan
- Make functional the referral system

» **Logistics & Equipment Supply**

- Check inventories for basic equipment and medicines required as listed in section 7.2 below and ensure availability
- Ensure adequate arrangement of staff
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Organize fresher/refresher targeted training course on the National Guideline on the Management of Heat Related Illness for doctors, EMO's, nurses, SACMO's, Ward Boys, Aya
- Initiate recording and reporting on the Spectrum of HRIs, updating and maintaining hospital records
- Improve recording of heat illness examination procedures and cause of death

7.1.2 Hospital Preparedness- Heat Season

A) Community Clinic

» **Facility Readiness**

- Keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply – install tubewell and if possible, store water in pitcher

» **Logistics & Equipment Supply**

- Make available and ensure cold sponging facilities
- Check inventories for applicable basic equipment and medicines and ensure availability required as listed in section 7.2 below

» **Capacity Development**

- Arrange training of CHCP
- Map susceptible locations (identify areas/population that are vulnerable)
- Community involvement to create awareness through Community Groups/Community Support Groups

B) Union Sub Centres

» **Facility Readiness**

- Keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply – install tubewell and if possible, store water in pitcher

» **Logistics & Equipment Supply**

- Make available and ensure cold sponging facilities- – active cooling mechanism
- Check inventories for basic equipment and medicines required and ensure availability as listed in section 7.2 below
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Arrange training for MO, SACMO, Pharmacists
- Map susceptible locations (identify areas/ population that are vulnerable)
- Community involvement to create awareness

C) Upazila Health Complex

» **Facility Readiness**

- If possible, install Air Conditioner (AC), Cooler Fan
- Where AC is not available, keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply – if possible, in pitcher
- Activate fully functional One Stop Emergency Centre (OSEC)
- Make functional of the referral system
- Identify and activate Rapid Response Team (RRT) to respond to any emergency call outside the facility
- Create awareness through engaging communities by trained staff

» **Logistics & Equipment Supply**

- If not already available, make available Water Cooler, Refrigerator
- Make available and ensure cold sponging facilities – active cooling mechanism
- Check inventories for basic equipment and medicines required as listed in section 7.2 below and ensure availability
- Ensure adequate arrangement of staff
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Prepare a detailed action plan to tackle HRI starting from Communities, Community Clinics, Union sub centres, UzHC, Private sector clinics and hospitals. The plan should be developed with full engagement of the community leaders, Community Group Members, Union Parishad Chairman and members, Upazila Parishad Chairman and members, where applicable Chairman of City Corporation/ Municipalities and ward commissioners. The plan should be updated annually
- Organize fresher/refresher targeted training course on the National Guideline on the Management of Heat-Related Illness for doctors, nurses, SACMO's, Ward Boys, Aya, Health Inspectors, Has, CHCPs etc

- Initiate recording and reporting on the Spectrum of HRIs, updating and maintaining hospital records
- Improve recording of heat illness examination procedures and cause of death
- Activate facility death review committee and conduct death autopsy of HRI related deaths in facilities
- Organize social autopsy for deaths related to HRIs
- Create awareness through engaging communities by trained staff
- Map susceptible locations (identify areas/ population that are vulnerable)

D) Civil Surgeon

- Prepare a detailed action plan to tackle HRI starting from wards, Urban dispensaries, School Health Clinics, Private sector clinics and hospitals. The plan should be developed with full engagement of the community leaders, Chairman of City Corporation/Municipalities and ward commissioners. The plan should be updated annually
- Create awareness through engaging communities by trained staff
- Map susceptible locations (identify areas/population that are vulnerable)

E) District Hospitals/Medical College Hospitals/Specialized Hospitals

» **Facility Readiness**

- If possible, install Air Conditioner (AC), Cooler Fan
- Where AC is not available, keep air passage clear with windows and door wide open
- Ensure ceiling fan is working. If needed, install Wall Mountain Fan as per requirement
- Keep in stock some Hand Fans for use during electrical failure
- Ensure availability of safe drinking water supply in water purifier
- Activate fully functional One Stop Emergency Centre (OSEC)
- Prepare the emergency room and the indoor wards as detailed in Part C: Management Plan
- Make functional of the referral system

» **Logistics & Equipment Supply**

- If not already available, make available Water Cooler, Refrigerator
- Make available and ensure cold sponging facilities- – active cooling mechanism
- Check inventories for basic equipment and medicines required as listed in section 7.2 below and ensure availability
- Ensure adequate arrangement of staff
- If needed, establish outreach centres at various locations easily accessible to the vulnerable population

» **Capacity Development**

- Organize fresher/refresher targeted training course on the National Guideline on the Management of Heat-Related Illness for doctors, EMO's, nurses, SACMO's, Ward Boys, Aya
- Initiate recording and reporting on the Spectrum of HRIs, updating and maintaining hospital records
- Improve recording of heat illness examination procedures and cause of death

- Activate facility death review committee and conduct death autopsy of HRI related deaths in the facility
- Organize social autopsy for deaths related to HRIs

7.1.3 Hospital Preparedness — Post Heat Season

The following activities should be undertaken during the post heat period at all level of health facilities to rectify in preparation for next year's heat season:

i). Review to assess/identify gaps, if any, on the following issues
   - Any shortage of equipment, medicine, staff, its reasons and any loopholes
   - Any long-term measures adopted and maintained which should be repeated
   - Any flaw/fault in reporting channel/format/ efficiency and how to amend those
   - Number of deaths reviewed related to HRI's

ii). Document the lessons learnt for the next season

7.2 Basic Equipment and Medicines Required as a Part of Hospital Preparedness for Heat Season

Community Clinic/USC (CC/USC), Upazila Health Complex (UzHC) and District Hospital (DH)/Medical College Hospital (MCH) should ensure the following requirements before the start of heat season:

Equipment and Logistics:

1. Dedicated bed for HRI patients in cooler area of hospital
2. ECG equipment: ECG machine, Gel, electrodes, ECG paper, CTG machine with Paper, USG Machine
3. Cooling equipment: AC, cooler, fan as per requirement
4. Water cooler
5. Ambulance with ice packs and cold water
6. Thermometer
7. Glucometer and testing strips
8. Ice packs
9. BP apparatus
10. Paediatric BP Cuff
11. Paediatric stethoscope

Drugs and Accessories

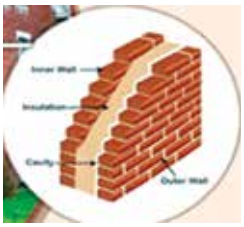
12. 5% DA with 0.45% NS
13. Silver sulphadiazine cream, Calamine lotion, Chlorhexidine in a light cream or lotion base,
14. Cold IV normal saline (0.9%), dextrose 50% in water solution (D50W)
15. Medicines: Lorazepam, Diazepam (oral/IM/suppository) Non-adrenalin, Nalepsin/MgSo4, Insulin, Antihypertensives

7.3 Recommendation for Health Managers and Planners for Measures for Reduction of Temperature at Facilities

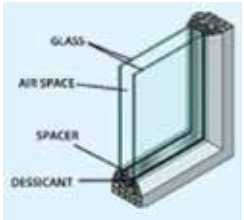
Health Managers and Planners may consider the following for reduction of temperature in health facilities:

- **Plantation of trees** around all health facilities, accommodation facilities of hospital staff, approaching road etc. Trees mitigate heat by altering evapotranspiration processes and providing shade to their surrounding environment. Trees contribute to their environment by providing oxygen, improving surrounding air quality, climate amelioration, conserving water and preserving soil. During the process of photosynthesis, trees take in carbon dioxide and produce the oxygen we breathe. As trees grow, they help stop climate change by removing carbon dioxide from the air, storing carbon in the trees and soil, and releasing oxygen into the atmosphere.
- **Hollow Brick:** Hollow bricks, also known as hollow cement blocks or hollow concrete blocks, are bricks with a cavity or void in the centre. Hollow bricks have several advantages over traditional bricks. They are more durable, lighter, provide better insulation against heat and noise, and can withstand a higher degree of loading. They are also more cost-effective due to using less material in their construction.

- **Cavity Wall:** Cavity walls serve a number of purposes in the construction of hospital buildings. The primary purpose is to prevent moisture from outside from penetrating up the outer walls and into the inner rooms. When constructing a cavity wall, this leaves a gap in the middle which could make it easy to lose heat through your walls. The cavity should be vented to allow some limited, but not necessarily through, movement of air. Where wall areas are divided by horizontal cavity barriers ventilation openings should be provided to each section.



- **Double Glazing Window:** Double glazed windows help keep heat in or out of the hospital indoor environment and reduce external noise. They are efficient in both warmer climates. However, their effectiveness can vary based on how they were installed, type of windows and frames used, and the climate in the area.



- **Solar Reflective Paint:** works by creating a barrier between the surface of the roof it covers and the sun. It effectively acts like a sun cream. Solar reflective paint can be silver or white in colour. The solar reflective paint contains pigments designed to reflect the UV rays of the sun.
- **Cross Ventilation** is a natural phenomenon where wind, fresh air or a breeze enters upon an opening, such as a window, and flows directly through the space and exits through an opening on the opposite side of the hospital building (where the air pressure is lower). For cross ventilation to work, at least two openings (windows or doors) must be in the room. Wind needs to have an inlet and an outlet. It works best when at least one opening face prevailing wind and the other opening on the opposite side of the room. These openings can be windows, doors or vents.

- Installation and increase use **of renewable energy such as solar, wind and hydro power** at all health facilities. Increase use of 'off grid' solar for remote areas.
- **Cool roof mechanism** - A cool roof is a roofing product that reflects sunlight and absorbs less heat than traditional roofs. It is designed to reflect more sunlight than a conventional roof, absorbing less solar energy. This lowers the temperature of the facilities just as wearing light-colored clothing Cool roofs lower roof temperatures on hot sunny days and therefore keep homes cooler inside. Cool roofs save energy, increase thermal comfort and reduce cooling demand. Cool roofs reflect sunlight and absorb less heat. Depending on the setting, cool roofs can help keep indoor temperatures lower by 2 to 5°C (3.6- 9°F) as compared to traditional roofs. The key driver for adoption of cool roofs for these types of buildings is the cooling load reduction and resulting energy savings. Cool roofs techniques can be broadly divided into four categories:

  i). ***Coated cool roofs:*** these roofs involve the coating of a material or paint with high reflectivity on top of a conventional roof material to increase the roof surface's solar reflectance index. These are liquid applied coatings made of simple materials such as lime wash or an acrylic polymer or plastic technology and are usually white in color.

  ii). ***Membrane cool roofs:*** these roofs involve using pre-fabricated materials such as membranes or sheeting to cover an existing roof in order to increase the roof surface's SRI. These types of roofs can be polyvinyl chloride (PVC) or bitumen-based.

  iii). ***Tiled cool roofs:*** these roofs involve the application of high albedo, china mosaic tiles or shingles on top of an existing roof or to a new roof.

  iv). ***Green roofs:*** green roofs make use of vegetation to help the roof absorb less solar energy by providing a thermal mass layer to reduce flow of heat into a building. Vegetation is especially useful in reflecting infrared radiation.

8 Community Preparedness and Engagement Plan

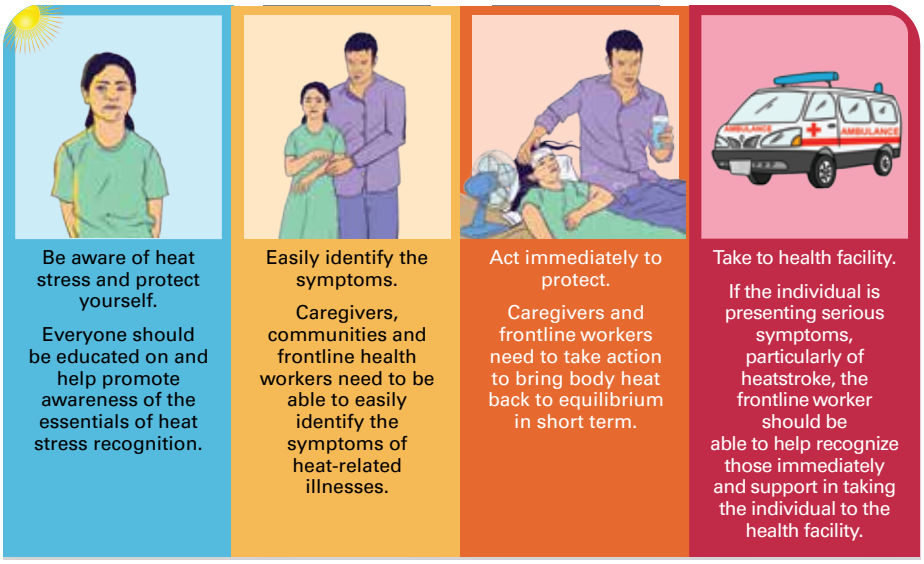
8.1 Risk Communication and Community Engagement (RCCE) Framework for Heat Stress- 'B.E.A.T. the Heat' Framework

There has been a rising trend in Bangladesh in the occurrence of heatwaves in recent years, significantly affecting various aspects of life, including the impacts on health for at-risk population, notably but not limited to pregnant and lactating women (PLW), children, the elderly, and other vulnerable population such as slum residents, individuals residing in tin sheds or temporary roadside structures without a proper ceiling, rickshaw pullers, street vendors, day labourers, frontline workers, co-morbid patients, and people with disabilities.

Therefore, robust risk communication and community engagement (RCCE) interventions are essential to beat the heat. The heat stress-related RCCE interventions can follow the B.E.A.T. the heat framework to make the at-risk population aware of the impact of heat and preventive measures, enable communities at large to identify the heat stress-related symptoms, promote actions to act immediately, and take the individual to the health facility or a doctor while showing serious symptoms such as heatstroke. Thus, the B.E.A.T. the heat framework for RCCE interventions stands for:

- **BE AWARE of heat stress and protect yourself:** Recognize heat stress and know what actions to take
- **EASILY IDENTIFY the symptoms:** Recognize the symptoms of various heat-related illnesses that caregivers, communities and frontline workers need to know
- **ACT IMMEDIATELY to protect:** Learn the first-aid actions that caregivers and frontline workers need to take to rebalance body heat in short term; and
- **TAKE to a health facility:** If an individual is showing serious symptoms, especially signs of heatstroke, frontline workers, community stakeholders and caregivers should recognize the symptoms immediately and help take the individual to a health facility

Figure 11: B.E.A.T. the Heat RCCE Framework



In February 2024, an online poll was conducted through the **U-Report platform** among young people on health stress to understand public knowledge before the heatwave. The poll generated participation from 30,983 U-Reporters across all eight divisions of Bangladesh. The findings revealed that 85% of the population recognized that the increased temperature was causing additional health problems, while 62% of the respondents reported experiencing health-related health impacts (fever, rashes, extreme fatigue, muscle cramps, heatstroke) themselves or within their family. Besides, a staggering 73% of the respondent are not familiar with any measures to avoid heat-related illness and 78% of the respondents also indicated not receiving any alerts or information regarding heatwaves.The overall findings reflect a need to raise public awareness about heatwave and equip people with the knowledge to avoid heat-related illness effectively, particularly for high-risk groups like pregnant mothers, newborns, children, and the elderly.

8.2 Identifying Target Groups

To design RCCE interventions at the national and local level, it is important to understand the primary audience for B.E.A.T. the heat framework, and the following table explains the primary audience in the Bangladesh context.

Table 3: Primary Audience for B.E.A.T. the Heat Framework

Occupational Groups	Age groups	Based on Health Status	Large scale social event during the heat session	Vulnerable Population	Frontline Worker
Farmers	Infant (parents/ caregivers)	Pregnant Women	Persons celebrating Bangla New Year	Dwellers of Heat prone areas	Health Service providers
Rickshaw puller	School Students	Lactating Mothers	Persons participating in Eid al-Fitr prayer	Dwellers of Char, Haor, coastal Areas	Police & other law Enforcement Providers
Construction & industry labour	Elderly Population	Co-morbid patient		Dwellers of Metropolitan cities / Slum residents	Community Service providers
Transport worker		People with disability		People residing in tin sheds without proper ceiling	
Hawkers (Pedlar) & day labour					

To reach out to the primary target groups through the RCCE interventions, it is central to mobilize community networks of health, agriculture, livestock, and other departments, teachers, management committee members for schools, colleges, and madrasa, religious leaders, local influentials, public representatives, youth groups, relevant government offices, media, and policymakers. It is also important to highlight that the primary audience mentioned above is not limited to the group specified here, it may include many more based on the context of the RCCE intervention.

8.3 Potential Channels for Communication and Engagement

At the national level, television, radio, social media platforms, mobile phone networks, and the private sector can be used to generate awareness and inform the at-risk population about the impact of heat and help them understand the symptoms, required actions, and moment to bring the individual to the health care facility or doctor. Along with government's communication and media networks, the engagement of private media houses and communication networks is vital to reach out to a large number of population at risk. At the divisional and local level, cable networks, radio, and social media platforms can also be utilized to cascade the impact of RCCE interventions, In addition to promoting heat stress-related risk communication, the **community networks of health, agriculture, livestock, and other departments, teachers, management committee members for schools, colleges, and madrasa, religious leaders, local influentials, public representatives, youth groups,** and other community networks can also be utilized to strengthen community engagement and actions to beat the heat. To ensure the effectiveness of the RCCE interventions, local evidence can also be generated through dialogue with the communities, social listening, interaction with the carers, health practitioners, and doctors to understand the community perceptions of the health impact of heat stress, and knowledge to identify the symptoms and take action. An interactive tool such as UNICEF's U-Report can also be deployed to generate such evidence at the national or local level to ensure effective RCCE interventions. During the generation of such evidence, community preferences on the channels of communication and engagement can also be identified to sustain the impact of the RCCE interventions.

Key Consideration for Heat Stress related risk communication and community engagement (RCCE)

- **Establish coordination** with relevant authorities and stakeholders in advance for coordinated RCCE interventions for heatwave
- **Follow the weather** forecast from the Bangladesh Meteorological Department (BMD)' to design any RCCE intervention or health advisory related to heatwave
- **Keep messaging** clear and short, contextualized as necessary for specific audiences, use plain language and avoid unnecessary jargon. Include high risk communities and vulnerable groups in the communication. Ensure pretesting of the contextualized messages
- **Consider low-cost,** low-tech, and actionable solution while developing RCCE interventions on heatwave
- **Adjust and contextualize** RCCE interventions for heatwave to include specific guidance for specific target groups that can be followed and maintained by them
- **Use a range of communication and community engagement channels** to maximize the reach and promoting actions on heatwaves

8.4 Coordination of Risk Communication and Community Engagement

To tackle the increased impact of heat stress on health, multi-sectoral engagement is critical at all levels for effective and successful RCCE interventions. **Therefore, robust coordination is important at national, divisional, and local levels to enhance the impact of RCCE interventions and protect the target groups from heat stress.**

DGHS already has a mechanism to coordinate RCCE interventions on public health issues at national level among different government ministries and departments including Ministry of information, Department of Mass communication, Bangladesh Television, Bangladesh Betar, Directorate of Primary Education, Directorate of Secondary & Higher Education, Islamic Foundation, Department of Agriculture, Agriculture Information Service, Private sector such as telecom operators, development partners such as UNICEF, WHO, volunteer networks such as Bangladesh Red Crescent Society, Bangladesh Scouts etc. This coordination

structure can also be mobilized to implement and coordinate the B.E.A.T. RCCE framework for heat stress.

In addition, approved messages and information from the RCCE coordination mechanism will also be useful for other coordination structures at the national level that may work with disaster risk reduction and climate change adaptation to ensure the population at risk is receiving necessary information in a coordinated manner that enables them to be aware, informed, and oriented to take the necessary action to reduce the impact of heat stress.

To strengthen the heat stress related to RCCE coordination, relevant departments, and ministries such as the Ministry of Women and Children Affairs, the Bangladesh Meteorological Department, the Department of Disaster Management, the Department of Livestock, and the Department of Environment also need to be involved, and more private sector partners such as large companies, BGMEA, and associations of workers can also be invited to promote comprehensive RCCE on heat stress. The principle of this RCCE coordination can also be cascaded at the divisional level under the leadership of the Divisional Director of health. Along with ensuring consistency in messaging and information, this coordination structure can also develop and implement a plan to reach out and engage at-risk communities through different channels to ensure people are in a better position to tackle heat stress.

The RCCE coordination can also use tool such as social listening to gather detailed real-time insights into public concern, emerging issues, information needs, and the spread of misinformation during heatwaves. The insights generated through social listening will help the RCCE coordination to develop evidence-based contents, and revise strategies where necessary for effective RCCE interventions.

8.5 Community Action to Reduce the Risk of Heat-Related Illness (HRI)

Community actions are crucial in reducing the impact of heatwaves on human health. Informed and awared individuals within the community can play a significant role by encouraging everyone to stay hydrated and providing clean drinking water to those in need. Additionally, they can advise people to take regular breaks from work during peak heat hours and establish community cooling centers in neighborhoods to provide temporary shelter for those seeking a break from the heat.

Furthermore, community members, especially youth groups, can organize themselves to regularly check on vulnerable groups such as the elderly, individuals with special needs, those with co-morbidities, children, pregnant mothers, etc. Their efforts can include raising awareness among the vulnerable population in the community about the impact of heat, ensuring access to life-saving supplies, and being aware of community support available, if assistance is needed to transfer individuals to the hospital. These proactive community actions can significantly mitigate the adverse effects of heatwaves on human health and well-being.

In the long term, community actions must consider following actions but not limited to increasing green spaces, planting trees, and buildings community spaces with natural cooling features, to help mitigate the heat island effect. In addition, the community can also be involved in developing and implementing heat action plans and ensuring healthcare facilities are prepared for managing increased cases of heat-related illnesses. Continuously educating the different groups of the community on coping mechanisms for heatwaves, engaging in community resilience efforts for heat, and advocating for supporting local initiatives to address heatwaves are also essential for the community to consider as a long-term intervention for heatwaves in Bangladesh.

8.6 Key Messages related to Heat Stress

Health care providers, carers, doctors, and practitioners will follow the key information to address heat stress and heat stress-related illnesses as part of their duties and responsibilities. However, to inform, aware, and orient the at-risk population, customized information and messages will be required to be shared and disseminated to the different target groups through various channels.

Some generic messages are suggested as guidance for national, divisional, and local-level RCCE interventions. It is important to highlight that the Risk Communication and Community Engagement (RCCE) platform at the national level may provide more specific messages and information considering different aspects and standards of the RCCE approaches. Usually, the messages are agreed upon and approved at the national level by the respective entities, and they communicate with all concerns through an official letter for wider dissemination and use at events and actions for community engagement. The following messages may be used with the guidance of the national-level RCCE platform and customization considering the standard RCCE approach:

- Too much heat is dangerous for one's health, especially for infants, children, pregnant women the elderly and co-morbid patients
- Children's bodies have more trouble regulating temperature than those of adults, and they rely on adults to help protect them from heat
- Check regularly to see if you or children, pregnant women, the elderly and co-morbid patients is thirsty, sweating, feeling hot, vomiting, has a dry and sticky mouth, or is experiencing headaches
- If you have other health issues, please consult your doctor about what to do before summer
- Children should not go outside unless necessary during extreme heat. Take a regular break from work in intense heat. Take care of pregnant mothers, children and the elderly
- Heat stress can cause mild health issues, like dehydration and higher body temperature, as well as severe issues, such as cardiovascular diseases, organ failure, muscle, and nerve dysfunction, and even death
- Severe symptoms of heat stress require urgent care. These symptoms include confusion or inability to respond, fainting, high body temperature, rapid heartbeat or breathing, seizures and even loss of consciousness
- Stay away from intense heat, rest occasionally in the shade
- Drink plenty of safe water. Avoid unhealthy drinks and foods. Bathe more than once if necessary
- Wear loose thin clothing in hot weather, avoid colored clothing if possible
- In a hot weather, if you recognize any of the sign such as sweating has stopped, sign of nausea, vomiting, severe headache, high body temperature, decreased urination, burning sensation in urine, confusion, or inability to respond, seizures and fainting, go to the hospital immediately and seek medical advice

In addition, target group specific messages such as Hajj pilgrims, educational institutions, at risk population and participants of the social, cultural, and religious gatherings are included as annex-1 of this guideline can be followed by the respective authorities to inform, aware and mobilize specific population.

Table 4: Risk Communication and Community Engagement (RCCE) Response Matrix for Different Phases of the Heat Stress/Heatwave

Phases of the Heatwave	Key Messages/Information for public	Responsible Stakeholders	Channels
Before heatwave	• Intense heat is harmful to the human body. Stay away from heat, take occasional rest in the shade. • Drink at least 2.5 to 3 litters of safe water in a day. Avoid unhealthy drinks and foods. Bathe more than once if necessary. • Wear light loose clothing in hot weather, avoid colored clothing if possible. • If you have other health issues, consult your doctor before summer about what to do in heatwave.	DGHS, DoAE, DoPE, DoSHE, DLS, BTV, Bangladesh Betar and other government departments with access to the communities. Non-government organizations. All the frontline workers of the Bangladesh Government including CHCP of DGHS. Social Media Platforms, Private television, FM radios, Telecom	Newspapers, radio, television, social media, Miking, Community Networks, Frontline workers, Community Clinic,
During the heatwave	• Drink at least 2.5 to 3 litters of safe water in a day. Avoid unhealthy drinks and foods. Bathe more than once if necessary. • Everyone should take regular rest while working in the intense heat. • Wear light loose clothing in hot weather, avoid colored clothing if possible. • Children face more problems regulating their body temperature than adults. Children should not go outside unless necessary during extreme heat. • Take special care of children, pregnant women, and the elderly. • If necessary, please call 16263 at the Health Help Line for medical advice	DGHS, BMD, Local Government Institutions, DoAE, DoPE, DoSHE, DLS, Islamic Foundation, DMC, BTV, Bangladesh Betar and other government departments with access to the communities. Non-government organizations. All the frontline workers of the Bangladesh Government including CHCP of DGHS. Youth and volunteers' network across the country. Social Media Platforms, Private television, FM radios, Telecom.	Miking, Dissemination through the religious institutions, Community Networks, Frontline workers, Community Clinic, Youth Network, Radio, Television, social media,
First Aid for Heat Cramps	• If someone show signs of heavy sweating with painful muscle pain or spasms in the abdomen, arms, or legs during or after activity in the heat, move him to a cool place as soon as possible. Offer him or her safe drinking water. Bring a source of air, such as a fan, to cool the body, use water if necessary. If heat cramps are continued more than an hour, take him or her immediately to the nearest health Centre. • If necessary, please call 16263 at the Health Help Line for medical advice.	DGHS, DoPE, DoSHE, DoY, DoL, BGMEA, REHAB Islamic Foundation, DMC, BTV, Bangladesh Betar and other government departments with access to the communities. Non-government organizations. Community Health Care Providers. Youth and volunteers' network across the country. Social Media Platforms, Private television, FM radios, Telecom.	Academic institutions, Community Networks, Frontline workers, Community Clinic, Youth Network, Radio, Television, social media,

Phases of the Heatwave	Key Messages/Information for public	Responsible Stakeholders	Channels
First Aid for Heat Exhaustion	• If someone shows signs of fatigue, excessive sweating, headache, a weak pulse, rapid breathing, excessive thirst, or dizziness during hot weather, remove him from the heat areas and move him to a cool place as soon as possible. • In case no response from the affected person in 30 minutes, bring a source of air, such as a fan, to cool the body and use water if necessary. Loosen the clothes. • In case person is responding, offer him or her safe drinking water. Take him or her to a doctor or the nearest health center further treatment.	DGHS, DoPE, DoSHE, DoY, DoL, BGMEA, REHAB Islamic Foundation, DMC, BTV, Bangladesh Betar and other government departments with access to the communities. Non-government organizations. Community Health Care Providers. Youth and volunteers' network across the country. Social Media Platforms, Private television, FM radios, Telecom.	Academic institutions, Community Networks, Frontline workers, Community Clinic, Youth Network, Radio, Television, social media,
First Aid for Heatstroke	• If someone shows signs of heatstroke such as nausea, vomiting, severe headache, increased body temperature, reduced urination, burning sensation during urination, abnormal behavior, and fainting, go to the hospital immediately and seek medical advice. • Call an ambulance, in absence of an ambulance transport him through the available means to the nearest hospitals. • If necessary, please call 16263 at the Health Help Line for medical advice.	DGHS, DoAE, DoPE, DoSHE, DoL, Local Government Institutions, BGMEA, REHAB DLS, Islamic Foundation, DMC, BTV, Bangladesh Betar and other government departments with access to the communities. Non-government organizations. All the frontline workers of the Bangladesh Government including CHCP of DGHS. Social Media Platforms, Private television, FM radios, Telecom.	IEC materials, Community Networks, Frontline workers, Community Clinic, Youth Network, Radio, Television, social media,

Notes: Messages needs to be contextualized for specific target groups mentioned at the 8.2 Identifying Target Groups. The proposed stakeholders and channels are suggestive only, any other appropriate channels can be used by the responsible stakeholders. The messages attached in Bangla are guidance only, in case of need for specific RCCE materials (such as poster, leaflet, miking script etc.), RCCE platform at DGHS can be contacted to receive materials for specific audiences.

Part C
MANAGEMENT PLAN

9 Spectrum of Heat-Related Illnesses

The HRI encompass a spectrum of disorders ranging from non–life-threatening conditions (heat edema, prickly heat, heat syncope, heat cramps, heat exhaustion and heat rash) to life-threatening heat stroke resulting from an increase in body temperature above a dangerous threshold.

These illnesses arise when there is a disruption in regulating the body's temperature because heat input from the environment and body metabolism is increased compared with output from the skin via radiation, evaporation, and convection.

Among Heat-Related illness, **heat stroke is a medical emergency** and may lead to mortality as high as 70%. However, if appropriate treatment is started without delay, survival rates can approach 100%.

9.1 Heat-Related Illnesses

i). Heat Edema

Mild swelling to the limbs during the first few days of heat exposure due to increased plasma volume, peripheral vasodilation and interstitial pooling of blood.

ii). Heat Rash (also known as prickly heat and miliaria)

An inflammatory disorder of the epidermis that results from blockage of sweat gland, may be followed by superimposed bacterial soft tissue infection. Symptoms can range from small blisters to deep inflamed lumps. Some forms of heat rash are very itchy, occur when sweat is trapped in the skin.

iii). Heat Cramps

Painful muscle spasms in the abdomen, arms, or legs during or after activity in the heat, which often occur when excessive amounts of sodium loss during sweating from physical exertion. Generally, occur after exercise in non-acclimatized individuals who sweat freely and replace loses with water or other hypotonic solutions, so they become salt depleted. Salt supplementation reduces the incidence.

iv). Heat Tetany

Heat tetany is usually related to short periods of stress in intense heat environments. Symptoms may include hyperventilation, extremity paresthesia, raspatory problems, numbness, tingling or muscle spasm/carpopedal spasm.

v). Heat Syncope

Brief loss of consciousness due to vasodilation and pooling of blood in the limbs as a result of physiological compensation to heat exposure.

vi). Heat Exhaustion

Characterized by decrease in body water content or blood volume due to water or salt depletion from heat exposure. It is an inability to continue an activity due to heat stress. It presents with thirst, profound fatigue, weakness lethargy, headache, nausea or dizziness (or a combination of these

symptoms) but importantly a normal mental status. Mild elevation (<40°C) in body temperature may be present. Some literature describes it as benign as it may be protective in the development of heat stroke, causing an individual to stop an activity and thus the generation of Heat Stroke.

vii). Heat Stroke

Neurological impairment with core body temperature ≥ 40°C (rectal temperature is gold standard in a pre-hospital environment). Symptoms can involve a coarse muscle tremor, confusion, aggression and loss of consciousness. Sweating may be absent due to dehydration and failure of thermoregulatory mechanisms.

Heat stroke, the most serious heat-related illness, is subcategorized as "classic" or "exertional"; the former is typically observed in patients with preexisting conditions and the latter primarily in healthy persons who exceed thermoregulatory boundaries owing to increased metabolic heat generation from performing demanding physical tasks, often but not necessarily in conjunction with exposure to high ambient temperature. Both conditions lead to a similar cascade of physiologic abnormalities caused by a failure to dissipate excessive body heat, including a decrease in central venous pressure, the onset of cellular and organ dysfunction, injury to the gastrointestinal tract and resulting endotoxemia, triggering of a systemic inflammatory response, and elevation of the core body temperature[19].

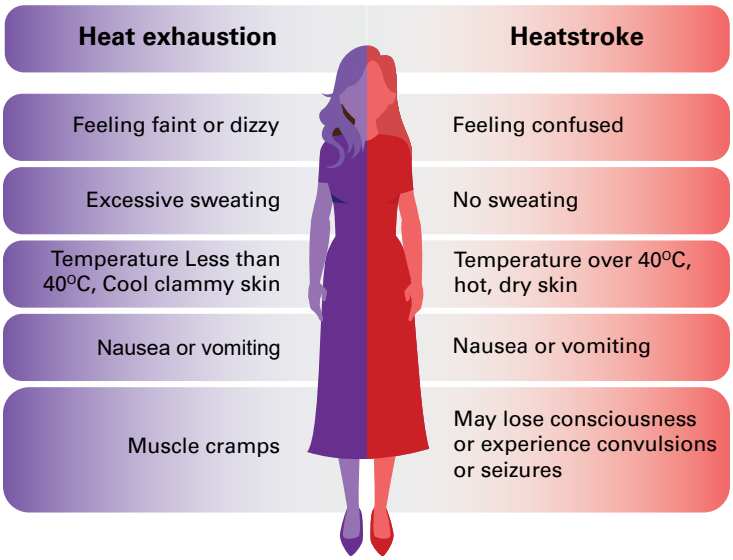
Heat stroke is a medical emergency that requires rapid recognition and treatment to prevent permanent complications and death; mortality from classic heat stroke approaches 80% and, for exertional heatstroke, 33% in the absence of prompt treatment. The hallmark of heat stroke is the combination of central nervous system dysfunction and a core body temperature of greater than 40°C.

Beyond traditionally recognized heat-related illnesses, many diseases are "heat sensitive," meaning that they are exacerbated or triggered by exposure to heat. Multiple studies have shown increases in the occurrence and exacerbations of a wide range of conditions during periods of high temperature, including ischemic heart disease, cardiac dysrhythmias, ischemic stroke, asthma and chronic obstructive pulmonary disease, respiratory tract infections, hyperglycemia, kidney failure, neuropsychiatric disorders (e.g., psychosis, suicides, homicides, anxiety, and depression), and adverse birth outcomes, such as preterm delivery and small-for-gestational-age infants.

- A multisystem, life-threatening illness characterized by elevation of the core body temperature (to >40°C) and CNS dysfunction
- **Classic heat stroke:** most often occurs among older persons with compromised behavioral and physiological compensatory responses to heat exposure
- **Exertional heat stroke:** most often occurs among healthy persons during extreme physical exertion, which results in excessive metabolic heat generation, often but not always with concomitant ambient heat exposure

[19]Treatment and Prevention of Heat-Related Illness | NEJM; Cecilia Sorensen, M.D., and Jeremy Hess, M.D., M.P.H.

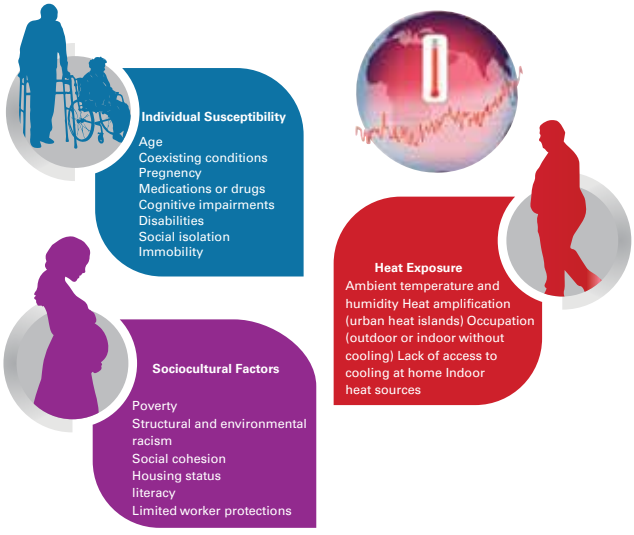
Figure 12: Difference in Heat Exhaustion and Heatstroke[20]



9.2 Risk Factors for Heat-Related Illnesses

The risk of heat-related illness results from a combination of individual susceptibility, endogenous and exogenous heat exposure, and sociocultural factors that affect the ability to adapt. Older persons (>65 years of age), young children, infants, pregnant women, persons with preexisting medical conditions (including obesity) or disabilities, outdoor workers, and athletes are at increased risk, as are persons living in lower-income households and some communities of color.

Figure 13: Key Factors Affecting the Risk of Heat-Related Illness



i). Age older than 65 years or younger than 15 years and pregnant women

ii). Strenuous outdoor activity during hottest daytime hours

iii). Diabetes Mellitus

[20]Source: NNS

iv). CVD patients (IHD, Stroke etc.)

v). Chronic lung diseases (COPD, Bronchial Asthma, Bronchiectasis etc.)

vi). Obesity

vii). Mental illness

viii). Physical disabilities/impaired mobility

ix). Frail

x). Urban residence or living on higher floors

xi). Cognitive impairment

xii). Drugs:

- Antidepressants e.g. SSRI, TCA
- Antipsychotics
- Anticholinergics e.g. Oxybutynin, Diphenhydramine, Benztropine
- Diuretics e.g. loop diuretics and thiazide diuretics
- Antihypertensives e.g. ACE inhibitors, Beta blockers, Calcium Channel blockers

xiii). Recreational agents: Alcohol, Cocaine, Amphetamine

10 Clinical Manifestation and Management of HRI

Table 5: Clinical Manifestation and General Management of HRI

Clinical Entity	Cardinal Symptoms	Investigations	Management
Heat Oedema	• Mild swelling of feet, ankle and hands • Appears in a few days of exposure to the hot environment • Does not progress to pretibial region	Usually does not require any investigation	• Avoid hot environment as far as possible • Drinking plenty of fluids • Keeping cool • Wearing loose cotton, light colored clothing and comfortable shoes • Minimum gentle exercise or physical activity to encourage blood flow • Usually resolves spontaneously within days to 6 weeks • Elevate leg • Compressive stocking • Diuretics are not effective

Clinical Entity	Cardinal Symptoms	Investigations	Management
Heat Rash/ Prickly Heat/ Miliaria[1]	• Pruritic, maculopapular, erythematous rash typically over covered areas of body • Itchiness- itchy rash with Small Red BUMPS at pores in the skin • Seen in the setting of heat exposure; bumps can sometimes be filled with clear or white fluid • Prolonged or repeated heat exposure may lead to chronic dermatitis		• Avoid hot environment as far as possible • Drinking plenty of fluids • Evaporative cooling • Wearing loose cotton, light colored clothing and comfortable shoes • Glucocorticoid and antibacterial cream as needed • Avoid topical emollient • Monitor for cellulitis
Heat Cramps	• Painful, involuntary, spasmodic contractions of skeletal muscle (calves, thighs and shoulder) • Occur in individuals sweating profusely and only drinking water or hypotonic solutions • Usually of short duration • Involve certain group of muscles		• Remove patient from heat • Rest in a cool environment • Oral fluid and salt replacement
Heat Tetany	• Hyperventilation • Paresthesia of the extremities • circumoral paresthesia • Carpopedal spasm		• Removing the affecting person from heat • Calm the patient to reduce respiratory rate • Fluid and salt replacement
Heat Syncope	• Postural hypotension (dizziness on standing from sitting) • Feeling hot and weak; lightheadedness followed by a brief loss of consciousness • Commonly in elderly age groups		• Removal from the heat • Treat with rest in supine position • Evaporative cooling • IV or oral rehydration • Elevate legs • Monitor vital signs • Rule out other causes of syncope

Clinical Entity	Cardinal Symptoms	Investigations	Management
Heat Exhaustion	• Profound fatigue • Sweaty/diaphoretic; flushed skin; hot skin; Normal Core Temperature; +/- • dazed, +/- generalized weakness, slight disorientation • Malaise, dizziness • Muscle cramps • Weakness • Nausea, Vomiting • Headache • Temperature less than 40°C or normal • No altered mental status • May progress to heat stroke if fails to improve with treatment • Sweaty, flushed and hot skin • Core Temperature less than 40°C • Slight disorientation		• Remove the patient from the heat stress area • Treat with rest in supine position • Evaporative cooling • Volume replacement (IV or oral) • Monitor mental status • If there is no response to treatment in 30 minutes, then aggressively cool the patient to a core temperature of 39°C
Heat Stroke	• Core body temperature more than 40°C/104⁰ F (Core Temp ≥40°C OR ≥104°F) • Hot dry skin • Signs of CNS dysfunction: Confusion, delirium, ataxia, seizures, coma. (altered mental status with disorientation, incoherent behaviour, Coma, Convulsion) • Other late findings: absence of sweating (anhidrosis) coagulopathy, multiple organ failure • Flushed, Dry Skin (not always) • tachycardia • +/- hypotension	• CBC • Arterial Blood Gases (ABG) • Random Blood Sugar • Serum electrolytes • LFTs • ECG • Coagulation Profile • Renal Function Tests • CPK/LDH/S. Aldolase • To exclude other conditions- Chest X-Ray, CSF Study, Brain Imaging	• Move the patient to cool environment • Manage airway, breathing, circulation • Rapid cooling with cold water or ice water immersion or other means • Administer IV rehydration and volume replacement • If there is no response to treatment in 30 minutes, then aggressively coo the patient to the core temperature of 39°C • ICU referral for end-organ sequelae

Potential Signs and Symptoms of Heat-Related Illnesses in all Populations, Infants and Children, Adolescents and Pregnant Women is given at Annex-2 and symptoms categorized by mild and severe symptoms is at Annex-3.

11 Diagnostic Tests for Heat Stroke

There is no specific diagnostic test for heatstroke. However, laboratory tests are available to detect end-organ damage secondary to the metabolic derangement and rule out other differential diagnoses of hyperthermia and CNS dysfunction. The following laboratory investigations need to be done.

Sl. No	Laboratory Investigation	Rationale
1	**Arterial Blood Gases (ABG)**	To detect hypoxaemia in a patient with continuous seizure or inadequate respiration secondary to brain injury. Metabolic acidosis (due to lactic acidosis) can occur secondary to acute renal impairment.
2	**Random Blood Sugar**	Exclude diagnosis of hypoglycaemia in unconscious patient and also hyperglycaemia in a patient with underlying diabetes or undiagnosed diabetes.
3	**Serum Electrolytes**	**Sodium** Detection of hypernatremia or hyponatremia due to reduced intake of fluid and dehydration, and guide the choice of fluid for resuscitation. **Potassium** To detect hypokalemia or hyperkalemia that occurs in early phases of heatstroke, muscle damages and during treatment. **Calcium** Hypocalcaemia occur due to the binding of calcium to damaged muscles.
4	**Liver Function Test (LFT)**	Hepatic injury is a consistent finding in patients with heatstroke. Aspartate aminotransferase [AST] and Alanine aminotransferase [ALT] levels commonly rise to thousands during the early phases of heatstroke and peak at 48 hours. However, sometimes they may take as long as 2 weeks to peak. Jaundice may be striking and maybe noted 36-72 hours after the onset of liver failure.
5	**Coagulation Profile**	Direct thermal injury also leads to the denaturation of proteins exhibited by dysfunctional enzymes. Any derangement of coagulation is a sign of poor prognosis.

Sl. No	Laboratory Investigation	Rationale
6	**Complete Blood Count**	Thermal injury to vascular endothelium causes platelet aggregation and deactivation of plasma protein leading to platelet aggregation and decreased clotting factor. Total white cell count (as high as 40,000/µL) may be elevated due to infection and thrombocytopenia. Also, there is haemo concentration which is indicated by elevated PCV and Hb.
7	**Renal Function Test (RFT)**	Acute kidney injury may be due to inadequacy of volume, dehydration, rhabdomyolysis, or direct thermal injury to renal parenchyma. Elevations in serum uric acid levels, blood urea nitrogen, and serum creatinine are standard in patients whose clinical course is complicated by renal failure.
8	**Cerebrospinal Fluid Analysis**	Cerebrospinal fluid (CSF) cell counts may show a nonspecific pleocytosis, and CSF protein levels may be elevated as high as 150 mg/dL. This test may be considered in patients with whom CNS infection has been kept as a possibility.
9	**Muscle Function Tests**	Creatinine kinase (CK), Lactate dehydrogenase (LDH), Aldolase, and Myoglobin are commonly released from muscles when muscle necrosis occurs. CK levels exceeding 100,000 IU/mL are typical in patients with exertional heatstroke. Elevations in myoglobin may not be noted despite muscle necrosis because myoglobin is metabolised rapidly by the liver and excreted rapidly by the kidneys.
10	**Electrocardiography (ECG)**	Arrhythmias is one of the complications of heatstroke. Also, rule out underlying cardiac disease / myocardial injury.
11	**Imaging studies**	**Chest X-ray** CXR carried out to detect the presence of atelectasis, pneumonia, pulmonary infarction and pulmonary oedema, complementing clinical examination. **CT Scan** CT scan can be performed once the patient is hemodynamically stable and is helpful to rule out intracranial bleeding in a patient who does not show improvement in neurological signs.
Specific for Pregnant Women		
12	**Cardiotocography (CTG) test**	To monitor the fetal heartbeat, cardiac activities, and contractions of the uterus during heat stress.
13	**USG of Pregnancy profile/Bio- physical profile**	To monitor and detect the fetal distress, fetal growth etc.

12 Assessment of Heat Stroke: Adult Populations

12.1 Primary Assessment

- Prompt diagnosis based on focus history (heat exposure or heat exertion)
- Clinical assessment is vital in ensuring improved clinical outcome
- Effective cooling measures
- Avoiding a series of metabolic event that may progress into irreversible injury and death
- At the scene of incidence/PHC, detect the clinical syndrome of heat exhaustion/heat stroke
- Initiate effective cooling measures immediately, subsequently
- Transfer to nearest appropriate hospital for definitive treatment

Figure 14: Assessment Workflow of Heat Stroke in Adult Population

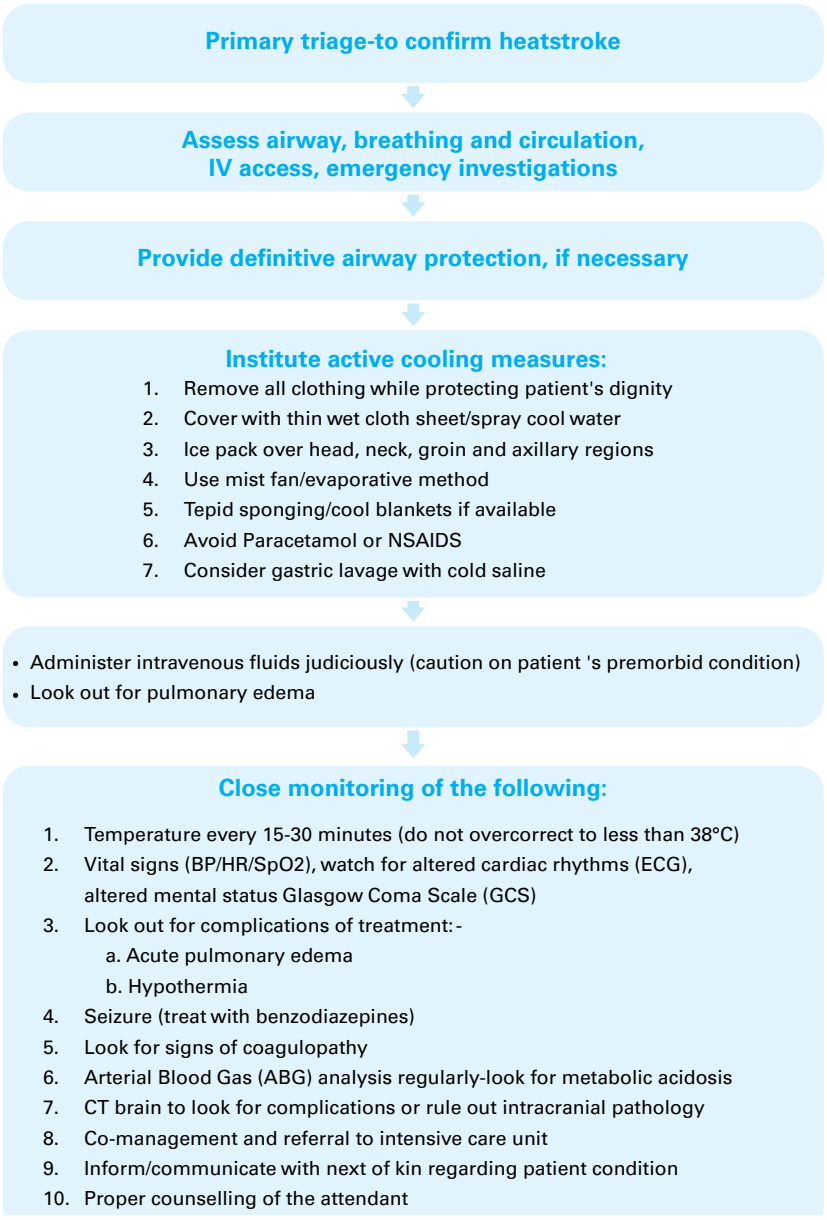
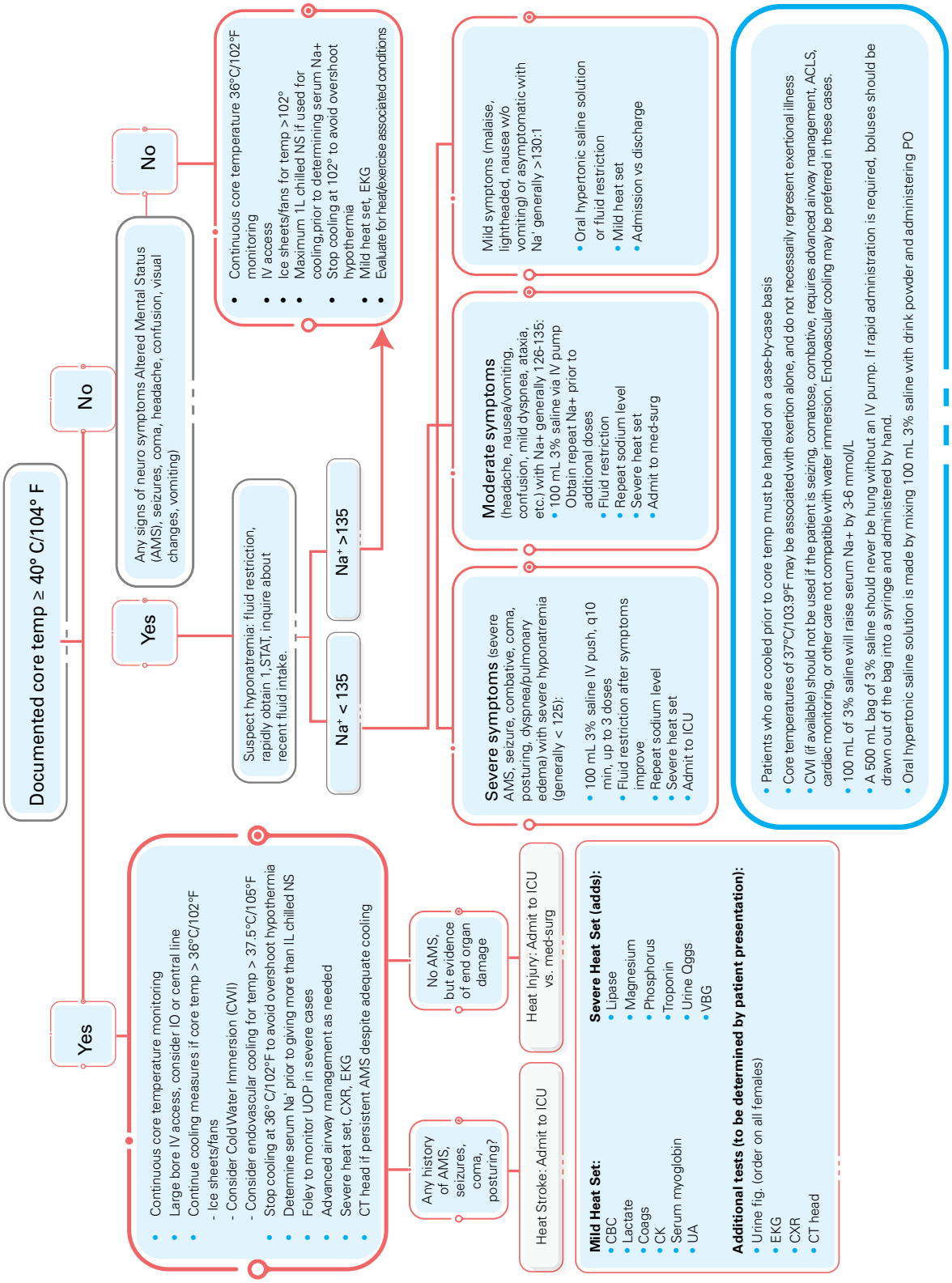


Figure 15: Case Management Flow for Diagnosing and Treatment of Heat-Related Illness Patients[21]



[21]Endorsed by the Warrior Heat- and Exertion-Related Event Collaborative (WHEC) and USU/CHAMP (Current 16 March 2020)

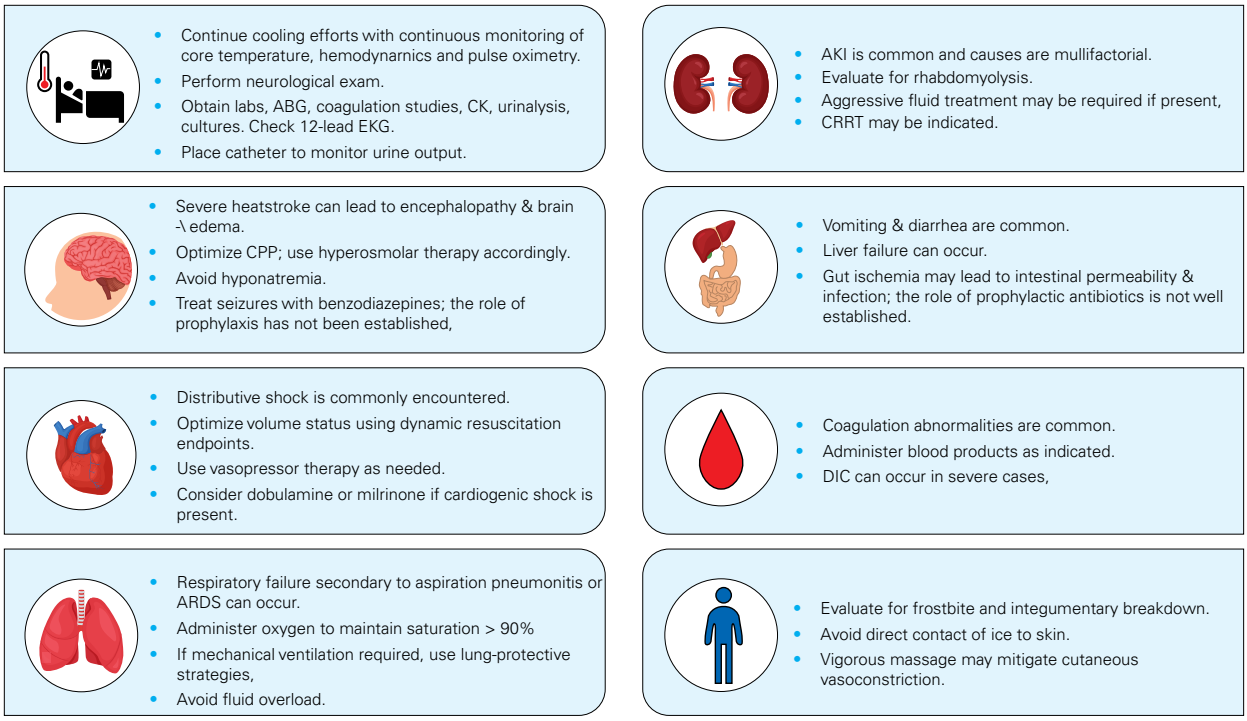
12.2 Indications for Hospitalization

- Heat Stroke
- Heat Exhaustion
- Heat Syncope

12.3 Indication of Referral to ICU

- End organ damage.

Figure 16: Overview of ICU Management[22]



AGB=Arterial Blood Gas; ARDS=Acute Respiratory Distress Syndrome; AKI=Acute Kidney Injury; CK=Creatine Kinase; CPP=Cerebral Perfusion Pressure; CRRT=Continuous Renal Replacement Therapy; DIC=Disseminated Intravascular Coagulation; EKG=Electrocardiogram

12.4 General Preventive Measures

- Keeping living spaces cool with fans, air conditioning and misting
- Decreasing/rescheduling the exercises or strenuous activities for cooler parts of the day
- Wearing clothing that is light colored and loose fitting
- Increasing carbohydrate intake and decreasing protein intake to decrease endogenous heat production
- Drinking plenty of electrolyte rich fluids, even when not thirsty
- Avoiding alcoholic beverages because they promote dehydration
- Avoiding direct exposure to the sun
- Rest in shade at regular interval during work

[22]http://journals.lww.com/ccmjournal by BhDMf5ePHKav1zEoum1tQfN4a+kJLhEZgbsIHo4XMi0hCywCX1AWnYQp/IlQrHD3i3D0OdRyi7TvSFl4Cf3VC1y0abggQZXdtwnfKZBYtws=on 04/02/2024

13 Management of Heat-Related Illness: Pregnant Women[23]

13.1 Recommendations for Providing First Aid to Pregnant Women with HRIs[24]

Table 6: Flow Chart for Providing First Aid to Pregnant Women

■ **High severity and urgency**

Step 0 **Cool and rush to a health facility if severe**	**Take to a health facility:** • If a pregnant woman is confused or not responding; is having seizures; has a high body temperature, especially with no sweat; has rapid heartbeat or breathing; is fainting; or has early contractions or intense cramping • It is important to cool the body immediately if they are experiencing severe symptoms of HRI • For this, have the woman sit or lie down in a cool, shaded area with good ventilation. Close curtains to create more shade. If there is a fan or air conditioner in the house, turn it on. Apply wet towels or cloth to the skin at head, neck, armpits and groin. If available, apply cold water and ice over the body • **Pregnant women:** have them remove excess layers of clothing in a private area (if possible). Have them sleep on their left side or leaning to the left • If unconscious or vomiting, lay the person on their side until transport arrives • If no severe symptoms, continue to step 1
Step 1 **Reduce temperature**	• Move the person into a cool, shaded area with good ventilation. Don't cover the body with the blanket Close curtains to create more shade. If there is a fan or air conditioner in the house, turn it on • **Pregnant women:** Apply wet towels or cool water to the body, particularly at head, neck, armpits and groin. Keep changing the cloths or dipping them in cool water every few minutes to provide cool water for the body. Ask about heat rashes and any contractions they may have experienced. Check for swelling at hands, wrists, ankles, and feet. Hands and feet can be put into containers of cool water to help improve bodily comfort Use a misting spray to spray cool water onto the body and dry it off with a fan running at the same time. Place ice or a wet towel on the neck, armpits or groin with the fan running as well. Help fan the body manually if no electric fan is present • **Do not give paracetamol without advice of health provider.**
Step 2 **Rehydrate**	• **Pregnant women:** Supply water or support the family in sourcing water from the nearest safe water source. Add ORS to water if excessively sweating. If no premade ORS is available: • Give the woman a drink made with 6 level teaspoons of sugar and 1/2 level teaspoon of salt dissolved in 1 litre of clean water • Have pregnant women drink 100 millilitres of ORS every 5 minutes until they seem better
Step 3 **Remind**	• **Finish providing first aid by sharing a list of recommendations on how to prevent future heat stress** • Go through the list of symptoms of heat stress as well as recommendations for how to stay safe and protect pregnant women and children right before and during extreme heat periods

Instructions for Front Line Workers and Care Givers

Front-line workers and caregivers should aim to stock or always carry with them the following during extreme heat periods:

- Water bottle with drinking water: to rehydrate people experiencing heat stress
- Small towels: to use to cool down overheated bodies
- ORS packets: to mix into water for overheated/dehydrated individuals
- Optional: Thermometer: to check temperature outside as well as inside houses, and other spaces

If the patient is presenting severe symptoms the care giver should either call for ambulatory services or arrange for other transport of the patient to the health facility immediately.

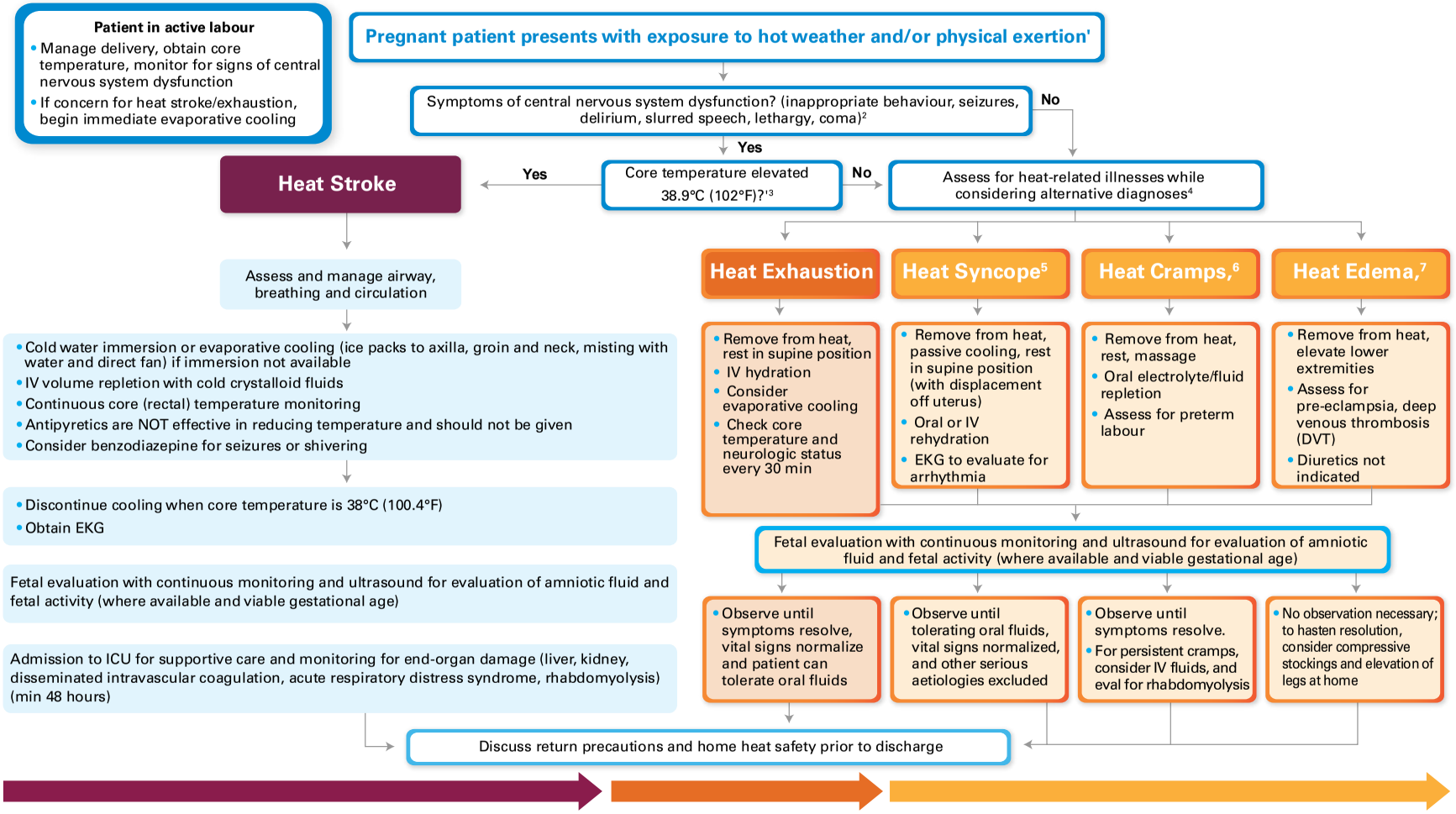
[23]Referenced symptoms taken from CDC, WHO and American Pediatric Association.

[24]World Health Organization Regional Office for Europe, Public Health Advice on Preventing Health Effects of Heat: New and updated information for different audiences, WHO/Europe, Copenhagen, 2011.

13.2 Case Management Flow for Diagnosing and Treatment of HRI in Pregnancy

Pregnant women are considered vulnerable to extreme heat because ambient heat exposure has been linked to pregnancy complication related to mother and fetus.

Figure 17: Case Management of Heat-Related Illnesses in Pregnant Women[25]



[25]Protecting Children from Heat Stress; A technical note; © UNICEF, May 202

Other conditions need to be considered

1. Pregnant patients may present with myriad symptoms, including contractions/pelvic cramping or high body temperature. Evaluate for active labour
2. Symptoms of central nervous system dysfunction may be subtle and can manifest as impaired judgment or inappropriate behaviour, or more neurologic symptoms may be present, such as seizures, delirium, hallucinations, balance issues, slurred speech or coma
3. Keep in mind that some cooling may have occurred during transportation and the temperature may be less than 38.9°C at the time of presentation. If in doubt, treat for heat stroke
4. Assess for differential diagnosis if the patient presents with altered consciousness and/or elevated core temperature, such as severe traumatic brain injury (often accompanied by hyperthermia), infectious diseases (sepsis), toxic overdose, meningitis/encephalitis, serotonin syndrome, neuroleptic malignant syndrome, thyroid storm, etc.
5. Heat Syncope: Alternative life-threatening diagnoses to consider include: pulmonary embolism, aortic dissection, coronary dissection, amniotic _uid embolism, uterine rupture, placental abruption, and ruptured ectopic
6. Heat Cramps: Alternative life-threatening diagnoses to consider include: HELLP syndrome, uterine rupture, ruptured ectopic, and placental abruption
7. Heat Oedema: Alternative diagnoses to consider include: pre-eclampsia, deep venous thrombosis (DVT), and Mirror Syndrome

13.3 Health Provider Checklist for Discharge of Pregnant Women

Actions	Tick
Discuss comorbidities and social factors with caregiver that may increase the pregnant woman's risk of HRI	
Review recommendations to PREVENT future HRI and schedule any follow-ups during cooler parts of the day, week or month (can use list of messages in Section 3, under 'BE AWARE of heat stress and protect yourself')	
Review signs and symptoms and the 'B.E.A.T. the Heat' risk communication framework with the pregnant woman; emphasize the importance of immediately cooling the body and maintaining access to water	
Ensure patient has a cool environment to return home to OR access to a nearby cooling facility; if not, advise on how to stay cool using feet immersion, fans, towels, baths, sprays, curtains, etc.	
Ensure family is being visited by a community health worker and has their contact information (if relevant to the community)	
Recommend making follow-ups and prenatal visits in the cooler parts of the day or week	
Write a prescription with advice for woman and family members to keep handy	

13.4 Specific recommendations for pregnant women

- Sleep on left side to reduce the risk of supine hypotension
- If starting to feel overheated, can place hands or feet in cool water for 20 minutes or so for relief, or use wet towels with a fan on
- It is OKAY to exercise at light and moderate intensity, as long as not feeling uncomfortable and hydrating properly

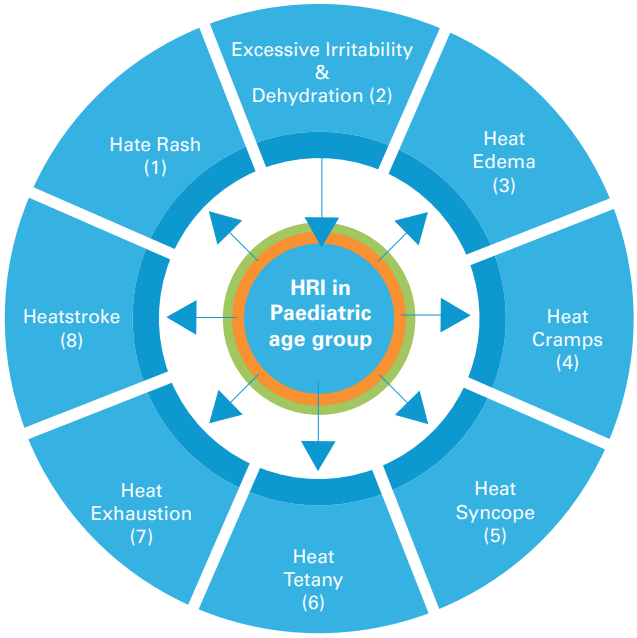
14 Management of Heat-Related Illness: Infants, Children and Adolescents

Heat-Related Illnesses (HRI) in children and adolescent age group encompass a spectrum of disorders from heat rash, heat syncope, and heat exhaustion to a life-threatening emergency such as heatstroke. Once symptoms are well understood in the community, if severe or dangerous symptoms are observed – whether at home, school, preschool or any other institution – it is important for caregivers and front-line workers to immediately triage and provide first aid treatment to the individuals and assist them in going to the health facility.

14.1. Danger Signs

- Refusal to feed; Vomits everything, Shrunken eyes
- Excessive irritability
- Decreased urine output
- Dry oral mucosa & absence of tear/sunken eyes
- Lethargy/altered sensorium
- Seizures
- Bleeding from any site - seek immediate medical help if danger signs are present

Figure 18: Spectrum of HRI in Infants, Children and Adolescents



14.2. Assessment for HRI in Infants, Children and Adolescents

When heat illness is suspected, document the temperature. For suspected heat exhaustion or heat stroke do Electrolyte, Arterial Blood Gas (ABG) and RBS. Signs, symptoms and investigation findings for each stage of heat illness:

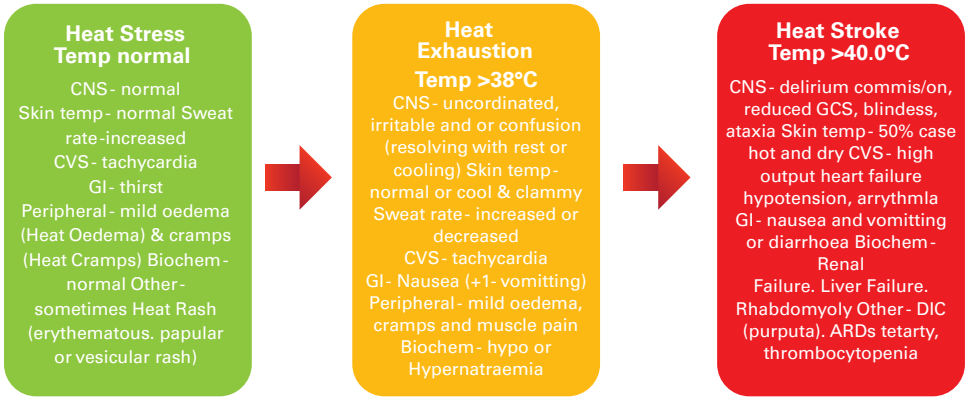


Table 7: Flow Chart for Providing First Aid to Infants, Children and Adolescents

Step 0 **Cool and rush to a health facility if severe**	**Take to a health facility:** • **If a child or infant is confused or not responding; is having seizure; has a high body temperature, especially with no sweat; has rapid heartbeat or breathing; or has a sunken forehead** • **It is important to cool the body immediately if they are experiencing severe symptoms of HRI** For this, have the infant, child or adolescent sit or lie down in a cool, shaded area with good ventilation. Close curtains to create more shade. If there is a fan or air conditioner in the house, turn it on. Apply wet towels or cloth to the skin at head, neck, armpits and groin. If available, apply cold water and ice over the body. **Infants and children:** have caregivers remove outer layers of clothing. If unconscious or vomiting, lay on their side until transport arrives. If no severe symptoms, continue to step 1.
Step 1 **Reduce temperature**	Move the person into a cool, shaded area with good ventilation. Close curtains to create more shade. If there is a fan or air conditioner in the house, turn it on. **Infants and children:** Apply wet towels or cool water to the body, particularly at head, neck, armpits and groin. Keep changing the cloths or dipping them in cool water every few minutes to provide cool water for the body. If the child is young, ask the caregiver what symptoms they have noticed. **Do not** immerse infants and young children into very cold water. **Do not** point fan at the face, especially with infants. **If the nose is bleeding,** tilt the head slightly forward and pinch the soft part of the nose for 10 minutes. Catch blood in napkin or cloth. Hands and feet can be put into containers of cool water to help improve bodily comfort. Older children and adults can be immersed into cool (but NOT ice cold) water if available, in a bathtub or bucket or running water spray, or put under a cold shower. Use a misting spray to spray cool water onto the body and dry it off with a fan running at the same time. Place ice or a wet towel on the neck, armpits or groin with the fan running as well. Help fan the body manually if no electric fan is present. **Do not give paracetamol without advice of health provider.**

Step 2 Rehydrate	**Infants under 6 months:** Breastfeed to rehydrate the infant. Encourage mother to drink more water, especially if breastfeeding. **Older infants and children:** Given your infant or child water in small amounts to help them become used to it. If the child has sweated a lot or is sweating a lot, add some Oral Rehydration Salt (ORS) to the water for the child. Carefully follow the directions on the packet. If there are no directions, use the following guidance: • A child under the age of two years needs at least 1/4 to 1/2 of a large (250 ml) cup of the ORS drink • A child aged two years or older needs at least 1/2 to 1 whole large (250 ml) cup of the ORS drink If no premade ORS is available dissolve six level teaspoons of sugar and 1/2 level teaspoon of salt in 1 litre of clean water. **Older children** and pregnant women: Add ORS to water if excessively sweating. They should drink 100 ml of ORS every 5 minutes until they seem better.
Step 3 Remind	**Finish providing first aid by sharing a list of recommendations on how to prevent future heat stress.** Go through the list of symptoms of heat stress as well as recommendations for how to stay safe and protect infants, children and adolescents right before and during extreme heat periods (found in 'BE AWARE of heat stress and protect yourself' subsection above).

14.3. Clinical Workflow in Emergency Department for Management of Heatstroke in Infants, Children and Adolescents[26]

Primary triage-confirm heatstroke

- Assess the airway, breathing, circulation, and (neurologic) impairment, ensure IV access and send relevant investigations
- Consider intubation if necessary
- Consider benzodiazepines for seizures, or excess shivering

Shock:

- Normal saline bolus @ 20 ml/kg and reassess
- Repeat bolus if necessary up to total of 60 ml/kg
- Watch for features of fluid overload
- Continue normal maintenance fluid

No shock:

- Assess dehydration status, correct and start normal maintenance fluid

Institute active cooling measures:

- Removal of all clothing while protecting patient's dignity
- Cover with thin wet sheet and spray cool water
- Ice pack over head, neck, groin and axillary regions
- Use mist fan/evaporative method
- Tepid sponging/cool blankets if available
- Make the child lie down; raise the feet slightly
- Avoid Paracetamol or NSAIDS
- Consider gastric lavage with cold saline

Close monitoring of the following:

- Temperature every 15-30 minutes (do not overcorrect to less than 38°C). Even hypothermia can be fatal in children
- Vital signs (BP/HR/SpO:), watch for altered cardiac rhythms (ECG), altered mental status (GCS)
- Look out for complications of treatment: -
  - Acute pulmonary Oedema
  - Hypothermia
- Seizure-treat with benzodiazepines (Midazolam 0.1-0.2 mg/kg/dose slow over 5 minutes I/V or Lorazepam 0.05-0.1 mg/kg/dose over 2-5 minutes I/V
- Prevent shivering (by paralyzing patient if intubated)
- Look for signs of coagulopathy
- Arterial Blood Gases (ABG) regularly-look for metabolic acidosis
- CT brain-to look for complications or rule out intracranial pathology
- Continue management and referral to intensive care unit
- Inform/communicate with next of kin regarding patient condition & prognosis

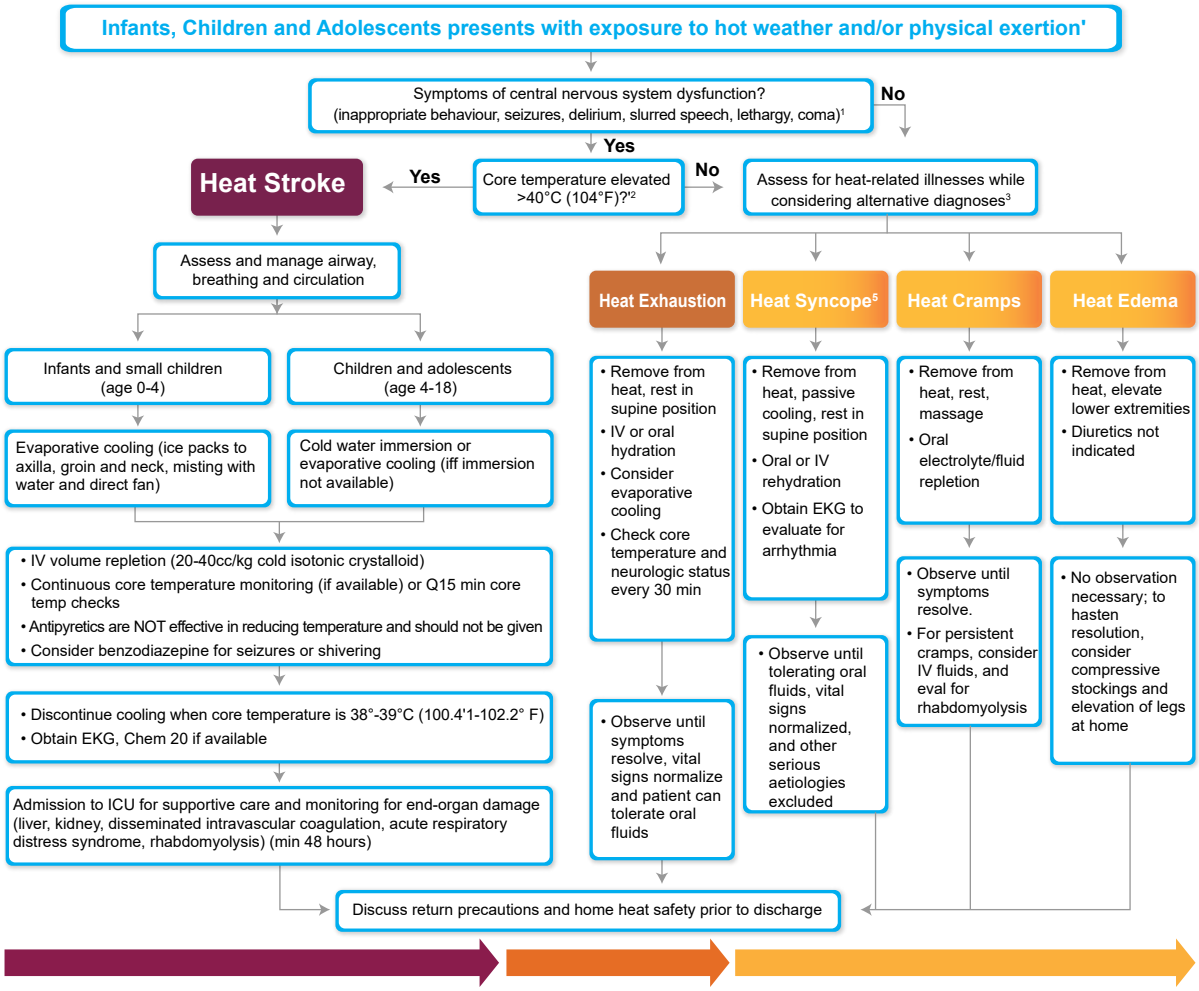
[26]https://pubmed.ncbi.nlm.nih.gov/30824495/

14.4 Case Management Flow for Management of HRIs in Infants, Children and Adolescents

When infants, children and adolescents are admitted as patients to a health facility, it is important to ensure that they are assessed immediately for any HRIs. To properly diagnose patients, clinicians and other health facility staff need to become familiar with the case management flow that is recommended for infants, children and adolescents admitted to their facilities with symptoms of heat stress.

The flow chart demonstrates how these populations can be triaged and treated at the health facility based on a hierarchy of symptom assessment. This is followed by footnotes relevant to better understanding and interpreting the instructions in the flow charts, as well as a checklist for clinicians to go through prior to discharging the patient.

Figure 19: Case Management of Heat-Related Illnesses in Infants, Children and Adolescents[27]



1. Symptoms of central nervous system dysfunction may be subtle and can manifest as impaired judgment or inappropriate behavior. However, children commonly present with more significant neurologic symptoms such as seizures, delirium, hallucinations, balance issues, slurred speech or coma.
2. Keep in mind that some cooling may have occurred during transportation and the temperature may be less than 40°C at the time of presentation. If in doubt, treat for heat stroke.
3. Assess for differential diagnosis if the patient presents with altered consciousness and/or elevated core temperature, such as severe traumatic brain injury (often accompanied by hyperthermia, infectious diseases (sepsis), toxic overdose, meninoitisienceohalitis. serotonin syndrome. neuroleptic malignant syndrome. thyroid storm. etc.

[27]Protecting Children from Heat Stress; A technical note; © UNICEF, May 2023

14.5 Checklist During Management

a). For Heat stroke every 15 minutes

b). For Heat Exhaustion every 30 minutes

- If the child can take fluid /food orally or not
- Temperature status
- Dehydration status
- Mental status
- BP measure
- Pulse rate
- Respiratory rate
- Urine output

14.6 Discharge Criteria

- Child can take food orally
- Temperature. BP rate, Pulse rate, Respiratoty rate and Urine output normal according to the age at least for 24 hours

14.7 Health Provider Checklist for Discharge of Infants, Children and Adolescents

Once the infant, child or adolescent is stabilized and/or provided the necessary treatment, the health provider is recommended to go through the following checklist before discharging and complement it with key risk communication messaging for the caregiver.

Actions	Tick
Discuss comorbidities and social factors with caregiver that may increase child's risk of HRI	
Review recommendations to PREVENT future HRI and schedule any follow-ups during cooler parts of the day, week or month (can use list of messages in under 'BE AWARE of heat stress and protect yourself')	
Review signs and symptoms of HRI in infants, children and adolescents and 'B.E.A.T. the Heat' risk communication framework with caregiver to facilitate treatment of mild symptoms at home; advise caregiver to return to health facility if they observe any severe symptoms	
Ensure patient has a cool environment to return home to OR access to a nearby cooling facility; if not, advise on how to stay cool using fans, towels, baths, sprays, curtains, etc.	
Ensure family is being visited by a community health worker and has their contact information (if relevant to the community)	
Write prescription with advice for caregiver and other family members to keep handy	

14.8 Specific Recommendations for Parents/Caregivers

- DO NOT give infants and children paracetamol or other antipyretics at home if they are showing symptoms of heat stress again – implement the 'B.E.A.T the Heat' risk communication framework or bring to health facility if severe

15 Medications and Complications

When issuing a treatment, clinicians should note what medications and existing vulnerabilities can predispose individuals towards a greater risk of experiencing heat stress, or cause complications due to it.

Medication: Patients should be made aware of the effects of medications on body heat and dehydration. Patients should be encouraged to remain hydrated and to take all necessary breaks from heat exposure during their use. This will enable the patient to be more aware of what is contributing to their diagnosis and help them practice self-care outside of the health care facility.

Table 8: Mechanisms for Medication Increasing the Risk of Heat-Related Illnesses

Effect	Medication/Agent
Reduced vasodilation	Beta-blockers
Decreased sweating	Anticholinergics, e.g., tricyclic antidepressants and benztropine, beta-blockers, antihistamines, phenothiazines
Increased heat production	Antipsychotic drugs, e.g., risperidone and olanzapine; stimulants, e.g., amphetamine, cocaine, caffeine
Decreased thirst	Butyrophenones, e.g., haloperidol and droperidol; angiotensin-converting enzyme (ACE) inhibitors
Dehydration[79]	Diuretics, caffeine, alcohol
Aggravation of heat illness by worsening hypotension in vulnerable patients	Vasodilators, e.g., nitrates, calcium channel blockers, other antihypertensives
Increased toxicity for drugs with a narrow therapeutic index in dehydration	Digoxin, lithium, warfarin

16 Comorbidities and Health Emergencies Causing Excessive Mortality from Heat Stress

Many individuals are already more susceptible to extreme heat because they have pre-existing medical and health conditions that exacerbate the effects of heat stress; this could be due to infections or diseases triggering biological reactions that weaken the body's response to heat stress. Additionally, individuals living in areas affected by health emergencies can also face higher risk from heatwaves or extreme heat periods, as the diversion of resources to another emergency leaves fewer staff, rooms and materials available to treat heat stress.

Therefore, it is important for facilities to: a) have contingency plans in place to treat heat stress in vulnerable populations during any disease outbreaks; and b) be aware of comorbidities that might complicate the treatment of and recovery from heat stress. Table 10 shows chronic illnesses and impairments that can leave individuals at higher risk of experiencing HRIs.

Table 9: Medical Conditions that Put People at Increased Risk During Periods of Extreme Heat

Condition	Types
Chronic illnesses	Heart disease, high blood pressure, diabetes, cancer, kidney disease, alcohol and other substance use, mental illness, respiratory illnesses (e.g., asthma)
Conditions that impair sweating	Heart disease, dehydration, extremes of age, skin disorders (e.g., sunburn, prickly heat, excessive scarring and burns), congenital impairment of sweating, cystic fibrosis, Parkinson's disease, quadriplegia, scleroderma, people taking medications with anticholinergic effects, acute illness
Impaired activities of daily living	Poor mobility, cognitive impairment

In addition, lifestyles that are solitary or socially isolated can add to one's vulnerability, as can low socio-economic status, being employed in jobs requiring outdoor exposure – such as farming and construction work – and indoor environments without significant ventilation or mechanical cooling.

17 Illnesses with Similar Symptoms and Pathologies

Because most HRI symptoms are shared by other illnesses – such as headaches, high body temperatures and dizziness – there is a risk of misdiagnosing such illnesses as HRIs and vice versa. For example, sepsis, a life-threatening infection that can lead to tissue damage and organ failure, has overlapping symptoms and shared pathophysiological traits with heat stress. Symptoms of sepsis include high temperature, confusion and sleepiness, and shortness of breath. In pregnant women, pre-eclampsia can produce symptoms such as severe headaches, vomiting and sudden swelling of hands and feet. Maternal sepsis, which can also become a life-threatening condition, produces symptoms such as fevers, rapid heartbeat, dizziness, and fatigue – all common to heat exhaustion.

Therefore, it is important for health providers to carefully consider the manifesting symptoms, differences in the combination of symptoms, social and biological factors, as well as medical histories when diagnosing patients who are presenting HRI symptoms.

Annex – 1

Specimen Messages Related to Heat Stress

A). Heat Stress Related Messages in Bangla for Hajj Pilgrims

হজ্বের সময় তীব্র গরমের হাত থেকে রক্ষা পেতে এবং অসুস্থ রোগীকে সহযোগিতায় করণীয় সম্পর্কে নির্দেশিকাঃ

- অন্যান্য স্বাস্থ্যগত সমস্যা থাকলে হজ্বের পূর্বেই বিশেষ করে গরমের সময় করণীয় সম্পর্কে চিকিৎসকের পরামর্শ নিন।
- হজ্বের সময় তীব্র গরম থেকে দূরে থাকুন, রোদে সাদা রঙের ছাতা ব্যবহার করুন। মাঝে মাঝে ছায়ায় বিশ্রাম নিন। সুর্যের তাপ থেকে রক্ষা পেতে সুরক্ষামূলক ক্রীম ব্যবহার করুন।
- সারাদিনে কমপক্ষে ২.৫ লিটার থেকে ৩ লিটার নিরাপদ পানি পান করুন। অস্বাস্থ্যকর পানীয় ও খাবার পরিহার করুন। প্রয়োজনে একবারের বেশি গোসল করুন।
- কোন কোন হাজ্বী সাহেব হজ্বের বিভিন্ন বিধি বিধান যেমন তওয়াফ, সায়ী, কংকর নিক্ষেপ ইত্যাদি বিধান প্রচন্ড ভীড় ও গরমের মধ্যে আদায় করেন। কেউ কেউ আবার হজ্ব ও উমরার সময়কালে কষ্ট করে অনেক রাত পর্যন্ত জেগে থাকেন এবং যথেষ্ট পরিমাণ বিশ্রাম গ্রহণ করেন না, তাদের শরীর অনেক ক্লান্ত ও দুর্বল থাকে। সুস্থভাবে পবিত্র হজ্ব সম্পন্ন করার জন্য কম ভীড়ে হজ্বের বিধি বিধান পালন করার চেষ্টা করুন এবং প্রতিদিন পর্যাপ্ত পরিমাণ বিশ্রাম গ্রহণ করুন। নারী ও বয়স্কদের দিকে বিশেষ খেয়াল রাখুন।
- হজ্বে সময় কারো অত্যন্ত ক্লান্তি, অত্যাধিক ঘাম, পেশীতে ব্যাথা, দুর্বল স্পন্দন, দ্রুত শ্বাস প্রশ্বাস, অধিক তৃষ্ণা, মাথা ঘোরার মত লক্ষণ দেখা দিলে, তাকে অতি দ্রুত ঠান্ডা জায়গায় সরিয়ে নিন। তার জামা কাপড় ঢিলা অথবা খুলে দিন। শরীরকে ঠান্ডা করার জন্য বাতাসের উৎস যেমন এয়ার কন্ডিশন অথবা ফ্যানের সামনে নিয়ে আসুন, প্রয়োজনে পানি ব্যবহার করুন। নিরাপদ পানি অথবা জুস পান করতে দিন। প্রয়োজনে এ্যাম্বুলেন্স ডাকুন এবং নিকটস্থ স্বাস্থ্য কেন্দ্রে নিয়ে যান।
- গরমের সময় হিট স্ট্রোকের বিভিন্ন লক্ষণ যেমন বমি বমি ভাব, বমি হওয়া, প্রচন্ড মাথা ব্যাথা, শরীরের তাপমাত্রা বেড়ে যাওয়া, প্রসাব কমে যাওয়া, প্রসাবে জ্বালা পোড়া করা, অস্বাভাবিক আচরণ, ও অজ্ঞান হয়ে গেলে হলে দ্রুত নিকটস্থ স্বাস্থ্য কেন্দ্রে যান এবং চিকিৎসকের পরামর্শ নিন। স্বাস্থ্য কেন্দ্রে যাওয়ার জন্য প্রয়োজনে এ্যাম্বুলেন্স ডাকুন।

B). Heat Stress Related Guidance for Schools/Colleges/Madrasas in Bangla

তাপদাহের সময় শিক্ষা প্রতিষ্ঠানের জন্য নির্দেশিকাঃ

- তাপমাত্রা যখন ৪০-৪১.৯ ডিগ্রি সেলসিয়াসের মধ্যে থাকে, তখন তাকে তীব্র তাপপ্রবাহ বলা হয়। শিক্ষার্থীদের স্বাস্থ্য সুরক্ষায় তীব্র তাপপ্রবাহের সময় প্রাথমিক শিক্ষা অধিদপ্তর এবং মাধ্যমিক ও উচ্চশিক্ষা অধিদপ্তর শিক্ষা প্রতিষ্ঠান ছুটি দেয়া সহ অন্যান্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে পারে।
- এছাড়াও তাপদাহের সময় শিক্ষা প্রতিষ্ঠানে নিম্নে বর্ণিত ব্যবস্থা সমূহ গ্রহণ করা যেতে পারে।
- পর্যাপ্ত পরিমাণে নিরাপদ পানির ব্যবস্থা করা।
- শ্রেণী কক্ষে বাতাস চলাচলের ব্যবস্থা করা, প্রয়োজনে দরজা জানালা খোলা রাখা।
- প্রতিষ্ঠান চলাকালীন সময়ে কোন শিক্ষার্থী ও শিক্ষকের মাঝে গরম জনিত অসুখের লক্ষণ যেমন অত্যন্ত ক্লান্তি, অত্যাধিক ঘাম, পেশীতে ব্যাথা, দুর্বল স্পন্দন, দ্রুত শ্বাস প্রশ্বাস, অধিক তৃষ্ণা, মাথা ঘোরা দেখা দিলে অতি দ্রুত ঠান্ডা জায়গায় সরিয়ে নেয়া, শরীরকে ঠান্ডা করার জন্য বাতাসের উৎস যেমন ফ্যানের সামনে নিয়ে আসা, প্রয়োজনে পানি ব্যবহার, এবং পানি পান করানোর মত প্রাথমিক চিকিৎসা ব্যবস্থার বিষয়ে শিক্ষক, কর্মচারী ও শিক্ষার্থীদের অবহিত করা।
- শিক্ষা প্রতিষ্ঠান চলাকালীন সময়ে কেউ অসুস্থ হলে কোন চিকিৎসকের সাথে যোগাযোগ করবে এবং নিকটস্থ কোন স্বাস্থ্যকেন্দ্রে নিয়ে যাওয়া হবে তা পূর্বে থেকেই নির্ধারণ করে রাখা এবং তাদের সাথে যোগাযোগের নম্বর সবাই দেখতে পায় এমন জায়গায় লাগিয়ে রাখা।

- ছাড়াও শিক্ষকবৃন্দ শিক্ষার্থীদের গরমের সময়ে নিম্নে বর্নিত করণীয় সম্পর্কে নিয়মিত অবহিত ও কার্যকর ব্যবস্থা গ্রহণে উৎসাহিত করতে পারেন।
- সারাদিনে কমপক্ষে ২.৫ লিটার থেকে ৩ লিটার নিরাপদ পানি পান করুন। অস্বাস্থ্যকর পানীয় ও খাবার পরিহার করা। প্রয়োজনে একবারের বেশি গোসল করা।
- গরমের সময়ে ঢিলেঢালা পাতলা কাপড় পরা, সম্ভব হলে রঙ্গিন পোশাক এড়িয়ে চলা।
- তীব্র গরমের সময় প্রয়োজন না হলে ঘরের বাইরে না যাওয়া। তীব্র গরমে শরীর ঠান্ডা রাখার জন্য বাতাস চলাচল করে এমন জায়গায় বিশ্রাম নেয়া। গর্ভবতী মা, শিশু ও বয়স্কদের প্রতি যত্ন নেয়া।
- বাড়ীর কারো অন্যান্য স্বাস্থ্যগত সমস্যা থাকলে তাকে অনুরোধ করা গরমের পূর্বেই করণীয় সম্পর্কে চিকিৎসকের পরামর্শ নেয়া।

C). Heat Stress Related Guidance for at Risk Population

- বাংলাদেশ আবহাওয়া অধিদপ্তরের তথ্যমতে তাপমাত্রা যখন ৩৬-৩৭.৯ ডিগ্রি সেলসিয়াস হয়, তখন তাকে মৃদু তাপপ্রবাহ বলে। ৩৮-৩৯.৯ ডিগ্রি সেলসিয়াস তাপমাত্রাকে মাঝারি তাপপ্রবাহ বলা হয়। তাপমাত্রা যখন ৪০-৪১.৯ ডিগ্রি সেলসিয়াসের মধ্যে থাকে, তখন তাকে তীব্র তাপপ্রবাহ বলা হয়। এছাড়া, তাপমাত্রা ৪২ ডিগ্রি সেলসিয়াস বা তার বেশি হলে তাকে অতি তীব্র তাপপ্রবাহ বলে। ২০১৭ সাল থেকে ২০২৩ সাল পর্যন্ত বাংলাদেশে তীব্র তাপপ্রবাহ পরিলক্ষিত হয়েছে। সাধারণত এপ্রিল থেকে আগষ্ট মাস পর্যন্ত গরম বেশি অনুভূত হয়।
- রাজশাহী ও খুলনা বিভাগের বিভিন্ন জেলাসহ বাংলাদেশের যে সকল জেলার মানুষ তীব্র গরমের কারণে ঝুঁকিতে বসবাস করছেন, তাদের মাঝে স্বাস্থ্য বিভাগ, কৃষি বিভাগ, শিক্ষা বিভাগ, ইসলামিক ফাউন্ডেশন, গনযোগাযোগ অধিদপ্তর, ও অন্যান্য সরকারী বিভাগ এবং বেসরকারী সংস্থাসমূহের মাঠ পর্যায়ের কর্মকর্তা ও কর্মীদের মাধ্যমে জনসাধারণের করণীয় সম্পর্কে প্রচার, প্রচারণা ও জনসম্পৃক্ততামূলক কার্যক্রম পরিচালনা করা যেতে পারে। নিম্নে বর্নিত বার্তাসমূহ তীব্র গরম বিষয়ক প্রচার ও জনসম্পৃক্ততামূলক কার্যক্রমে ব্যবহার করা যেতে পারে।
- তীব্র গরম মানুষের শরীরের জন্য ক্ষতিকর। গরম থেকে দূরে থাকুন, মাঝে মাঝে ছায়ায় বিশ্রাম নিন।
- সারাদিনে কমপক্ষে ২.৫ লিটার থেকে ৩ লিটার নিরাপদ পানি পান করুন। অস্বাস্থ্যকর পানীয় ও খাবার পরিহার করুন। প্রয়োজনে একবারের বেশি গোসল করুন।
- গরমের সময়ে ঢিলেঢালা পাতলা কাপড় পরুন, সম্ভব হলে রঙ্গিন পোশাক এড়িয়ে চলুন।
- অন্যান্য স্বাস্থ্যগত সমস্যা থাকলে গরমের পূর্বেই করণীয় সম্পর্কে চিকিৎসকের পরামর্শ নিন।
- বয়স্কদের তুলনায় শিশুদের শরীর তাপমাত্রা নিয়ন্ত্রণে বেশি সমস্যার সম্মুখীন হয়। তীব্র গরমের সময় প্রয়োজন না হলে শিশুরা ঘরের বাইরে যাবে না। শিশু, গর্ভবতী মা, ও বয়স্কদের বিশেষ যত্ন নিন। সকলে তীব্র গরমে কাজের ফাকে নিয়মিত বিশ্রাম নিন।
- গরমের সময় কারো অত্যন্ত ক্লান্তি, অত্যাধিক ঘাম, পেশীতে ব্যাথা, দুর্বল স্পন্দন, দ্রুত শ্বাস প্রশ্বাস, অধিক তৃষ্ণা, মাথা ঘোরার মত লক্ষণ দেখা দিলে, তাকে অতি দ্রুত ঠান্ডা জায়গায় সরিয়ে নিন। তার জামা কাপড় ঢিলা অথবা খুলে দিন। শরীরকে ঠান্ডা করার জন্য বাতাসের উৎস যেমন ফ্যানের সামনে নিয়ে আসুন, প্রয়োজনে পানি ব্যবহার করুন। নিরাপদ পানি পান করতে দিন। নিকটস্থ স্বাস্থ্য কেন্দ্রে নিয়ে যান।
- গরমের সময় হিট স্ট্রোকের বিভিন্ন লক্ষণ যেমন বমি বমি ভাব, বমি হওয়া, প্রচন্ড মাথা ব্যাথা, শরীরের তাপমাত্রা বেড়ে যাওয়া, প্রসাব কমে যাওয়া, প্রসাবে জ্বালা পোড়া করা, অস্বাভাবিক আচরণ, ও অজ্ঞান হয়ে গেলে হলে দ্রুত হাসপাতালে যান এবং চিকিৎসকের পরামর্শ নিন।
- প্রয়োজনে স্বাস্থ্য বাতায়নের ১৬২৬৩ নম্বরে যোগাযোগ করুন।

D). Heat Stress Related Guidance for Public Participating in Social/Cultural/ Religious Gathering During the Summer

বাংলাদেশে জলবায়ু পরিবর্তনের কারণে প্রতিনিয়ত তাপমাত্রা বাড়ছে। বাংলাদেশ আবহাওয়া অধিদপ্তরের তথ্যমতে তাপমাত্রা যখন ৩৬-৩৭.৯ ডিগ্রি সেলসিয়াস হয়, তখন তাকে মৃদু তাপপ্রবাহ বলে। ৩৮-৩৯.৯ ডিগ্রি সেলসিয়াস তাপমাত্রাকে মাঝারি তাপপ্রবাহ বলা হয়। তাপমাত্রা যখন ৪০-৪১.৯ ডিগ্রি সেলসিয়াসের মধ্যে থাকে, তখন তাকে তীব্র তাপপ্রবাহ বলা হয়। এছাড়া, তাপমাত্রা ৪২ ডিগ্রি সেলসিয়াস বা তার বেশি হলে তাকে অতি তীব্র তাপপ্রবাহ বলে। ২০১৭ সাল থেকে ২০২৩ সাল পর্যন্ত বাংলাদেশে তীব্র তাপপ্রবাহ পরিলক্ষিত হয়েছে। সাধারণত এপ্রিল থেকে আগষ্ট মাস পর্যন্ত গরম বেশি অনুভূত হয়।

এমতাবস্থায়, গরমের সময়ে দেশব্যাপী অনুষ্ঠিত বিভিন্ন সামাজিক, সাংস্কৃতিক, ও ধর্মীয় অনুষ্ঠানে অংশগ্রহণকারী ও সাধারণ জনসাধারণকে তাপপ্রবাহের বিষয়ে করণীয় সম্পর্কে সংশ্লিষ্ট অনুষ্ঠানের আয়োজকবৃন্দ ও বড় আকারের অনুষ্ঠানের সময় টেলিভিশন, রেডিও, সামাজিক গনমাধ্যমসহ ও অন্যান্য সকল মাধ্যমে নিম্নে বর্নিত বার্তাসমূহ প্রচার করা যেতে পারে। পাশাপাশি, এই সকল বার্তা জনসম্পৃক্ততামূলক কার্যক্রমেও ব্যবহার করা যেতে পারেঃ

- গরমের সময়ে রোদে অথবা বাইরে কোন ধরণের অনুষ্ঠানে যোগ দেয়ার আগে আবহাওয়ার পূর্বাভাস সম্পর্কে জেনে নিন। আপনার অন্যান্য স্বাস্থ্যগত সমস্যা থাকলে গরমের করণীয় সম্পর্কে চিকিৎসকের পরামর্শ নিন এবং পরামর্শ অনুযায়ী ব্যবস্থা গ্রহণ করুন।
- তীব্র গরমে বেশিক্ষণ থাকবেন না। মাঝে মাঝে ছায়ায় বিশ্রাম নিন।

সারাদিনে কমপক্ষে ২.৫ লিটার থেকে ৩ লিটার নিরাপদ পানি পান করুন। অস্বাস্থ্যকর পানীয় ও খাবার পরিহার করুন। প্রয়োজনে বাইরে অথবা রোদ থেকে বাসায় এসে গোসল করুন।

- রোদে বা বাইরে থাকার সময়ে ঢিলেঢালা পাতলা কাপড় পরুন, রঙ্গিন পোশাক এড়িয়ে চলুন।
- তীব্র গরমের সময় প্রয়োজনে যদি গর্ভবতী মা, শিশু ও বয়স্কদের রোদে অথবা বাইরে যেতেই হয়, তাদের দিকে বিশেষ খেয়াল রাখুন। নিয়মিত বিরতিতে ছায়ায় বিশ্রামের ব্যবস্থা করুন।
- রোদে অথবা বাইরে থাকাকালীন কারো অত্যন্ত ক্লান্তি, অত্যাধিক ঘাম, পেশীতে ব্যাথা, দুর্বল স্পন্দন, দ্রুত শ্বাস প্রশ্বাস, অধিক তৃষ্ণা, মাথা ঘোরার মত লক্ষণ দেখা দিলে, তাকে অতি দ্রুত ঠান্ডা জায়গায় সরিয়ে নিন। তার জামা কাপড় ঢিলা অথবা খুলে দিন। শরীরকে ঠান্ডা করার জন্য বাতাসের উৎস যেমন ফ্যানের সামনে নিয়ে আসুন, প্রয়োজনে পানি ব্যবহার করুন। নিরাপদ পানি পান করতে দিন। নিকটস্থ স্বাস্থ্য কেন্দ্রে নিয়ে যান।
- গরমের সময় বমি বমি ভাব, বমি হওয়া, প্রচন্ড মাথা ব্যাথা, শরীরের তাপমাত্রা বেড়ে যাওয়া, প্রসাব কমে যাওয়া, প্রসাবে জ্বালা পোড়া করা, অস্বাভাবিক আচরণ, ও অজ্ঞান হয়ে গেলে হলে দ্রুত হাসপাতালে যান এবং চিকিৎসকের পরামর্শ নিন।
- প্রয়োজনে স্বাস্থ্য বাতায়নের ১৬২৬৩ নম্বরে যোগাযোগ করুন।

পাশাপাশি আয়োজকবৃন্দ নিম্নে বর্নিত ব্যবস্থা গ্রহণ করতে পারেঃ

অনুষ্ঠান চলাকালীন সময়ে কেউ অসুস্থ হলে কোন চিকিৎসকের সাথে যোগাযোগ করবেন এবং নিকটস্থ কোন স্বাস্থ্যকেন্দ্রে নিয়ে যাওয়া হবে তা পূর্বে থেকেই নির্ধারণ করে রাখুন এবং তাদের সাথে যোগাযোগের নম্বর সবাই দেখতে পায় এমন জায়গায় লাগিয়ে রাখুন।


গরম যখন চরমে
সবাই চলি নিয়মে
তীব্র গরমে
হিটস্ট্রোকের
ঝুঁকি
যাদের বেশি
নবজাতক ও শিশু
বিশেষ চাহিদাসম্পন্ন ব্যক্তি
শ্রমজীবী
গর্ভবতী নারী
রোদে সেবা প্রদানকারী
বয়স্ক ব্যক্তি
অতিরিক্ত ওজনের ব্যক্তি
তীব্র গরমে
করণীয়
• সারাদিনে পূর্ণবয়স্ক ব্যক্তি কমপক্ষে ২.৫-৩ লিটার নিরাপদ পানি পান করুন
• রাস্তাঘাটে তৈরি খাবার ও পানীয় পরিহার করুন
• মাঝে মাঝে ছায়া অথবা ঠান্ডা স্থানে বিশ্রাম নিন
• প্রয়োজনে একবারের বেশি গোসল করুন
• গরমের সময়ে সাদা অথবা হালকা রঙের ঢিলেঢালা পাতলা সুতি কাপড় পরিধান করুন
• বিভিন্ন স্বাস্থ্য সমস্যা, যেমন - ডায়াবেটিস, কিডনি রোগ, উচ্চ রক্তচাপ অথবা, অন্যান্য রোগ থাকলে গরমের সময়ে করণীয় সম্পর্কে দ্রুত চিকিৎসকের পরামর্শ নিন
• শিশু, গর্ভবতী মা, বিশেষ চাহিদা সম্পন্ন মানুষ, বয়স্ক মানুষ, এবং অন্যান্য রোগে আক্রান্ত মানুষের প্রতি বিশেষ খেয়াল রাখুন ও যত্ন নিন
• গরমে সুস্থ থাকার জন্য নিজে নির্দেশিত ব্যবস্থা গ্রহণ করুন এবং অন্যকেও উৎসাহিত করুন
স্বাস্থ্য পরামর্শের জন্য প্রয়োজনে স্বাস্থ্য বাতায়ন ১৬২৬৩ নম্বরে যোগাযোগ করুন
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তীব্র গরমে
ঝুঁকির কারণে
শিশুদের
রাখতে হবে
সাবধানে
গরম যখন চরমে
সবাই চলি নিয়মে
বয়স্কদের তুলনায় শিশুরা শরীরের তাপমাত্রা নিয়ন্ত্রণে বেশি সমস্যার সম্মুখীন হয়। কিন্তু নিয়মকানুন মেনে চললে সুস্থ থাকা সম্ভব।
• পরিবারের শিশুদের প্রতি বিশেষ খেয়াল রাখুন, পর্যাপ্ত তরল খাবার খাওয়ান ও যত্ন নিন
• তীব্র গরমে প্রয়োজন না হলে শিশুদের ঘরের বাইরে নিবেন না
• শিশুদের বিভিন্ন ধরনের মৌসুমি ফল, যেগুলোতে জলীয় অংশ বেশি, খেতে দিন
• নবজাতকদের নিয়মিত মায়ের দুধ পান করান
• গরমে শিশুদের সাদা অথবা হালকা রঙের ঢিলেঢালা পাতলা সুতি কাপড় পরান
• গরমে শিশুদের সুস্থ রাখতে নির্দেশিত ব্যবস্থা গ্রহণ করুন
স্বাস্থ্য পরামর্শের জন্য প্রয়োজনে স্বাস্থ্য বাতায়ন ১৬২৬৩ নম্বরে যোগাযোগ করুন
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সকল শিশুর জন্য


তীব্র গরমে ঝুঁকির কারণে
শ্রমজীবী মানুষ ও রোদে সেবা প্রদানকারীদের
থাকতে হবে সাবধানে
গরম যখন চরমে
সবাই চলি নিয়মে
• মাঝে মাঝে ছায়ায় অথবা ঠান্ডা স্থানে বিশ্রাম নিন। প্রয়োজনে রোদে ছাতা ব্যবহার করুন
• সারাদিনে পূর্ণবয়স্ক ব্যক্তি কমপক্ষে ২.৫-৩ লিটার নিরাপদ পানি পান করুন। রাস্তাঘাটে তৈরি খাবার ও পানীয় পরিহার করুন
• প্রয়োজনে একবারের বেশি গোসল করুন
• গরমের সময়ে সাদা অথবা হালকা রঙের ঢিলেঢালা পাতলা সুতি কাপড় পরিধান করুন
• বিভিন্ন স্বাস্থ্য সমস্যা, যেমন - ডায়াবেটিস, কিডনি রোগ, উচ্চ রক্তচাপ অথবা, অন্যান্য রোগ থাকলে গরমের সময়ে করণীয় সম্পর্কে দ্রুত চিকিৎসকের পরামর্শ নিন
• গরমে নিজের দিকে খেয়াল রাখুন এবং মানসিক স্বাস্থ্যের প্রতি যত্ন নিন
• গরমে সুস্থ থাকার জন্য নিজে নির্দেশিত ব্যবস্থা গ্রহণ করুন এবং অন্যকেও উৎসাহিত করুন
স্বাস্থ্য পরামর্শের জন্য প্রয়োজনে স্বাস্থ্য বাতায়ন ১৬২৬৩ নম্বরে যোগাযোগ করুন
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তীব্র গরমে
ঝুঁকির কারণে
গর্ভবতী
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গরম যখন চরমে
সবাই চলি নিয়মে
গরমের সময়ে গর্ভবতী মায়েরা শারীরিক কারণে ঝুঁকিতে থাকেন। নিয়মকানুন মেনে চললে সুস্থ থাকা সম্ভব।
• চিকিৎসকের সাথে আলোচনা করে গরমের সময়ে করণীয় সম্পর্কে ঠিক করে নিন
• চিকিৎসকের সাথে সাক্ষাতের সময় দিনের প্রথম দিকে অথবা, বিকালে যখন তাপমাত্রা কম থাকে তখন নির্ধারণ করুন
• গর্ভবতী মায়েরা গরমের সময়ে চিকিৎসকের পরামর্শ অনুযায়ী পরিমিতভাবে হাঁটুন, ঘন ঘন বিশ্রাম নিন এবং প্রচুর পরিমাণে পানি পান করুন
• সহজে হাঁটাচলা ও নড়াচড়া করা যায় এমন আরামদায়ক ও সুতি কাপড়ের পোশাক পরুন
• যেকোনো কাজের ফাঁকে নিয়মিত বিশ্রাম নিন
• পরিবারের অন্যান্য সদস্যরা গর্ভবতী মায়েদের প্রতি বিশেষ খেয়াল রাখুন ও যত্ন নিন
• গরমে গর্ভবতী মায়েদের সুস্থ থাকার জন্য নির্দেশিত ব্যবস্থা গ্রহণ করুন
স্বাস্থ্য পরামর্শের জন্য প্রয়োজনে স্বাস্থ্য বাতায়ন ১৬২৬৩ নম্বরে যোগাযোগ করুন
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Annex – 2

Potential Signs and Symptoms of Heat-Related Illnesses in All Populations, Infants and Children, Adolescents and Pregnant Women[28]

Target Populations	Heat Stroke	Heat Exhaustion	Heat Syncope	Heat Cramps	Heat Edema	Heat Rashes	Dehydration**
All Populations	• **Altered mental state (e.g., inappropriate behaviour, seizures, delirium, slurred speech, extreme lethargy, coma/loss of consciousness)** • Very high core body temperature (40°C/104°F) • Associated symptoms include: • Nausea • Rapid heartbeat/ breathing • Hot and dry or damp skin • Sweating may or may not be present	• No altered mental state • High core body temperature (under 40°C/104°F) • Increased thirst • Heavy sweating • Headache • Cool and/or damp skin • Weakness and tiredness • Muscle cramps • Nausea or vomiting	• Brief loss of consciousness, usually in person standing for a prolonged period or rapidly changing positions in a warm environment	• Painful and involuntary contractions of skeletal muscle • Flushed and/or moist skin	• Swelling of hands, feet or other dependent areas	• Tiny bumps on skin, usually in chest or upper back • Could result in tiny blisters	• Dry mouth and tongue Sticky lips/mouth • Drowsy or sleepy • Little urine • Dark urin • Dizziness • Sunken eyes

[28]Protecting Children from Heat Stress; A technical note; © UNICEF, May 2023

Specific to Infants and Children under 4 years	• Very irritable (unable to express specific symptoms) • May present symptoms of dehydration as well	• **Very irritable (unable to express specific symptoms)**		• Very irritable (unable to express specific symptoms) • Mild/slightly high core body temperature may be present (less than 39.5°C/102.5°F)		• Can occur in diapered area or if baby is overclothed/ overdressed	• Sunken soft spot (fontanelle) on baby's head and cheeks • No tears when crying • Decreased urine output or dark urine • Irritable (unable to express specific symptoms)
Specific to Older Children and Adolescents	• May be associated with exertion, e.g., sports	• Muscle cramps (may be verbally expressed) • Nausea (may be verbally expressed)					
Specific to Pregnant Women	• Very high core body temperature (above 39°C/102°F)* • Symptoms of severe dehydration such as labour contractions (Braxton Hicks) may present	• Increase in core body temperature (under 39°C/102°F)		• Involuntary contractions may affect calves, arms and stomach area (most common)	• Swelling most often seen around lower legs and feet	• Tiny bumps on the skin, in particular in the crease between and beneath the breasts, crease where bulge of lower abdomen rubs against the top of pubic area, on back, inner thighs, armpits, and other creasing areas	• Inadequate breastmilk production • False labour (Braxton- Hicks) contractions

Annex – 3

Signs and Symptoms of HRIs in All Populations, Infants and Children, Adolescents and Pregnant Women Categorized by Mild and Severe Symptoms

■ High severity and urgency

Population	Milder Symptoms (Treat at home)	Severe Symptoms (Take to hospital immediately)
General Population	• Dry Lips, sticky mouth • Excessive thirst • Excessive sweating • Weakness, dizziness • Nausea, vomiting • Small blisters, rashes • Heat rashes • Mild, slightly high body temperature • Cramps, usually in arms and legs • Nosebleeds (common in hot and dry environments)	• **Confusion/not responding clearly, seizures, coma, very dull, not waking up (MOST SEVERE)** • Very high body temperature for Longer than two hours **(40°C/104°F)** • Fainting • Dark urine • No urine in more than eight hours • Rapid heartbeat and breathing • No sweating (but skin may be wet and hot)
Specific to Infants and Young Children (up to 4 years of age)	• Heat rashes in diapered area • Irritable and/or crying	• Crying without tears • Sunken eyes and/or forehead • Vomiting or GIArs„hsw, • Extreme irritability • Fewer wet diapers
Specific to Older Children and Adolescents (approximately 4-19 years of age)	• Expresses nausea • Expresses having headaches • Muscle cramps (especially after exercising outside, which is common for this age group)	• Deep or severe muscle pain (especially after exercising outside, which is common for this age group)
Specific to Pregnant Women	• Heat rashes in body areas that rub against each other • Muscle cramping in stomach area	• Very high body temperature • Extreme nausea • Early contractions • Swelling of body parts • Severe muscle cramping

Annex – 4

List of contributors

The ***National Guideline on Heat-Related Illness*** has been drafted and compiled by Dr. S. M. Asib Nasim, Consultant, UNICEF with overall support of Dr. Afreena Mahmood, Director, Planning & Research, DGHS and Dr. Abdul Alim Prodhan, DPM, P&M, DGHS. Prof. Dr. Meerjady Sabrina Flora, Additional Director General (Planning and Development), DGHS, Professor Robed Amin, LD, NCDC and Ms Maya Vandenent, Chief Health, UNICEF Bangladesh provided overall technical guidance.

Professors of different specialty as users, Program and Health managers, technical persons, technical agencies, institutes and academicians provided insights which led to finalization of this document. Names of those who contributed are as below (Not according to seniority):

1. Prof Rubina Yasmin, Professor & Head of Department of Medicine, Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur
2. Prof. Dr. Suraiya Begum, Professor, Pediatric and Vice President, Bangladesh Pediatric Association
3. Dr. Shamima Yeasmin, Assistant Professor, Pediatric, DMCH
4. Dr. Abu Sayeed Chowdhury, Child specialist & Consultant (Pediatric), Mugda Medical College & Hospital
5. Prof. Dr. Mala Banik, Department of Obstetrics and Gynecology Sir Salimullah Medical College
6. Prof. Dr. Md. Shafiqul Bari, Department of Medicine, Dhaka Medical College & Hospital
7. Dr. HM Nazmul Ahsan, Associate Professor, Department of Medicine, ShSMC
8. Dr. Mir Mobarak Hossain, Deputy Director, Planning & Research, DGHS
9. Dr. Sohel Rahman, Assistant Professor, IEDCR
10. Dr. Ahasun Ullah Sikder, Research Officer, Planning & Research, DGHS
11. Prof. Salma Rouf, Secretary General, OGSB, Bangladesh
12. Dr Animesh Biswas, Technical Officer (Fistula and MPDSR), UNFPA Bangladesh
13. Dr. Raunak Jahan, Assistant Professor, Feto Maternal Medicine , Obs & Gyn , Shaheed Suhrawardy Medical College
14. Dr Umme Ruman Siddiqi , Assistant Director, Planning and Research, Directorate General of Health Services
15. Dr. Mustufa Mahmud, DPM (EOC), MNCAH, DGHS
16. Dr. Shamsul Huq Milon, Program Manager (Adolescent Health), MNCAH, DGHS
17. Dr. Zarafat Zabin, Medical Officer, Planning & Research, DGHS
18. Dr. Md. Saiful Islam, Medical Officer, Planning & Research, DGHS
19. Dr. Afsana Alamgir Khan, Assistant Director (Project Coordination), DGHS
20. Dr Dhimanendu Roy Dhiman, Medical Officer, DGHS
21. Dr Nazma Akhter, Assistant Director (Research), Planning and Research, Directorate General of Health Services
22. Dr Mahamuda Ali, Assistant Health Officer, DNCC

23. Dr. Iffat Rubaiya Nasir, Medical Officer, Planning & Research, DGHS
24. Dr. Priscilla Wobil, Health Specialist, UNICEF Bangladesh
25. Dr. Hasnain Ahmed, Health Officer, UNICEF Bangladesh
26. Ms. Yasmin Khan, SBC Manager, UNICEF Bangladesh
27. Mr. Sheikh Masudur Rahman, SBC Specialist, UNICEF Bangladesh
28. Mr. Abdullah Al Razwan (Nabin), SBC Expert (Emergency), UNICEF Bangladesh
29. Ms. Hasina Akter, Director, Department Mass Communication
30. Mr. Badrul Alam, Deputy Chief, Bureau of Health Education
31. Ms. Mahbuba Ferdous, Programe Executive, Bangladesh Television
32. Dr. Md. Shakhawat Hossain, Program Manager (TSD), Lifestyle and Health Education & Promotion, BHE
33. Dr Mahmuda Ali, AHO, Dhaka North City Corporation
34. Dr Md Saba Al Galib, Jn, Consultant, Dhaka Medical College Hospital
35. Mr. Md. Iqbal Hossen, Deputy Director, Bangladesh Scouts
36. Mr. Faiem Ahmed, Senior Officer, German Red Cross
37. Dr. Nishat Parveen, Health Officer, Dhaka South City Corporation
38. Ms. Bushra Afreen, Chief Heat Officer, Dhaka North City Corporation
39. Mr. Md. Sharif Khan, Senior Officer, IFRC
40. Dr. Afrin Rahman, Health Officer, IFRC
41. Mr. Md. Shahjahan (Saju), Assistant Director, Bangladesh Red Crescent Society

স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

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