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Strengthening Health Systems Preparedness for Heat Related Illnesses (HRI) in India

MOHFW

GOVERNMENT OF INDIA

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Background

World Meteorological Organization (WMO) defines heat wave as five or more consecutive days during which the daily maximum temperature exceeds the average max temperature by 5º C. Higher daily peak temperatures and longer, more intense heat waves are becomingly increasingly frequent globally due to climate change. The extreme temperatures and resultant atmospheric conditions adversely affect people as they cause various Heat Related Illnesses (HRI), physiological stress, sometimes resulting in death.

India has a tropical climate and there are strong variations in seasons. Summers can become extremely hot, stretching between March and June with maximum temperatures in certain parts reaching at least 40°C. India too is feeling the impact of climate change in terms of increased instances of heat waves which are more intense in nature with each passing year, and have a devastating impact on human health thereby increasing the number of heat wave casualties.[1] India saw a 55% rise in deaths due to extreme heat between 2000-2004 and 2017-2021, a recent study published in a medical journal quoted. While many parts of the country have regularly experienced heatwaves in summer, experts have said these are now becoming longer, more intense and frequent.

Key Challenges faced by the States

- Insufficient facility preparedness for management of HRIs.
- Lack of workflows/standard operating procedures for emergency management of heatstroke.
- Insufficient knowledge regarding setting up of Emergency management system /heatstroke room at Community Health Centre (CHC) or District Hospital level.

Purpose of the guidance Document

The MoHFW envisages to strengthen public health systems across the country for management of HRIs. This guidance document will help in invoking preparedness and building capacity of states and Union territories towards combating HRIs attributed to heat wave. This challenge is faced by the entire country, as a consequence of the global climate change. The areas of guidance will be for Community Health Centre (CHC) and District Hospital level across three key thematic areas which are as follows:

1. **Guidance on facility preparedness** for management of HRIs at CHCs/DHs
    - Pre Heat Season
    - During Heat Season
    - Post Heat Season
2. **Workflows/standard operating procedures** for emergency management of Severe HRI
    - Adult patient
    - Pediatric Patient
    - Emergency management of Severe HRI case during ambulance transport
3. **Setting up of heatstroke room** in
    - Health Facility
    - Ambulance

[1] https://ndma.gov.in/Natural-Hazards/Heat-Wave

1. Health Facility Preparedness for Management of Heat-Related Illnesses (HRI) for Community Health Centre (CHC) and District Hospitals (DH)

This healthcare facility preparedness guideline aims to provide a baseline framework for preparing, implementing, coordinating, and evaluating extreme heat response activities in health facilities in States/UTs. This includes planning in pre-heat season, during heat season and post-heat season.

Pre-Heat Season

• Prepare a detailed action plan to tackle HRI (updated annually) with details of
  ○ Vulnerable population and hotspots of high heat impact
  ○ IEC, Trainings, Surveillance, Alerts, Logistics etc.
  ○ Funding and resources
• Ensure the availability of funds for activities
• Identify area, room or bed that can be used for management of HRI during heat season
• Check inventories for basic equipment and medicines required for emergency and routine care of HRI
• Train clinicians in diagnosis and management of Heat Stroke cases
• Ensure adequate training of staff in identification, management and surveillance of HRI
• Conduct sensitization meetings of stakeholders
• Identify Rapid Response Team (RRT) to respond to any exigency call outside the hospitals
• Ensure preparedness of ambulance
• Prepare targeted IEC hoardings, banner, poster, leaflets, factsheets, information cards, media, mic announcements, rallies, song/drama activities, street plays. (See Annexure 1 for example)
• Adopt long term measures such as cool roofs and improving green coverage of health facility.

During Heat Season
• Make Heat Stroke room/ward operational. Identify surge capacities and mark the beds dedicated to treat the HRI cases • Review stock of adequate medical supplies • Ensure IMD's heat warnings are received and staff is informed of heatwave conditions • Ensure reporting and monitoring of HRI cases and deaths daily in appropriate surveillance formats • Support investigation and reporting of suspected heatstroke death and maintaining line lists • Adopt and display HRI treatment and prevention protocols • Enhance emergency department preparedness to handle more patients • Ensure IEC display and dissemination in patient area • Conduct awareness sessions for vulnerable populations through increased outreach of ASHA/ANM/MPHW • Organize dedicated heat corners during a heat alert, if feasible. • Ensure ambulance availability with appropriate supplies
Post-Heat Season

• Review to assess/identify gaps-if any, e.g.,
  ▶ Any shortage of equipment, medicine, staff.
  ▶ Any long- term measures that can be adopted and maintained
• Analyze the HRI surveillance reports and revise HRI action plan accordingly
• Enlist/document the lessons learnt for the next season

2. Emergency Management and Cooling for Severe Heat-Related Illnesses (HRI) for Community Health Centre (CHC) and District Hospitals (DH)

A. Workflow for Emergency Management of Heatstroke in Adult Patient

- Primary triage: confirm heatstroke
- Confirm the diagnosis of heat stroke by typical history, physical examination and Laboratory workup.
- Differentiate between Classic and Exertional Heatstroke (HS).

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- Reassess airway, breathing and circulation, IV access
- Provide definitive airway protection if necessary

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Institute active cooling measures (Target to cool to *102°F)*

1. Remove all clothing while protecting patient's dignity
2. If Classic HS, start cooling by evaporation (mist and fan). Cover with thin wet cloth sheet / spray cool water. Ice packs to be placed on groin, axilla, neck, and areas near other great vessels. Tepid sponging cool blankets if available.
3. If Exertional HS, immersion cooling by disposable waterproof zipper body bags can be started. Cold NS gastric lavage may also be tried.
4. Make the patient lie down; raise the feet slightly
5. Avoid Paracetamol or NSAIDS. There is no therapeutic role for antipyretics. Paracetamol can worsen functions.

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Administer IV fluids judiciously (be cautious with patient's premorbid status and pulmonary Oedema)

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Closely monitor following

1. Temperature (Rectal) every 15-30 minutes. Continuous core-temperature monitoring should be done (do not overcorrect to less than 38°C). If rectal temperature recording is not feasible, then use the equation: '0.94×axillary temperature+2.92' to convert axillary to rectal temperature (in °C).
2. Airway, breathing, circulation to be ensured.
3. Vital signs (BP/HR/SpO2), watch for altered cardiac rhythms (ECG), altered mental status (GCS)
4. RBS and serum electrolytes to be done and corrective actions to be taken. Hypotension despite fluid resuscitation to be preferably corrected by I.V. dopamine or dobutamine.
5. Look out for complications of treatment: -
    a. Acute pulmonary edema
    b. Hypothermia
6. Treat seizure with benzodiazepines (name of commonly available as per EDL) (avoid barbiturates)
7. Prevent shivering (by paralyzing patient if intubated)
8. Look for signs of coagulopathy (bleeding, etc. signs)
9. Arterial Blood Gas (ABG) analysis regularly – look for metabolic acidosis
10. CT brain – to look for complications or rule out intracranial pathology, if facility exists.
11. Co-management and referral to intensive care unit
12. Inform / communicate with next of kin regarding patient condition & prognosis

B. Workflow for Emergency Management of Heatstroke in Pediatric Patients

- Primary triage: confirm heatstroke. Heat stroke be suspected in any child brought to a healthcare facility with altered consciousness, confusion or seizures in a heatwave or high ambient temperature conditions especially in summer season.
- For making the diagnosis of heat stroke, there should be hyperpyrexia (>40°C core body temperature) with alteration in mental status. Core body temperature can be measured from the sites like esophagus, oral cavity, and rectum. Rectal temperature is required for the same.
- Usually, axillary temperatures are less precise than the rectal temperature. There is a correlation between axillary and rectal temperature measurements, the axillary temperature is usually 0.5-0.8°C lower than rectal temperature.
- As the rectal thermometers are not available at most of the centers, we should proceed with the temperature recording from the armpit; if it exceeds 40°C, a presumptive diagnosis of heat stroke should be made.

- Assess airway, breathing and circulation, and neurologic impairment
  - Consider intubation if necessary
- Ensure IV access
- Send relevant investigations
- Consider benzodiazepines for seizures, or excess shivering
- Provide definitive airway protection if necessary

- If patient is in shock:
  - Give Normal saline bolus @ 20 ml/kg and reassess
  - Repeat bolus if necessary upto total of 60 ml/kg
  - Watch for features of fluid overload
  - Continue normal maintenance fluid
- If not in shock: Assess dehydration status, correct and start normal maintenance fluid

Institute active cooling measures

(Target: *rapid therapeutic cooling at 1°C every 10 minutes till a core temperature reaches 38°C)*

- Removal of all clothing while protecting patient's dignity
- Emergency cooling measures should be initiated in the heat stroke case as early as possible till the temperatures are reduced to below 39°C.
- Evaporative cooling is the most effective method of external cooling and is typically used in the field. The skin is sprayed with cool water and then fanned to promote evaporation of the water. The evaporation of water from the skin requires body heat, called the heat of vaporization.
- All centers should have facility to start spraying of ice cool water with the garden water sprayer.
- If ice cold water or ice cubes are not available, it is advised to remove clothes and drape body with wet sheet loosely. Spray the body continuously with a cool mist of water at about 15°C.
- If cool water is not available, even water at normal temperature e.g., tap water should be tried for spraying over the body or draping the body with wet linen.
- In the absence of air conditioning, a table fan or desert cooler kept close to the child will also facilitate evaporation and such facility should be made available at all settings.
- External cooling is the easiest and quickest way to reduce the body temperature. This involves placing the ice packs in the groin and axilla and covering the upper thorax and neck with ice, then placing cool blankets/linen over the entire length of the body.
- The major drawback of external cooling is the risk of shivering, which raises the body temperature which can be taken care of by rubbing the body.
- Make the child lie down; raise the feet slightly
- Avoid Paracetamol or NSAIDS

Close monitoring of the following;

1. Temperature every 15-30 minutes (do not overcorrect to less than 38°C).
Even hypothermia can be fatal in children
2. Vital signs (BP/HR/SpO2), watch for altered cardiac rhythms (ECG), altered mental status (GCS)
3. Look out for complications of treatment: -
    a. Acute pulmonary Oedema
    b. Hypothermia
4. 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
5. Prevent shivering (Benzodiazepines (Midazolam / Lorazepam) can be used in conscious patients; by paralyzing patient if intubated)
6. Look for signs of coagulopathy
7. Arterial Blood Gases (ABG) regularly – look for metabolic acidosis
8. CT brain – to look for complications or rule out intracranial pathology
9. Continue management and referral to intensive care unit
10. Inform / communicate with next of kin regarding patient condition & prognosis

C. Emergency Cooling of Severe HRI Case during Ambulance Transport

Guidelines for cooling

TARGET – Cool and Transport fast to nearest health care facility

- To identify a suspected case of heat stroke by typical history and taking temperature (preferably by rectal thermometer).
- Continue cooling in ambulance by evaporation (mist and fan) Ice packs to be place on groin, axilla, neck, and areas near other great vessels.
- Check RBS by glucometer and start intravenous D50W/D25W if hypoglycemic.
- Start oxygen supplementation
- If trained, TACO* method of cooling may be employed in adult cases of exertional heatstroke.

*TACO: Tarp-assisted cooling with oscillation [TACO].

Recommended treatment for exertional heat stroke includes whole-body cold-water immersion (CWI). However, remote locations or monetary or spatial restrictions can challenge the feasibility of CWI. Thus, the development of a modified, portable CWI method allows for optimal treatment of exertional heat stroke in the presence of these challenges. A plastic tarp held by staff members serves as the container for cold water while the patient sits or lies in the middle.

Case Definitions / symptoms/ first aid of various Heat related illnesses like heat rash, Heat cramps, Heat syncope, Heat Exhaustion, Heat stroke are provided in Annexure 2

3. Heatstroke Room for Emergency Management of Severe Heat-Related Illnesses (HRI) for Community Health Centre and District Hospitals

Heatstroke Room for Emergency Management of Severe Heat-Related Illnesses (HRI)

For Community Health Centre and District Hospitals

A. Setting up Heatstroke Room in Health Facility

Logistic requirements

1. Dedicated heat stroke room (at least 2 beds, 14'X16') (with cooling equipment: AC/ cooler/ fans/ water sprinkler/ refrigerator / ice packs)

   Selecting a heatstroke room: A room in the health center be designated where the ambient temperature could be maintained optimally with appropriate natural shading and ventilation and should have continuous electricity supply or generator backup. It should not be on the top floor and can be cooled effectively with fans and desert coolers wherever air conditioning is not available. This room should contain refrigerator, ice box, ice packs, ice cool water, cool blankets, wet linens, garden sprayer round the clock.
2. Thermometer/ Rectal Thermometer/ Rectal Probe/ Multipara monitor/ Stethoscope / BP apparatus/ ET tube and laryngoscope
3. Disposable waterproof zipper body bags for immersion cooling
4. High flow oxygen
5. ECG equipment: ECG machine, Gel, electrodes, ECG paper.
6. Glucometer and testing strips.
7. Ryle's tube
8. Multifunction monitor, cardioversion/defibrillator facility
9. Medicines: Lorazepam, Diazepam, IV antiseizure medicines like phenytoin and valproate cold IV normal saline (0.9%), dextrose 50% in water solution (D50W), Dopamine, dobutamine
10. Trained Staff
11. Treatment protocol on walls
12. IEC Material

B. Setting up for Heatstroke facilities in Ambulance Transport

Logistic requirements

1. Air conditioning with ice box.
2. Thermometer, Rectal Thermometer, Stethoscope , BP apparatus, ET tube , laryngoscope and High flow oxygen
3. Ice packs, Cold towels, ORS, small/hand fans, Tarpaulin
4. IV catheters, drip set, cold IV normal saline (0.9%), dextrose 50% in water solution (D50W)
5. Glucometer and testing strips
6. TACO (tarpaulin assisted cooling oscillation) method (depending on feasibility and training)

Annexure 1: Sample IEC

Government of Rajasthan

Rajasthan Climate Change Project
Heat Action Plan

TYPES OF HEAT RELATED ILLNESSES

Heat Rash : Heat rash is a skin irritation caused by excessive sweating during hot, humid weather. Diffuse, pruritic, maculopapular or vesicular rash in the setting of heat exposure, often with insulating clothing or swaddling.

Heat Cramps : Heat cramps are the mildest form of heat illness and consist of painful muscle cramps and spasms that occur during or after intense exercise and sweating in high heat.

Heat Exhaustion : Heat exhaustion is more severe than heat cramps and results from a loss of water and salt in the body. It occurs in conditions of extreme heat and excessive sweating without adequate fluid and salt replacement. Heat exhaustion occurs when the body is unable to cool itself properly and, if left untreated, can progress to heat stroke.

Heat Syncope : Heat syncope is a fainting (syncope) episode or dizziness that usually occurs with prolonged standing or sudden rising from a sitting or lying position. Factors that may contribute to heat syncope include dehydration and lack of acclimatization.

Heat Stroke : Heat stroke, the most severe form of heat illness, occurs when the body's heat-regulating system is overwhelmed by excessive heat. It is a life-threatening emergency and requires immediate medical attention.

SYMPTOMS AND TREATMENT OF HEAT-RELATED ILLNESSES:

Type of Heat-related Illness	Symptoms	First Aid and Treatment
Heat Rash	• Clusters of red bumps on skin • Often appears on neck, upper chest, folds of skin	When possible, a cooler, less humid work environment is best treatment. Keep rash area dry. Powder may be applied to increase comfort. Ointments and creams should not be used.
Heat Cramps	• Painful cramps, especially in the legs • Flushed	Move to a cool place and rest, remove excess clothing Place cool cloths on skin and fan skin. Give cool drinks containing salt and sugar. Stretch cramped muscles slowly and gently.
Heat Exhaustion	• Muscle cramps, Thirst, Pale, Moist skin • Usually fever over 100.4° F • Nausea, Vomiting, Diarrhea • Headache, Fatigue, Weakness • Anxiety, Dizziness, • Light headedness and faint feeling	Move to a cool place and rest, remove excess clothing Place cool cloths on skin and fan skin. Give cool drinks containing salt and sugar. If no improvement or unable to take fluids, take person to an emergency health department immediately. IV (intravenous) fluids may be needed.
Heat Syncope	• Fainting (Short duration) • Dizziness Light-headedness	Sit or lie down in a cool place. Slowly drink water, clear juice, or a cool drinks.
Heat Stroke	• High body temperature (above 104°F) • Hot, red, dry or moist skin • Rapid and strong pulse • Possible unconsciousness • Loss of appetite • Nausea, Vomiting • Headache, Fatigue, Confusion, • Agitation, Lethargy, Stupor, Seizures, • Coma, and death are possible	Move to a cool place and rest. Heat stroke is a life-threatening medical emergency and needs to be treated by a doctor. Remove excess clothing and drench skin with cool water. Place ice bags on the head, armpits and groin areas. Offer cool fluids if alert and able to drink. In Emergency Health Department Ice bath immersion, Evaporative cooling Monitor temperature and blood chemistries Initiate IV hydration, Neuroleptics for seizures Mannitol/diuretics if needed Stop cooling at rectal temperature of 100.4°F

IEC Developed by Government of Rajasthan)

IEC Developed by Ahmedabad Municipal Corporation)

Annexure 2: Symptoms and first Aid for various heat disorder

Heat Disorder Symptoms First Aid	Heat Disorder Symptoms First Aid	Heat Disorder Symptoms First Aid
Heat rash	Skin redness and pain, possible swelling, blisters, fever, headaches.	Take a shower using soap to remove oils that may block pores preventing the body from cooling naturally. If blisters occur, apply dry, sterile dressings and seek medical attention
Heat Cramps	Painful spasms usually in leg and abdominal muscles or extremities. Heavy sweating	Move to cool or shaded place. Apply firm pressure on cramping muscles or gently massage to relieve spasm. Give sips of water. If nausea occurs, discontinue.
Heat Exhaustion	Heavy sweating, weakness, Skin cold, pale, headache and clammy extremities. Weak pulse. Normal temperature possible. Fainting, vomiting.	Get victim to lie down in a cool place. Loosen clothing. Apply cool, wet cloth. Fan or move victim to air-conditioned place. Give sips of water slowly and if nausea occurs, discontinue. If vomiting occurs, seek immediate medical attention, call 108 and 102 for ambulance.
Heat Stroke (Sun Stroke)	High body temperature. Hot, dry skin. Rapid, strong pulse. Possible unconsciousness or altered mental status. Victim will likely not sweat.	Heat stroke is a severe medical emergency. Call 108 and 102 for ambulance for emergency medical services or take the victim to a Health center or hospital immediately. Delay can be fatal. Move victim to a cooler environment. Try a cool bath or sponging to reduce body temperature. Use extreme caution. Remove clothing. Use fans and/or air conditioners. **DO NOT GIVE FLUIDS ORALLY if the person is not conscious.**

Clinical evaluation or differential diagnosis:

Mild heat illness: A rectal temperature is most reliable measurement as alternatives; oral, tympanic, axillary and skin temperature are less accurate. Core temperature and absence of central nervous system symptoms will help the diagnosis and treatment of heat related illnesses. In the absence of hyperthermia, presence of central nervous system symptoms suggests the investigation for differential diagnosis.

Heat Exhaustion: In the case of heat exhaustion, the skin may appear pale associated with tachycardia or hypotension. Headache, dizziness, nausea, vomiting as well as diarrhea and loss coordination may occur. Such patients are advised to be in supine position with elevation of legs. They are instructed to remove excess clothing and are moved in cool shaded environment. Oral fluids are recommended for rehydration. Vital signs should be monitored with the transport to emergency department if symptoms don't improve after 20-30 minutes of onset.

Heat Cramps: Exercise associated muscle cramps are more common during hot and humid environment and is characterized by dehydration, depletion of electrolytes, hyponatremia etc. The treatment includes rest, prolonged stretching of affected muscle groups and oral sodium intake. For severe conditions, intravenous Normal Saline may be very useful for more rapid relief for severe cramping.

Heat Stroke: Heat Stroke requires immediate diagnosis and early treatment. It is characterized by the elevation of core temperature associated with involvement of central nervous system disturbances. Rectal temperature is recommended to obtain as early as possible. Treatment regime includes stabilizing airway, breathing and circulation. Onsite cooling is preferred generally. Applying ice packs or wet towels to axillary, groin, head, neck region is alternative option. The combination of rapid fan movement and spraying moderate temperature mist of water tends to have effective evaporative and convective cooling. Intravenous hydration needs to be recommended to maintain renal blood flow. In rural areas, community settings, patients should be kept in cool shaded environment without excess clothing till ambulance reach. The curative action taken in this time may decide the degree of cell damage leading to organ failure. Prevention of stroke includes the identification of older population having chronic medical disease or physical disabilities, which lack access to air conditioning and providing them the cooler environment.