

HEAT ILLNESS OR HEAT DISORDERS MANAGEMENT GUIDELINES

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SUMMARY OF ABBREVIATIONS

ABG	– Arterial blood gas
ATN	– Acute tubular necrosis
CVP	– Central venous pressure
DIC	– Disseminated intravascular coagulation
DKA	– Diabetes ketoacidosis
FBC	– Full blood count
MODS	– Multiorgan dysfunction syndrome
ORS	– Oral rehydration salt



BACKGROUND

Heat disorders or heat illness can range from minor nuisance to rapidly fatal conditions if left uncared for or misdiagnosed. While environmental factors of climate change leading to heat spells, humidity and solar radiation can harm the health and life of mankind, lack or insufficient basic needs such as electricity, safe water supply, and shady and well-ventilated shelters can make people more vulnerable to heat and other elements. Certain individuals and communities may be exposed more severely to heat stress for specific reasons such as being displaced, having to conduct livelihood and required activities in unprotected situations, and due to other politico-socio-economic conditions.

This set of guidelines covers heat stroke as the most important syndrome in the spectrum of heat disorders, and it also includes other conditions: heat exhaustion, heat syncope, heat cramp, and heat rash.



I. HEAT STROKE

Diagnostic Criteria for Heat Stroke

1. High core body temperature: >40° C / 104° F (oral), >41° C / 105.8° F (rectal)
2. Hot and dry skin with absence of sweating
3. Neurological dysfunction (confusion, delirium, convulsion, coma)

Awareness of possibility of heat stroke in all patients with above triad of symptoms during hot season is very important.

Types

- Classical or non-exertional heat stroke
 - ▶ Prolong exposure to heat
 - ▶ Very young or elderly
 - ▶ Chronic mental disorders
 - ▶ Cardiopulmonary diseases
 - ▶ Drugs causing salt and water imbalance, anti-cholinergic and tranquilizers impairing sweating
- Exertional heat stroke
 - ▶ Manual worker
 - ▶ Military and combat personnel
 - ▶ Athletes
 - ▶ Amphetamine and cocaine overdose

Predisposing factors

- Unacclimatized individual
- Extremes of age: infancy and old age
- Unsuitable clothing
- Poor ventilation especially in enclosed space

- Acute febrile illnesses, e.g., malaria, urinary tract infection, pneumonias (by inhibition of sweating during fever)
- Concomitant degenerative cardiovascular diseases or diabetes mellitus
- Increased production of heat due to body metabolic processes (e.g., hyperthyroidism, excessive muscular activity) in conditions of high temperature and humidity, and lack of shade such as construction site
- Congenital absence of sweat glands (cystic fibrosis)
- Obesity
- Use of anticholinergic drugs (e.g., atropine)
- Excessive consumption of alcohol (by increasing the metabolic production of heat by peripheral vasodilatation with subsequent dehydration)
- Dehydration, (if dehydration is untreated in heat exhaustion, cessation of sweating follows)
- Use of dermatological oily preparations (by inhibiting sweating)

CLINICAL FEATURES

- The core temperature ranges from 40°-47°C (104-117°F). Brain dysfunction is usually severe but may be subtle, manifesting only as inappropriate behaviour or impaired judgment leading to delirium to frank coma. Seizures may occur.
- All patients have tachycardia and hyperventilation. PaCO₂ is <20 mmHg.
- Some patients may have hypotension.
- Other features: respiratory alkalosis, lactic acidosis, hypophosphaemia, hypokalemia, rarely hypoglycaemia, hypocalcaemia, hyperproteinemia.
- Exertional heat stroke: rhabdomyolysis, hyperphosphataemia, hypocalcaemia, hyperkalaemia.

COMPLICATIONS

- MODS (multi-organ dysfunction syndrome)
 - ▶ Encephalopathy
 - ▶ Rhabdomyolysis
 - ▶ Acute kidney injury
 - ▶ Acute respiratory distress syndrome
 - ▶ Myocardial injury
 - ▶ Hepatocellular injury
 - ▶ Intestinal ischemia or infarction
 - ▶ Pancreatic injury and Haemorrhagic complications (especially DIC with pronounced thrombocytopenia)

INVESTIGATIONS (IF AVAILABLE AND INDICATED)

- ▶ Urine: protein, tubular cast, myoglobin
- ▶ ECG: commonly shows non-specific ST and T wave changes and/or SVT
- ▶ Glucose: normal or low, hyperglycaemia, DKA
- ▶ U&E: ↓/↑ K⁺, dehydration, renal failure from ATN or rhabdomyolysis, ↓/↑ Na⁺
- ▶ CK, AST, LDH: raised with rhabdomyolysis
- ▶ Ca²⁺, PO₄, Mg²⁺: all usually low
- ▶ FBC: haemoconcentration, neutrophilia
- ▶ ABG: initial respiratory alkalosis, then metabolic (lactic acidosis)
- ▶ AST: if >1,000 IU/L in the first 24 hours, prognosis poor with serious brain, kidney and liver injury
- ▶ Blood culture and sensitivity
- ▶ Blood for malaria parasites and/ or malaria ICT
- ▶ Chest X-Ray
- ▶ CT head

MANAGEMENT

1. Heat stroke is an acute medical emergency.
2. Most important measure is rapid cooling: spraying with water/ sponging/wrapped loosely in a cool wet sheet. Evaporation hastened by continuous fanning.
 - a. Ice packs applied to armpits, groins and neck.
 - b. Cold water immersion is inappropriate for unstable patients.
 - c. Monitor body temperature closely and reduce to 100° F/37° C within one hour.
 - d. Stop vigorous cooling when the body temperature reaches 39° C (102.2° F).
3. Nursed in air-conditioned room (or) kept in well-ventilated room, directly under ceiling fan or close to standing fan.
4. Stabilize the patient.
 - Airway, Breathing and Circulation (ABC)
 - O₂ at 4 L/minute.
 - IV fluids (crystalloids) promptly. N/S or 5% D/W
5. Urinary catheterization to aim for an output of >30 ml/hour.
6. Exclude or correct hypoglycaemia.
7. Correct fluid and electrolytes (35-45 ml/kg of water, 1.5-2 mmol/kg of Na⁺ and 1-1.5 mmol/kg of K⁺).
8. Broad spectrum parenteral antibiotics if necessary.
9. Avoid injection anti-pyretic.
10. Treat associated febrile illness even on clinical ground (malaria, pneumonia).
11. Treat complications: pulmonary oedema, liver failure, rhabdomyolysis, cerebral oedema, DIC, lactic acidosis.
12. Continued sponging and keeping the patient in cold area is important since thermoregulatory function may remain unstable for up to a week.

TREATMENT OF COMPLICATIONS

- Respiratory failure: consider intubation.
- Seizures: IV benzodiazepine.
- Hypotension: fluids for volume expansion, consider vasopressors, monitoring CVP.
- MODS: supportive therapy.



II. HEAT EXHAUSTION

Heat exhaustion is the body's response to an excessive loss of water and salt usually through excessive sweating. Heat exhaustion can most likely affect:

- The elderly
- People with high blood pressure
- Those working in a hot environment

CLINICAL FEATURES

- Headache
- Nausea
- Dizziness
- Weakness
- Irritability
- Thirst
- Heavy sweating
- Elevated body temperature
- Decreased urine output

MANAGEMENT

- Take the patient to a clinic or emergency room for medical evaluation and treatment.
- Keep the patient under close observation.
- Remove the patient from the hot area and give liquids to drink.
- Remove unnecessary clothing, particularly tight ones.
- Cool the patient with cold compresses or washing the head, face, and neck with cold water.
- Encourage frequent sips of cool water.



III. HEALTH SYNCOPE

Heat syncope usually occurs when standing for too long or suddenly standing up from sitting or lying position. Fainting, dizziness or fatigue is due to cerebral anoxia arising during exposure to heat and caused by vasodilatation leading to pooling of body fluid in the legs. Factors that may contribute to heat syncope include dehydration and lack of acclimatization.

CLINICAL FEATURES

- Fainting (short duration)
- Dizziness, light-headedness or fatigue from standing too long or suddenly rising from a sitting or lying position.
- Usually in unacclimatized individuals very soon after exposure to heat. Residents in hot climate are affected when performing excessive exercise or when there is sudden rise of environmental temperature or humidity.

MANAGEMENT

- Rest lying down in a cool place.
- Slowly drink water, clear juice, or ORS
- Patient should be kept from unnecessary exertion until acclimatized.



IV. HEAT CRAMPS

Heat cramps usually affect those who sweat a lot during strenuous activity. This sweating depletes the body's salt and moisture levels. Low salt levels in muscles cause painful cramps. Heat cramps may also be a symptom of heat exhaustion.

CLINICAL FEATURES

- Muscle cramps, pain, or spasms in the abdomen, arms, or legs
- Painful spasms of the voluntary muscles following heavy physical work in hot surroundings. They occur after heavy sweating and concurrent drinking of large quantities of unsalted fluids.

MANAGEMENT

- Drink water and have a snack or a drink that replaces carbohydrates and electrolytes (e.g., Oral Rehydration Salt) every 15 to 20 minutes. Mild attacks respond to salt given orally.
- Observe closely help if the patient:
 - ▶ Has heart problems.
 - ▶ Has cramps that do not subside within 1 hour.
- Most severe attacks respond to the single intravenous administration of 300-500 ml of isotonic (normal) saline.



V. HEAT RASH AND PRICKLY HEAT

Also known as sweat rash lichen tropicus or miliaria rubra, heat rash is a skin irritation caused by excessive sweating during hot and humid weather.

CLINICAL FEATURES

- Infant and children with thin skin, or individuals with multiple skinfolds, and unacclimatised
- Red clusters of pimples or small blisters
- Usually on the neck, upper chest, groin, under the breasts, elbow creases, back of the knees and waist.

MANAGEMENT

- Keep the patient in a shaded, cooler, well-ventilated and less humid environment, if possible.
- Keep the rash area dry.
- Apply powder to increase comfort.
- Avoid ointments and creams.
- Heat rash may be difficult to treat and need removal of the patient to a cooler climate.



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