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Heat stroke

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Abstract

Heat-related illness is a spectrum of conditions progressing from heat exhaustion, heat injury, to life-threatening heat stroke. Heat stroke is a clinical constellation of symptoms that include a severe elevation in body temperature which typically, but not always, is greater than 40°C. The main sign of heatstroke is a markedly elevated body temperature (greater than 104 degree F) with changes in mental status ranging from personality changes to confusion and coma. Heatstroke, also called sunstroke, is the most severe form of hyperthermia, or heat-related illness. Heatstroke can lead to brain damage, organ failure or death.

Keywords: Heat stroke, body temperature, exertional heatstroke, clinical constellation, overheating

Introduction

Heatstroke is a life-threatening condition that causes your body to overheat. It's defined as a body temperature above 104 degrees Fahrenheit (40 degrees Celsius). Heatstroke, also called sunstroke, is the most severe form of hyperthermia, or heat-related illness. It occurs when the body can no longer control its temperature: the body's temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106°F or higher within 10 to 15 minutes. Heatstroke is a condition caused by your body overheating, usually as a result of prolonged exposure to or physical exertion in high temperatures. This most serious form of heat injury, heatstroke, can occur if your body temperature rises to 104 F (40 C) or higher.

There are two types of heatstroke

1. Exertional heatstroke: This form of heatstroke is usually the result of physical overexertion in hot, humid conditions. It can develop in a few hours.
2. Non-exertional heatstroke: Also called classic heatstroke, this type can occur due to age or underlying health conditions. It tends to develop over several days.

Prevalence

Age group of infants and children up to age 4 and people over 65 years, pregnant women, people who have existing medical conditions, such as cardiovascular disease, kidney disease, diabetes, or mental illness. However, even young and healthy people can be affected if they participate in strenuous physical activities during hot weather.

Epidemiology

Studies suggest that heatstroke occurs in about 20 out of 100,000 people each year in the U.S. It's most common in urban areas during periods of very hot weather. Heatstroke causes between 240 and 833 deaths in the U.S. annually. Estimating the public health impact of extreme heat is difficult because health care providers are not required to report heat-related illnesses. In the United States, from 2006 to 2010, there were at least 3332 deaths attributed to heat stroke. However, these numbers are believed to be largely under-reported. Mortality correlates with the degree of body temperature elevation, time to initiation of cooling, and the number of organ systems affected.

Etiology

Heatstroke occurs when your body can't cool itself down. Your hypothalamus (a part of your brain that controls many bodily functions) sets your core body temperature. It typically sets your temperature at about 98.6 degrees Fahrenheit (37 degrees Celsius). But if your body takes in more heat than it releases, your internal temperature rises above this set-point.

Other factors that increase your risk of heatstroke include

1. Drinking alcohol.
2. Being male.
3. Being dehydrated.
4. Drugs like antihistamines, diet pills, diuretics, sedatives, tranquilizers, stimulants, seizure medications (anticonvulsants), heart and blood pressure medications such as beta-blockers and vasoconstrictors, and medications for psychiatric illnesses such as antidepressants and antipsychotics. Illegal drugs such as cocaine and methamphetamine also are associated with increased risk of heat stroke.
5. Having certain diseases that affect your ability to sweat, such as cystic fibrosis.
6. Health conditions which include heart, lung, or kidney disease, obesity or underweight, high blood pressure, diabetes, mental illness, sickle cell trait, alcoholism, sunburn, and any conditions that cause fever.
7. Wearing heavy or tight clothing, such as protective gear.
8. Having a high fever.
9. Having obesity.
10. A past history of heatstroke.
11. Poor physical conditioning or not being used to hot conditions.
12. Other risk factors associated with heat-related illness include:
13. Age group of infants and children up to age 4, and adults over age 65, are particularly vulnerable because they adjust to heat more slowly than other people.

Symptoms

- Symptoms of heat stroke include: Confusion, altered mental status, slurred speech. Loss of consciousness (coma) Hot, dry skin or profuse sweating.
- Throbbing headache, confusion, nausea, dizziness, body temperature above 103°F, hot, red, dry or damp skin, rapid and strong pulse, fainting, loss of consciousness.

The following signs or symptoms, call for emergency immediately

- Anhidrosis (dry skin that doesn't sweat, which is more common in non-exertional heatstroke).
- Ataxia (problems with movement and coordination).
- Balance problems.
- Delirium (confusion or disorientation).
- Dizziness.
- Excessive sweating that continues after you've stopped exercising (more common in exertional heatstroke).
- Hot, flushed skin or very pale skin.
- Low or high blood pressure.
- Lung crackles (bubbling or gurgling sound in the

lungs).

- Nausea and vomiting.
- Oliguria (low urine output).
- Rapid breathing or tachycardia (fast heart rate).
- Seizures.
- Syncope (fainting) or loss of consciousness.
- Weakness.

Heat emergencies have three stages: heat cramps, heat exhaustion, and heatstroke. All three stages of heat emergency are serious. If you live in hot climates or play sports in the summertime, you should know how to spot the symptoms of heat emergency.

Effects of heat stroke

The field has documented changes in the immune system of humans and animals years after a heatstroke. Heatstroke victims also have a greater frequency of developing chronic heart disease and kidney diseases later in life.

Some individuals experience serious organ damage or neurological dysfunction due to heatstroke. Periodic tests to monitor liver functioning and kidney functioning are recommended as heat stroke victims are more prone to developing chronic heart and kidney diseases.

Heatstroke can result in a number of complications, depending on how long the body temperature is high. Severe complications include: Vital organ damage. Without a quick response to lower body temperature, heatstroke can cause your brain or other vital organs to swell, possibly resulting in permanent damage.

Treatment/management

Management of heat stroke includes ensuring adequate airway protection, breathing, and circulation. After ABC's, rapid cooling becomes the mainstay of treatment with ancillary management in response to other end-organ damage. Intubation for profound unconsciousness is rarely needed, as rapid cooling quickly improves the Glasgow coma scale. Adequate rehydration is essential without over-correcting the sodium if derangements exist. It is mandatory to measure core temperature with a rectal or oesophageal probe continually and cooling measures should be stopped once the temperature is 38 to 39 degrees Celsius.

Several pharmacologic adjuncts also merit consideration in the treatment of heat stroke. Dantrolene is a skeletal muscle relaxer, shown to reduce heat production in sustained muscle contracture, and is useful for the treatment of malignant hyperthermia. However, it has been shown to have no effect on patient outcomes with heat stroke. A small study suggested that high-dose benzodiazepine may blunt the shivering reflex and decrease oxygen consumption, therefore providing a theoretical benefit to patients. Therefore the universal use of benzodiazepines is not the current recommendation but could be tailored to the shivering, agitated patient. There is no role for antipyretics in the treatment of heatstroke patients and may be toxic to the liver.

Remedial management at home

- Immerse you in cold water. A bath of cold or ice water has been proved to be the most effective way of quickly lowering your core body temperature. The quicker you can receive cold water immersion, the less risk of death

and organ damage. Use evaporation cooling techniques.

- Cool the body by:
- Placing person in a cool (not cold) bath or shower.
- Spraying with a garden hose.
- Sponging with cool water.
- Fanning: Remove excessive clothing and loosen any tight clothing. Immerse hands and feet in cold water, cool by fanning and moisten the skin, if possible. If fully alert and responsive, give them frequent small drinks of water. If muscle cramps occur, gently stretch the affected muscles to ease pain.
- Seek emergency medical care
- Put the person in a cool tub of water or a cool shower.
- Spray the person with a garden hose.
- Sponge the person with cool water.
- Fan the person while misting with cool water.
- Place ice packs or cool, wet towels on the neck, armpits and groin.
- Cover the person with cool, damp sheets.

Hydrating Foods to Help You Beat the Summer Heat

- Cooked Zucchini – water content: up to 95%
- Watermelon – water content: up to 92%
- Raw Spinach – water content: 91-93%
- Peaches – water content: up to 89%
- Yogurt – water content: up to 88% (plain, whole milk)

Complications

People with heatstroke can develop shock or slip into a coma. High body temperature can lead to:

1. Acute respiratory distress syndrome (ARDS).
2. Brain swelling.
3. Kidney failure.
4. Liver failure.
5. Metabolic dysfunction.
6. Nerve damage.
7. Reduced blood flow to the heart and other circulatory problems.

In most cases, it's possible to prevent heatstroke by

- a) Avoiding strenuous physical activity in hot, humid conditions.
- b) Consuming sports drinks, lightly salted water or broth.
- c) Gradually letting your body acclimate to warm temperatures over several weeks if you'll have to be in hot conditions for work or sports.
- d) Never leaving children (or pets) in closed, hot spaces such as cars.
- e) Staying in air-conditioned or well-ventilated areas during heat waves.
- f) Wearing lightweight, light – coloured and loose-fitting clothing if you'll be out in the heat.

Conflict of Interest

Not available

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Not available

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