EDITORIAL

PREPARE FOR ANOTHER HOTTER SUMMER THAT MAY IMPACT YOUR HEALTH

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Globally next few years will be hotter than before. Heat wave is expected in Pakistan also. Heat stress is the leading cause of weather-related deaths and can exacerbate underlying illnesses including cardiovascular disease, diabetes, mental health, asthma. Heat stroke is a medical emergency with a high-case fatality rate. Infants and elderly persons are more prone to temperature changes. Above environmental temperature around 33–35 °C heat stress begins. When the body experiences heat stress and body temperature rises beyond normal, cells release heat shock proteins (HSP) that can trigger inflammatory responses mediated by cytokines. This process contributes to endothelial damage, vasodilation, and widespread cell death, resulting in potential organ damage. When an unacclimatized person is exposed to extreme heat for prolonged time, the person may suffer heat exhaustion or heat stroke. Heat exhaustion is a heat-related illness caused by excessive sweating, which leads to loss of water and electrolytes and a decreased blood volume. Without replacement of water and electrolytes, this will lead to decreased arterial pressure and feelings of dizziness, muscle cramps, and fainting. Heat exhaustion, if untreated, can lead to heat stroke. World Health Organization (WHO) and National Disaster Management Authority (NDMA) advised that people should drink water frequently, especially when going outside; avoid heat exposure by limiting outdoor activities between 10 AM to 4 PM; use light coloured and loose-fitting clothes; never leave children in parked vehicles.

Keywords: Heat shock proteins, Heat stress, Heat stroke, Heat wave

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Global warming damages the environment and threatens the life on earth. Globally this is expected that 2026 will be the fourth successive year in which temperature will have reached at least 1.4 °C above pre-industrial levels (1850-1900).[1] Summer 2026-2027 in Pakistan is expected to be intensely hot and the Pakistan Meteorological Department (PMD) has warned of severe heat waves across the country, creating significant health risks.[2]

A heatwave is a period where local excess heat accumulates over a sequence of unusually hot days and nights. Heatwaves and prolonged excess heat conditions are increasing in frequency, duration, intensity and magnitude due to climate change. Even low and moderate intensity heat waves can impact the health and well-being of vulnerable populations. It is difficult to complete work or learning in very hot weather and heatwaves may lead schools and other institutions to close. Heatwaves can also be associated with hazardous air pollution events. Heat stress is the leading cause of weather-related deaths and can exacerbate underlying illnesses including cardiovascular disease, diabetes, mental health, asthma, and can increase the risk of accidents and transmission of some infectious diseases. Heat stroke is a medical emergency with a high-case fatality rate.[3]

Environmental temperature has greater impact on those who engage in physical work in the outdoors, such as labourers, farmers, military personnel, and fire-fighters. Infants and elderly persons are more prone to temperature changes. Although heat production and heat loss mechanisms are functional in neonates and children, these are easily exhaustible, leading to the development of hypothermia or hyperthermia. Elderly show decreased thermos-sensitivity, causing delayed or insufficient responses to thermal changes leading them to be more susceptible to hypothermia or hyperthermia.

Essentially all the energy spent by the body is eventually converted into heat. As long as skin temperature is greater than the temperature of the surroundings, heat can be lost by radiation, conduction and convection. At very high ambient temperatures, the only means by which the body can rid itself of heat is by evaporation.[4] The temperature range needed for the body's metabolic processes to function correctly is between 37±0.5 °C (98.6±0.9 °F). The ability to regulate body temperature within a physiological range remains a key requirement for survival and daily functions.

Temperature comfort zone for human body is between 20–25 °C; body feels warm at 25–30 °C, body feels hot above 30 °C, body's heat loss mechanisms start becoming ineffective around 33–35 °C. Above this range, heat stress begins.[5] The human body employs several physiological mechanisms to prevent heat exhaustion when exposed to high temperatures. Sweating and evaporative cooling, cutaneous vasodilation and heat acclimatization are developed to tolerate heat. During acclimatization body starts earlier and increased sweating but the sweat contains less

amount of salts. The human body typically requires 7 to 14 days of consistent daily exposure of 60 to 90 minutes to heat to achieve full acclimatization. Physical activity in the heat accelerates the process compared to sitting still. Acclimatization is temporary and benefits begin to fade within a week and are largely lost after 2 to 3 weeks.[6]

When the body experiences heat stress and temperatures rise beyond normal, cells release heat shock proteins (HSP) that can trigger inflammatory responses mediated by cytokines. This process contributes to endothelial damage, vasodilation, and widespread cell death, resulting in potential organ damage. Untreated, patients may become comatose and hypotensive, and may experience shock, cardiac collapse and death.

Studies between year 2000 and 2019 show approximately 489,000 heat-related deaths each year, with 45% of these in Asia and 36% in Europe.[7] When an unacclimatized person is exposed to extreme heat for prolonged time, the person may suffer heat exhaustion or heat stroke. Heat Exhaustion is a heat-related illness caused by excessive sweating, which leads to loss of water and electrolytes and a decreased blood volume. Without replacement of water and electrolytes, this will lead to decreased arterial pressure and feelings of dizziness, muscle cramps, and fainting. Heat exhaustion, if untreated, can lead to heat stroke. Heat Stroke is a body temperature more than 40 °C (104 °F) accompanied by dry, hot skin and central nervous system abnormalities such as convulsions, delirium, and/or coma. An alternative definition is that heatstroke is a form of hyperthermia associated with a systemic inflammatory response that leads to multiorgan dysfunction, especially encephalopathy.[8]

The negative health impacts of heat are predictable and largely preventable with specific public health and multi-sectoral policies and interventions. WHO has issued guidance for public health institutions to identify and manage extreme heat risks. Action on climate change combined with comprehensive preparedness and risk management can save lives now and in the future.[3] WHO and NDMA advised that people should drink water frequently, especially when going outside; avoid heat exposure by limiting outdoor activities between 10 am to 4 pm; use light coloured and loose-fitting clothes; never leave children in parked vehicles.

WHO's "Beat the Heat" initiative, running from January 2025 to June 2026, aims to protect workers, attendees, and local communities from extreme heat and other environmental hazards and to provide adequate drinking water and sanitation. Extreme heat is now recognized as a critical public health issue. The initiative will mobilize global support with a focus on developing action plans to ensure that workplaces and public spaces are equipped with heat response strategies.[9]

REFERENCES

1. Madge G. 2026 outlook: likely another year above 1.4 °C. https://www.metoffice.gov.uk/about-us/news-and-media/media-centre/weather-and-climate-news/2025/2026-outlook-likely-another-year-above-1.4c#:~:text=The%20average%20global%20temperature%20for,C%20above%20pre%2Dindustrial%20levels. [Accessed: 23-4-2026]
2. Pakistan Meteorological Department. Warning of severe heat waves across the country, creating significant health risks. https://www.accuweather.com/en/pk/lahore/260622/july-weather/260622#:~:text=According%20to%20AccuWeather%2C%20the%20average%20high%20temperature,or%20two%20with%20a%20high%20of%2099%C2%B0 [Accessed: 23-4-2026]
3. World Health Organization. Heat and Health. https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health. [Accessed: 28-4-2026]
4. Hall JE, Hall ME. Body temperature regulation and fever. In: Guyton and Hall Textbook of Medical Physiology. 15th ed. Philadelphia: Elsevier; 2025. pp 923–34.
5. Barrett KE, Barman SM, Brooks HL, Yuan JX-J, (Editors).. Ganong's Review of Medical Physiology. 26th ed. New York: McGraw-Hill Education; 2019.
6. Centers for Disease Control and Prevention (CDC). (2022).* Heat Stress—Hydration and Acclimatization. National Institute for Occupational Safety and Health (NIOSH).
7. Perez RI, Londono MJ, Everitt B, Young D, Hood RL, De Lorenzo RA, McDermott BP. Exertional and classic heat stroke: A narrative review. Am J Emerg Med 2026;102:49–54. doi: 10.1016/j.ajem.2026.01.008. [Accessed: 27-4-2026]
8. Leon LR, Bouchama A. Heat stroke: Role of the systemic inflammatory response. J Appl Physiol 2010;109(6):1980–8.
9. WHO's "Beat the Heat" initiative making strides to protect workers and event participants from extreme heat and related environmental hazards. https://www.who.int/news/item/12-06-2025-who-s--beat-the-heat--initiative-making-strides-to-protect-workers-and-event-participants-from-extreme-heat-and-related-environmental-hazards [Accessed: 14-4-2026]

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