



Hypothermia

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Definition

- It is a condition characterized by lowering of body temperature than 36.5°C .
- It occurs when the body loses heat faster than it can produce it leading to very low body temperature.
- **Hypothermia** is a medical emergency.





Prevalence

- Globally, ranges from 32% - 85%
- In sub – Saharan countries, it is high; Ethiopia, 66.3% (Alabachew et.al, 2019), In Uganda, 32% had mild hypothermia while 18% had moderate hypothermia (Mukunya et.al, 2021)
- In Kenya it is as high as 87% (Nyandiko et.al, 2021)



The problem

- There is low adherence to the WHO thermal care guidelines (Nyandiko et.al, 2021).
- Sub-optimal thermal care practices, inadequate thermal education among providers (Onalo, 2013; Lunza et.al, 2012)
- Poor adherence to the warm chain protocols.

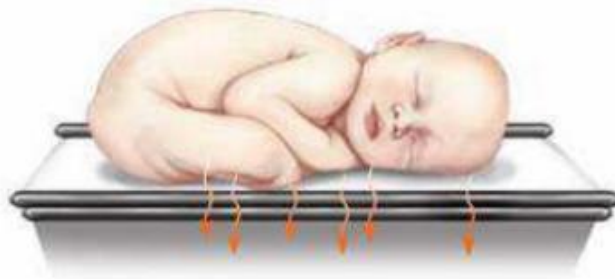


Etiology

- Environmental factors
- Disorders that impair thermoregulation (eg, sepsis, intracranial hemorrhage, drug withdrawal).



Babies loose heat through...



A. Conduction



B. Convection



C. Evaporation



D. Radiation



The physiology

- Thermal equilibrium is affected by relative humidity, air flow, direct contact with cool surfaces and proximity to cool objects.
- Cold stress may divert calories to produce heat, thus impairing growth.
- Neonates have a metabolic response to cooling that involves chemical (non-shivering) thermogenesis.
- Activation of glycogen stores can cause transient hyperglycemia.
- Persistent hypothermia can result in hypoglycemia, metabolic acidosis and increases the risk of late-onset sepsis and mortality.



Mechanisms of heat production in the newborn

- **Metabolic processes** - The brain, heart, and liver produce the most metabolic energy by oxidative metabolism of glucose, fat and protein.
- **Voluntary muscle activity** - Increased muscle activity generate heat. A flexed position decreases exposed surface area thus conserve heat.
- **Peripheral vasoconstriction** - Reduces blood flow to the skin thus decreases loss of heat from skin surfaces.
- **Non-shivering thermogenesis** - Heat is produced by metabolism of **brown fat**. Thermal receptors transmit impulses to the hypothalamus, which stimulate the sympathetic nervous system and causes norepinephrine release in brown fat. Norepinephrine activates lipase, which results in lypolysis and fatty acid oxidation. Heat is generated by releasing the energy produced instead of storing it as Adenosine-5-Triphosphate (ATP).



Babies have....

- A large surface area-to-body mass ratio
- Decreased subcutaneous fat
- Greater body water content
- Immature skin leading to increased evaporative water and heat losses
- Poorly developed metabolic mechanism for responding to thermal stress (e.g. no shivering)
- Altered skin blood-flow (e.g. peripheral cyanosis)
- Limited capacity to thermoregulate.



Classification

Based on timing or severity

- Primary hypothermia – occurs immediately after birth
- Secondary hypothermia – occurs later e.g due to sepsis



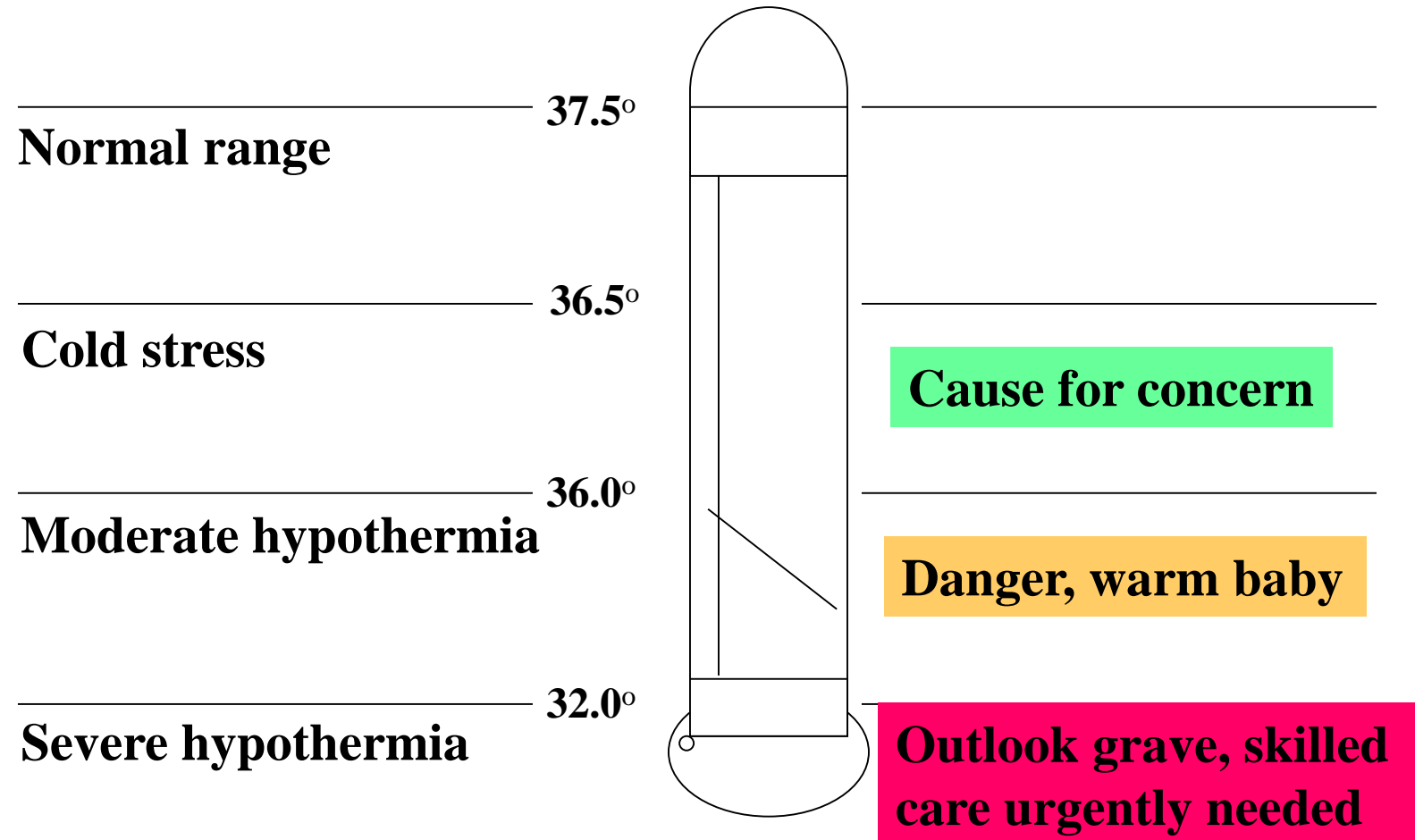
Who is at risk?

- Preterm infants.
- Underweight for gestational age or wasted infants
- Infected or hypoxic infants.
- Infants who have not been fed
- Wet infants
- Infants exposed to a cold environment





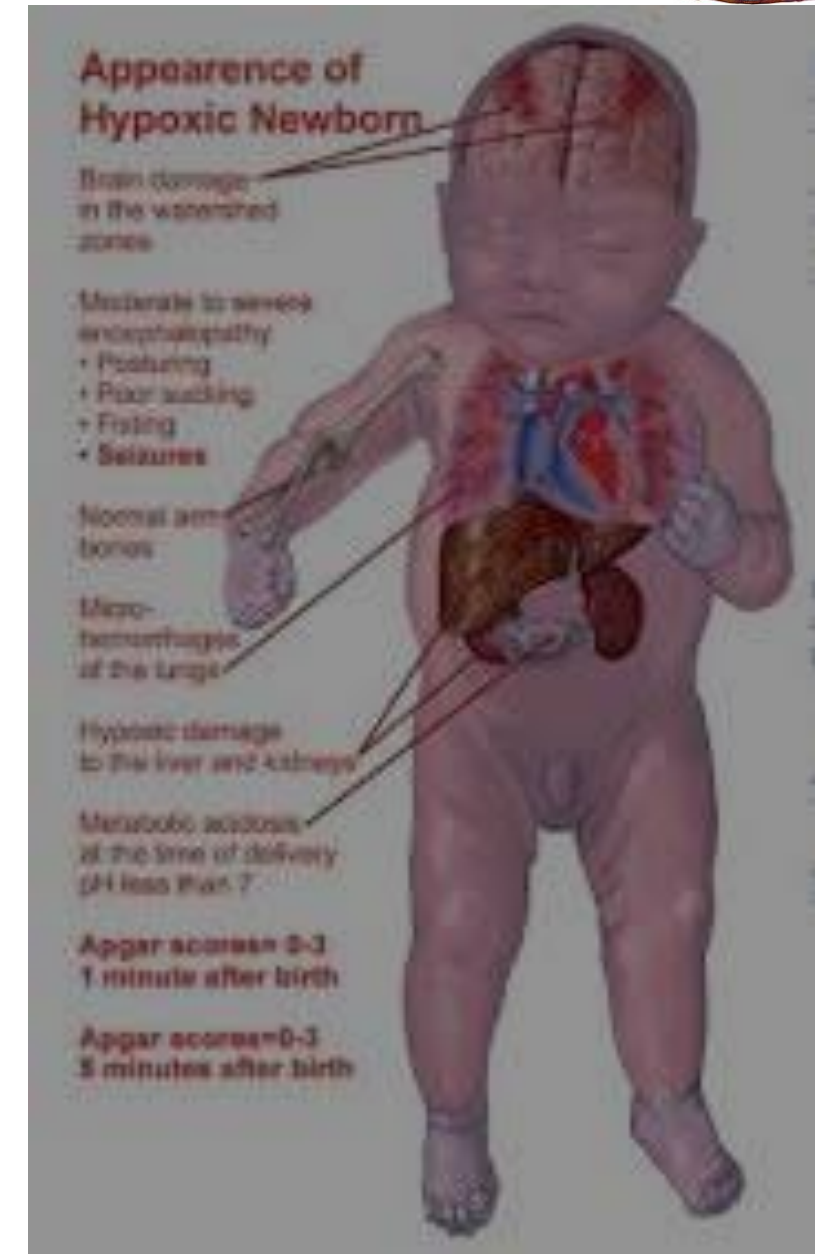
Degrees of hypothermia





Clinical presentation

- Low temperature, Cold to the touch
- Limp, A weak cry
- Poor sucking or feeding
- Slow or shallow respiration or signs of respiratory distress.
- Slow heart rate (< 100/min)
- Lethargic
- Pale or blue hands, but their tongue and cheeks are pink
- No centrally cyanosis.
- Peripheral oedema
- Bleeding from the mouth, nose or needle punctures.
- Chronic signs: weight loss, failure to thrive





Management

- Rewarming the neonate.
- Monitor and treat for hypoglycemia, hypoxemia, and apnea if needed.
- Monitor temperature
- Manage underlying conditions.





Management – Mild hypothermia (Temp 35°C – 36.4°C)

- Skin-to-skin contact, in a warm room (at least 25°C).
- Place cap on newborn head
- Cover mother and newborn with warm blankets





Management: Moderate hypothermia (Temp 32°C – 34.9°C)

- Under a radiant heater
- In a warmed incubator
- If no equipment is available or if the newborn is clinically stable, skin-to-skin contact with the mother can be used in a warm room (at least 25°C)





Management: Severe hypothermia (Temp below 32°C)

- Use a warm incubator (should be set at 1 to 1.5°C higher than the body temperature) and should be adjusted as the newborn's temperature increases
- If no equipment is available, skin-to-skin contact or a warm room or cot can be used





Prevention

- **Maintain the warm chain**
- **Provide a warm environment for all infants:**
 - Use skin-to-skin care (kangaroo mother care) whenever possible.
 - Never place an infant in a cold incubator.
 - Keep the incubator ports closed.
 - Do not nurse an infant near a cold window.
 - Delay bathing for 24 hours
 - Insulate the infant. Dress with a cap.
 - Rooming in





Prevention (Cont'd)

- Care for premature infants in an incubator/ NBU.
- Dry term babies and place a premature baby into a polyethylene bag immediately after birth to maintain the infant's temperature.
- In case of resuscitation or observation, place under a radiant warmer.
- Identify all infants at high risk of hypothermia.
- Provide energy (calories) by oral, nasogastric tube or intravenous feeding.
- Treat any infection or hypoxia.
- Monitor the temperature .
- Training and raising awareness



Conclusion

- “Warm chain” will help prevent hypothermia
- Ensure closer monitoring and stricter preventive measures for LBW and other at risk neonates
- Early detection and interventions to prevent hypothermia





References

- Alebachew Bayih, W., Assefa, N., Dheresa, M. *et al.* Neonatal hypothermia and associated factors within six hours of delivery in eastern part of Ethiopia: a cross-sectional study. *BMC Pediatr* **19**, 252 (2019). <https://doi.org/10.1186/s12887-019-1632-2>
- Nyandiko WM, Kiptoon P, Lubuya FA (2021) Neonatal hypothermia and adherence to World Health Organisation thermal care guidelines among newborns at Moi Teaching and Referral Hospital, Kenya. *PLoS ONE* 16(3): e0248838. <https://doi.org/10.1371/journal.pone.0248838>
- Onalo R. Neonatal hypothermia in sub-Saharan Africa: A review. 2013;16. pmid:23563449
- Lunze K, Hamer DH. Thermal protection of the newborn in resource-limited environments. *J Perinatol*. 2012;32: 317–324. pmid:22382859
- Mukunya, D., Tumwine, J. K., Nankabirwa, V., Odongkara, B., Tongun, J. B., Arach, A. A., Tumuhamy, J., Napyo, A., Zalwango, V., Achora, V., Musaba, M. W., Ndeezi, G., & Tylleskär, T. (2021). Neonatal hypothermia in northern Uganda: A community-based cross-sectional study. *BMJ Open*, 11(2). <https://doi.org/10.1136/bmjopen-2020-041723>

