

THERMAL CARE IN NEW BORN - A REVIEW**Dr. Shubhangi Kapil Thakur***

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ABSTRACT

Appropriate thermal protection of the newborn prevents hypothermia. Neonatal hypothermia is a worldwide problem and leads to increased morbidity and mortality in new born infants. Physiological, environmental and behavioural risk factors predispose the newborn infants for neonatal hypothermia.^[1] Hypothermia remains a wide spread problem in this population, especially after birth and through the first week of life. This review focuses on reduce heat loss after birth and during neonatal intensive care unit hospitalisation. Recommendations for practice are given to minimize heat loss during care and promote thermal stability for very low birth infants. It is essential to continue focus on thermal stability and eliminate hypothermia in the very low birth weight population.

KEYWORDS: Neonate, Hypothermia, thermal stability, low birth weight.**INTRODUCTION**

Globally, 2.5 million children died in the first month of life in 2017, which accounts for 47 percent of all under five child death.^[2] Although, hypothermia is a rarely a direct cause of death, it contributes to a substantial proportion of neonatal mortality globally, mostly as co morbidity.^[3] So needed to eliminate hypothermia and improve infant thermal stability in order to improve outcomes in these fragile infants.

Thermoregulation after birth

Humans are homotherms; capable of maintaining body temperature at a relatively constant level despite changes in the external environment. The ability of infants to regulate temperature in response to thermal stress is limited. Infants are unable to sweat in order to give off excessive heat when they become overheated. The infant is capable of heat production through three mechanisms 1) voluntary muscle activity, 2) involuntary muscle activity, and 3) metabolism. Voluntary and involuntary muscle activity is limited and requires a chemical reaction utilizing large stores of energy. Term infants are capable of assuming a flexed position when cool and an extended position when overheated. The ability is limited in the premature infant, though it may be present to some extent. on-shivering thermo genesis appears to be the most consistent method of heat production in the neonate regardless of gestational age or birth weight. The major source of heat energy in the newborn is fatty acids. Thermo genesis is directly dependent on tissue oxygenation to utilize heat energy. Oxidized fatty acids generally are Believed to derive from brown fat stores in the neonate.

Brown fat has high vascularization and is virtually nonexistent in preterm infants. Term infants have approximately 16 percent of body tissue mass as adipose tissue, but the preterm infant may have as little as 3.5 percent adipose tissue per body weight. Brown fat is located around the mediastinal structures, kidneys, scapulas, axilla and nape of the neck. Primitive brown cells first appear at 26-30 weeks gestation and ordinarily disappear by three to five weeks after birth.

Upon exposure to cold, thermal receptors in the skin (many of which are located in the face) signal the neonate's central hypothalamus resulting in sympathetic nervous system arousal and the release of norepinephrine. The release of norepinephrine then stimulates the hydrolysis or breakdown of the brown fat. The rapid metabolism of brown fat produces heat, which warms the blood perfusing surrounding tissue. This heat is then transferred via the circulation to the rest of the body. This process consumes a lot of oxygen and glucose.^[4,5]

Mechanisms of heat loss

An infant loses heat through its skin and respiratory tract to the environment through radiation, conduction, convection, and evaporation. Fat under the skin acts as an insulator to prevent heat loss; however, the more prematurely an infant is born, the less fat insulation there will be. It is important to understand the mechanisms of heat loss so that interventions can be aimed to block the transfer of heat from the infant to the environment.

- **Radiation**-All body surfaces emit heat in the form of electromagnetic waves,^[6] which is called radiation.

Body temperature will decrease or increase depending on the energy transferred through radiation, and the rate of heat loss is proportional to the temperature difference between the skin and the radiating surface.^[7] An infant may lose heat to a cold wall located nearby or gain heat from a over-bed heat source on a warming table through radiation.

- **Conduction** -An infant can lose heat through conduction when their skin surface touches a colder object, such as a cold blanket. Conductive heat loss can occur through exposure to colder air, fluids, or solid surfaces. Heat will transfer from the warm molecules of the infant's skin to the colder molecules of the alternate surface as the molecules collide. Prewarming surfaces and fluids will minimize conductive heat losses while caring for a premature infant.

- **Convection** -When heat is transferred from the skin to the environment through moving air or water, convective heat transfer occurs. Heat will be transferred from an infant's skin to the air when the skin is warmer than the air. The molecules rise into the air from the skin due to being less dense than colder molecules, then the heat molecules are swept away by convection through air or water. Convective heat loss is amplified in the delivery room when an infant is delivered into a cold room, then carried from the mother to a nearby warming table. As the infant is carried through the cold air, heat easily rises off the skin and is swept away.

- **Evaporation** -Heat loss from evaporation occurs through the skin or respiratory tract when water is converted to a gas. The evaporative rate is proportional to the water vapor-pressure gradient between the skin and environment; there is a linear relationship between the ambient humidity and the evaporation rate, with higher evaporation rates at lower levels of humidity.^[8] Evaporation causes 0.6 kcal of heat to be lost for every 1 g of water lost from the body.^[9] Hammerlaud et al found that evaporative heat loss is greatest right after birth;^[10] therefore, interventions in the delivery room to reduce heat loss should be targeted towards reducing evaporative heat loss.

Despite being hemothermic, a newborn's ability to maintain body temperature can be easily overwhelmed by environmental temperatures. Thermal protection of the newborn is a set of continuing measures, which start at birth to ensure that the baby maintains a normal body temperature.

Temperature ranges^[11]

Normal axillary temperature	- 36.5 to 37.5 c
Mild hypothermia or cold stress	-36 to 36.4 c
Moderate hypothermia.	-32 to 35.9 c
Severe hypothermia.	- Less than 32 c
Hyperthermia.	- Greater than 37.5 c

From these temperature ranges guidelines it is evident that clinicians should strive to keep infant body temperature above 36.5 c as minimum safe level to prevent hypothermia.

Methods of Recording temperature

Touch method – Abdominal skin and hands and feet are touch with back of health providers hand to note the warmth. Abdominal temperature is irrespective of the core temperature.

Baby's feet and hands are warm– Thermal comfort

Hands and feet are cold but the abdomen is warm -Cold stress

Hands and feet as well as abdomen are cold - Hypothermia

- Thermometers – temperature measures by digital or Mercury thermometers.

- Thermisterprobe –Skin temperature can be recorded by a thermistor probe .probe is attached to the skin over upper abdomen.

Recording temperature

Minimum schedule for taking the temperature of the new born is recommended:

- Immediately after completion of initial care of the new-borns.
- Arrival in the nursery or postnatal ward.
- For healthy babies with their mother's no further routine measurements are required.

However it should be explained to the mother that if the baby's feet feel cold, the temperature should be checked. Having identified that an infant is at risk, appropriate nursing measures should be taken immediately.

Temperature should be monitored every 1-2 hours for a sick baby, twice daily for babies weighing between 1500-2499 gms four times daily for babies below 1500gm.

However to maintain babies temperature we know the concept of warm chain.

The concept of warm chain

The warm chain is a set of interlinked steps carried out at birth and later, which reduce the chances of hypothermia in newborn's.

- Thermal care in delivery room – after birth, newborn's core and skin temperature can drop at a rate of 0.1 c and 0.3 c per minute, respectively. The delivery room should be clean, warm and free from air drafts from open windows and doors and fans.
- Warm resuscitation – The baby should be resuscitated using warm supplies, equipment and drugs. Cold items should be avoided to come in contact with baby.
- Immediate drying –After birth baby should be immediately dried with a dry and warm towel starting with the head after drying thoroughly, the baby should be covered with another dry and warm towel and the head is covered with warm cap.
- Skin to skin contact – Healthy baby should be kept in skin to skin contact of the mother immediately after delivery while the mother is being attended for placental delivery, episiotomy suturing and during

her transfer to postnatal ward and for initial few hours.

- Breast feeding – Breastfeeding should begin as soon as possible after birth preferably within an hour.
- Postpone bathing and weighing – bathing should be postponed in all babies until stable. Weighing should be done after one hour of skin to skin contact and after ensuring zero correction, baby should be covered immediately thereafter.
- Clothing and bedding -in – newborn should be covered with 1-2 layers of cloth and caps socks and mittens are provided. The mother and the baby should be nursed on the same bed for thermal protection and breastfeeding.
- Warm transportation – in case of transport, whether to home, to another hospital or ward, thermal protection should be ensured. Stable babies including preterm and low birth weight can be transported in skin to skin contact. Temperature should be checked before and after transport.
- Training and awareness – All health care personnel involved in the newborn care should be adequately trained and informed about the principles of warm chain.

DISCUSSION

The main goal of achieving thermal stability in infants is to maintain a normal body temperature. Temperature will vary depending on the site of measurement and device used. We are aware of mechanisms of heat loss we know what temperature to strive for and what defines hypothermia in an infant. Study can be designed to minimize heat loss and aim for thermal stability.

CONCLUSION

Hypothermia continues to be a problem that contributes to increased mortality and morbidity of infants. Infants hypothermia remains prevalent through thermal care by maintaining warm chain like thermal care in delivery room, warm resuscitation, immediate drying, early breast feeding, skin to skin contact and eliminate the incidence of hypothermia from birth onwards. And which can help to minimize the infant mortality and morbidity rate by hypothermia. New ways of following continuous temperature monitoring from delivery room through stabilization. Once New born infant is stabilized, we must ensure continued thermal stability to promote early discharge home.

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