

**ADAPTIVE MECHANISMS, NURSING CARE, AND CLINICAL
MANAGEMENT ALGORITHM FOR NEWBORNS WITH
HYPOTHERMIC SYNDROME: EFFECTIVENESS OF
THERMOBLANKETS IN TERM AND PRETERM INFANTS**

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Abstract

Neonatal hypothermia is defined as a decrease in body temperature below 36.5°C and is considered a major contributor to neonatal morbidity and mortality [1]. Newborns, especially preterm infants, have limited thermoregulatory capacity because of immature skin, low subcutaneous fat, and a high body surface area [2]. Adaptive mechanisms in hypothermic newborns include peripheral vasoconstriction, non-shivering thermogenesis through brown adipose tissue, and increased metabolic activity [3]. However, prolonged cold stress leads to hypoglycemia, metabolic acidosis, respiratory distress, and increased oxygen consumption [4]. Effective nursing care includes immediate drying after birth, use of radiant warmers or incubators, early skin-to-skin contact, and continuous temperature monitoring [5].

Keywords: neonatal hypothermia, adaptive mechanisms, thermoregulation, nursing care, thermoblanket, preterm infant, management algorithm

**АДАПТИВНЫЕ МЕХАНИЗМЫ, СЕСТРИНСКИЙ УХОД И
АЛГОРИТМ КЛИНИЧЕСКОГО ВЕДЕНИЯ НОВОРОЖДЕННЫХ С
ГИПОТЕРМИЧЕСКИМ СИНДРОМОМ: ЭФФЕКТИВНОСТЬ
ТЕРМООДЕЯЛ У ДОНОШЕННЫХ И НЕДОНОШЕННЫХ ДЕТЕЙ**

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Аннотация

Неонатальная гипотермия определяется как снижение температуры тела ниже 36,5°C и считается одним из основных факторов неонатальной заболеваемости и смертности [1]. Новорожденные, особенно недоношенные, имеют ограниченную терморегуляционную способность из-за незрелой кожи, низкого содержания подкожного жира и большой площади поверхности тела [2]. Адаптивные механизмы у новорожденных с гипотермией включают периферическую вазоконстрикцию, термогенез без дрожания за счет бурой жировой ткани и повышенную метаболическую активность [3]. Однако длительный холодовой стресс приводит к гипогликемии, метаболическому ацидозу, дыхательной недостаточности и увеличению потребления кислорода [4]. Эффективный сестринский уход включает немедленное высушивание после рождения, использование лучистых обогревателей или инкубаторов, ранний контакт кожа к коже и непрерывный мониторинг температуры [5].

Ключевые слова: неонатальная гипотермия, адаптивные механизмы, терморегуляция, сестринский уход, термоодеяло, недоношенный ребенок, алгоритм ведения

Introduction

Globally, neonatal hypothermia affects up to 40–80% of newborns in low- and middle-income countries and remains a critical determinant of survival. Preterm infants are particularly vulnerable because of immature skin barrier, reduced subcutaneous fat, large body surface area, and poor vasomotor control. Hypothermia is associated with hypoglycemia, metabolic acidosis, respiratory distress syndrome (RDS), sepsis, intraventricular hemorrhage, and increased neonatal mortality. Therefore, strengthening thermal care practices is essential for improving neonatal outcomes.

Adaptive Mechanisms in Newborns with Hypothermic Syndrome

Newborns maintain body temperature primarily through non-shivering thermogenesis mediated by brown adipose tissue. Cold stress activates sympathetic pathways, increasing oxygen consumption and glucose utilization. In preterm infants, insufficient brown fat and immature enzymatic systems lead to rapid depletion of energy stores. Prolonged hypothermia disrupts cardiovascular stability, reduces cardiac output, and compromises pulmonary function. Consequently, adaptive capacity becomes overwhelmed, predisposing the infant to multi-organ dysfunction.

Nursing and Medical Care Strategies

Comprehensive thermal care should begin immediately after birth and continue throughout hospitalization. Key strategies include:

- Drying and wrapping immediately after delivery
- Maintaining delivery room temperature at 26–28°C
- Skin-to-skin contact (kangaroo mother care)
- Use of incubators or radiant warmers
- Application of thermoblankets
- Warmed intravenous fluids and humidified oxygen
- Continuous axillary temperature monitoring

Education of healthcare providers and caregivers is essential to ensure consistent implementation of these measures.

Clinical Management Algorithm

1. Measure axillary temperature at admission
2. Classify hypothermia (mild, moderate, severe)
3. Initiate warming using thermoblanket or incubator
4. Monitor temperature every 30–60 minutes
5. Assess for associated conditions (RDS, sepsis, asphyxia)
6. Provide targeted treatment
7. Reassess and modify warming strategy

Effectiveness of Thermoblankets

Thermoblankets minimize heat loss through evaporation, convection, conduction, and radiation. Clinical studies demonstrate that their use reduces the incidence of persistent hypothermia and shortens rewarming time, particularly in preterm infants. Compared with conventional methods alone, thermoblankets provide an additional protective barrier and improve thermal stability during transport and routine care.

Table 1. Classification and Clinical Impact of Neonatal Hypothermia

Severity	Temperature (°C)	Physiological Effects	Clinical Outcomes
Mild	36.0–36.4	↑ metabolism	Hypoglycemia
Moderate	32.0–35.9	↑ O ₂ consumption	RDS, acidosis
Severe	<32.0	Cardiovascular instability	High mortality

Mild hypothermia: A slight drop in temperature, increases metabolism, and may cause low blood sugar.

Moderate hypothermia: More serious, increases oxygen consumption, and can lead to respiratory distress syndrome (RDS) and metabolic acidosis.

Severe hypothermia: Life-threatening; cardiovascular stability is impaired, with a high risk of mortality.

Table 2. Comparison of Thermal Protection Methods

Method	Mechanism	Advantages	Limitations
Kangaroo care	Direct heat transfer	Low-cost	Requires mother
Incubator	Controlled environment	Precise	Expensive
Radiant warmer	External heat	Easy access	Dehydration risk
Thermoblanket	Heat conservation	Portable, effective	Needs monitoring

Kangaroo care: Skin-to-skin contact; very low-cost, but depends on the mother's presence. Provides a controlled and precise environment, but expensive.

Radiant warmer: Convenient for care, but increases the risk of dehydration.

Incubator: Convenient for care, but increases the risk of dehydration.

Thermoblanket: Portable and effectively conserves heat; requires careful monitoring.

Conclusion

Neonatal hypothermia remains a major clinical challenge. Understanding adaptive mechanisms and implementing structured care algorithms, including routine use of thermoblankets, can significantly improve neonatal survival, particularly in preterm infants.

References

1. World Health Organization. Thermal protection of the newborn. Geneva; 1997.
2. World Health Organization. Essential newborn care. Geneva; 1996.
3. Demtse AG, et al. Hypothermia in Preterm Newborns: Impact on Survival. *Global Pediatric Health*. 2020.
4. Mullany LC. Neonatal hypothermia in low-resource settings. *Semin Perinatol*. 2010.
5. Lunze K, et al. Global burden of neonatal hypothermia. *BMC Med*. 2013.
6. Chang HY, et al. Outcomes in very low birth weight infants with admission hypothermia. *PLoS One*. 2015.
7. Miller SS, et al. Hypothermia in very low birth weight infants. *J Perinatol*. 2011.
8. Lee HC, et al. Delivery room management and hypothermia prevention. *Pediatrics*. 2014.
9. Mullany LC, et al. Neonatal hypothermia and mortality. *Arch Pediatr Adolesc Med*. 2010.
10. Ogunlesi TA, et al. Point-of-admission hypothermia among Nigerian newborns. *BMC Pediatr*. 2008.
11. Wilson E, et al. Admission hypothermia and neonatal outcomes. *J Pediatr*. 2016.

12. Silverman WA, Sinclair JC. Temperature regulation in the newborn. *N Engl J Med.* 1966.
13. Kattwinkel J, et al. Neonatal resuscitation guidelines. *Circulation.* 2010.
14. Manani M, et al. Elimination of admission hypothermia. *Perm J.* 2013.
15. Muhe LM, et al. Causes of illness and death in preterm infants in Ethiopia. *Lancet Glob Health.* 2019.