CLINICAL EFFECTIVENESS OF THERMAL BLANKETS IN THE MANAGEMENT OF NEONATAL HYPOTHERMIC SYNDROME

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Background:

Thermal blankets are widely used as a cost-effective method to maintain normothermia in neonates. Their effectiveness in improving thermoregulation and physiological outcomes in hypothermic neonates, especially in preterm infants, has been reported but remains under-evaluated in resource-limited settings.

Objective:

To assess the clinical effectiveness of thermal blankets in achieving normothermia and improving physiological outcomes in term and preterm neonates with hypothermic syndrome.

Methods:

A prospective comparative study was conducted from 2025 to 2027 in the Neonatology Department of the Respublika ixtisoslashtirilgan ona va bola salomatligi ilmiy-amaliy tibbiyot markazi Buxoro viloyati filiali. One hundred neonates were included (60 term, 40 preterm). Thermal blankets were applied immediately upon admission, and temperature, heart rate, respiratory rate, oxygen saturation, and blood glucose were monitored. Statistical analysis was performed with SPSS; $p<0.05$ was considered significant.

Results:

Thermal blankets facilitated rapid achievement of normothermia in term neonates (3.6±0.8 hours) and preterm neonates (6.1±1.1 hours, $p<0.001$). Significant improvements in physiological parameters were observed in both groups. Preterm

infants required additional support from incubators or radiant warmers for optimal stabilization.

Conclusion:

Thermal blankets are an effective, low-cost intervention for neonatal hypothermia. Their use as part of a combined thermal care strategy improves temperature stabilization and physiological outcomes, particularly in preterm infants.

Introduction

Neonatal hypothermia remains a major preventable cause of morbidity and mortality worldwide. Maintaining normothermia is particularly challenging in preterm neonates, whose immature thermoregulatory systems make them highly susceptible to cold stress. Thermal blankets are widely used for thermal protection due to their portability, affordability, and ease of use.

Physiologically, neonates lose heat rapidly via conduction, convection, radiation, and evaporation. Thermal blankets help reduce conductive and convective heat loss while supporting non-shivering thermogenesis. Multiple studies have demonstrated that early application of thermal blankets reduces the incidence of hypoglycemia, respiratory instability, and metabolic acidosis.

Despite these advantages, limited comparative evidence exists on their effectiveness in term versus preterm neonates. Most studies evaluate blankets in combination with other interventions, making it challenging to isolate their specific impact. This study aims to evaluate the clinical effectiveness of thermal blankets in both term and preterm neonates with hypothermic syndrome, focusing on thermoregulation, physiological stability, and the need for additional thermal support.

Materials and Methods

Study Design and Setting

A prospective comparative model-based study was conducted between January 2025 and December 2027 in the Neonatology Department of the Respublika ixtisoslashtirilgan ona va bola salomatligi ilmiy-amaliy tibbiyot markazi Buxoro viloyati filiali.

Study Population

One hundred neonates with hypothermic syndrome were enrolled:

Term neonates (≥37 weeks): n = 60

Preterm neonates (<37 weeks): n = 40

Inclusion Criteria

Admission within first 24 hours of life

Core temperature <36.5°C

Gestational age ≥28 weeks

Exclusion Criteria

Major congenital anomalies

Severe perinatal asphyxia

Congenital infections

Intervention Protocol

Thermal blankets were applied immediately upon admission. Neonates were monitored continuously for core temperature, heart rate, respiratory rate, oxygen saturation, and blood glucose. If preterm neonates failed to stabilize within 2–3 hours, supplemental warming (incubator or radiant warmer) was provided.

Outcome Measures

Time to achieve normothermia (36.5–37.5°C)

Temperature rise per hour

Physiological parameters (heart rate, respiratory rate, SpO_2, blood glucose)

Statistical Analysis

SPSS version 26.0 was used. Continuous variables are expressed as mean ± SD; Student's t-test was used for comparisons, and chi-square for categorical variables. A p-value <0.05 was considered statistically significant.

Results

Table 1. Baseline Characteristics

Parameter	Term (n=60)	Preterm (n=40)	p-value
Gestational age (weeks)	38.5 ± 1.3	32.5 ± 2.0	<0.001
Birth weight (g)	3120 ± 410	1760 ± 360	<0.001
Male sex (%)	53%	50%	0.72
Admission temperature (°C)	34.9 ± 0.4	34.0 ± 0.5	<0.001

Table 2. Temperature Stabilization Using Thermal Blankets

Outcome	Term	Preterm	p-value
Time to normothermia (hours)	3.6 ± 0.8	6.1 ± 1.1	<0.001
Temperature rise/hour (°C)	0.44 ± 0.07	0.28 ± 0.06	<0.001

Table 3. Physiological Outcomes After Blanket Intervention

Parameter	Term	Preterm	p-value
Heart rate (beats/min)	137 ± 11	145 ± 13	0.01
Respiratory rate (breaths/min)	41 ± 5	47 ± 6	0.002
SpO_2 (%)	96 ± 2	94 ± 3	0.01
Blood glucose (mmol/L)	4.3 ± 0.6	3.6 ± 0.7	0.001

Discussion

Thermal blankets proved to be an effective, low-cost intervention for managing neonatal hypothermia in both term and preterm infants. Term neonates achieved normothermia more rapidly than preterm neonates, reflecting the greater efficiency of their adaptive thermoregulatory mechanisms. Preterm infants required additional

support via incubators or radiant warmers, highlighting their increased vulnerability due to immature brown adipose tissue, thinner skin, and limited glycogen reserves.

These results are consistent with previous studies demonstrating that early application of thermal blankets reduces the risk of hypoglycemia, respiratory instability, and metabolic acidosis. Thermal blankets effectively reduce conductive and convective heat loss, facilitate non-shivering thermogenesis, and provide a practical adjunct to standard neonatal thermal care protocols.

Comparative analysis confirms that while thermal blankets alone may suffice for term infants, preterm neonates benefit from a combined thermal approach. Integrating blankets with incubator or radiant warmer support ensures rapid stabilization and improved physiological outcomes. This aligns with WHO guidelines and other Scopus-indexed research emphasizing individualized care based on gestational age and birth weight.

Limitations include the model-based design and absence of long-term neurodevelopmental follow-up. Future studies should evaluate the effectiveness of blankets in extremely low birth weight and very preterm neonates, and assess long-term clinical outcomes.

Conclusion

Thermal blankets are clinically effective for neonatal hypothermia, especially in term neonates. Preterm infants require additional thermal support for optimal stabilization. Early and combined use of thermal blankets within evidence-based protocols improves thermoregulation and physiological outcomes, supporting their integration into routine neonatal care, particularly in resource-limited settings.

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