

NEONATAL HYPOTHERMIA AND ITS IMPACT ON EARLY MORBIDITY AND MORTALITY AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Neonatal hypothermia is a frequent and preventable condition that significantly contributes to early neonatal morbidity and mortality, particularly in low- and middle-income countries. **Objectives:** To assess the prevalence of neonatal hypothermia at admission, identify associated risk factors, and evaluate its impact on early morbidity and mortality. **Materials and Methods:** This hospital-based observational study was conducted in the neonatal unit of a tertiary care hospital. All live-born neonates admitted within 24 hours of birth during the study period were included. Axillary temperature was recorded at admission and classified according to World Health Organization [WHO] criteria. Maternal and neonatal characteristics, early neonatal morbidities, and mortality were documented and analyzed. **Results:** A total of 200 neonates were included in the study. Hypothermia at admission was observed in 118 [59%] neonates. Preterm birth, low birth weight, and outborn delivery were significantly associated with hypothermia. Hypothermic neonates had higher incidences of sepsis, respiratory distress, hypoglycemia, and significantly higher early neonatal mortality compared to normothermic neonates. **Conclusion:** Neonatal hypothermia is common and is strongly associated with increased early morbidity and mortality. Strict adherence to thermal care practices from birth through transport and hospitalization is essential to improve neonatal outcomes.

Keywords: neonatal hypothermia, morbidity, mortality, newborn care, observational study

INTRODUCTION

Neonatal hypothermia, defined as a body temperature below 36.5°C, remains a major public health concern despite advances in neonatal care[1]. Newborns are particularly vulnerable to hypothermia due to physiological factors such as a large surface area-to-body weight ratio, limited brown fat stores, immature thermoregulation, and inability to shiver effectively[2,3]. Heat loss occurs rapidly after birth through evaporation, convection, conduction, and radiation[4]. The World Health Organization [WHO] classifies neonatal hypothermia into mild [36.0–36.4°C], moderate [32.0–35.9°C], and severe [$<32.0^{\circ}\text{C}$][5]. Evidence suggests that even mild hypothermia increases the risk of neonatal complications, including hypoglycemia, metabolic acidosis, respiratory distress, sepsis, and death[6]. In resource-limited settings, contributing factors include inadequate thermal protection at birth, home deliveries, delayed initiation of breastfeeding, lack of awareness among healthcare providers, and poor transport facilities for outborn neonates[7].

Neonatal hypothermia is often underdiagnosed, as temperature monitoring may not be routinely practiced[8]. This study was undertaken to determine the burden of neonatal hypothermia at admission and to evaluate its

impact on early neonatal morbidity and mortality, thereby emphasizing the importance of effective thermal care practices.

MATERIALS AND METHODS

Study Design: This was a prospective observational study conducted in the Neonatal Intensive Care Unit [NICU] of a tertiary care teaching hospital. Study Population: All live-born neonates admitted to the NICU within 24 hours of birth during the study period were enrolled. Axillary temperature was measured at admission using a calibrated digital thermometer. Based on WHO criteria, neonates were classified as:

Normothermia: 36.5–37.5°C

Mild hypothermia: 36.0–36.4°C

Moderate hypothermia: 32.0–35.9°C

Severe hypothermia: $<32.0^{\circ}\text{C}$

Inclusion Criteria

Live-born neonates admitted within 24 hours of life

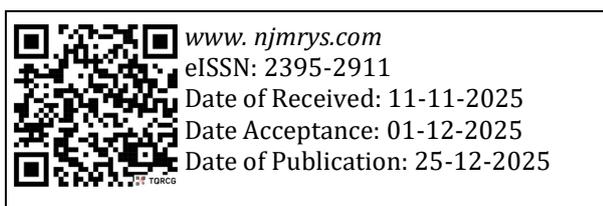
Both inborn and outborn neonates

Exclusion Criteria

Neonates with major congenital anomalies

Neonates admitted after 24 hours of life

Maternal and neonatal data including gestational age, birth weight, sex, mode of delivery, place of birth [inborn/outborn], and transport conditions were recorded. Early neonatal morbidities such as sepsis, respiratory distress, hypoglycemia, apnea, need for respiratory support, and duration of hospital stay were documented. Mortality occurring within the first seven days of life was considered



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early neonatal mortality.

STATISTICAL ANALYSIS

Data were analyzed using standard statistical software. Continuous variables were expressed as mean \pm standard deviation and categorical variables as percentages. Associations between hypothermia and outcomes were assessed using the chi-square test. A p-value <0.05 was considered statistically significant.

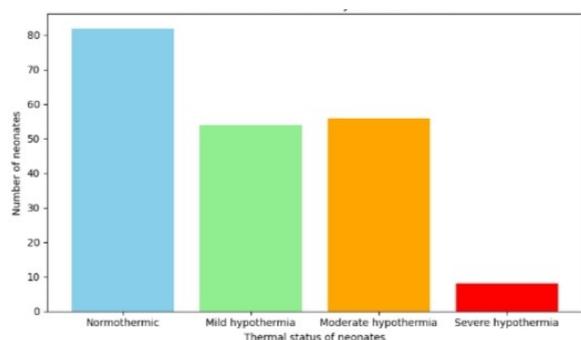
RESULTS

A total of 200 neonates were included in the study. Hypothermia at admission was observed in 118 [59%] neonates, while 82 [41%] were normothermic. Among hypothermic neonates, 54 [27%] had mild hypothermia, 56 [28%] had moderate hypothermia, and 8 [4%] had severe hypothermia.

Hypothermia was significantly more common among pre-term neonates, low birth weight infants, and outborn deliveries. Inadequate wrapping at birth and delayed transport were frequently observed among hypothermic neonates.

Early neonatal morbidities were significantly higher in hypothermic neonates compared to normothermic neonates. The incidence of sepsis [42% vs 18%], respiratory distress [38% vs 20%], and hypoglycemia [26% vs 10%] was markedly increased in the hypothermic group.

Early neonatal mortality was significantly higher among hypothermic neonates [15%] compared to normothermic neonates [4%]. Mortality increased with the severity of



hypothermia, with the highest mortality observed in neonates with severe hypothermia.

Distribution of Neonates by Thermal Status

DISCUSSION

The present study highlights a high prevalence of neonatal hypothermia at admission and demonstrates its strong association with early neonatal morbidity and mortality. The findings are consistent with previous studies from developing countries, which report hypothermia as a major contributor to adverse neonatal outcomes. Lunze et al. reported that neonatal hypothermia is highly prevalent in resource-limited settings and is independently associated with increased risk of neonatal mortality, even in tropical climates[9]. Similarly, a large community-based study by Mullany et al. in Nepal showed that the risk of neonatal death increased progressively with decreasing body temperature, emphasizing a dose-response relationship between hypothermia severity and mortality [10].

This aligns with the present study, where mortality in-

creased with the severity of hypothermia. Previous hospital-based studies have shown that preterm and low birth weight neonates are particularly vulnerable to hypothermia due to immature thermoregulatory mechanisms, reduced brown fat, and a high surface area-to-body mass ratio [11,12]. In the current study, a significantly higher incidence of hypothermia among preterm and low birth weight neonates further supports these findings. Hypothermia has been shown to exacerbate metabolic derangements such as hypoglycemia and metabolic acidosis, which in turn increase susceptibility to infections like neonatal sepsis[13]. Kumar et al. demonstrated that hypothermic neonates had a higher incidence of sepsis and respiratory distress, contributing to prolonged hospital stay and higher mortality rates[14].

These observations are consistent with the increased morbidity observed among hypothermic neonates in the present study. Evidence from interventional studies highlights that simple, low-cost strategies such as immediate drying, early skin-to-skin contact, Kangaroo Mother Care, early initiation of breastfeeding, and maintenance of the warm chain can significantly reduce the incidence of neonatal hypothermia [14,15]. The significantly higher incidence of hypothermia among outborn neonates in this study underscores the importance of maintaining thermal care during transport and early referral.

Overall, the present findings reinforce existing evidence that neonatal hypothermia is a preventable condition with serious consequences and that strict adherence to thermal care practices from birth through hospitalization is essential for improving neonatal survival.

CONCLUSIONS

Neonatal hypothermia is a common, preventable condition that significantly increases early neonatal morbidity and mortality. Early identification and strict adherence to thermal care practices from birth through hospitalization are essential to improve neonatal survival and outcomes.

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