

# Integrating Kangaroo Mother Care And Baby Warmer For Preterm Infants In Low And Middle-Income Countries: A Comprehensive Approach To Neonatal Health

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## Abstract:

Complications stemming from preterm birth persist as significant hurdles to neonatal health, especially in low and middle-income countries (LMICs) where access to advanced medical care is limited. Kangaroo Mother Care (KMC) has emerged as a cost-effective intervention, advocating skin-to-skin contact, breastfeeding, and thermal regulation, thus enhancing outcomes for preterm infants. However, in LMICs, where environmental conditions can be harsh and resources scarce, additional thermal support is often required. This study explores the fusion of KMC with a low-cost baby warmer to offer comprehensive care for preterm infants in LMIC settings. Through collaborative efforts among healthcare providers, engineers, and community stakeholders, a prototype amalgamating KMC and a baby warmer was devised, considering local contextual factors and resource limitations. Preliminary field trials in LMIC settings display promising outcomes, including enhanced thermal stability, bolstered parental bonding, and heightened breastfeeding rates. This integrated approach presents a practical resolution to tackle multiple challenges confronting preterm infants in LMICs, potentially diminishing neonatal mortality and morbidity rates. Further investigation is warranted to evaluate scalability, long-term effects, and implementation strategies to ensure widespread adoption and sustained impact across diverse LMIC contexts.

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## I. Introduction:

Preterm birth remains a significant global health challenge, particularly in countries such as India, where high birth rates and large populations present considerable obstacles in neonatal care. <sup>(1) (2) (3)</sup> Premature infants, born before completing 37 weeks of gestation, confront unique health risks due to their underdeveloped organs and physiological systems. <sup>(2) (5) (6)</sup> Among these challenges, neonatal hypothermia emerges as a crucial concern, exerting profound effects on morbidity and mortality rates among preterm babies.

<sup>(1) (3) (4) (6) (7)</sup> Neonatal hypothermia, characterized by a drop in body temperature below normal levels, poses serious threats to the health and well-being of preterm infants. Their immature thermoregulatory mechanisms render them highly susceptible to heat loss, leading to elevated oxygen and energy consumption, cold stress, and potential health complications. In resource-constrained settings, where

access to advanced medical equipment and facilities may be limited, addressing neonatal hypothermia becomes even more daunting.

Traditionally, approaches like <sup>(11) (14) (22) (25)</sup> Kangaroo Mother Care (KMC) have been employed to provide warmth and support to preterm infants. KMC entails skin-to-skin contact between the baby and the caregiver, typically the mother, offering natural warmth and fostering bonding while facilitating thermoregulation. While

KMC has demonstrated effectiveness in various contexts, it also presents limitations, such as the requirement for continuous caregiver presence, which may not always be feasible, particularly in resource-constrained settings or where cultural norms pose obstacles.

In response to the challenges posed by neonatal hypothermia and the constraints of existing interventions, innovative solutions have emerged, aiming to offer practical, cost-effective, and accessible thermoregulation support for preterm infants. <sup>(5) (10) (23)</sup> One such solution is the Neonatal Warming System, a novel approach designed to address the multifaceted needs of preterm babies with efficiency and simplicity.

In this paper, we delve into the Neonatal Warming System as a promising advancement in neonatal care, highlighting its fundamental features, advantages, and potential impact on enhancing outcomes for preterm infants, particularly in resource-limited settings like India. By providing an in-depth overview of this innovative solution, we seek to underscore its significance in tackling the critical issue of neonatal hypothermia and

advancing the quality of care for preterm babies globally.

**Preterm or premature infants:**

Preterm or premature infants, commonly known as preemies, are babies born prior to completing the full 37 weeks of gestation. <sup>(4)(1)(2)(5)(8)</sup> Their early arrival presents several hurdles and health concerns stemming from their underdeveloped organs and systems. Here are essential points to grasp about preterm infants:

**Gestational Age:**

Preterm infants are classified according to their gestational age. Those born very prematurely arrive before 32 weeks of gestation, while moderately preterm infants are born between 32 and 34 weeks, and late preterm babies are delivered between 34 and 37 weeks.

**Size and Weight:**

Preterm infants generally exhibit smaller size and lighter weight compared to full-term babies, as they haven't had the complete gestational period to mature. They might possess less subcutaneous fat, crucial for maintaining body temperature.

**Preterm Children in India:**

India, akin to numerous other nations, grapples with significant issues concerning preterm children, born prematurely before completing the full 37 weeks of gestation. Preterm birth represents a global challenge, but in India, it assumes particular importance due to the country's high birth rate and vast population. <sup>(14)</sup> As of January 2022, India stood among the countries with the highest prevalence of preterm births globally, with an estimated 3.5 million occurring annually. Here are some notable points regarding preterm children in India:

**Prevalence:**

India ranks among the nations with the highest prevalence of preterm births worldwide. <sup>(9)</sup> These births contribute significantly to neonatal mortality rates in the country.

**Healthcare Infrastructure:**

Despite notable advancements in healthcare infrastructure and accessibility to medical services, India still grapples with disparities in healthcare quality and availability, particularly in rural regions. Such discrepancies can affect the care and survival rates of preterm infants.

**Neonatal Mortality:**

Preterm birth stands as a leading cause of neonatal mortality in India. <sup>(9)</sup> Efforts aimed at reducing neonatal deaths often target the challenges associated with preterm infants.

**Hypothermia:**

Hypothermia represents a critical risk factor for morbidity and mortality among new-borns, especially those with low birth weights or born prematurely. <sup>(7)</sup> These infants not only require effective thermal insulation to preserve heat but also necessitate additional thermal support during the initial days to avert hypothermia.

**Malnutrition and Low Birth Weight:**

Malnutrition and low birth weight are prevalent concerns among pregnant women in India, both of which can contribute to preterm births and the associated health complications in preterm children.

**Kangaroo Mother Care (KMC)** <sup>(2)(11)(14)(22)</sup> stands as a revolutionary and highly efficient approach to tending to premature or underweight infants, drawing inspiration from the nurturing behaviours observed in kangaroos. Originating in Colombia in the late 1970s, this pioneering method has gained global recognition as a vital component of neonatal care. KMC entails intimate skin-to-skin contact between new-borns and their mothers (or caregivers), mimicking the warmth, protection, and nourishment provided by a kangaroo's pouch to its young. This practice facilitates crucial physical and emotional bonding between parents and their infants, fostering optimal health and development for the babies. In this exploration, we delve into the core principles, advantages, and significance of

Kangaroo Mother Care in enhancing neonatal outcomes and bolstering the well-being of both infants and their families.

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