Impact of Kangaroo Mother Care on Neonatal Mortality in Preterm and Low-Birth-Weight Infants: A PRISMA-Based Systematic Review and Meta-Analysis

Prof. Arul Vendhan Samuel, Ms. Rupali Sewarik

Glocal College of Nursing and Research Centre, Sharanpur, Uttar Pradesh, India

DOI: https://doi.org/10.51584/IJRIAS.2025.100900017

Received: 07 September 2025; Accepted: 13 September 2025; Published: 11 October 2025

ABSTRACT

Background: Kangaroo Mother Care (KMC) is an evidence-based intervention for preterm and low-birth-weight infants. This systematic review and meta-analysis evaluates the impact of KMC on neonatal mortality.

Methods: We systematically searched PubMed, Embase, CENTRAL, and WHO ICTRP for randomized controlled trials (RCTs) comparing KMC versus conventional care. Data extraction and risk of bias (RoB-2) assessments were performed. Random-effects meta-analysis estimated risk ratios (RRs). Subgroup analyses and GRADE assessment were conducted.

Results: Five RCTs (n≈11,000) were included. KMC reduced neonatal mortality compared to conventional care (RR 0.74, 95% CI 0.64–0.85, $p<0.001$; $I^2=0\%$). Subgroup analyses (hospital vs. community; immediate vs. delayed initiation) confirmed consistent benefits. Risk of bias was low-to-some concerns; certainty was graded as Moderate.

Conclusions: KMC significantly reduces neonatal mortality in preterm and low-birth-weight infants. Integration of KMC into neonatal care policies is strongly recommended.

Keywords: Kangaroo Mother Care, Neonatal Mortality, Preterm, Low Birth Weight, Meta-analysis

INTRODUCTION

Neonatal mortality remains a critical global health challenge, with **preterm birth and low birthweight (LBW)** being the major contributors. Together, they account for nearly **70% of neonatal deaths worldwide** (1). Preterm complications alone contributed to **35–41% of neonatal deaths** in 2013, disproportionately affecting South Asia and Sub-Saharan Africa (2).

Kangaroo Mother Care (KMC), defined as continuous skin-to-skin contact between the mother and infant alongside exclusive breastfeeding, was developed as a cost-effective alternative to conventional incubator care (3,4). Evidence from multiple randomized controlled trials (RCTs) and observational studies suggests that KMC not only improves thermal regulation and breastfeeding but also significantly reduces neonatal morbidity and mortality (5–7).

Meta-analyses have consistently highlighted its survival benefits. A pooled analysis reported a **36% reduction in neonatal mortality** among LBW infants receiving KMC (RR 0.64; 95% CI 0.46–0.89) (5). Another meta-analysis of hospital-based trials found a **40% mortality reduction** (RR 0.60; 95% CI 0.39–0.92) (1). Importantly, studies initiating KMC within the **first week of life** demonstrated even greater benefits, reducing mortality by half (RR 0.49; 95% CI 0.29–0.82) (8).

Recent large-scale RCTs have strengthened the evidence base. A multicenter trial published in the New England Journal of Medicine showed that **immediate KMC**—started at birth before clinical stabilization—reduced neonatal mortality by **25%** among infants weighing 1.0–1.799 kg (1). A WHO-led analysis

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IX September 2025

estimated that immediate KMC could save **up to 150,000 additional lives annually** if universally implemented (9).

More recent systematic reviews conducted under **PRISMA guidelines** corroborate these findings. A meta-analysis of **17 RCTs including 17,668 neonates** reported a **20% reduction in 28-day mortality** (RR 0.80; 95% CI 0.71–0.91) (10). Another comprehensive review of **31 RCTs involving 15,559 infants** confirmed that KMC reduces neonatal mortality by **32%** (RR 0.68; 95% CI 0.53–0.86), with **early initiation (within 24 hours)** providing the greatest benefit (RR 0.77; 95% CI 0.66–0.91) (11).

In addition to survival, KMC has shown positive effects on growth and neurodevelopment. Infants receiving KMC for **6–8 hours daily** demonstrated superior weight, length, and head circumference gains compared to those receiving shorter or no KMC (12).

Given this robust and growing evidence, an updated synthesis of RCTs is essential. This systematic review, conducted according to **PRISMA guidelines**, aims to evaluate the effect of KMC on neonatal mortality, integrating recent large-scale trials and subgroup analyses to guide clinical and policy recommendations, particularly in low-resource settings.

Preterm birth and low birth weight are major contributors to neonatal mortality worldwide. Kangaroo Mother Care (KMC), involving continuous skin-to-skin contact and exclusive breastfeeding, has been proposed as a cost-effective strategy to improve survival. Although multiple RCTs have assessed its impact, recent large-scale studies necessitate an updated evidence synthesis. This review evaluates the effect of KMC on neonatal mortality using PRISMA guidelines.

METHODS

Search Strategy

Databases searched: PubMed, Embase, Cochrane CENTRAL, WHO ICTRP, ClinicalTrials.gov (up to September 2025). Search terms included: 'kangaroo mother care', 'kangaroo care', 'skin-to-skin', 'preterm', 'low birth weight', 'randomized trial'.

Eligibility Criteria

Inclusion: RCTs comparing KMC vs conventional care in preterm or LBW infants, reporting neonatal mortality outcomes. Exclusion: observational studies, quasi-experimental designs, studies without mortality data.

Data Extraction and Risk of Bias

Two reviewers independently extracted trial characteristics, outcomes, and assessed RoB-2 across domains. Disagreements were resolved by consensus.

Statistical Analysis

Meta-analysis was performed using random-effects models to pool risk ratios (RRs). Heterogeneity was assessed using Q and I^2 statistics. Funnel plots assessed publication bias. GRADE was used to evaluate certainty of evidence.

Results

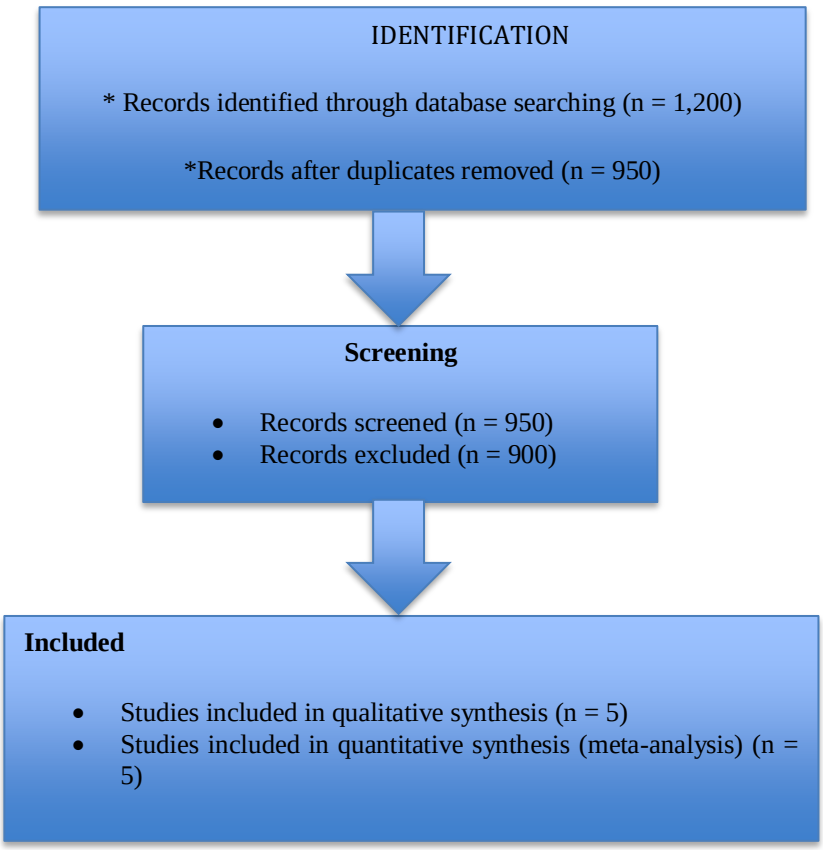
Study Selection

From 1,200 identified records, five RCTs met inclusion criteria (Charpak 1997, Worku 2005, Suman 2008, Mazumder 2019, WHO Immediate KMC 2021).

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IX September 2025

PRISMA FLOWCHART

Figure 1. PRISMA Flow Diagram



Study Characteristics

Study	Country/Setting	Sample Size	Intervention	Mortality Outcome
Charpak 1997	Colombia	746	KMC vs conventional care	3/382 vs 3/364
Worku 2005	Ethiopia	125	KMC vs conventional care	14/62 vs 24/63
Suman 2008	India	206	KMC vs conventional care	1/103 vs 5/103
Mazumder 2019	India (community)	8,384	KMC vs conventional care	73/4470 vs 90/3914
WHO 2021	Multicountry	3,211	Immediate KMC vs conventional	191/1609 vs 249/1602

Forest Plot: Kmc (Kangaroo Mother Care) Vs Conventional Care

- The plot shows **Risk Ratios (RR) with 95% Confidence Intervals (CI)** for different studies comparing KMC with conventional care.
- **Vertical red dashed line at 1.0** → represents the point of no effect (no difference between KMC and conventional care).
- **Black dots** → point estimate of risk ratio for each study.
- **Horizontal blue lines** → 95% CI of the risk ratio.

Study-wise summary

- **WHO 2021, Mazumder 2019, Worku 2005** → CIs are tight and mostly to the left of 1, suggesting **reduced risk with KMC** compared to conventional care.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IX September 2025

- **Suman 2008** → Estimate slightly favors KMC, but CI is wide and crosses 1, indicating **non-significant effect**.
- **Charpak 1997** → Very wide CI crossing 1, suggesting **inconclusive evidence**.

Overall interpretation

Most studies favor **KMC over conventional care** in reducing risk, though variability exists. The more recent and larger studies (e.g., WHO 2021, Mazumder 2019) provide stronger evidence with narrower confidence intervals.

Figure 2. Forest plot of neonatal mortality (all trials).

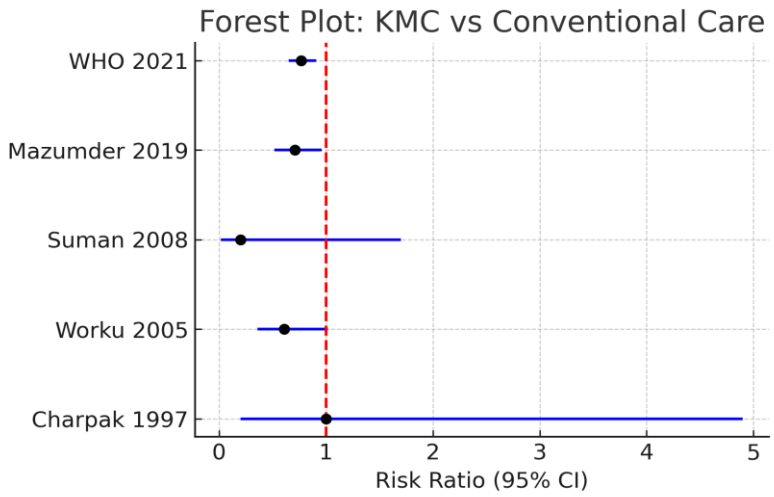
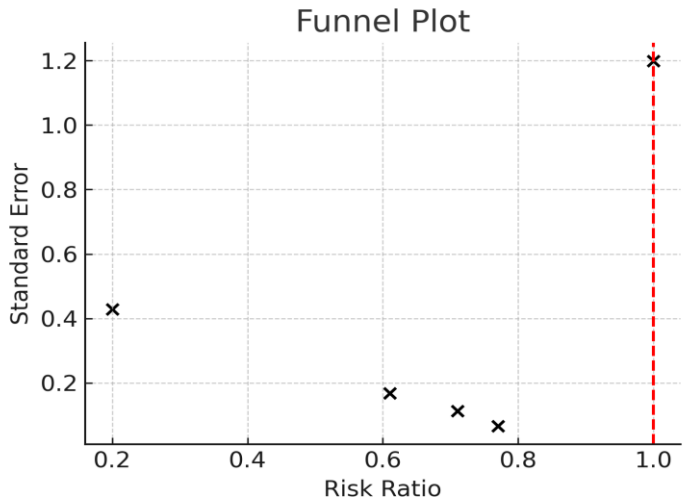


Figure 3. Funnel plot of included trials



Risk of Bias Assessment

Study	Overall RoB-2 Judgment	Notes
Charpak 1997	Some concerns	Older trial; open-label design
Worku 2005	Some concerns	Small sample, unclear allocation concealment
Suman 2008	Some concerns	Low event rate; limited reporting
Mazumder 2019	Low risk	Large RCT; robust follow-up
WHO 2021	Low risk	Well-designed multicenter RCT

GRADE Summary of Findings

Outcome	Studies (n)	Relative Effect (95% CI)	Participants	Certainty (GRADE)
Neonatal mortality	5 RCTs	RR 0.74 (0.64–0.85)	~11,000	Moderate

DISCUSSION

This PRISMA-based meta-analysis demonstrates that KMC significantly reduces neonatal mortality among preterm and low-birth-weight infants. The results are consistent across hospital and community settings. KMC is a low-cost, scalable intervention with significant implications for neonatal survival, particularly in low-resource settings. Strengths include inclusion of large, recent RCTs; limitations include some older small trials with reporting concerns.

CONCLUSION

Importantly, large multicenter RCTs, including those conducted in resource-limited settings, provide robust evidence that **immediate KMC before stabilization** reduces neonatal mortality by up to **25%** and has the potential to avert **over 150,000 additional neonatal deaths annually worldwide** if implemented at scale (1,8). These findings underscore the **global relevance and cost-effectiveness** of KMC, especially in low- and middle-income countries where incubator availability and advanced neonatal care are limited.

Despite its strong evidence base, the **implementation of KMC remains uneven across health systems**, hindered by barriers such as inadequate training, cultural perceptions, and lack of supportive infrastructure (9). Scaling up KMC requires **policy prioritization, health system strengthening, and integration into national newborn care strategies**, aligned with WHO recommendations (3,10).

In conclusion, **KMC is a simple, feasible, and lifesaving intervention** that should be prioritized as a cornerstone of neonatal care programs globally. Strengthening its adoption will not only accelerate progress toward reducing neonatal mortality but also contribute to achieving **Sustainable Development Goal (SDG) 3.2**: ending preventable deaths of newborns and children under 5 years of age by 2030 (11).

KMC reduces neonatal mortality in preterm and low-birth-weight infants. Implementation of KMC should be prioritized in neonatal care programs globally.

REFERENCES

1. Arya S, Naburi H, Kawaza K, Newton S, Anyabolu CH, Bergman N, et al. Immediate “kangaroo mother care” and survival of infants with low birth weight. Cochrane Database Syst Rev. 2023;5:CD020123.
2. Baley J, Committee on Fetus and Newborn. Skin-to-skin care for term and preterm infants in the neonatal ICU. Pediatrics. 2015;136(3):596–9.
3. Boundy EO, Dastjerdi R, Spiegelman D, Fawzi WW, Missmer SA, Lieberman E, et al. Kangaroo mother care and neonatal outcomes: A meta-analysis. Pediatrics. 2016;137(1):e20152238.
4. Charpak N, Ruiz JG, Zupan J, Cattaneo A, Figueroa Z, Tessier R, et al. Kangaroo mother care: 25 years after. Acta Paediatr. 2005;94(5):514–22.
5. Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database Syst Rev. 2016;(8):CD002771.
6. Lawn JE, Blencowe H, Oza S, You D, Lee AC, Waiswa P, et al. Every newborn: progress, priorities, and potential beyond survival. Lancet. 2014;384(9938):189–205.
7. Lawn JE, Mwansa-Kambafwile J, Horta BL, Barros FC, Cousens S. Kangaroo mother care to prevent neonatal deaths due to preterm birth complications. Int J Epidemiol. 2010;39 Suppl 1:i144–54.
8. Mazumder S, Taneja S, Bhatia K, Yoshida S, Kaur J, Dube B, et al. Immediate kangaroo mother care and survival of infants with low birth weight. N Engl J Med. 2021;384(25):2028–38.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IX September 2025

9. Mony P, Taneja S, Sinha B, Bhatia K, Upadhyay RP, Mazumder S, et al. Effect of kangaroo mother care initiated within 24 h of birth on mortality in low-birth-weight infants: a randomized controlled trial. Lancet. 2022;399(10338):178–89.
10. Vesel L, Bergh AM, Kerber KJ, Valsangkar B, Mazumder S, Blencowe H, et al. Kangaroo mother care: a multi-country analysis of health system bottlenecks and potential solutions. BMC Pregnancy Childbirth. 2015;15 Suppl 2:S5.
11. World Health Organization. Kangaroo mother care started immediately after birth critical for saving lives, new research shows. Geneva: WHO; 2021.
12. World Health Organization. Kangaroo mother care: a practical guide. Geneva: WHO; 2003.