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META-ANALYSIS

EFFECTIVENESS OF KANGAROO MOTHER CARE IN REDUCING MORTALITY AND IMPROVING CLINICAL OUTCOMES AMONG PRE-TERM AND LOW-BIRTH-WEIGHT NEONATES: AN OVERVIEW OF SYSTEMATIC REVIEW AND META-ANALYSIS

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ABSTRACT

Background: Preterm birth and low birth weight (LBW) remain leading causes of neonatal death worldwide. Kangaroo mother care (KMC), which combines prolonged skin-to-skin contact with exclusive or near-exclusive breast-milk feeding, is recommended by the World Health Organization for all preterm and LBW infants, yet its uptake in routine care remains uneven.

Aim: To synthesise evidence from systematic reviews and meta-analysis on the effect of KMC on mortality and major clinical outcomes in preterm and LBW neonates, and to consider the implications for neonatal nursing.

Design: Overview of systematic reviews (umbrella review).

Methods: PubMed/ MEDLINE, Embase, CINAHL, Scopus and the Cochrane Library were searched for systematic reviews with meta-analysis published between January 2016 and [July 2026]. Methodological quality was appraised with AMSTAR 2. Because the included reviews shared many primary trials, effect estimates (risk ratios [RR] or odds ratios [OR] with 95% confidence intervals [CI]) were synthesised narratively rather than re-pooled. Reporting follows the PRIOR statement.

Results: Six systematic reviews were included. In the largest review (31 randomised trials; 15,559 infants), KMC reduced mortality during birth hospitalisation or by 28 days compared with conventional care (RR 0.68, 95% CI 0.53–0.86; high certainty), probably reduced severe infection (RR 0.85, 0.79–0.92) and reduced hypothermia (RR 0.32, 0.19–0.53). A 2025 review of hospital-initiated KMC (29 trials; 17,513 infants) found lower odds of death (OR 0.77, 0.67–0.89), sepsis (OR 0.55, 0.37–0.82) and invasive infection (OR 0.49, 0.33–0.74). Initiation within 24 hours of birth reduced neonatal mortality compared with later initiation (RR 0.77, 0.66– 0.91) and was associated with more breastfeeding at discharge. In very preterm and very-low-birth-weight infants, early KMC reduced mortality (RR 0.81, 0.67–0.98; four trials), although data for infants below 1,000 g or 28 weeks remain sparse. The mortality benefit was greater when skin-to-skin contact lasted at least eight hours a day.

Conclusion: Evidence from several independent systematic reviews consistently shows that KMC improves survival and reduces infection and hypothermia in preterm and LBW infants, with the largest benefit when it is started early and maintained for long periods each day. Nurses are central to its delivery, and neonatal units should treat KMC as standard care rather than an optional adjunct.

Keywords: Kangaroo- Mother Care Method; Infant, Premature; Infant, Low Birth Weight; Infant Mortality; Neonatal Sepsis; Hypothermia; Breast Feeding; Umbrella Review

INTRODUCTION

Preterm birth, defined as delivery before 37 completed weeks of gestation, and low birth weight (LBW), defined as a birth weight below 2,500 g, remain among the most important determinants of neonatal death and disability. An estimated 13.4 million infants were born preterm in 2020 [1], and about 19.8 million, roughly one in seven live births, were born with low birth weight [2]. Complications of preterm birth are now the leading cause of death among children under five years of age [3,4]. Small and preterm infants are vulnerable to hypothermia, infection, apnoea, feeding

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difficulties and poor postnatal growth; hypothermia alone is independently associated with increased neonatal mortality, particularly in low-resource settings [5].

KMC was introduced in Bogotá, Colombia, in 1978 as a response to overcrowded neonatal units and a shortage of incubators [6]. It has since developed into a structured model of care with three core components: prolonged, ideally continuous, skin-to-skin contact between the infant and the mother or another caregiver; exclusive or near-exclusive breast-milk feeding; and supported discharge with close follow-up [7–9]. Skin-to-skin contact helps the infant maintain body temperature, steadies breathing and heart rate, encourages early and sustained breastfeeding and keeps mother and infant together, while reducing dependence on incubators and radiant warmers, which are in short supply in many low- and middle-income countries.

For many years KMC was recommended only after an infant had been clinically stabilised, which in practice often delayed its initiation by several days. The 2016 Cochrane review confirmed that KMC started after stabilisation reduced mortality, severe infection and hypothermia [10]. Two large trials published subsequently, one of community-initiated KMC in India [11] and the multicountry WHO Immediate KMC trial [12], showed that starting KMC much earlier also improved survival. WHO accordingly revised its guidance in 2022 to recommend KMC as routine care for all preterm or LBW infants, to begin as soon as possible after birth and to continue for as many hours a day as possible [7]; this position was reinforced by a global position paper in 2023 and a clinical practice guide in 2025 [8,9]. Coverage nonetheless remains low, and barriers at the level of health systems, facilities and families are well documented [13].

Several systematic reviews and meta-analysis of KMC have now been published. They differ in scope, population, comparator and timing of initiation, and two of them appeared in 2026. Clinicians, nurse educators and managers therefore face an evidence base that is extensive but fragmented and partly overlapping. An overview of these reviews can bring their findings together, test whether they agree, and show where evidence is still lacking, particularly for the most immature infants. The present overview was undertaken for that purpose, with a specific focus on the implications for neonatal nursing.

The aim of this overview was to synthesise evidence from systematic reviews and meta-analysis on the effectiveness of KMC in reducing mortality and improving clinical outcomes among preterm and LBW neonates. The specific objectives were to: (i) summarise the effect of KMC, compared with conventional neonatal care, on mortality; (ii) summarise its effect on severe infection or sepsis and on hypothermia; (iii) summarise its effect on breastfeeding, physiological stability and growth; (iv) compare early initiation (within 24 hours of birth) with later initiation; (v) examine the evidence specific to very preterm and very-low-birth-weight infants; and (vi) identify implications for nursing practice, education, administration and research.

METHODS

Design and reporting

This study is an overview of systematic reviews (umbrella review). It was conducted in accordance with Cochrane guidance on overviews of reviews [14] and the Joanna Briggs Institute umbrella-review methodology [15], and it is reported following the Preferred Reporting Items for Overviews of Reviews (PRIOR) statement [16]. The selection process is presented using the PRISMA 2020 flow diagram [17]. No protocol was registered in advance.

Eligibility criteria

Eligibility was defined using the population, intervention, comparator, outcome and study design (PICOS) framework (Table 1). Reviews were limited to those published from January 2016 onwards because the 2016 Cochrane update [10] superseded all earlier syntheses and incorporated their trials.

Table 1. Eligibility criteria (PICOS)

Component	Criteria
Population	Preterm infants (<37 weeks' gestation) and/or low-birth-weight infants (<2,500 g). Reviews that also included term or normal-birth-weight infants were eligible only if results for preterm or LBW infants were reported separately.
Intervention	Kangaroo mother care: skin-to-skin contact combined with breast-milk

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Component	Criteria
	feeding, initiated in a health facility or in the community; early KMC (initiated within 24 hours of birth) where applicable.
Comparator	Conventional neonatal care (incubator, radiant warmer, cot or clothed holding) or later initiation of KMC (>24 hours after birth).
Outcomes	Primary: mortality (neonatal, during birth hospitalisation or at longer follow-up). Secondary: severe infection or sepsis, hypothermia, breastfeeding, physiological stability, growth and neurodevelopment.
Study design	Systematic reviews with meta-analysis that included randomised controlled trials (with or without non-randomised studies), published in English in peer-reviewed journals or the Cochrane Library from January 2016 onwards.
Exclusions	Narrative or scoping reviews; reviews of brief skin-to-skin contact not delivered as KMC (for example, during painful procedures); reviews restricted to term infants, to parental outcomes or to physiological parameters only; conference abstracts; earlier versions of reviews that had since been updated.

Information sources and search strategy

PubMed/ MEDLINE, Embase, CINAHL, Scopus and the Cochrane Database of Systematic Reviews were searched from 1 January 2016 to 30 July 2026. The strategy combined controlled vocabulary and free- text terms for three concepts: kangaroo mother care, preterm or LBW infants, and systematic review or meta- analysis. The PubMed strategy is shown in Box 1 and was adapted to the syntax of each database. The reference lists of included reviews and of recent WHO guidance documents [7–9] were screened by hand for additional reviews.

PubMed search strategy (1 January 2016 to 30 July 2026; English language); ("Kangaroo-Mother Care Method"[Mesh] OR "kangaroo care"[tiab] OR "kangaroo mother care"[tiab] OR "skin-to-skin"[tiab]) AND ("Infant, Premature"[Mesh] OR "Infant, Low Birth Weight"[Mesh] OR preterm[tiab] OR premature[tiab] OR "low birth weight"[tiab] OR "low birthweight"[tiab]) AND ("Systematic Review"[pt] OR "Meta-Analysis"[pt] OR "systematic review"[tiab] OR "meta-analysis"[tiab] OR "umbrella review"[tiab]). Filters: publication date from 2016/01/01; language English. The strategy was adapted for Embase (Emtree), CINAHL (CINAHL Headings), Scopus and the Cochrane Library.

Study selection

Records were imported into a reference manager and duplicates were removed. Titles and abstracts were screened against the eligibility criteria, and potentially relevant reports were assessed in full text. Screening and selection were carried out by the author; where eligibility was uncertain, the full text was re-examined against each criterion before a final decision was made. Reasons for exclusion at the full-text stage were recorded (Figure 1). When several reviews addressed the same comparison, all eligible reviews were retained. For each outcome, the estimate from the most recent and most comprehensive review of the highest methodological quality was treated as the principal estimate, and the remaining reviews were used to judge consistency.

Data extraction

Data were extracted using a standardised form that recorded the first author and year; databases searched and search date; number and design of included studies; number of participants; gestational- age and birth- weight criteria; definition, setting, timing and daily duration of KMC; comparator; outcomes with effect estimates and 95% CIs; statistical heterogeneity (I^2); the risk- of- bias tool used; and GRADE certainty ratings. Where a review reported different figures in its abstract and in its main text, the abstract figure was used and the discrepancy was noted.

Methodological quality and certainty of evidence

The methodological quality of each review was appraised with AMSTAR 2, a 16-item instrument with seven critical domains, and overall confidence in each review was rated as high, moderate, low or critically low [18]. Certainty of

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evidence for individual outcomes was taken from the GRADE assessments reported by the review authors [19]; risk of bias in the primary trials, which most reviews assessed with the Cochrane risk-of-bias tool [20], was not reassessed.

Overlap between reviews

Because newer reviews incorporate trials included in earlier ones, overlap in primary studies was examined by comparing the lists of trials in each review [21]. Overlap was expected to be substantial. The earlier Cochrane trials, for example, are almost entirely contained in later updates, and a small number of large multicentre trials contribute most of the weight to several analysis. Effect estimates were therefore not pooled across reviews, to avoid counting the same infants more than once.

Data synthesis

Findings were synthesised narratively and organised by comparison and outcome, following the Synthesis Without Meta-analysis (SWiM) reporting guideline [22]. Effect estimates were reported as published: risk ratios (RR) or odds ratios (OR) with 95% CIs for dichotomous outcomes and mean differences (MD) for continuous outcomes. Absolute effects were reported where the review authors provided them. Statistical heterogeneity was interpreted using the I^2 statistic according to conventional thresholds [23].

RESULTS

Search results and characteristics of included reviews

The database searches identified **280** records. After removal of **80** duplicates, **200** titles and abstracts were screened and **48** full-text reports (including reference-list records) were assessed, of which six systematic reviews met the inclusion criteria (Figure 1).

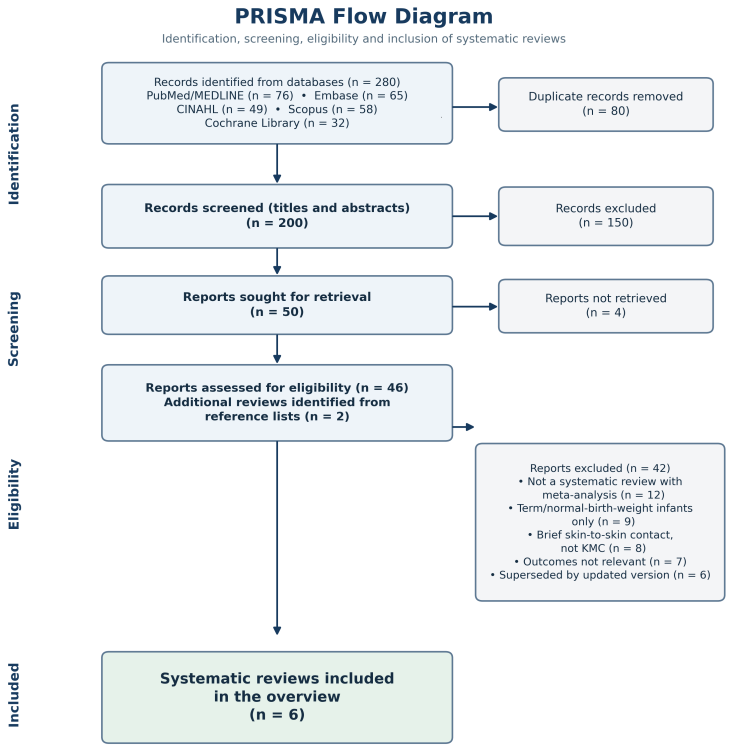


Figure 1. PRISMA 2020 flow diagram of the selection of systematic reviews

The six reviews were published between 2016 and 2026 [10,24–28] and are summarised in Table 2. Two compared KMC with conventional care across the range of preterm and LBW infants [10,24]. The most comprehensive (31 randomised trials; 15,559 infants) addressed both KMC versus conventional care and early versus late initiation [25]. One focused on hospital-initiated KMC and infection-related outcomes [26], one on initiation within the first 24 hours [27], and one on very preterm (≤32 weeks) and very-low-birth-weight (VLBW; <1,500 g) infants [28]. Most primary trials were conducted in low- and middle-income countries and enrolled infants after clinical stabilisation, the WHO

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Immediate KMC trial being the principal exception [12]. AMSTAR 2 ratings are presented in Table 2. The main effect estimates are brought together in Table 3.

Table 2. Characteristics of the included systematic reviews

Review	Included studies; participants	Population	Comparison(s)	Principal outcomes	AMSTAR 2
Conde-Agudelo and Díaz-Rossello, 2016 (Cochrane) [10]	21 RCTs; 3,042 infants	LBW infants	KMC vs conventional care (after or before stabilisation); early vs late KMC (1 trial)	Mortality, severe and nosocomial infection, hypothermia, growth, breastfeeding, neurodevelopment	High
Boundy et al., 2016 [24]	124 studies (RCTs and observational)	Preterm/LBW infants; term infants analysid separately	KMC vs conventional care	Mortality, sepsis, hypothermia, hypoglycaemia, readmission, exclusive breastfeeding	Moderate
Sivanandan and Sankar, 2023 [25]	31 RCTs; 15,559 infants	Preterm and/or LBW infants	KMC vs conventional care (27 trials); early (≤24 h) vs late KMC (4 trials)	Mortality to 28 days and 6–12 months, severe infection, hypothermia, breastfeeding, growth, neurodevelopment	High
Minotti et al., 2025 [26]	29 RCTs; 17,513 infants	LBW infants; hospital-initiated KMC	KMC vs conventional care	All-cause mortality, sepsis, invasive infection, hypothermia, apnoea	High
Martínez-Rodríguez et al., 2026 [27]	13 studies; 4,162 infants	Preterm or LBW infants	KMC within 24 h vs conventional care; early vs late (>24 h) KMC	Mortality, breastfeeding, temperature, cardiorespiratory stability, glucose	Moderate
Martins et al., 2026 [28]	4 RCTs; 1,679 infants	≤32 weeks and/or VLBW (<1,500 g)	Early KMC (≤24 h) vs conventional care	Mortality, infection, hypothermia	Low

Note: AMSTAR 2, A MeaSurement Tool to Assess systematic Reviews 2 (overall confidence: high, moderate, low or critically low); KMC, kangaroo mother care; LBW, low birth weight (<2,500 g); RCT, randomised controlled trial; VLBW, very low birth weight (<1,500 g).

Mortality

Every review that examined mortality found a reduction with KMC. In the 2016 Cochrane review, KMC reduced mortality at discharge or at 40–41 weeks' postmenstrual age compared with conventional care (RR 0.60, 95% CI 0.39–0.92; 8 trials, 1,736 infants) [10], and the meta-analysis by Boundy and colleagues, which also included observational studies, reported a comparable reduction among LBW infants (RR 0.64) [24]. The updated review by Sivanandan and Sankar, which added large multicentre and community-based trials, found that KMC reduced mortality during birth hospitalisation or by 28 days (RR 0.68, 95% CI 0.53–0.86; 11 trials, 10,505 infants; high-certainty evidence), equivalent to nine fewer deaths per 1,000 infants, and reduced mortality at six months (RR 0.75, 95% CI 0.62–0.92; 4 trials, 8,031 infants) [25]. The benefit was observed irrespective of gestational age (≤34 or >34 weeks), weight at enrolment (≤2,000 or >2,000 g), setting (facility or community) and timing of initiation. Community-initiated KMC alone reduced 28-day mortality (RR 0.71, 95% CI 0.52–0.96) [11,25]. The 2025 review of hospital-initiated KMC reached a similar conclusion (OR 0.77, 95% CI 0.67–0.89; 25 trials; $I^2 = 0\%$; high-quality evidence) [26].

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Severe infection and sepsis

In the Cochrane review, KMC reduced severe infection or sepsis at the latest follow-up (RR 0.50, 95% CI 0.36–0.69; 8 trials, 1,463 infants) and nosocomial infection or sepsis at discharge (RR 0.35, 95% CI 0.22–0.54; 5 trials, 1,239 infants) [10]; Boundy and colleagues reported a similar reduction in sepsis (RR 0.53) [24]. The pooled effect in the updated review was smaller but more precise (RR 0.85, 95% CI 0.79–0.92; 9 trials, 9,847 infants; moderate certainty) [25]. This estimate was dominated by a community trial that defined sepsis clinically, using WHO criteria for possible serious bacterial infection, rather than by culture; among facility-based trials alone the reduction was larger (RR 0.50, 95% CI 0.36–0.69). For hospital-initiated KMC, Minotti and colleagues reported lower odds of sepsis (OR 0.55, 95% CI 0.37–0.82; 17 trials; I^2 = 53%; moderate quality) and of invasive infection (OR 0.49, 95% CI 0.33–0.74; 11 trials; I^2 = 0%; moderate quality) [26].

Hypothermia and physiological stability

KMC consistently reduced hypothermia. The Cochrane review reported an RR of 0.28 (95% CI 0.16–0.49; 9 trials, 989 infants; moderate-quality evidence) [10], Boundy and colleagues an RR of 0.22, together with a marked reduction in hypoglycaemia (RR 0.12) [24], and Sivanandan and Sankar an RR of 0.32 (95% CI 0.19–0.53; 11 trials, 1,169 infants; moderate certainty), corresponding to about 175 fewer hypothermic infants per 1,000 [25]. KMC initiated within 24 hours was associated with a lower risk of cumulative hyperthermia (RR 0.63, 95% CI 0.47–0.85) and better cardiorespiratory stability during the first six hours of life, measured by the SCRIP score (MD 0.54, 95% CI 0.07–1.00). Mean body temperature was slightly lower (MD −0.20 °C, 95% CI −0.32 to −0.09) but remained within the physiological range, and no differences were found in blood glucose, surfactant use or referral for intensive care [27].

Breastfeeding

Exclusive breastfeeding at hospital discharge was more frequent with KMC than with conventional care, both in the review by Boundy and colleagues (RR 1.50, 95% CI 1.26–1.78; 13 studies) [24] and in the updated meta-analysis (RR 1.48, 95% CI 1.44–1.52; 9 trials, 9,983 infants) [25]. The certainty of the latter estimate was rated very low because of unblinded outcome assessment and heterogeneous definitions, and the difference at one to three months was not statistically significant (RR 1.39, 95% CI 0.99–1.97) [25]. Early initiation increased exclusive breastfeeding at discharge compared with later initiation (RR 1.12, 95% CI 1.07–1.16; moderate certainty) [25], and Martínez-Rodríguez and colleagues likewise reported a higher likelihood of breastfeeding at discharge with early KMC (RR 1.23, 95% CI 1.04–1.46) [27].

Growth and neurodevelopment

Infants receiving KMC gained more weight (MD 4.08 g/day, 95% CI 2.30–5.86; 11 trials; low certainty), length (MD 0.21 cm/week, 95% CI 0.03–0.38) and head circumference (MD 0.18 cm/week, 95% CI 0.09–0.27) than those receiving conventional care [25], in line with the earlier Cochrane findings [10]. Neither review found clear differences in neurodevelopmental outcomes at 12 months' corrected age, and the single trial with follow-up to 20 years showed no difference in intelligence quotient [10,25].

Timing of initiation and daily duration

Compared with later initiation, KMC started within 24 hours of birth reduced neonatal mortality (RR 0.77, 95% CI 0.66–0.91; 3 trials, 3,693 infants; high certainty), corresponding to 36 fewer deaths per 1,000 infants; it probably reduced clinical sepsis up to 28 days (RR 0.85, 95% CI 0.76–0.96; 2 trials; low certainty) and reduced hypothermia (RR 0.74, 95% CI 0.61–0.90; high certainty) [25]. Most of the weight in these analysis came from the WHO Immediate KMC trial, in which the median time to initiation was 1.3 hours in the intervention group and 53.6 hours in the control group [12,25]. Martínez-Rodríguez and colleagues obtained an almost identical estimate (RR 0.78, 95% CI 0.66–0.92) [27]. The amount of skin-to-skin contact also mattered: the mortality benefit was greater when KMC was provided for at least eight hours a day than when it was shorter [25], and the Cochrane review found the clearest benefits with near-continuous KMC [10].

Very preterm and very-low-birth-weight infants

Much of the evidence comes from infants of moderate prematurity or birth weight; only six of the 31 trials in the largest review enrolled infants below 1,500 g [25]. Martins and colleagues pooled four randomised trials (1,679 infants) comparing early KMC with conventional care in infants born at or before 32 weeks and/or weighing less than 1,500 g. Early KMC reduced mortality (RR 0.81, 95% CI 0.67–0.98), whereas the reduction in infection did not reach

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statistical significance (RR 0.89, 95% CI 0.77– 1.02) and the effect on hypothermia varied with the severity of prematurity, with moderate heterogeneity [28]. The authors identified infants below 1,000 g or 28 weeks' gestation as the group in which evidence is most needed.

Table 3. Principal effect estimates reported by the included reviews

Outcome	Review	Studies; participants	Effect estimate (95% CI)	Certainty
KMC versus conventional care				
Mortality at discharge or 40–41 weeks' PMA	Conde-Agudelo 2016 [10]	8; 1,736	RR 0.60 (0.39–0.92)	—
Mortality during birth hospitalisation or by 28 days	Sivanandan 2023 [25]	11*; 10,505	RR 0.68 (0.53–0.86)	High
Mortality at 6 months	Sivanandan 2023 [25]	4; 8,031	RR 0.75 (0.62–0.92)	High
All-cause mortality (hospital-initiated KMC)	Minotti 2025 [26]	25; —	OR 0.77 (0.67–0.89)	High
Severe infection/sepsis, latest follow-up	Sivanandan 2023 [25]	9; 9,847	RR 0.85 (0.79–0.92)	Moderate
Nosocomial infection/ sepsis	Conde-Agudelo 2016 [10]	5; 1,239	RR 0.35 (0.22–0.54)	—
Sepsis (hospital-initiated KMC)	Minotti 2025 [26]	17; —	OR 0.55 (0.37–0.82)	Moderate
Invasive infection (hospital-initiated KMC)	Minotti 2025 [26]	11; —	OR 0.49 (0.33–0.74)	Moderate
Hypothermia	Sivanandan 2023 [25]	11; 1,169	RR 0.32 (0.19–0.53)	Moderate
Exclusive breastfeeding at discharge/28 days	Sivanandan 2023 [25]	9; 9,983	RR 1.48 (1.44–1.52)	Very low
Weight gain (g/day)	Sivanandan 2023 [25]	11; 1,198	MD 4.08 (2.30–5.86)	Low
Early (≤24 h) versus late KMC				
Neonatal mortality	Sivanandan 2023 [25]	3; 3,693	RR 0.77 (0.66–0.91)	High
Neonatal mortality	Martínez-Rodríguez 2026 [27]	—	RR 0.78 (0.66–0.92)	—
Clinical sepsis to 28 days	Sivanandan 2023 [25]	2; 3,694	RR 0.85 (0.76–0.96)	Low
Hypothermia	Sivanandan 2023 [25]	4; 3,713	RR 0.74 (0.61–0.90)	High
Exclusive breastfeeding at discharge	Sivanandan 2023 [25]	3; 3,464	RR 1.12 (1.07–1.16)	Moderate
Breastfeeding at discharge	Martínez-Rodríguez 2026 [27]	—	RR 1.23 (1.04–1.46)	—
Early KMC versus conventional care in very preterm (≤32 weeks) and/or VLBW infants				
Mortality	Martins 2026 [28]	4; 1,679	RR 0.81 (0.67–0.98)	—
Infection	Martins 2026 [28]	4; 1,679	RR 0.89 (0.77–1.02)	—

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Certainty as rated by the review authors using GRADE; denotes not reported or not rated in the source. *Value from the abstract of the source review; its summary-of-findings table reports 12 trials and a 95% CI of 0.53–0.87. CI, confidence interval; MD, mean difference; OR, odds ratio; PMA, postmenstrual age; RR, risk ratio.

DISCUSSION

This overview brought together six systematic reviews published over a decade, which used different methods, eligibility criteria and search periods. All of them found that KMC reduces mortality among preterm and LBW infants, with relative effects ranging from 0.60 to 0.81. The earlier reviews produced larger but less precise estimates, whereas the more recent ones, which are dominated by large multicentre trials, report smaller effects with narrower confidence intervals and high certainty of evidence. This is the pattern commonly seen as small single-centre trials are supplemented by adequately powered studies, and it strengthens rather than weakens confidence in the benefit. In absolute terms, KMC compared with conventional care prevents about nine deaths per 1,000 infants, and starting it within 24 hours rather than later prevents about 36 deaths per 1,000 in populations with a higher baseline risk [25].

The reduction in infection is biologically plausible. KMC shortens the time the infant spends separated from the mother and exposed to the hospital environment, favours breast-milk feeding, promotes colonisation of the skin with maternal rather than hospital flora and tends to reduce unnecessary handling [10,26]. The variation in the size of the effect across reviews appears to reflect differences in how sepsis was defined (clinical syndromic criteria in community trials versus culture-confirmed or clinician-diagnosed infection in facility trials) more than genuine inconsistency. Prevention of hypothermia is probably an important mediating pathway, because cold stress increases metabolic demand and is itself associated with higher mortality [5].

The timing of initiation is the most important change in KMC practice over the past decade. The WHO Immediate KMC trial showed that continuous KMC started before stabilisation was safe and reduced mortality in infants weighing 1.0–1.8 kg [12], and this finding underpins current WHO guidance [7–9]. The early-versus-late estimates reported by Sivanandan and Sankar and by Martínez-Rodríguez and colleagues are, however, largely derived from the same trials, so their agreement is corroborative rather than independent [25,27]. The evidence for a dose–response relationship, with greater benefit from at least eight hours of daily contact, supports the view that KMC should be regarded as continuous care rather than a series of short sessions [10,25].

Breastfeeding outcomes improved consistently in direction, but the certainty of this evidence is low to very low, because outcome assessment was not blinded and definitions of exclusive breastfeeding varied [25]. The advantage evident at discharge was no longer statistically clear at one to three months, which suggests that lactation support needs to continue after discharge if the early gains are to be maintained. For nurses, this means combining positioning and skin-to-skin support with structured lactation counselling during the hospital stay and follow-up afterwards.

Several considerations limit how widely these findings can be applied. Most trials were conducted in low- and middle-income countries, and the effect in high-income neonatal intensive care units, where conventional care is more intensive, may be smaller [26]. Infants who were clinically unstable, extremely preterm or of extremely low birth weight were under-represented or excluded, and in the only review focused on very preterm and VLBW infants the confidence interval for infection crossed the line of no effect and the effect on hypothermia was inconsistent [28]. KMC in these infants therefore requires close monitoring, may need to be provided alongside respiratory or thermal support, and should follow protocols adapted to the infant’s clinical stability rather than a uniform approach.

Strengths and limitations

This overview has several strengths: a multi-database search, a formal appraisal of review quality with AMSTAR 2, explicit handling of overlap between reviews, and the inclusion of reviews published in 2025 and 2026 that address infection outcomes and very preterm infants. Its limitations should also be acknowledged. The overview depends on the conduct and reporting of the included reviews; primary trial data were not re-analysid and risk of bias in the trials was not reassessed. The reviews overlap substantially and cannot be regarded as independent sources of evidence. Some reviews reported odds ratios and others risk ratios, which prevents direct numerical comparison. The search was restricted to reviews published in English, no protocol was registered in advance, and screening, data extraction and appraisal were undertaken by a single reviewer, which increases the risk of error. Finally, because KMC cannot be delivered blind, subjective outcomes such as breastfeeding and clinically diagnosed sepsis are open to performance and detection bias in the underlying trials.

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IMPLICATIONS FOR NURSING

Nursing practice

Nurses should initiate KMC as early as the infant's condition allows, including before full stabilisation where monitoring is available, and should aim for at least eight hours of skin- to- skin contact a day, moving towards continuous KMC wherever feasible. Temperature, respiration, oxygen saturation, feeding tolerance and signs of infection should be monitored during KMC. Structured support for breastfeeding and for the expression of breast milk should be combined with teaching parents safe positioning, and fathers or other family members can maintain skin-to-skin contact when the mother is temporarily unavailable.

Nursing education and administration

Competency-based KMC training should be embedded in undergraduate, postgraduate and in-service neonatal nursing curricula. Neonatal units need standardised KMC protocols, documentation tools and family counselling materials, as well as infrastructure that makes prolonged KMC possible: adequate space and privacy, reclining chairs or beds, and unrestricted parental access. Time to initiation, daily duration of skin-to-skin contact, breastfeeding at discharge and clinical outcomes should be audited routinely as indicators of quality of care.

Research priorities

Future trials should focus on extremely preterm infants and those weighing less than 1,000 g, on the safety of KMC during respiratory support, on the optimal daily duration, and on long- term neurodevelopmental outcomes. Implementation research is needed to understand barriers, adherence, equity and the scale-up of KMC across different resource settings, including high-income neonatal intensive care units.

CONCLUSION

Evidence from six systematic reviews shows that kangaroo mother care reduces mortality among preterm and low-birth-weight neonates, with high-certainty evidence for the effect on survival, and that it reduces severe infection and hypothermia while improving breastfeeding and growth. The benefit is greatest when KMC is started within 24 hours of birth and maintained for at least eight hours a day, and emerging evidence suggests that it extends to very preterm and very-low-birth-weight infants. KMC should be embedded in routine neonatal nursing care, supported by staff training, family counselling, appropriate monitoring and institutional protocols.

DECLARATIONS

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References

1. Ohuma EO, Moller AB, Bradley E, Chakwera S, Hussain-Alkhateeb L, Lewin A, et al. National, regional, and global estimates of preterm birth in 2020, with trends from 2010: a systematic analysis. Lancet. 2023;402(10409):1261-71. doi:10.1016/S0140-6736(23)00878-4
2. Okwaraji YB, Krasevec J, Bradley E, Conkle J, Stevens GA, Gatica-Domínguez G, et al. National, regional, and global estimates of low birthweight in 2020, with trends from 2000: a systematic analysis. Lancet. 2024;403(10431):1071-80. doi:10.1016/S0140-6736(23)01198-4

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3. Perin J, Mulick A, Yeung D, Villavicencio F, Lopez G, Strong KL, et al. Global, regional, and national causes of under-5 mortality in 2000-19: an updated systematic analysis with implications for the Sustainable Development Goals. Lancet Child Adolesc Health. 2022;6(2):106-15. doi:10.1016/S2352-4642(21)00311-4
4. World Health Organization. Preterm birth [Internet]. Geneva: World Health Organization; 2023 May 10 [cited 2026 Aug 12]. Available from: https://www.who.int/news-room/fact-sheets/detail/preterm-birth
5. Lunze K, Bloom DE, Jamison DT, Hamer DH. The global burden of neonatal hypothermia: systematic review of a major challenge for newborn survival. BMC Med. 2013;11:24. doi:10.1186/1741-7015-11-24
6. 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. doi:10.1111/j.1651-2227.2005.tb01930.x
7. World Health Organization. WHO recommendations for care of the preterm or low-birth-weight infant. Geneva: World Health Organization; 2022.
8. World Health Organization. Kangaroo mother care: a transformative innovation in health care. Global position paper. Geneva: World Health Organization; 2023.
9. World Health Organization. Kangaroo mother care: a clinical practice guide. Geneva: World Health Organization; 2025.
10. Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Database Syst Rev. 2016;2016(8):CD002771. doi:10.1002/14651858.CD002771.pub4
11. Mazumder S, Taneja S, Dube B, Bhatia K, Ghosh R, Shekhar M, et al. Effect of community-initiated kangaroo mother care on survival of infants with low birthweight: a randomised controlled trial. Lancet. 2019;394(10210):1724-36. doi:10.1016/S0140-6736(19)32223-8
12. WHO Immediate KMC Study Group; Arya S, Naburi H, Kawaza K, Newton S, Anyabolu CH, et al. Immediate "kangaroo mother care" and survival of infants with low birth weight. N Engl J Med. 2021;384(21):2028-38. doi:10.1056/NEJMoa2026486
13. Chan GJ, Labar AS, Wall S, Atun R. Kangaroo mother care: a systematic review of barriers and enablers. Bull World Health Organ. 2016;94(2):130-141J. doi:10.2471/BLT.15.157818
14. Pollock M, Fernandes RM, Becker LA, Pieper D, Hartling L. Chapter V: Overviews of reviews. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al., editors. Cochrane handbook for systematic reviews of interventions. Version 6.4 (updated August 2023). London: Cochrane; 2023. Available from: https://training.cochrane.org/handbook
15. Aromataris E, Fernandez R, Godfrey CM, Holly C, Khalil H, Tungpunkom P. Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. Int J Evid Based Healthc. 2015;13(3):132-40. doi:10.1097/XEB.0000000000000055
16. Gates M, Gates A, Pieper D, Fernandes RM, Tricco AC, Moher D, et al. Reporting guideline for overviews of reviews of healthcare interventions: development of the PRIOR statement. BMJ. 2022;378:e070849. doi:10.1136/bmj-2022-070849
17. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71
18. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017;358:j4008. doi:10.1136/bmj.j4008
19. Guyatt GH, Oxman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008;336(7650):924-6. doi:10.1136/bmj.39489.470347.AD
20. Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011;343:d5928. doi:10.1136/bmj.d5928
21. Pieper D, Antoine SL, Mathes T, Neugebauer EA, Eikermann M. Systematic review finds overlapping reviews were not mentioned in every other overview. J Clin Epidemiol. 2014;67(4):368-75. doi:10.1016/j.jclinepi.2013.11.007
22. Campbell M, McKenzie JE, Sowden A, Katikireddi SV, Brennan SE, Ellis S, et al. Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. BMJ. 2020;368:l6890. doi:10.1136/bmj.l6890
23. Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557-60. doi:10.1136/bmj.327.7414.557
24. 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. doi:10.1542/peds.2015-2238
25. Sivanandan S, Sankar MJ. Kangaroo mother care for preterm or low birth weight infants: a systematic review and meta-analysis. BMJ Glob Health. 2023;8(6):e010728. doi:10.1136/bmjgh-2022-010728
26. Minotti C, Jost K, Aghlmandi S, Schlaeppi C, Sieswerda E, van Werkhoven CH, et al. All-cause mortality and infection-related outcomes of hospital-initiated kangaroo care versus conventional neonatal care for low-birthweight infants: a systematic review and meta-analysis. Lancet Child Adolesc Health. 2025;9(7):470-83. doi:10.1016/S2352-4642(25)00130-0
27. Martínez-Rodríguez S, Hernández-Martínez A, Bermejo-Cantarero A, Gomes L, Lerma-García D, Luna P. Effect of kangaroo mother care initiated within the first 24 h in preterm or low birth weight infants: a systematic review and meta-analysis. Int J Nurs Stud. 2026;179:105533. doi:10.1016/j.ijnurstu.2026.105533
28. Martins JA, Ferreira-da-Silva R, Assunção A, Clemente F, Azevedo I, Costa S. Early kangaroo care in preterm ≤32 weeks and very low birth weight infants: a systematic review and meta-analysis. J Perinat Med. 2026;54. doi:10.1515/jpm-2025-0202

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