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Empowering parents through early kangaroo mother care a holistic approach to neonatal health: A systematic review

Endah Dessirya, Kusnul Hasanah, Yeni Rustina, Happy Hayati, Mega Hasanul Huda*

Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

Abstract

Background: The transition of premature infants from the intrauterine to the extrauterine environment is a complex and challenging adaptation process for infants and their mother. Empowering parents through education and support is crucial in navigating these challenges.
Propose: To review parental empowerment through early kangaroo care a holistic approach to neonatal health.
Method: Systematic review research according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This literature research uses seven electronic databases, namely PubMed, Proquest, Sciencedirect, Wiley Online, Emerald insight, Sage Journals, and JSTOR. The data search began on September 30, 2024, using the keywords "parent" or "mother" or "maternal" and "infant" or "preterm" and "early" or "immediately" and "skin-to-skin" or "kangaroo-mother-care". The literature criteria used were full texts that discussed prematurity (newborns with a gestational age of <37 weeks), mothers who performed early KMC, parents who performed early KMC, the outcomes measured in this study were infant outcomes (morbidity, mortality, physiological status, weight, and length of stay) and maternal outcomes (exclusive breastfeeding, maternal mental health), and this study used a randomized control design. This study is registered with PROSPERO (CRD42025633170).
Results: The search process identified 318 articles. Further screening resulted in a final sample of 7 articles. The review results showed that early KMC has benefits for both mothers and infants. Benefits of early KMC for mothers include increased exclusive breastfeeding, reduced depression, and increased maternal self-satisfaction in caring for preterm infants. Furthermore, in preterm infants, early KMC has been shown to improve physiological stability, weight gain, reduce mortality, morbidity, infections, weight gain, and reduce length of hospitalization.
Conclusion: Early implementation of KMC not only provides clinical benefits for preterm infants, but also contributes to improved maternal mental health. These findings support the promotion of KMC as a standard intervention in neonatal intensive care units to optimize short- and long-term outcomes for mothers and preterm infants.

Keywords: Kangaroo Mother Care (KMC); Neonatal; Parents.

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INTRODUCTION

Prematurity is one of the leading causes of neonatal morbidity and mortality worldwide, particularly in countries with limited healthcare resources (World Health Organization, 2012). Premature infants often face various challenges, including risks of medical complications, deleyed growth, and long-term developmental impairments (Jańczewska, Wierzba, Jańczewska, Szczurek-Gierczak, & Domżalska-Popadiuk, 2023). The birth and hospitalization of a premature infant increases the mother's emotional vulnerability, thereby contributing to the increases in stress and anxiety related to the infant, the risk of possible complications, and the need for long-term separation (Cho, Kim, Kwon, Cho, Kim, Jun, & Lee, 2016; Polizzi, Perricone, Morales, & Burgio, 2021). Empowering parents through education and support is crucial in navigating these challenges.

Kangaroo Mother Care (KMC) has been proven to enhance survival and improve health outcomes for low birth weight (LBW) infants, especially in low- and middle-income countries (World Health Organization, 2012). KMC is a type of care where the mother and child have constant skin-to-skin contact, which can help decreased risk of mortality, morbidity, severe infection, hypotermia, increase weight gain, and promote successful breastfeeding (Conde-Agudelo, Belizán, & Diaz-Rossello, 2012).

In clinical practice, KMC for premature infants is often delayed until after stabilization or routine care. However, emerging evidence suggests that initiating KMC within the first 24 hours can significantly improve the quality of care in facilities lacking neonatal intensive care. Studies indicate that early initiation of KMC can reduce neonatal mortality compared to delayed initiation. Early KMC has the potential to reduce complications such as respiratory disease, hypothermia, hypoglycemia, and infections that can result in impaired neurocognitive development (World Health Organization, 2020).

KMC also positively impacts maternal mental health. Intensive skin-to-skin contact can reduce maternal stress and anxiety, enhance confidence in caregiving, and strengthen the bond between mother and child (Feng & Zhang, 2024; Kirca & Adibelli, 2021). The evidence, assessed with high certainty, indicates that kangaroo mother care is associated with a significant decrease in the incidence of moderate to severe postpartum maternal depression compared to standard care or no intervention (Pathak, Sinha, Sharma, Mazumder, & Bhandari, 2023). Care for kangaroos had a significantly positive impact on infants (on stabilizing infant physiological functions) and for mother (increasing maternal–infant attachment, and reducing maternal stress (Cho et al., 2016).

RESEARCH METHOD

Systematic review research according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This literature research uses seven electronic databases, namely PubMed, Proquest, Sciencedirect, Wiley Online, Emerald insight, Sage Journals, and JSTOR. The data search began on September 30, 2024, using the keywords "parent" or "mother" or "maternal" and "infant" or "preterm" and "early" or "immediately" and "skin-to-skin" or "kangaroo-mother-care".

The literature criteria used were full texts that discussed prematurity (newborns with a gestational age of <37 weeks), mothers who performed early KMC, parents who performed early KMC, the outcomes measured in this study were infant outcomes (morbidity, mortality, physiological status, weight, and length of stay) and maternal outcomes (exclusive breastfeeding, maternal mental health), and this study used a randomized control design. This study was limited to articles that were entirely in English. However, the researchers did not limit the year of publication of the articles studied, as long as the topics discussed were relevant.

The article screening process, first by removing duplicate articles. After that, reviewing the titles and abstracts of studies that met certain eligibility criteria. Furthermore, the full texts that met the criteria were analyzed in depth. Any differences of opinion were resolved through deliberation to reach a mutual agreement. Two researchers (ED and KH) performed data extraction and collected data together, including participant characteristics, interventions, and relevant outcomes. Conflicting views were reviewed by the researcher with the initials MHH as a mediator to reach a mutual agreement. Three researchers (ED, KH, and MHH) performed a separate risk of bias analysis for each study included in the study using Cochrane risk of bias 2.0. Six categories of bias

Endah Dessirya, Kusnul Hasanah, Yeni Rustina, Happy Hayati, Mega Hasanul Huda*

Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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include random sequence generation, allocation concealment, participant blinding, outcome blinding, incomplete assessment management, and selective reporting. Each domain was categorized as low risk, some concerns, and high risk of bias.

In the systematic search stage, the reviewer identified 318 data-based articles. Of the 318 articles that met the criteria, 2 articles were removed due to duplicates and 305 articles did not meet the established eligibility criteria. Then, 11 articles underwent full-text review. There were 3 articles that did not meet the PICO criteria and 3 articles were incomplete. The researcher conducted a manual search through the website and obtained two articles, bringing the total to 2 articles. After full-text review, the researcher obtained seven articles for review. This study is registered with PROSPERO (CRD42025633170).

Regarding risk of bias assesment, the most affected domains (those with more studies that have a low risk of bias) are shown in the figure below.

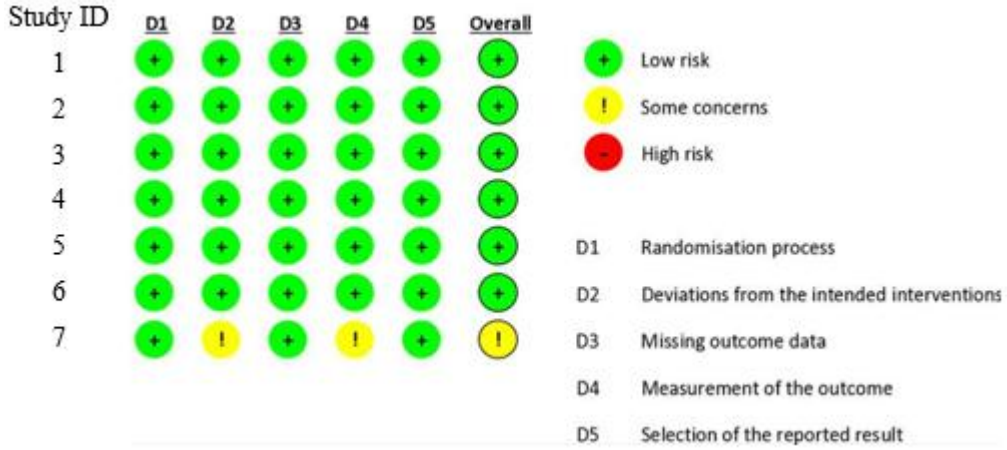


Figure Risk of Bias

Endah Dessirya, Kusnul Hasanah, Yeni Rustina, Happy Hayati, Mega Hasanul Huda*

Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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RESEARCH RESULTS

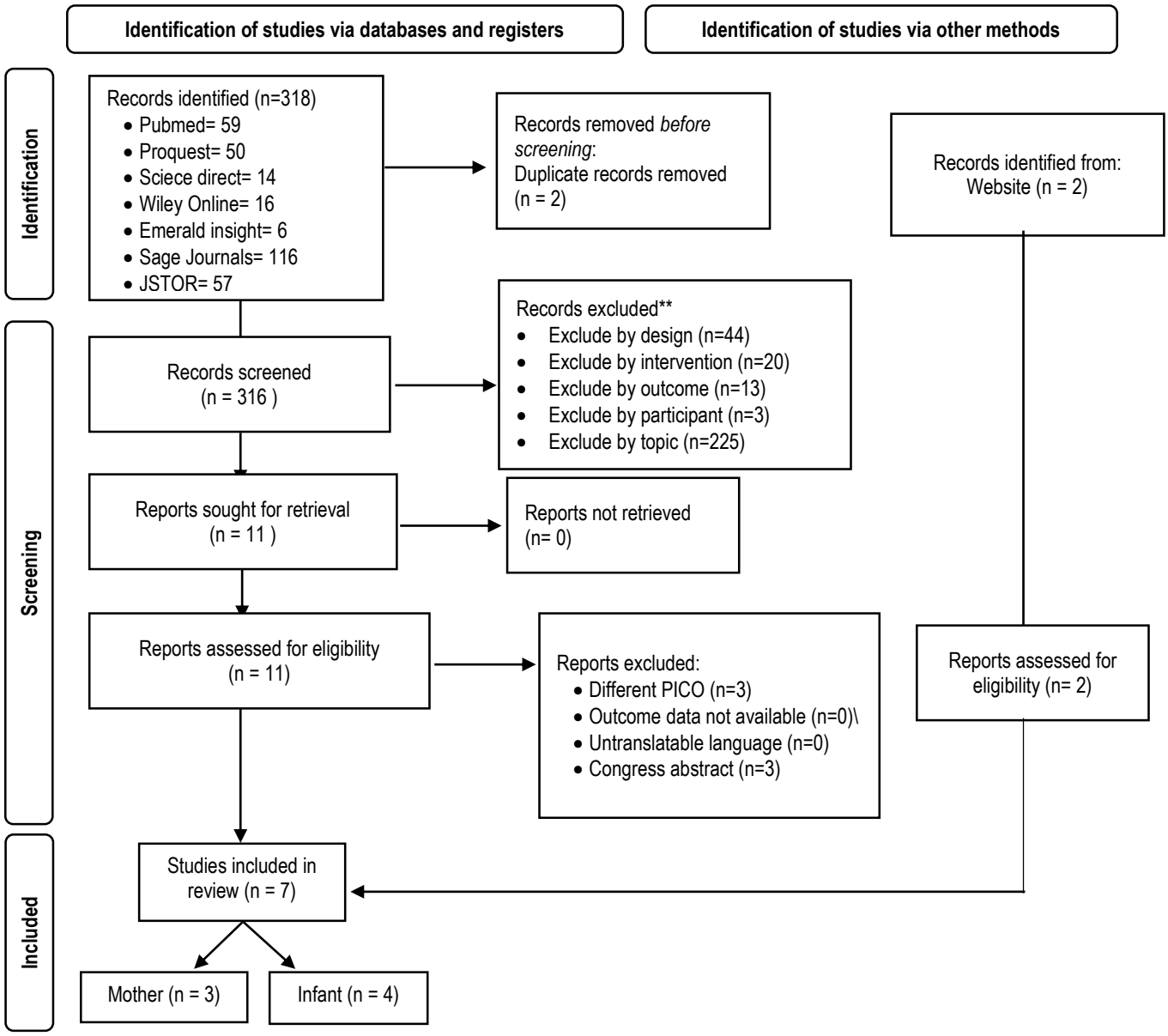


Figure 2 PRISMA Flow Diagram

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Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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Table The Main Characteristics of Included Studies

(Author, Year) (Country)	Purpose	Method	Results
(Jayaraman et al., 2017) (India)	To assess the effectiveness of early KMC on exclusive breastfeeding, growth, mortality, and morbidity.	A randomized controlled trial was conducted for 15 months in a level 2 and 3 tertiary care neonatal unit. Neonates weighing between 1 and 1.8 kilograms at birth who were hemodynamically stable were randomized to receive either early KMC, initiated within the first four days of life, or late KMC without respiratory support or IV fluids. Follow-up was performed up to one month after hospital discharge.	The early KMC group (n = 80) had significantly higher rates of exclusive (86% vs. 45%, p < .001) and immediate (49% vs. 30%, p = .021) breastfeeding in the hospital, as well as near-exclusive (73% vs. 36%, p < .001) breastfeeding up to one month post-discharge, compared to the late KMC group (n = 80). The incidence of apnea (11.9% vs. 20%, p = .027) and recurrent apnea requiring ventilation (8.8% vs. 15%, p = .02) was significantly lower in the early KMC group. There were no significant differences in mortality, morbidity, or growth during the hospital stay or post-discharge.
(Linnér et al., 2023) (Ghana, India, Malawi, Nigeria, and Tanzania)	The goal is to investigate the safety of skin-to-skin contact initiated immediately after birth on cardiorespiratory parameters in unstable low-birth-weight infants.	From 2017 to 2020, a randomized clinical trial was conducted in tertiary neonatal care units in Ghana, India, Malawi, Nigeria, and Tanzania. The trial included infants weighing between 1.0 and 1,799 grams at birth. The intervention group received kangaroo care immediately after birth and continued to receive it until discharge, while the control group received conventional care with kangaroo care initiated after meeting stability criteria.	A total of 1,602 infants were assigned to the control group, while 1,609 were assigned to the intervention group. The mean birth weight was 1.5 kg (SD 0.2), and the mean gestational age was 32.6 weeks (SD 2.9). Compared to the intervention group, infants in the control group had a mean heart rate that was 1.4 beats per minute higher (95% CI: -0.3 to 3.1, p = 0.097), a mean respiratory rate that was 0.4 breaths per minute higher (95% CI: -0.7 to 1.5, p = 0.48), and a mean oxygen saturation that was 0.3% higher (95% CI: -0.1 to 0.7, p = 0.14). There were no significant differences in cardiorespiratory parameters during the first four postnatal days.

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Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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(Author, Year) (Country)	Purpose	Method	Results
(Brotherton et al., 2021). (Gambia)	To understand the impact of early maternal kangaroo care on the survival of neonates with mild-moderate instability <2000 grams	This pragmatic, non-blinded, randomized clinical trial was conducted at the only teaching hospital in The Gambia. Eligibility criteria included a weight of less than 2,000 grams and an age of one to 24 hours, with exclusion for being either stable or very unstable. Neonates were randomly assigned to receive either standard care, including KMC, after stabilization at greater than 24 hours after admission (control group), or KMC initiated at less than 24 hours after admission (intervention group). Randomization was stratified by weight, and twins were placed in the same group.	The proportion of patients who died within 28 days was 24% (34 out of 139) in the control group versus 21% (29 out of 138) in the intervention group (risk ratio: 0.84; 95% confidence interval: 0.55–1.29; p = 0.423). There were no differences between the groups for secondary outcomes or serious adverse events (20% for the control group and 22% for the intervention group; none were related). One-third of the intervention group returned to standard care for clinical reasons. Due to low statistical power, this study cannot draw definitive conclusions about the impact of early KMC on mortality in unstable neonates. However, these results may contribute to meta-analyses and provide important insights into the safety and implementation of early KMC use in unstable neonates in level 2/2+ neonatal special care units.
(World Health Organization, 2021) (Swiss)	To evaluate the safety and effectiveness of early KMC	This two-arm randomized controlled trial was conducted in high-volume public tertiary care units in Ghana, India, Malawi, Nigeria, and Tanzania. Infants in the kangaroo care group began the intervention as soon as possible after birth. They received an average of 17 hours of kangaroo care per day in the Maternal-Newborn ICU for the first three days. The control group received kangaroo care only after they were stable, for an average of 1.5 hours per day in the Neonatal ICU. Both study groups received kangaroo care thereafter, for an average of 19 hours per day.	Results of a new clinical trial published today in the New England Journal of Medicine show that immediate kangaroo care, which involves skin-to-skin contact with the mother and exclusive breastfeeding, started soon after a premature or low-birth-weight baby is born, dramatically improves survival. WHO recommendations call for kangaroo care to be started only after the baby has been stabilized in an incubator or warmer, which can take an average of 3-7 days. The new study shows that, compared with current practice, starting kangaroo care soon after birth could save up to 150,000 more lives each year.

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Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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(Author, Year) (Country)	Purpose	Method	Results
(Chiu & Anderson, 2009) (Washington)	To examine the effect of skin-to-skin contact on late preterm mother–infant interactions up to 18 months of age.	Randomized controlled trial with follow-up. A total of 100 mothers and their late preterm infants (32 to <37 weeks' gestation) were recruited. Mother-infant interactions were assessed at 6, 7, and 8 months of age. The mothers and preterm infants were videotaped during feeding sessions at six and twelve months of age and during teaching sessions at six, twelve, and eighteen months of age. Their interactions were assessed using the Nursing Child Assessment Satellite Feeding Scale and the Teaching Scale.	At 6 and 12 months, skin-to-skin and control infants had similar feeding scores. However, skin-to-skin infants had lower infant teaching scores at six months, though this difference disappeared afterwards.
(Nagai et al., 2010) (Ethiopia)	To test the effectiveness of continuous Kangaroo Mother Care (KMC) from early on for relatively stable low birth weight (LBW) infants in resource-limited countries.	A randomized controlled trial was conducted with low birth weight (LBW) infants at a referral hospital in Madagascar. Early continuous KMC (the intervention) began as soon as possible, within 24 hours of birth. Later continuous KMC (the control group, or conventional care) began after complete stabilization, usually after 24 hours of birth. The primary outcome measure was mortality during the first 28 days postpartum.	Although early continuous KMC had higher mortality, it was not statistically significant within the first 28 days postpartum (1 vs. 2; risk ratio, 1.95; 95% confidence interval [CI], 0.18–20.53; p = 1.00). There was no difference in the incidence of morbidity. Infants in the early KMC group experienced significantly less weight loss from birth to 24 hours postpartum compared with infants in the late KMC group (-34.81 g vs. -73.97 g; mean difference, 39.16 g; 95% CI, 10.30–68.03; p = 0.01; adjusted p = 0.02). There was no difference in adverse events or length of hospitalization between the two groups.

Endah Dessirya, Kusnul Hasanah, Yeni Rustina, Happy Hayati, Mega Hasanul Huda*

Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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(Author, Year) (Country)	Purpose	Method	Results
(Worku & Kassie, 2005) (Ethiopia)	The goal is to study the effectiveness of early kangaroo care for low birth weight infants before stabilization compared with conventional care.	A randomized controlled trial was conducted over a one-year period from November 2001 to November 2002. Of the 259 infants weighing less than 2000 g during the study period, 123 (47.5%) low birth weight infants were enrolled in the study. Sixty-two infants were enrolled in the Kangaroo Care Method (KMC), and the remaining 61 were enrolled in the Conventional Care Method (CMC). The mean age at enrollment was 10.0 hours for the KMC group and 9.8 hours for the CMC group ($p > 0.05$ at a 95% confidence interval).	The mean birth weight was 1,514.8 g (range, 1,000–1,900 g) for KMC and 1,471.8 g (range, 930–1,900 g) for CMC ($p > 0.05$, 95% CI). The mean gestational age was 32.42 and 31.59 weeks for KMC and CMC, respectively. Fifty-eight percent of KMC cases and 52% of CMC cases were on intravenous fluids. Of the KMC infants, 21/62 (34%) and of the CMC infants, 23/61 (37%) were on oxygen via a nasopharyngeal catheter. The mean age at discharge from the study was 4.6 days for the KMC group and 5.4 days for the CMC group. Ninety-one percent and 88% of infants in the KMC and CMC groups, respectively, were discharged within the first seven days of life. The study showed that 14 of 62 (22.5%) KMC infants versus 24 of 63 (38%) CMC infants died during the study ($p < 0.05$, 95% CI). The majority of deaths occurred within the first 12 hours of life. The survival rate of preterm low birth weight infants was significantly higher for those in the early maternal kangaroo care group than for those in the conventional care group during the first 12 hours and thereafter.

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Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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DISCUSSION

The results of the study showed that early KMC has advantages for infants and mothers. Early KMC has been shown to increase physiological stability, weight gain, reduce mortality, morbidity, infection, increase weight and reduce length of hospitalization. KMC is a modified treatment similar to intrauterine care, skin-to-skin contact plays a role in maintaining the baby's temperature for temperature, breathing, and heart stabilization (Conde-Agudelo et al., 2012). In this study, early KMC as a medium for infant adaptation from intrauterine to extrauterine has been shown to reduce the incidence of hypothermia.

This review showed that early KMC with early initiation time within 24 hours reduced mortality (Brotherton et al., 2021). The trial was underpowered as early neonatal mortality was halved, highlighting the importance of implementing existing small and sick newborn care interventions. However, another study found that some participants in the intervention group were returned to standard care due to clinical deterioration and received phototherapy (Linnér, Westrup, Rettedal, Kawaza, Naburi, Newton, & Bergman, 2023).

Early KMC can reduce the incidence of infection, found significant results with 1602 participants but other studies found different results, which may be due to clinical significance factors (Linnér et al., 2023). KMC can strengthen the infant's immune system through direct contact with the mother's skin and stimulate maternal skin microbes to transfer to the infant, which helps establish normal flora on the infant's skin. This prevents colonization of pathogenic bacteria that can cause infection (Bharadwaj & Iqbal, 2024; Rasalan-Fermin, Imperial, & de Ocampo, 2021).

The results showed that early KMC was proven to increase exclusive breastfeeding and reduce the length of hospitalization compared to the control group, with an average length of hospitalization of 12.34 days. As many as 91% and 88% of infants in KMC and CMC were discharged from the study within the first 7 days of life, respectively (Worku & Kassie, 2005). The results showed that early KMC was proven to reduce the incidence of weight loss in the first week and increase weight gain on the 14th day. Infants who receive KMC will feel comfortable, so that the baby's energy is used for growth and increased body metabolism and absorption of nutrients that contribute to weight gain. Compared to late KMC infants, early KMC newborns experienced significantly less weight loss from birth to 24 hours after birth (Nagai et al., 2010).

The results of the study found positive results in mothers who performed early KMC including the success of exclusive breastfeeding obtained significant results in three studies (World Health Organization, 2020; Brotherton et al., 2021; Jayaraman et al., 2017). Direct skin contact between mother and baby stimulates the release of oxytocin and prolactin hormones which will help the milk ejection reflex and increase milk production (Pados & Camp, 2024). The study found a good level of maternal satisfaction with 1609 participants, 95% of 62 participants reported that mothers were happy to perform early KMC. Maternal participation in infant care (KMC) influences these feelings in a positive direction (Mianaei, Karahroudy, Rassouli, & Tafreshi, 2014).

Early skin-to-skin contact has positive effects on mothers' feelings toward their premature infants and on infant development and family interactions (Ionio,Ciuffo, & Landoni, 2021). The skin-to-skin and control groups showed similar feeding outcomes at 6 and 12 months. However, the temporal differences in infant teaching scores at 6 months suggest the need for further research with larger sample sizes, increased skin-to-skin contact, and additional measures of mother-infant interaction, such as the Early Parent-Child Relationship Assessment and play-based behavioral coding (Chiu & Anderson, 2009).

Based on the search results, the inclusion criteria for infants consisted of premature infants with gestational age <37 weeks, average body weight <2000 grams, and infants without congenital abnormalities. The inclusion criteria for mothers were mothers who were willing to undergo KMC. This study compared early KMC with standard care. Early KMC was performed immediately after birth (24 hours), immediately after stabilization and on the fourth day of life. While in the standard group, infants did not undergo KMC on the 24th day of life, the infants were warmed using an incubator/baby warmer.

In the standard group, KMC was performed after the infant was stable (more than 24 hours, more than 36 hours, and more than 4 days of life. KMC was

Endah Dessirya, Kusnul Hasanah, Yeni Rustina, Happy Hayati, Mega Hasanul Huda*

Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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performed using KMC clothing (hat, diaper, and socks), KMC chair, and maternal bed, incubator or advanced KMC. From the reviewed articles, the benefits of early KMC for infants and mothers were found. The benefits of KMC for infants include reducing mortality, morbidity, improving infant physiological function, reducing the incidence of infection, reducing the incidence of apnea, increasing body weight, and reducing the length of hospitalization.

In addition, studies have found that early KMC can significantly reduce maternal depression, the release of oxytocin has anti-anxiety effects and can increase self-confidence and psychological comfort. This hormone plays an important role in maternal behavioral expressions that have the potential to reduce maternal anxiety and depression. Early KMC can increase infant attachment at 6-12 months, but declines at 12-18 months, so further research is needed with a larger sample size.

CONCLUSION

Early implementation of KMC not only provides clinical benefits for preterm infants, but also contributes to improved maternal mental health. These findings support the promotion of KMC as a standard intervention in neonatal intensive care units to optimize short- and long-term outcomes for mothers and preterm infants.

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Fakultas Ilmu Keperawatan, Universitas Indonesia
Corresponding author: *E-mail: megahasanulhuda@gmail.com

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