Systematic Review / Meta-analysis

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The effectiveness of kangaroo mother care in lowering postpartum depression in mothers of preterm and low birth weight babies: a systematic review and meta-analysis

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Background: Kangaroo mother care (KMC) intervention involves skin-to-skin contact between mother and infant. Some studies have shown a decrease in postpartum depression (PPD) in mothers of preterm and low birth weight (LBW) infants. However, the literature is scattered and of variable quality.

Aims: To conduct a systematic review of available literature and provide a comprehensive picture of the effect of KMC on PPD among mothers of preterm and LBW infants.

Methods: The study was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Guidelines. After PROSPERO registration, a systematic search was conducted using PubMed, Cochrane Central Library, and Google Scholar from the inception of the databases till 14 June 2021. Of the 2944 studies assessed for titles and abstracts, nine studies with 2042 participants were included in the review. Included articles targeted mothers with LBW (< 2500 g) or preterm infants (< 37 weeks), used an authentic PPD tool, and had standard care or an incubator as the control group. Studies not published in English and in which mothers had a previous psychiatric illness were excluded. The risk of bias was assessed using the Cochrane Risk of Bias Tool for randomized control trials and the Newcastle–Ottawa Scale for observational studies. All the results were converted to standard mean deviation and pooled together using a random-effects model with a 95% CI. A *P*-value of less than 0.05 is considered significant.

Results: KMC Intervention was significantly associated with a lower depression score than control groups. The reduction in depression in the intervention (KMC) group was moderate: SMD = −0.38 (−0.68 to −0.08; 95% CI; $I^2 = 86\%$; $P = 0.013$). No significant difference was found between the PPD scores of both groups using the Edinburgh Postpartum Depression Scale score.

Conclusions: The authors conclude that the negative effects of LBW and preterm birth experience on maternal mental health can be avoided to a moderate degree by KMC. Due to a lack of methodological uniformity, different scales for outcome measurement, and discrepancies in intervention features, significantly high heterogeneity was detected. The authors need further larger-scale studies with a uniform study design to better predict the efficacy of KMC better.

Keywords: depression, Kangaroo Mother care method, postpartum

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HIGHLIGHTS

- Postpartum depression is a major concern in mothers of preterm and low birth weight babies.
- Kangaroo mother care is effective in reducing mental health challenges in the postpartum period.
- Kangaroo mother care intervention showed a lower depression score compared to control groups.

Introduction

Postpartum depression (PPD) is a medical condition in which women experience strong feelings of sadness and anxiety after giving birth[3]. Every year 10–15% of adult mothers develop PPD, of which 25–50% have depressive symptoms for more than 6 months[4]. All pregnant women are at risk of developing PPD; however, the birth of a preterm infant is the leading risk factor, with a prevalence of 40% in the first year after delivery in

15–20% of all new mothers[5–7]. Enduring the trauma of premature birth and facing the consequences of emergency birth potentiates various psychological and emotional responses in mothers and makes them vulnerable to developing depressive symptoms, including fear, shame, failure, and uncertainty[8,9]. Depression compromises psychological health, and mothers may feel a lack of attachment to their newborn infant, thus failing to form a strong bond[10,11].

The neonatal intensive care unit (NICU) stay of preterm newborns limits the opportunities for physical proximity and touch between mother and infant, resulting in poor bonding. Various interventions have been introduced to favor skin-to-skin contact following birth to provide care and help in achieving early social and emotional development[12]. The kangaroo mother care (KMC) involves skin-to-skin contact; it was introduced in 1978 in Bogota and was first adopted in Brazil at Materno Infantil by Prof. Fernando **Figueira**[13]. It has been widely used in developing countries for decreasing mortality and morbidity in preterm and low birth weight infants[14]. Various studies have shown the benefits of skin-to-skin contact for preterm and low birth weight (LBW) infants. Infants who receive KMC experience favorable outcomes in terms of oxygen saturation, thermoregulation, blood glucose stabilization, and overall physiological indices with improving mental and cognitive development[14,15]. During KMC, the infant lies close to the mother, which helps in improving exclusive breastfeeding and strengthens the bonding between them[16]. A growing body of literature has provided evidence regarding the importance of KMC, but its role in decreasing anxiety and depression in mothers of preterm and low birth weight infants during the immediate postnatal period is still uncertain[17].

The literature lacks good quality comprehensive quantitative reviews on the benefit of KMC in PPD. The latest meta-analysis[16] has hinted toward lower depression with KMC; however, the review was of critically low quality as assessed by the AMSTAR-2 tool[18], Supplemental Digital Content 1, http://links.lww.com/MS9/A62. This meta-analysis did not account for the risk of bias in individual studies nor considered publication bias while interpreting the results. The quality of another recently published review[19] was also low by the AMSTAR-2 tool, Supplemental Digital Content 1, http://links.lww.com/MS9/A62. They used only bibliographic search engines in the health field and all the papers included were in English; hence, they are likely to have missed new research. We conducted this updated meta-analysis to determine the effectiveness of KMC in decreasing PPD in preterm mothers and mothers of low birth weight infants, and we included all available published evidence to select critical outcomes establishing its benefits.

Methods

In this meta-analysis, we complied with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 guidelines[20], Supplemental Digital Content 2, http://links.lww.com/MS9/A63. We also evaluated the quality of our systematic review using AMSTAR-2 criteria[18], Supplemental Digital Content 1, http://links.lww.com/MS9/A62. AMSTAR-2, Supplemental Digital Content 1, http://links.lww.com/MS9/A62 provides a critical assessment method to gage 16 core characteristics. Two separate researchers assessed the manuscript against the AMSTAR-2 checklist, Supplemental Digital Content 1, http://links.lww.com/MS9/A62, and a third researcher was consulted where consensus was not met. Our manuscript fulfilled 15 out of 16 points in the AMSTAR-2 Checklist, Supplemental Digital Content 1, http://links.lww.com/MS9/A62 and showed substantial compliance. The detailed checklist is provided in the appendices section.

Literature search and study selection

A systemic search of databases was conducted from the inception till 14 June 2021, on PubMed, Google Scholar, and the Cochrane Central Library. Several MeSH terms were used: [('kangaroo mother care' OR 'KMC' OR 'kangaroo care' OR 'kangaroo mother care method' OR 'mother/infant skin-to-skin contact' OR 'skin-to-skin contact' OR 'skin-to-skin care' OR 'SSC') AND ('depression' OR 'postpartum depression' OR 'PPD' OR 'postnatal depression' OR 'maternal well-being' OR 'maternal well-being' OR 'maternal stress' OR 'mental health')]. The detailed search strategy is given in Supplementary Table S1 (Appendix A, Supplemental Digital Content 3, http://links.lww.com/MS9/A64).

All articles were imported into EndNote X4[21] and screened for duplicates. The studies included in this meta-analysis were randomized control trials (RCT), observational studies, matched pair trials, pragmatic-controlled CTs, evaluation study, and a prospective cohort. AF and WA searched the databases and retrieved the articles, and AJ was consulted in case of any discrepancy. The articles were initially selected by reading the title and the abstract. Finally, a full-text review was conducted, and relevant articles that met the inclusion and exclusion criteria were selected. These studies were included based on the following eligibility criteria: mothers with low birth weight (< 2500 g) or preterm infants (< 37 weeks), KMC or skin-to-skin contact as the intervention, conducted either at home or in the NICU Standard care or the incubator as the control group, and PPD reported as an outcome studies published in English language mothers with no previous history of substance abuse, mothers with no previous drug history for any neurological disorder or psychiatric illness, mothers with no underlying psychiatric illness studies that reported singleton pregnancies. The following were our exclusion criteria: studies not published in the English language, studies where mothers had a previous psychiatric illness, mothers with a previous history of substance abuse, mothers with a previous drug history for any neurological disorder or psychiatric illness, studies where infants had any congenital anomaly. Gray unpublished literature, references of relevant meta-analyses, and review articles were also screened for potential studies. Details of the study selection are shown in Figure 1.

Data extraction and quality assessment

The data that were extracted included the name of the authors, the year of the study, the study design, the country the study took place in, control and intervention group characteristics, the total length of the KMC, the duration of each session, the session frequency, the place of the intervention, the mean and SD of the PPD measurement, and the inclusion criteria for mothers and infants. The mean depression score of the intervention and control groups was measured via the Edinburgh PPD scale in some studies, while other studies used the Beck Depression Inventory (BDI), Center for Epidemiological Studies Depression (CESD), the Patient Health Questionnaire,

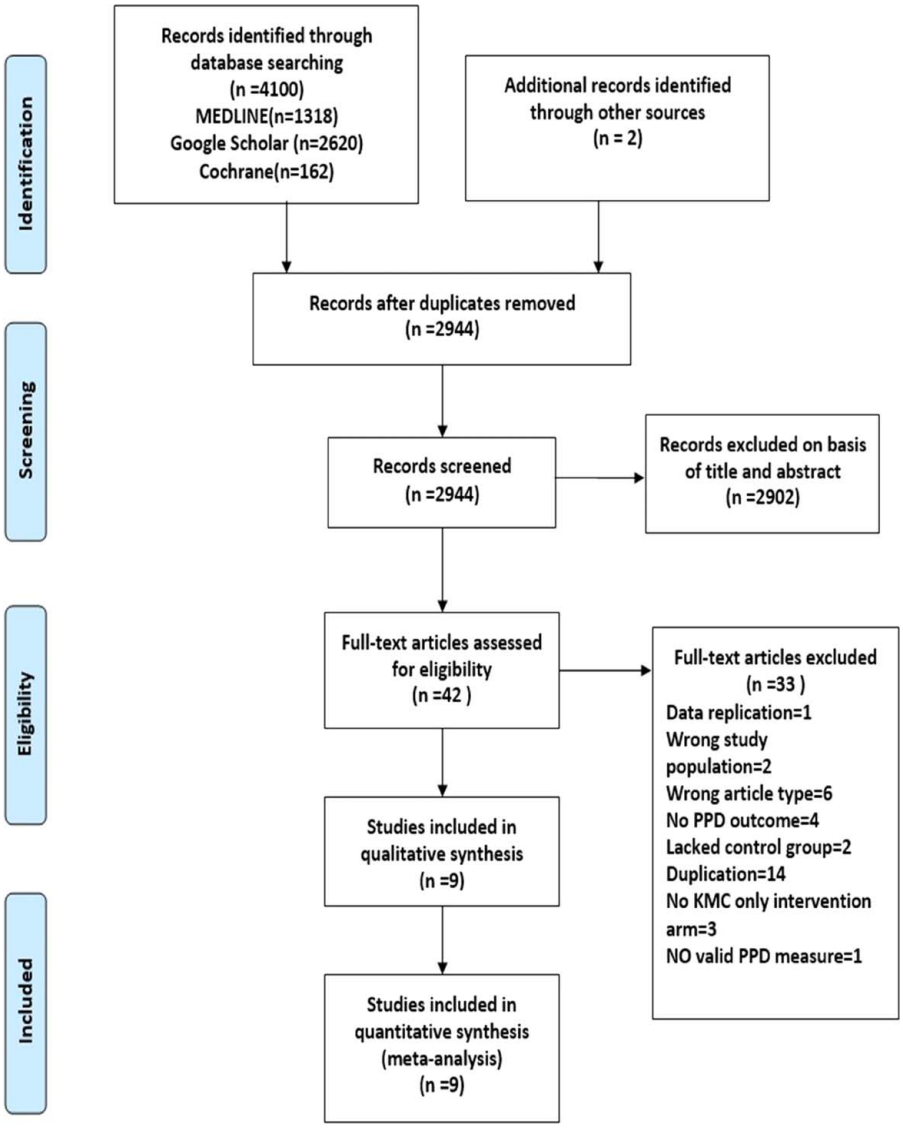

Figure 1. Flow chart of study selection according to PRISMA guidelines.

Postpartum Depression Screening Scale, and 28-item General Health Questionnaire developed by Goldberg. We used the Cochrane Risk of Bias Tool[1] for the quality assessment of RCTs and the Newcastle–Ottawa Scale for observational studies[2].

Data synthesis

After the data was extracted from the studies, Review Manager v.5.4[22] and Stata 11.0[23] were used for all statistical analyses. Standard Mean Deviation (SMD) was calculated using Cohen's[24]. Since all the scales were different, the results were converted to SMD and pooled together using a random-effects model with a 95% CI and a *P*-value of less than 0.05 was considered significant. Where adequate data was not present, the outcomes (e.g. anxiety and stress) were reported as descriptive results. Publication bias was assessed using Egger's regression test[25].

Results

Literature search

The electronic search yielded 2944 articles. After removing duplicates and exclusions based on title and abstract 42 articles remained. A total of 42 articles underwent a full-text review for eligibility. After the exclusions, nine articles remained. The flow chart (Fig. 1) summarizes the results of our literature search.

Study characteristics

The characteristics of the included studies are summarized in Table 1. These studies were from seven different countries and regions: USA ($n=1$)[26], UK ($n=1$)[27], South Korea ($n=1$)[28], Israel ($n=1$)[29], Iran ($n=2$)[30,31], Germany ($n=1$)[32], North India ($n=2$)[33,34]. The included studies were published between 2002 and 2021, with sample sizes ranging from 10 and 974. There are three RCTs, one pragmatic-controlled CT, one evaluation study, one matched pair trial, and one prospective cohort,

Table 1

Participant eligibility criteria within included studies for assessing the effect of KMC on PPD in mothers of preterm and LBW babies

References	Mother	Infant
Feldmann, 2002, 2014	No substance abuses (drug, smoking) during pregnancy age greater than or equal to 21 No single mother No recent immigrants	No neurological impairment No Intraventricular hemorrhage greater than or equal to 3 No reported perinatal asphyxia No metabolic genetic impairment
Miles, 2006	Physically fit to participate in study	No life-threatening congenital anomalies < 1 week old
Ahn, 2010	NR	Physiologically stable without mechanical ventilation, umbilical vein catheterization, umbilical artery catheterization, thoracotomy, or open wounds No congenital anomalies and no skin disorders
Holditch [26]	Has infant custody No risk factor causing inability to administer KMC (history of current bipolar disorder or psychosis) No current depression Is able to follow-up for 12 months	Random selection of one infant from many No congenital neurological illness No signs of substance exposure
Badiee [30]	Primary guardian of infant No current psychiatric disorder (anxiety or depression) No medical intervention	No congenital anomaly
Herizchi [31]	Able to do KMC No psychiatric illness such as psychosis or depression current serious illness Not taking medications for any neurological illness such as anticonvulsants	Infant born via Cesarean section No congenital anomalies
Mehler, 2019	Single pregnancy No mental disorders Mothers who possessed German language skills	Firstborn child No severe underlying disease No cardiopulmonary failure (FiO2 > 0.4 or severe apnea) No need for resuscitation after birth (5 min Apgar score <5)
Taneja, 2020	Mothers at home (identified by surveillance team during pregnancy every 3 months)	Stable late preterm or term SGA without problems at birth Infants able to feed, with no difficulty in breathing, normal movements, and no gross congenital malformations
Sinha [33]	Mothers screened within 72 h of birth Singleton pregnancies Mothers living with infant Mothers who were available for 6 months after delivery	No congenital anomalies or breathing problems Infant able to feed and with normal movements

one cross-sectional. Session duration for most studies was 60 min ranging from a minimum of 15 min to as long as the mothers could bear to hold the baby in that position. Study settings included the NICU and home (Table 2).

The outcome, PPD, was measured by including studies using five different scales. The scales included the Edinburgh Postnatal Depression Scale[29,31], General Health Questionnaire depression subscale[30], Center for Epidemiological Studies Depression Scale[26,32], BDI[29], and Patient Health Questionnaire-9[33,34].

Risk of bias

Five non-RCT studies were assessed using the Newcastle–Ottawa scale. Four studies[27,29–31] were good quality and had a low risk of bias. In one study[28], the risk of bias was unclear. In the four RCTs[26,32–34] risk of bias was low concerning the randomization process and intended intervention. Three studies[27,28,31] used EPDS. The characteristics of the studies and the risk of bias summary are presented in Table 3 (Appendix D, Supplemental Digital Content 3, http://links.lww.com/MS9/A64) and Table 4 (Appendix E, Supplemental Digital Content 3, http://links.lww.com/MS9/A64).

Meta-analysis

Overall PPD

Nine studies with 2042 participants were used in the analysis[26–34]. KMC Intervention was significantly associated with a lower depression score compared to control groups. There is a tendency to reduce PPD in the intervention (KMC) group: SMD = – 0.38 (– 0.68 to – 0.08; 95% CI; $I^2 = 86\%$; $P = 0.013$). However, no significant difference was seen between intervention and control groups when data was stratified into RCT subgroup: SMD = – 0.18 (– 0.40–0.05; 95% CI; $I^2 = 69.4\%$) and non-RCT subgroup: SMD = – 0.60 (– 1.34–0.13; 95% CI; $I^2 = 89.7\%$). Each group individually had no significance (Fig. 2).

Depression scores in EPDS

Only three studies[27,28,31] with 86 participants in the KMC group and 72 participants in the control group reported PPD scores using the EPDS. No significant difference was found between the PPD scores of both groups, SMD = – 0.85 (95% CI – 2.36–0.66; $P = 0.27$). Refer to in (Appendix B, Supplemental Digital Content 3, http://links.lww.com/MS9/A64).

Table 2

Characteristics and results of included studies for assessing the effect of KMC on PPD in mothers of preterm and LBW babies

References (Country)	Study design	Subjects: *N*; maternal age in years Mean (SD) Experimental	Subjects: *N*; maternal age in years Mean (SD) Control	Gestational age in weeks Mean (SD)	KMC intervention Total length	KMC intervention Session duration and frequency	KMC intervention Session setting	PPD measure
Feldmann, 2002, 2014 (Israel)	Matched pair trials	73; 29.63 (4.72)	73; 29.07 (6.14)	E = 30.38 (2.50) C = 30.82 (2.98)	2 weeks	60 min ;Daily	NICU	BDI continuous
Miles, 2006 (UK)	Pragmatic-controlled CT	43 ;30.3 (6.2)	26; 30.6 (6.6)	E = 28 (2.1) C = 28 (2.3)	4 weeks	20 mins ;Daily	NICU	EPDS
Ahn, 2010 (South Korea)	Evaluation study	10; 30.1 (4.3)	10; 31.3 (6.0)	E = 32.1 (1.76) C = 31.9 (1.97)	3 weeks	60 min ;10 sessions	NICU	EPDS
Holditch,2014 (USA)[26]	Prospective cohort	81;28.1 (6.1)	81;26.8 (6.5)	E = 27.2 (2.9) C = 27.4 (3.1)	Up to 2 months of infant corrected age	Minimum 15 mins ;3 times/week	Initiated at NICU, continued at home	CESD continuous
Badiee, 2014 (Iran)[30]	Prospective cohort	25; 28.46	25; 25.84	NR	7 days	60 mins; 3 times/day	NICU	28-item General Health Questionnaire developed by Goldberg and co-workers
Herizichi, 2017 (Iran)	Prospective cohort	30; NR	30; NR	NR	30 days	60 min; 1 h per day	NICU	EPDS
Mehler, 2019 (Germany)	RCT	44; NR	43; NR	E = 29(2) C = 29 (2)	Infant's corrected age of 6 months	DR-SCC: 60 mins; Daily VC: 5 mins; Daily	Intervention performed in a planned room, infants then moved to NICU after the first KMC, the subsequent KMC was done in the NICU	CESD
Taneja, 2020 (North India, Haryana)	RCT	276; 23.14 (3.9)	276; 22.95 (3.6)	E = 35.6 (1.9) C = 35.7 (2.0)	28 days of age or until infant wriggles out of KMC position	As long as possible throughout the day, preferably 24 h per day. Family member assistance may be taken	Home	PHQ
Sinha, 2021 [33] (North India, Faridabad and Palwal districts in Haryana)	Unmasked, parallel group individually randomized clinical trial (sub study of a larger trial)	974 ;23.4 (3.6)	852; 23.1 (3.5)	E = 35.8 (2.0) C = 35.8 (2.0)	Until 28 days of age, or until infant wriggled out of KMC position, or until infant no longer accepted SSC; whichever occurred earlier	As long as possible during day and night with family assistance Mean = 12 h per day	Home	PHQ

BDI, Beck Depression Inventory; CESD, Center for Epidemiological Studies Depression; EPDS, Edinburgh Postpartum Depression Scale; NICU, Neonatal Intensive Care Unit; PHQ, Patient Health Questionnaire.

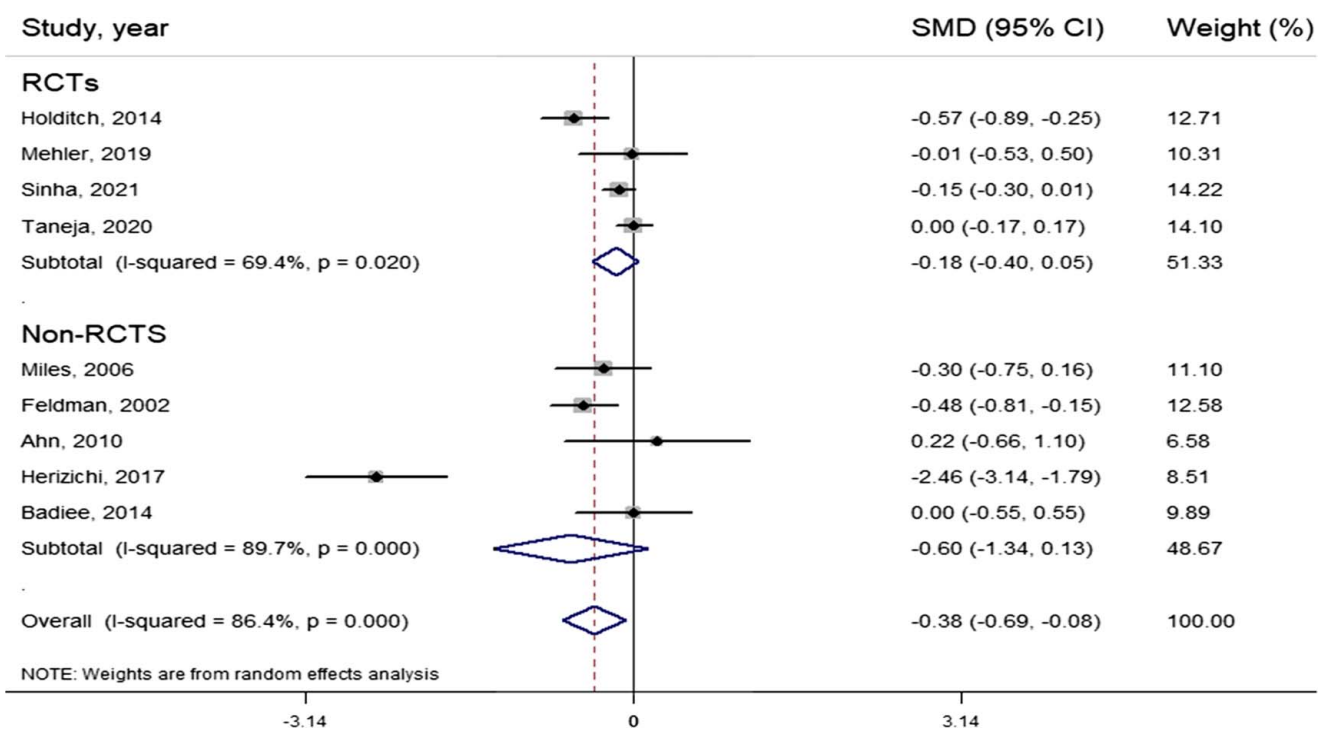

Figure 2. Meta-analysis of the included studies. Notes. SMD, standard mean difference. Results from individual studies were standardized and quality-weighted.

Anxiety

Anxiety was reported by three studies[26,29,30] Feldman and Holditch *et al.* assessed mothers with a subscale of the 'State-Trait Anxiety Inventory,' and mothers in Feldman reported lower anxiety following KMC with a mean (SD) = 31.47 (6.22), whereas Holditch related the scores on this instrument to other indicators of psychological stress, including stress due to the hospital environment and worry about the child's health. Badiee *et al.* stated that KMC improved anxiety symptoms with a mean (SD) = 5.96 (3.10) using a subscale of the General Health Questionnaire.

Stress

Stress was also reported by three studies[26,29,33]. In Feldman *et al.* parents filled out the 'Parenting Stress Index,' and following KMC, mothers reported lower parenting stress. Holditch *et al.* assessed parental stress on the parental stress scale and concluded that stress levels did not differ in KMC and control mothers. Sinha used maternal salivary cortisol as a biomarker for stress and calculated it before and after breastfeeding. There was no significant difference between intervention and control.

A funnel plot of effect size versus precision (SE) seemed symmetrical, which can be seen in (Appendix C, Supplemental Digital Content 3, http://links.lww.com/MS9/A64). Egger's test showed no significant publication bias ($P = 0.14$).

Discussion

Updated meta-analysis findings

Our review found that KMC has the tendency to reduce PPD. This updated meta-analysis with a larger sample size confirms the findings in clinical trials and previous meta-analysis. In the included studies, KMC was conducted both at home and in a NICU setup. NICU infants are already a vulnerable population with various medical concerns. Studies included in our meta-analysis mainly included physiologically stable babies or stable LBW mother-infant dyads with infant's weight ranging between 1500 and 2500 g, so generalization of our findings may be limited as they may not apply to mothers with unstable or very-LBW (i.e. <1500 g) infants.

Lack of methodological uniformity

High heterogeneity was detected in our study, which could be due to a lack of methodological uniformity among the included studies. In particular, we had both randomized and nonrandomized studies included. Other differences that may account for the inconsistency observed include differences in terms of the sample, intervention features, outcome measurement, and follow-up. The duration of KMC was also different in the various studies, which could be based on hospital policies or depending on the feasibility of those conducting the trials resulting in heterogeneity in the comparisons available. This type of heterogeneity may be unavoidable at the current time, and future research with robust evidence will help firm up unanimity, to the extent that it is necessary, in the field.

Evaluating PPD using a standardized depression scale

The array of studies in our review have reported PPD using five different scales: EPDS, the Center for Epidemiological Studies Depression, the BDI, and a 28-item general health questionnaire by Goldberg and co-workers. Since different scales were used in the included studies, a head-on comparison of the same scales

could not be made, but using SMD is a good meta-analytic solution in this situation. The result of our meta-analysis is statistically significant, showing a decrease in the mean depression score among mothers of preterm babies.

Assessing underlying depression

Many studies lacked the baseline depression scores of mothers, so the clinical efficacy of KMC in preventing or curing PPD cannot be clearly defined by prepost comparisons, which are more statistically robust than post only comparisons. From the included studies, we also cannot comment on the necessary frequency and duration for KMC to be effective. Also, there is no agreed protocol for KMC administration at the international level. This lack of consensus leaves the evidence synthesis and interpretation somewhat open, generating issues in the generalizability of our findings for practice.

Birth and initiation of KMC

The latency period between birth and KMC initiation is also underreported among studies. This time is of integral importance for mother-infant bonding and can serve as a critical period for KMC initiation. Early newborn hospitalization in the NICU is the most challenging period for mothers, exposing them to feeling depressed and empty as they cannot take care of their infants[35]. Studies have reported that skin-to-skin care may protect against psychological problems linked with PPD and possibly other forms of mental distress, like anxiety, that are very high in the NICU population[36].

EPDS scale

Several authenticated screening instruments measure PPD as a continuous outcome, both during pregnancy and the postpartum period. The EPDS has been validated extensively for use in the postpartum period[37] and during pregnancy[38]. This mainly addresses the anxiety component of postpartum mood and anxiety disorders and depressive symptoms. Anxiety, one of the presenting symptoms of postpartum mood and anxiety disorders, becomes vital to be assessed in the screening tool, making the EPDS the most widely used. Three of the studies we included in our meta-analysis used the EPDS scale, and our subgroup analysis results also favored the experimental group.

Research prospects

Concerning future research agendas, checking the reliability of the scores of the different scales was beyond the scope of our study, and further studies are needed for better prediction. We suggest that additional multicenter studies be conducted where similar populations are evaluated, with similar interventions, defined times for practical assessment, and the same depression scale. We also included other mental health outcomes, namely anxiety and stress, to broaden our understanding of the relationship between early and consistent mother-infant interactions. Two of the included studies[26,33] found no relation between stress levels with KMC, whereas studies[29,30] showed that KMC helped decrease anxiety levels in mothers of preterm babies. This can be an area of research to establish a more definite link between KMC and other mental health outcomes.

Conclusion

In conclusion, our findings concur with the previous meta-analysis[16] and with the recent large trial conducted by Sinha et al.[33], which reinforces the effectiveness of KMC in reducing the risk of postpartum depressive symptoms with a more vigorous study design as compared to other studies that were included in the previous meta-analysis. However, our study does have some limitations, such as a high heterogeneity, owing to the lack of methodological uniformity in the included studies. Also, in our subgroup analysis, comparing RCT with non-RCTs, each group individually showed no significant difference between intervention and control groups. RCT subgroup showed: SMD = – 0.18 (– 0.40–0.05; 95% CI; $I^2 = 69.4\%$) and non-RCT subgroup: SMD = – 0.60 (– 1.34–0.13; 95% CI; $I^2 = 89.7\%$).

Ethical approval

Ethical approval is not required for this paper.

Consent

Not applicable.

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Author contribution

All authors have made fundamental contributions in the paper. Dr F.A.: designed the concept, did literature search, took part in data collection and analysis and also writing the manuscript; Dr A.W.: did the literature search, data collection and analysis and writing of manuscript; Dr J.A.: did study conception and design, data analysis and critical review; Dr B.N.: contributed in data collection and analysis and writing the manuscript; Dr A.T.: contributed in literature search and writing the manuscript; Dr M.A.K.: contributed in writing; Dr K.S.K.: supervised the project, contributed towards conception and critically reviewing it.

Conflicts of interest disclosure

Authors have no conflict of interest to declare.

Research registration unique identifying number (UIN)

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2. Unique Identifying number or registration ID: CRD4202-1259698.
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Provenance and peer review

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References

[1] Higgins JPT, Altman DG, Gøtzsche PC, *et al*. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ [Internet] 2011;343.
[2] Ottawa Hospital Research Institute [Internet]. [cited 2023 Feb 21]. Available from: https://www.ohri.ca/programs/clinical_epidemiology/oxford.asp
[3] O'Hara MW, Wisner KL. Perinatal mental illness: definition, description and aetiology. Best Pract Res Clin Obstet Gynaecol [Internet] 2014;28:3–12.
[4] Anokye R, Acheampong E, Budu-Ainooson A, *et al*. Prevalence of postpartum depression and interventions utilized for its management. Ann Gen Psychiatry [Internet] 2018;17:18.
[5] Vigod SN, Villegas L, Dennis CL, *et al*. Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review. BJOG [Internet] 2010;117:540–0.
[6] de Paula Eduardo JAF, de Rezende MG, Menezes PR, *et al*. Preterm birth as a risk factor for postpartum depression: a systematic review and meta-analysis. J Affect Disord [Internet] 2019;259:392–403.
[7] Guintivano J, Manuck T, Meltzer-Brody S. Predictors of postpartum depression: a comprehensive review of the last decade of evidence. Clin Obstet Gynecol [Internet] 2018;61:591–603.
[8] Ukpong DI, Fatoye FO, Oseni SB, *et al*. Post partum emotional distress in mothers of preterm infants: a controlled study. East Afr Med J [Internet] 2003;80:289–92.
[9] O'Hara MW, Zekoski EM, Philipps LH, *et al*. Controlled prospective study of postpartum mood disorders: comparison of childbearing and nonchildbearing women. J Abnorm Psychol 1990;99:3–15.
[10] Spinelli M, Frigerio A, Montali L, *et al*. I still have difficulties feeling like a mother": the transition to motherhood of preterm infants mothers. Psychol Health [Internet] 2016;31:184–204.
[11] Slomian J, Honvo G, Emonts P, *et al*. Consequences of maternal postpartum depression: a systematic reviewof maternal and infant outcomes. Women's Heal [Internet] 2019;15:1745506519844044.
[12] Tallandini MA, Scalembra C. Kangaroo mother care and mother-premature infant dyadic interaction. Infant Ment Health J 2006. May27:251–75.
[13] Lima G, Quintero-Romero S, Cattaneo A. Feasibility, acceptability and cost of kangaroo mother care in Recife, Brazilhttp://dx.doi.org/101080/027249300920202016;20:22–6; [Internet], Mar [cited 2023 Feb 22], Available from: https://www.tandfonline.com/doi/abs/10.1080/02724930092020
[14] Charpak N, Gabriel Ruiz J, Zupan J, *et al*. Kangaroo Mother Care: 25 years after. Acta Paediatr [Internet] 2005;94:514–22.
[15] Nurian M, Mashdberd Y, Yaghmaei F, *et al*. Effects of kangaroo and routine care on physiologic parameters of low-birth-weight infants. Adv Nurs Midwifery 2009;18:19–24.
[16] Scime NV, Gavarkovs AG, Chaput KH. The effect of skin-to-skin care on postpartum depression among mothers of preterm or low birthweight infants: a systematic review and meta-analysis. J Affect Disord [Internet] 2019;253:376–84.
[17] Rao P,RR, Bethou A, Bhat V,CP. Does kangaroo mother care reduce anxiety in postnatal mothers of preterm babies? - A descriptive study from a tertiary care centre in South India. J Nepal Health Res Counc [Internet] 2019;17:42–5.
[18] Shea BJ, Reeves BC, Wells G, *et al*. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ [Internet] 2017;358:4008.
[19] Kirca N, Adibelli D. Effects of mother-infant skin-to-skin contact on postpartum depression: a systematic review. Perspect Psychiatr Care [Internet] 2021;57:2014–3.
[20] Page MJ, McKenzie JE, Bossuyt PM, *et al*. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Syst Rev [Internet] 2021;10.
[21] EndNote.Clarivate Analytics; 2010.
[22] Review Manager (RevMan). The Nordic Cochrane Centre, The Cochrane Collaboration; 2014.
[23] Stata Statistical Software: Release 11.College Station, TX: StataCorp LP; 2009.
[24] Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. Front Psychol [Internet] 2013;4:863.
[25] Lin L, Chu H. Quantifying publication bias in meta-analysis. Biometrics [Internet] 2018;74:785–94.
[26] Holditch-Davis D, White-Traut RC, Levy JA, *et al*. Maternally administered interventions for preterm infants in the nicu: effects on maternal psychological distress and mother-infant relationship. Infant Behav Dev [Internet] 2014;37:695.
[27] Miles R, Cowan F, Glover V, *et al*. A controlled trial of skin-to-skin contact in extremely preterm infants. Early Hum Dev [Internet] 2006;82:447–55.
[28] Ahn HY, Lee J, Shin HJ, *et al*. Kangaroo care on premature infant growth and maternal attachment and post-partum depression in South Korea. J Trop Pediatr [Internet] 2010;56:342–4.
[29] Feldman R, Eidelman AI, Sirota L, Weller A, *et al*. Comparison of skin-to-skin (kangaroo) and traditional care: parenting outcomes and preterm infant development. Pediatrics [Internet] 2002;110(1 Pt 1):16–26.
[30] Badiee Z, Faramarzi S, MiriZadeh T. The effect of kangaroo mother care on mental health of mothers with low birth weight infants. Adv Biomed Res [Internet] 2014;3:214.
[31] Herizchi S, Hosseini MB, Ghoreishizadeh M. The impact of Kangaroo-Mother care on postpartum depression in mothers of premature infants. Int J Women's Heal Reprod Sci 2017;5:312–7.
[32] K M, E H-R, P T-V, *et al*. Delivery room skin-to-skin contact for preterm infants-A randomized clinical trial. Acta Paediatr [Internet] 2020;109:518–26.
[33] Sinha B, Sommerfelt H, Ashorn P, *et al*. Effect of community-initiated kangaroo mother care on postpartum depressive symptoms and stress among mothers of low-birth-weight infants: a randomized clinical trial. JAMA Netw Open [Internet] 2021;4:e216040–.
[34] Taneja S, Sinha B, Upadhyay RP, *et al*. Community initiated kangaroo mother care and early child development in low birth weight infants in India-a randomized controlled trial. BMC Pediatr [Internet] 2020;20:150.
[35] K N, K A. Mothers' experience of being separated from their newborns. J Obstet Gynecol neonatal Nurs JOGNN [Internet] 2002;31:275–82.
[36] ATF R, GC L, V R, *et al*. Scoping review of the mental health of parents of infants in the NICU. J Obstet Gynecol Neonatal Nurs JOGNN [Internet] 2017;46:576–87.
[37] Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry [Internet] 1987;150(JUNE):782–6.
[38] ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologists number 92, April 2008 (replaces practice bulletin number 87, November 2007). Use of psychiatric medications during pregnancy and lactation. Obstet Gynecol [Internet] 2008;111:1001–20.