Effect of Kangaroo Mother Care on the Likelihood of Breastfeeding from Birth up to 6 Months of Age: A Meta-analysis

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ABSTRACT

Background. One of the World Health Organization (WHO) nutrition target by 2025 is 50% exclusive breastfeeding rate among infants until age 6 months. Kangaroo mother care (KMC) known to increase breastfeeding rates, especially in preterm and low birth weight (LBW) infants.

Objectives. This study determined the effect of KMC to the rate of exclusive breastfeeding among preterm and LBW infants at 6 months of age.

Methods. Conducted searches in MEDLINE and CENTRAL databases, likewise hand searched local publications December 1996 until June 2018. Included several randomized controlled trials and prospective observational studies comparing KMC and conventional care among preterm and LBW infants. The primary outcome was exclusive breastfeeding of infants at six months of age. Two authors independently assessed trial quality and extracted data the statistical analysis applied using Review Manager version 5.3.

Results. Identified nine eligible trials involving 1,202 neonates. All studies had low-to-moderate risk of bias. KMC significantly noted to increase the likelihood of exclusive breastfeeding by 1.9 times at birth up to 6 months (OR 1.93 [1.18,3.17], p=0.009).

Conclusion. KMC can increase exclusive breastfeeding among preterm and LBW infants from birth up to 6 months of age.

Key Words: Kangaroo mother care, kangaroo care, breastfeeding, low birth weight, preterm

BACKGROUND

Around 15 million babies are born too soon, as estimated by the World Health Organization (WHO) in 2018. Furthermore, an estimated of 4 million infants who die each year due to complications of preterm birth. Prematurity noted as the leading cause of global mortality in children under 5 years old. In Southeast Asia, including the Philippines, 14% of live births are preterm, and 12% are low birth weight (LBW) births. In low-income settings, infants born prematurely or with LBW are at higher risk of death and morbidity such as impaired growth and development. These are due to the lack of accessible and cost-effective care, which includes warmth, breastfeeding support, and basic needs for infection prevention.
Focus on preterm births needed to accelerate their progress thus reducing neonatal mortality. WHO defined “kangaroo mother care” (KMC) as a period of skin-to-skin contact (SSC) wherein the infant clothed only with a diaper and a bonnet, placed on the chest of a mother or caregiver who is lying in a (nearly) horizontal position, with the former held to the mother with a cloth. KMC maintained the entire day. The more holistic definition of KMC includes four components: early, continuous and prolonged skin-to-skin contact between mother-infant dyad, exclusive breastfeeding, early discharge with close monitoring and follow up.2,3

In 1978, Dr. Edgar Sanabria introduced KMC in Bogota, Colombia as an alternative to warmers and incubators for LBW infants. The KMC method decreases newborn mortality and morbidity by preventing infections and hypothermia, and promoting better weight gain through exclusive breastfeeding.2 It also strengthens the emotional bonding between parents or caregivers, and the infant, hence giving a more stable family unit.

The WHO nutrition targets for 2025 is to increase the exclusive breastfeeding rate by 50% among infants in the first six months of life. The purpose of this policy is to increase awareness, promote cost-effective interventions and strengthen policies that can help member states and their partners improve the rates of exclusive breastfeeding among infants less than six months.4

According to a 2014 WHO update, exclusive breastfeeding practice rates vary between different Asia-Pacific regions: Cambodia (74%), Republic of Korea (50%), Fiji (40%), Philippines (34%), Marshall Islands (31%), China (28%) Japan (21%) and Viet Nam (17%). Breastfeeding rates continuously decline as the child reaches two years of age.4

A systematic review (Deepak 2017) on the role of KMC in very low birth weight (VLBW) neonates showed not only a positive effect on growth but also an increase in the breastfeeding rates. In a meta-analysis (Boundy 2016) on KMC was found to decrease the risks of mortality, neonatal sepsis, hypothermia, hypoglycemia and hospital readmission. It also showed an increased likelihood of breastfeeding upon discharge and at 1- to 4-month follow up which increased by 39%.3,5

In 2009, a review of the three studies conducted by Conde et al. showed that KMC found to decrease severe illness and lower respiratory tract infection at 6 months. Likewise it also increase the chance of exclusive breastfeeding at discharge (RR =0.4; 95% CI: 0.25 to 0.68) compared to conventional care.6 In another review by Moore et al. demonstrated the superior performance of immediate SSC contact over standard care on breastfeeding status, infant physiologic stability after delivery, infant behavior and maternal-infant bonding among healthy newborns.7

Previously conducted about four Cochrane reviews. (1) A meta-analysis on neonatal outcomes (Boundy 2016); (2) a systematic review on role of KMC in growth and breastfeeding rates in VLBW neonates (Deepak 2017); (3) KMC to reduce morbidity and mortality in LBW infants (Conde-Agudelo 2009); and (4) skin-to-skin contact for mothers and their healthy newborn infants (Moore 2016).

This meta-analysis aims to review the effect of KMC on exclusive breastfeeding up to 6 months old among LBW infants, which is recommended by the WHO. The results from this meta-analysis would potentially help policy makers to strengthen the policies on KMC and exclusive breastfeeding to achieve our global nutrition target for 2025.

OBJECTIVES

To determine the effectiveness of KMC on exclusive breastfeeding among preterm and LBW at 6 months of age.

METHODS

Criteria for considering studies for this review

Types of studies
We included published and unpublished randomized controlled trials and prospective observational studies.

Types of participants
We included studies on preterm infants < 36 weeks age of gestation or <2500 grams (LBW) with breastfeeding duration of at least 6 months.

Types of interventions
We included studies that compared KMC to conventional care. KMC is continuous skin-to-skin contact between mother’s chest and her diaper-clad infant in a semi-upright position. The back of the infant covered with either a blanket or a cloth sling/binder, inside the mother’s clothing. Mothers were encouraged to render KMC for a minimum of eight hours per day. Conventional care refers to infants who received standard nursery care while placed inside an incubator or warmer/cradle with heat lamps until they could maintain their temperature.

Types of outcome measures

Primary outcome:
- Exclusive breastfeeding up to 6 months old, measured by breastfeeding rates.
Secondary Outcome/s:

• Other reported neonatal outcomes include weight gain, infection, mortality, infants’ physiologic outcome, length of hospital stay and prolactin level among postpartum mothers. These outcomes cannot be combined.

Search methods used to identify the studies

Electronic Searches

The search strategies for CENTRAL and MEDLINE used MeSH terms for kangaroo care, low birth weight infant, skin-to-skin care AND breastfeeding. No language restrictions applied. Other databases and websites searched included: Clinicaltrials.gov, Google Scholar, Oxford Journals, ProQuest, WHO International Clinical Trials Registry and Platform (http://www.who.int/ictrp/search/en/), and HERDIN, with the search terms “kangaroo care” AND “breastfeeding,” “kangaroo mother care,” “skin to skin care,” “low birth weight,” “breastfeeding outcomes.”

Searching other Resources

Citation lists in review articles, relevant publications, included and excluded studies searched. Conference proceedings and local journals were hand searched for related research. Unpublished research papers submitted to the Philippine Society of Newborn Medicine and Philippine Pediatric Society related to breastfeeding personally requested from the societies.

Selection of studies

Full articles of the studies that satisfied the inclusion criteria retrieved. Abstracts considered if enough information was presented. Any inconsistency regarding inclusion/exclusion of the studies resolved by discussion and unanimity by the principal investigator and the co-authors.

Data extraction and management

For each review, the author independently extracted data and compared entries separately from the included studies and counter-checked. The data included during the review as follows: authors, participants inclusion and exclusion criteria, methodology, interventions and outcomes, as well as the year of publication. Differences encountered during data extraction were discussed and resolved with consensus. Review Manager Version 5.3 (RevMan) software used to enter the data by one review author and data counterchecked by the other author.

Assessment of risk of bias in included studies

The methodological quality of the studies were assessed independently by the review authors, as outlined in the Cochrane Handbook for Systematic Reviews of Intervention. Any disparity was resolved by discussion or by involving a third assessor.

Sequence generation

The methods done for sequence generation in the included studies noted, to assess possible selection bias. The methods assessed as to:

• Low risk (note of application of randomization in the article, e.g., random number via table or computer-generated);
• High risk (any non-random process, e.g., hospital number); or
• Unclear risk

Allocation concealment

The allocation concealment methods noted to determine whether intervention allocation have been foreseen in advance of, or during recruitment or changed after assignment. The methods assessed as follows:

• Low risk (e.g., phone or central randomization; numbered-sealed envelopes; coding by third party. Computer generated sequence);
• High risk (e.g., not sealed or non-opaque envelopes; alternation)

Blinding

The methods for blinding noted, to determine possible performance and detection bias. Studies considered at low risk of bias if the process of blinding described in the included studies. The methods assessed as:

• Low, high or unclear risk for personnel; or
• Low, high or unclear risk for outcome assessors

Incomplete outcome data

The completeness of data observed by looking at the number of withdrawals/dropouts and their corresponding reasons for non-inclusion, the numbers included in the analysis compared with the total randomized participants to check for possible attrition bias.

• Low risk (e.g., absence of missing data or where reasons for missing data were described and balanced across groups)
• High risk (e.g., whether missing data are likely to be related to outcomes or are not balanced across groups)
• Unclear (e.g., inadequate reporting of attritions and exclusions)

Selective reporting bias

The methods assessed as:

• Low risk (e.g., report of the study’s pre-specified outcomes and all expected outcomes of interest to the review); 
• High risk (e.g., whether not all the study’s pre-specified outcomes have been reported; outcomes of interest are reported incompletely and so cannot be used; non-inclusion of results of an important outcome expected to have been reported) 
• Unclear risk
Other sources of bias
Any important concern for other possible sources of bias investigated. The included studies evaluated whether they were free of other problems as:
• Low risk
• High risk
• Unclear risk

Overall risk of bias
According to the criteria given in the Cochrane Handbook for Systematic Reviews of Intervention, the authors made a summary to review the overall risk of bias through clear judgment whether the studies were at low, unclear or high risk of bias. The magnitude and direction of bias whether it was likely to make an impact on the findings assessed.

Measures of treatment effect
The authors analyzed dichotomous data and results reflected as summary odds ratios with an odds ratio (OR) 1.93 (1.18-3.17) at 95% confidence intervals (CI).

Unit of analysis issues
Included studies were randomized controlled trials, and prospective cohort studies, both foreign and local, with control and intervention, and with no issues in the unit of analysis were infants as participants receiving more than one intervention, and multiple observations for the same outcome.

Assessment of heterogeneity
To assess the appropriateness of pooling the data, heterogeneity between trials examined by visually checking the forest plots and quantifying the I-squared test. The degree of heterogeneity was roughly categorized based on the value of the I² statistic according to Higgins et al. as: low (25%), moderate (50%), and high (75 %). If statistical heterogeneity noted, the authors planned to explore its possible causes through subgroup analysis (e.g., differences in study quality, participants, intervention regimens or outcome assessments). In case the presence of heterogeneity not explained, a random-effects model used to synthesize the data.

Data synthesis
Statistical analysis performed using the Review Manager software (RevMan 5.3). The Mantel-Haenszel method used for approximations of RR for dichotomous outcomes.

Assessment of publication bias
Visual examination of the funnel plot used to check for publication bias.

Sensitivity analysis
Sensitivity analysis was planned, should there be enough studies available (≥ 10 trials), to determine the effect of trial quality by excluding studies with inadequate randomization, questionable allocation concealment and significant loss to follow-up.

RESULTS

Description of studies

Results of the search
Out of 308 records from the database search, we removed 68 duplicates, and excluded 201 that were not able to meet the inclusion criteria (Figure 1). Of the remaining 39 studies that were retrieved for full text review, we excluded 17 studies for the qualitative synthesis: 15 studies on term infants, 2 studies that compared intermittent versus continuous KMC. 22 studies were included in the qualitative review: 4 Cochrane reviews, and 9 studies that had breastfeeding outcomes only upon discharge and only up to 4 months old. The remaining 9 studies were eligible for inclusion (Bier 1996; Charpak 2001, Hake-Brook 2008, Roberts 2009, Chiu 2009, Ali 2009, De Almeida 2010, Dumalag 2014, Ghavane 2016) and eventually analyzed for the meta-analysis.
Included studies
We included nine studies (8 RCTs and one prospective cohort study) that contributed data to the meta-analysis. About 1,202 newborns < 36 weeks age of gestation and < 2500 grams recruited into these trials. The characteristics of included studies are shown in Appendices 1 and 2.

Risk of bias in included studies
Majority of studies had overall low risk of bias. Figures 2 and 3 provided a summary of the risk of bias of included studies in this review.
Funnel plot was symmetrical indicating that publication bias was unlikely (Figure 4).

Effects of intervention

Primary Outcome
Pooled data showed that KMC significantly increased the odds of exclusive breastfeeding from birth up to 6 months by 1.93x (95% CI, 1.18, 3.17; 9 studies, N=1202; I²= 46%; p=0.009) (Figure 5).
Sensitivity analysis removing the prospective study did not change the direction of the treatment effect and even resulted in higher heterogeneity (I²=49%).

Other Outcomes
Summary measures of other reported neonatal outcomes (weight gain, infants’ physiologic outcome, length of hospital stay and prolactin level among postpartum mothers), neurodevelopmental indices as well as reduction in infections and mortality were not pooled since they varied between studies.

DISCUSSION
Summary of Main Results
In this meta-analysis, we were able to include nine studies with 1,202 infants to assess the effect of KMC on exclusive breastfeeding among preterm and LBW infants up to 6 months of age. KMC resulted in a 1.9 times increase in the likelihood of exclusive breastfeeding among preterm infants up to 6 months old (p=0.009).

The presence of moderate heterogeneity (I²=46%) in this study can be attributed to different variables such as the wide range of low birthweight distribution of the included studies, different primary outcome measures and the limitations of blinding. Hence a random-effects model was used to synthesize the data.

This study analyzed 8 RCTs and 1 prospective study. Sensitivity analysis removing the prospective study did not change the direction of the treatment effect and even resulted in higher heterogeneity (I²=49%). As such, the 9 studies were retained in this analysis.

In the meta-analysis of Boundy et al, their results showed that KMC increased the likelihood of infants to exclusive breastfeeding 1.78 times upon hospital discharge or 40 - 41 weeks postmenstrual age and, at 1- 4 month follow up by 1.4 times.1 However, we searched for studies with exclusive breastfeeding from birth up to 6 months of age since this is the duration of exclusive breastfeeding recommended by WHO Nutritional Targets for 2025.4
The effect of KMC among infants on exclusive breastfeeding from birth up to 6 months

Overall completeness and applicability of evidence
The participants in all studies have no significant difference in baseline characteristics. All outcome measures analysed and presented. The included studies conducted both in developed and low-to-middle income countries, namely the United States, Mexico, Brazil, Colombia, India, Iran, and the Philippines. In low-to-middle income countries, the incidence of preterm and low birthweight births is high and the breastfeeding rates are often suboptimal. KMC as an intervention to improve breastfeeding rates recommended helping achieve the 2025 Nutritional Target of 50% exclusive breastfeeding for at least 6 months of age.

Quality of the evidence
Three independent reviewers assessed the quality of evidence based in 6 domains: selection bias, performance, detection, attrition, reporting and other bias. The most common limitation in the included studies with high-risk bias was in the area of blinding. The assessors who collected the outcomes measures, monitoring of dropouts, and completeness of follow-up were not blinded. KMC and conventional care were difficult to blind due to the nature of intervention. The other domains were all low risk, hence the overall risk of bias was considered low.

Potential biases in the review process
The eligibility and exclusion criteria clearly specified. A systematic and comprehensive search strategy used in the identification and retrieval of relevant studies included in this meta-analysis. Two review authors independently examined and extracted data from each study included. Any disagreements were resolved through discussion or by a third assessor.

Agreements and disagreements with other studies or reviews
Presently there are no currently published reviews focusing on the effects of KMC on exclusive breastfeeding for preterm and low birth weight infants at 6 months of age.
CONCLUSIONS

Implications for practice

Exclusive breastfeeding for six months up to two years or beyond with sufficient and safe complementary foods, is one of the most effective ways to protect child health and promote healthy growth and optimal development in early childhood.

The WHO promotes a complete implementation plan on maternal, infant and young child nutrition. This plan included six global nutrition targets for 2025 and the 5th target is to increase the rate of exclusive breastfeeding by 50% in the first six months.

The global depiction of breastfeeding rates varies widely between low-and middle-income and high-income countries. In countries such as Sri Lanka, Oman, Sweden and Uruguay, almost all their babies are breastfed. On the other hand, countries such as China, Thailand, South Africa, Thailand and Philippines only have 50% and below who are breastfed.

Many factors can influence the wide variation of breastfeeding rates among different countries. Provision of a positive environment and strong support from national level such as policies guaranteeing parental leave and right to breastfeed in the workplace, restrictions on the marketing of breastmilk substitutes play a major role in increasing the rates of breastfeeding. Indeed, studies have found that combined implementation of promoting breastfeeding interventions within health systems and the community have the capacity to increase exclusive breastfeeding rates by 2.5 times.

In our country, to accelerate the rates of exclusive breastfeeding and improve the outcome of our LBW infants, it requires actions at the level of policy makers, community and health system. The evidence showing that KMC significantly improved the odds of exclusive breastfeeding of LBW infants at 6 months old would enable the policy maker to strengthen the implementation of KMC in their respective institutions in order to achieve our global nutrition target by 2025.

Policies and practices on KMC and breastfeeding in the community, different hospitals and lying-in clinics, especially in a resource-limited setting, need to strengthen through strict implementation, proper monitoring and surveillance by the top management per institution and the Department of Health.

Regular cascading and information dissemination to all pregnant mothers, physicians and allied medical practitioners about the benefits of KMC and breastfeeding will improve their awareness, knowledge and practices, hence improving the outcome of our LBW infants. Empowering ambulatory KMC units in an institution and community will lessen the dropouts in KMC dyads.

Implications for research

Future studies needed to increase the potential applicability of the results and should enroll sufficient infants and account for possible confounders. Long-term follow-up studies also needed to improve the outcome of exclusivity of breastfeeding at 6 months.

Statement of Authorship

Literature and hand search conducted by primary investigator. Assessment done by primary investigator and second co-author. The third co-author guided the protocol development and consulted for disagreement in trial assessment. All authors approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest and no affiliation with any pharmaceutical companies.

Funding Source

This study has no funding support.

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The effect of KMC among infants on exclusive breastfeeding from birth up to 6 months


16. Dumalag JA, Raguindin P, Uy ME. Low Birth Weight Infants Admitted to a Level II Neonatal Intensive Care Unit of the Philippine

APPENDICES

Appendix 1. Table of Included Studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study</th>
<th>Country Of Study</th>
<th>Inclusion</th>
<th>Exclusion</th>
<th>Intervention vs. Control</th>
<th>Outcomes</th>
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</thead>
<tbody>
<tr>
<td>Bier 1996</td>
<td>RCT</td>
<td>Rhode Island, New England Region of United States</td>
<td>Infants with BW &lt; 1500 g and whose mothers planned to breastfeed</td>
<td>Mother's positive history of illicit drug use, mental illness, human immunodeficiency virus (HIV) infection, or receiving any medications contraindicated to breastfeeding. In addition, any infants who had a positive toxicology screen for cocaine or other illicit drugs or were showing drug withdrawal symptoms at birth were excluded.</td>
<td>KMC or skin-to-skin versus control</td>
<td>Primary Outcome: Infant physiological data, i.e., oxygen saturation, heart rate, respiratory rate, and axillary temperature; maternal milk production; and duration of breastfeeding. Seconday outcome: Percentage of mothers who continued breast-feeding for the duration of their infants’ hospitalization and 1, 3, and 6 months after discharge from the hospital.</td>
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<tr>
<td>Roberts 2000</td>
<td>RCT</td>
<td>Australia</td>
<td>Infants born &gt; 30 weeks AOG, clinically stable and cleared by the unit specialist.</td>
<td>Infants who are not stable or with congenital anomalies</td>
<td>KMC vs. conventional cuddling care</td>
<td>Main outcomes: Infant weight gain, temperature maintenance during KMC and CCC, and length of hospital stay. Seconday outcomes: breastfeeding at discharge, 6 weeks, 3 months and 6 months.</td>
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## Appendix 2. Characteristics Of Included Studies (continued)

<table>
<thead>
<tr>
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<th>Type of Study</th>
<th>Country Of Study</th>
<th>Inclusion</th>
<th>Exclusion</th>
<th>Intervention vs. Control</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Charpak 2001</td>
<td>RCT</td>
<td>Colombia</td>
<td>All liveborn infants who weighed 2000 g and were eligible for KMC and whose mother or a relative was able to understand and was willing to follow the general instructions for taking care of a premature infant and complying with a 1-year follow-up schedule</td>
<td>Referral to another institution, plans to leave Bogota’ in the near future, lethal or major malformations, early major conditions arising from perinatal problems (e.g., severe hypoxic ischemic encephalopathy, pulmonary hypertension), and parental or family refusal to comply with the follow-up program or, in those assigned to KMC, with the intervention</td>
<td>KMC vs. Control, infants kept in the incubators</td>
<td>Main outcomes: Morbidity, mortality, growth, development, breastfeeding, hospital stay, and sequelae. Secondary outcomes: Length of hospital stay, the overall incidence of infection; the incidence of severe nosocomial infections or severe infections detected after discharge. Proportion of infants entirely or partially breastfed up to 12 months old.</td>
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<tr>
<td>Hakebrooks 2008</td>
<td>RCT</td>
<td>Cleveland, Ohio, Northern America</td>
<td>Mothers: English speaking, 18 years or older, anticipating a singleton birth, and healthy enough to experience KMC. Infants were included if they had 5 min Apgar ≥6 and were 1,300–3,000 g at birth, 32–36 completed weeks of gestation, and healthy enough to experience KMC.</td>
<td>Mothers with known drug abusers during pregnancy or if they had eclampsia, uncontrolled seizure disorder, severe depression or mental illness refractory to treatment, or maternal disease requiring transport to an intensive care unit post birth. Infants were excluded if they had a condition that could prevent KMC post birth or if they were diagnosed with a severe congenital anomaly.</td>
<td>KMC versus control infants were either on the postpartum unit or in the NICU, were wrapped in blankets whenever they were held.</td>
<td>Main outcome variables: Breastfeeding status at hospital discharge and at 1.5, 3, 6, 12, and 18 months as measured by the Index of breastfeeding status.</td>
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<tr>
<td>Chui 2009</td>
<td>RCT</td>
<td>Cleveland, Ohio, Northern America</td>
<td>Healthy preterm infants 32-36 weeks’ gestation and their mothers.</td>
<td>Infants with congenital anomalies</td>
<td>KMC versus control group (infants kept warm in incubators, warmer beds, bassinets or held wrapped in blankets)</td>
<td>Mother-preterm infant interaction (MPI) is measured by mean scores on the Nursing Child Assessment Satellite Training Program (NCAST) Feeding and Teaching scales at 6,12 and 18 months post birth (reported in Chiu 2009 using the same data set). Breastfeeding status (exclusivity) at hospital discharge, 6 weeks and 3, 6 and 12 months.</td>
</tr>
<tr>
<td>Ali 2009</td>
<td>RCT</td>
<td>India</td>
<td>Infants delivered by spontaneous vaginal delivery with weight 1200 grams to 1800 grams</td>
<td>Neonates delivered by caesarean section, with major life threatening congenital mal- formation, severe perinatal complication and pa- rental refusal for KMC intervention were excluded from the study.</td>
<td>KMC versus conventional care</td>
<td>Effect on growth, physiologic parameters, length of hospital stay, mortality, morbidity and exclusive breastfeeding rates at 40 weeks post-conceptual age, 3 and 6 months.</td>
</tr>
<tr>
<td>De Almeida 2010</td>
<td>Prospective cohort</td>
<td>Brazil</td>
<td>Infants weighing &lt; 2,000 g and staying in the neonatal unit for at least 7 days</td>
<td>Refusal to do KMC</td>
<td>Control group is conventional care prior to implementation of KMC.</td>
<td>Primary Outcome: Exclusive breastfeeding after discharge, 40 weeks, 3 months and 6 months.</td>
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Appendix 2. Characteristics Of Included Studies (continued)

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<th>Outcomes</th>
</tr>
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<tbody>
<tr>
<td>Dumalag 2014</td>
<td>RCT</td>
<td>Philippines</td>
<td>Infants weighing ≤ 2000g, and with Apgar score ≥ 7 at 5 minutes of life</td>
<td>Unstable infants namely extremely low birth weight (ELBW), infants with chromosomal and life threatening congenital anomalies, and infants with oxygen or cardiovascular support, b) mothers who are clinically unstable who cannot render KMC, c) mothers who have contraindication for breastfeeding, and finally d) mothers diagnosed with Prolactinoma.</td>
<td>KMC Group versus Control Group (routine newborn care)</td>
<td>Primary outcome: Prolactin levels of mothers in KMC versus Control. -Milk volume production on the 3rd and 7th day. -Mean length of stay Secondary outcome: Exclusive breastfeeding until 6 months old.</td>
</tr>
<tr>
<td>Ghavane Sunil 2016</td>
<td>RCT</td>
<td>Southern India</td>
<td>Infants with birth weight &lt;1500gm were enrolled. Inborn, singleton, VLBW (birth weight &lt;1500gm) infants, who are tolerating feeding and hemodynamically stable</td>
<td>Infants with major malformation were excluded</td>
<td>KMC versus control infants placed inside the incubator or under the warmer</td>
<td>Primary outcome: Growth outcomes Secondary Outcome: Nutritional indicators: Malnutrition, wasting, stunting and duration of exclusive breastfeeding at 40 weeks post conceptual aging, 3 months and 6 months old</td>
</tr>
</tbody>
</table>

Appendix 3. References to Excluded Studies


Mörelius E, Ortenstrand A, Theodorsson E, Frostell A. A randomized trial of continuous skin-to-skin contact after preterm birth and the effects on salivary cortisol, parental stress, depression, and breastfeeding. Early Human Development. 2015 Jan;91(1):63–70.
