ORIGINAL ARTICLE

# Impact of intermittent kangaroo mother care on weight gain of neonate in nicu: Randomized control trial

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## Abstract

**Objective:** To measure the impact of intermittent kangaroo mother care on weight-gain of neonates in a neonatal intensive care unit.

**Methods:** The randomised controlled trial was conducted at the Department of Neonatology, the Children Hospital and the Institute of Child Health, Lahore, Pakistan, from March to October, 2018, and recruited newborns admitted to the neonatal intensive care unit. The subjects were randomised into case and control groups. Intermittent kangaroo mother care was given in the case group for seven days. Data was collected and analysed using SPSS 23.

**Results:** Of the 153 neonates, 140(91.5%) were included; 70(50%) in each group. The most common reason for admission was bronchopneumonia 49(35%). In the case group, average weight gain was 10.22±1.65 grams/kg/day compared to 7.87±1.71 in the control group (p=0.0001). The average length of stay in the case group was significantly low compared to the control group (p=0.003). Multivariate analysis determined the effect of kangaroo mother care therapy as effective (p<0.0001).

**Conclusion:** Intermittent kangaroo mother care was found to be effective for improving weight-gain in neonates in addition to the conventional treatment.

**Keywords:** Intermittent kangaroo mother care, Neonate, Intensive care unit, Randomised controlled trial, Weight-gain. (JPMA 70: 973; 2020) DOI: https://doi.org/10.5455/JPMA.45123

## Introduction

Globally, five million babies die during the neonatal period every year and most of these deaths occur in low and middle-income countries (LMICs). Pakistan is amongst the countries with high perinatal mortality of 42/1000 live births.[1] Preterm birth is amongst the leading cause of death along with perinatal asphyxia and infections.[2] Out of these, 25% cases present in the neonatal intensive care unit (NICU).[3] Failure to gain weight during hospitalisation and later is a significant problem predominantly in low-resource countries.[3] Lack of knowledge regarding proper breast-feeding techniques, late introduction of feeding, improper dilution, infections, problems with digestion, increased length of stay and lack of resources are common causes of reduced weight-gain among the neonates.[4,5] Multiple interventions are applied to address the issues of weight-gain, including exclusive mother feeding, tube feeding with expressed breast milk (EBM), kangaroo mother care (KMC), and, where feedings are contraindicated, babies are administered total parenteral nutrition (TPN).[6,7] KMC is a unique intervention which was proposed by Martinez and Rey in 1978 that can provide warmth and early breast-feeding even when babies are on oxygen therapy.[8] The hallmark of KMC is the position in which the infant is taken care of with skin-to-skin contact (SSC) between the mother's breasts and under her clothes throughout the day. The other components in KMC are exclusive breastfeeding and early discharge, continuing KMC at home with close follow-up.[3,9] It has positive impact both on the baby and the mother. It provides ready access to feed and nourishment, is an effective way for protection from infection, is a source of stimulation, has positive effects on growth and development, and promotes safety and affection between the mother and the baby.[10,11] KMC with increased breast-feeding opportunities is found to be effective for improving weight-gain in neonates who have delayed weight-gain irrespective of birth-weight, gender, mode of delivery or gestational age.[12-14] It is associated with a 36% reduced risk of neonatal mortality among low birth-weight (LBW) newborns compared to the conventional care.[7] This method can be used continuously round the clock or for short periods per day gradually increasing as tolerated by the neonates who are compromised by severe health problems.[11] A study conducted in Lahore examined the effect of KMC on preterm and stable neonates in

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reducing morbidity and mortality using case series design,[13] focussing on the newborns in NICUs who suffered greater morbidity and mortality. The current study was planned to measure the impact of intermittent KMC on weight-gain of neonates in NICU.

## Patients and Methods

The randomised controlled trial (RCT) was conducted at the Department of Neonatology, the Children Hospital and the Institute of Child Health, Lahore, Pakistan, from March to October, 2018, and comprised newborns admitted to the NICU. Approval was obtained from the institutional review board, the sample size was calculated with 80% power of test and 5% level of significance by taking expected 25% of cases in NICU using n=Z^2(p) (1-p)/d^2 formula.3Simple random sampling technique was used to select the subjects for the study. Block randomisation was used for equal distribution of the sample to KMC and control groups. Neonates on odd-number beds received KMC and even-number beds received conventional therapy. All neonates in NICU either term or preterm whose parents consented to participate in the study were included. Babies with necrotising enterocolitis (NEC) or requiring mechanical ventilation or surgical intervention, and those who left against medical advice (LAMA) before the completion of data-collection process were excluded.

Intermittent KMC was applied for one hour at a time every 4-hourly for seven days. SSC) between the mother and the babies and mother feedings were ensured under the mother's clothes and the baby wearing only a diaper and a cap.

Each patient was subjected to detailed history and examination. Mothers and at least one other female family member were explained the method and its advantages. Babies were enrolled at 8th post-natal day and were given intermittent KMC in a separate area within the NICU.

Babies were weighed without clothes on an electronic weighing machine on admission and then daily until discharge. All babies were given exclusive breast-feeding and those who were not able to suck adequately had mixed feeding.

Data was analyzed using SPSS 23. Descriptive statistics were used for demographic profile of the neonates, their diagnosis and length of stay, to obtain the frequency and percentages of the two groups. Independent t-test was applied to measure difference among KMC and conventional treatment group. Chi-square Pearson correlation test of association was used to measure the association between the groups and variables of neonates' profile. $P<0.05$ was taken as significant for independent t-test and Chi-square test. Multivariate analysis was performed to determine the size effect of KMC therapy.

## Results

Of the 153 neonates, 140(91.5%) were included; 70(50%)

**Table-1:** Descriptive profile of neonates enrolled in the study.

| Profile of Case & Controls Subgroups | | KMC (n=70) | | Conventional (n=70) | | Total (n=140) | |
|---|---|---|---|---|---|---|---|
| | | N | % | n | % | n | % |
| Gender | Male | 35 | 25.0 | 34 | 24.29 | 69 | 49.29 |
| | Female | 35 | 25.0 | 36 | 25.71 | 71 | 50.71 |
| Diagnosis | Pneumonia | 24 | 17.1 | 25 | 17.86 | 49 | 35.00 |
| | Sepsis | 16 | 11.4 | 17 | 12.14 | 33 | 23.57 |
| | Prematurity | 11 | 7.9 | 12 | 8.57 | 23 | 16.43 |
| | RDS | 13 | 9.3 | 11 | 7.86 | 24 | 17.14 |
| | MAS | 6 | 4.3 | 5 | 3.57 | 11 | 7.86 |
| Feeding | Breast milk | 10 | 7.1 | 11 | 7.86 | 21 | 15.00 |
| | Expressed breast milk | 3 | 2.1 | 5 | 3.57 | 8 | 5.71 |
| | Formula milk | 6 | 4.3 | 5 | 3.57 | 11 | 7.86 |
| | Mix feed | 51 | 36.4 | 49 | 35.00 | 100 | 71.43 |
| Length of Hospital Stay | Mean (SD) | 18 (2.57) | | 21 (3.56) | | | |
| | Minimum | 11 | | 14 | | | |
| | Maximum | 29 | | 27 | | | |
| Gestational Age | Mean (SD) | 35.09 (2.68) | | 36.21 (2.43) | | | |
| | Minimum | 30 | | 30 | | | |
| | Maximum | 38 | | 40 | | | |

KMC: Kangaroo mother care; RDS: Respiratory distress syndrome; MAS: Meconium aspiration syndrome; SD: Standard deviation.

**Table-2:** Independent t-test for comparison among KMC and conventional group.

| Group (Case, KMC; Control, Conventional) | | Mean | SD | df | P-Value |
|---|---|---|---|---|---|
| Weight on day zero | KMC | 2.56 | 0.78 | 138 | .001 |
| | Conventional | 2.13 | 0.70 | | |
| Weight on day 1 | KMC | 2.58 | 0.78 | 138 | .001 |
| | Conventional | 2.15 | 0.71 | | |
| Weight on day 2 | KMC | 2.60 | 0.79 | 138 | .001 |
| | Conventional | 2.18 | 0.71 | | |
| Weight on day 3 | KMC | 2.62 | 0.79 | 138 | .002 |
| | Conventional | 2.20 | 0.72 | | |
| Weight on day 4 | KMC | 2.64 | 0.80 | 138 | .002 |
| | Conventional | 2.22 | 0.73 | | |
| Weight on day 5 | KMC | 2.66 | 0.80 | 138 | .002 |
| | Conventional | 2.24 | 0.74 | | |
| Weight on day 6 | KMC | 2.66 | 0.81 | 138 | .004 |
| | Conventional | 2.27 | 0.77 | | |
| Weight on day 7 | KMC | 2.71 | 0.81 | 138 | .004 |
| | Conventional | 2.31 | 0.79 | | |
| Average weight gain in grams per kg per day | KMC | 10.22 | 1.65 | 138 | .001 |
| | Conventional | 7.87 | 1.71 | | |

KMC: Kangaroo mother care; SD: Standard deviation.

**Table-3:** Multivariant analysis of average with among cases, controls weight-gain with days under KMC therapy.

| | KMC | Conventional | F Value Hypothesis, Error | Sig. | $n^2$ |
|---|---|---|---|---|---|
| Average weight gain in grams per kg per day and days under therapy | 10.22 (1.65) | 7.87 (1.71) | 0.128 7, 133 | 0.0001 | 0.872 |

KMC: Kangaroo mother care.

in each group. The most common reason for admission was bronchopneumonia 49(35%). Overall, 21(%) subjects received breast-feeding from the mother; 10(14.3%) the from KMC and 11(15.7%) from the control group. Gestational age of KMC neonates was 35.09±2.68 weeks, while it was 36.21±2.43 in the control group. KMC neonates' mean stay in hospital was 18±2.57 days compared to 21±3.57 day in the control group (p <0.003) (Table-1). The weight-gain in the KMC group was significantly higher than the control group (p=0.0001). In the KMC group, an average of 10.21±1.64gm increase in weight occurred every day, while in the control group it was 7.86±1.71gm (Table-2). In the KMC group, average weight-gain of term babies was 10.48±1.53 grams/kg/day, while in the control group it was 8.16±2.36 grams/kg/day (p=0.0001). Average weight-gain of preterm babies in the KMC group was 9.85±4.24 grams/kg/day, while in the control group it was 7.70±3.26 grams/kg/day (p=0.0001).

Follow-up comparison using multivariate analysis indicated that each pair-wise difference was significant (p<0.0001), and that there was significant increase of weight in the KMC group (Table-3).

## Discussion

The study evaluated the positive impact of intermittent KMC on weight-gain in NICU babies. The most common reason for admissions was infection, including bronchopneumonia and sepsis, followed by prematurity. In a study, sepsis was the commonest presentation in NICU.[15] Other studies done in the region showed sepsis as the most common reason for admission and morbidity in NICU.[16-18] These findings correlate with our similar socio-economic and environmental culture.

Effects of KMC are known in preterm and LBW babies regarding weight-gain and duration of illness. Two studies determined the effect of KMC only in preterm and LBW babies.[8,9] Our study is distinct from these studies as we assessed the effect of weight-gain in both term and preterm neonates who were suffering from serious illnesses. including prematurity, pneumonia, sepsis, respiratory distress syndrome (RDS), and meconium aspiration syndrome (MAS), and showed

effective weight-gain in the KMC group compared to the conventional group. This was also shown by s similar study.[19]

The current study showed that the average weight-gain was more and statistically significant in the KMC group compared to the conventional group. In one study, average weight-gain in KMC babies was more than double the average weight-gain per day of the babies in the control group.[3] A study done in western India reported an average weight-gain per day in the KMC babies of 23.99g versus 15.58g in the conventional method of care.[20] Similar beneficial role of KMC was observed in studies done in India.[21] A large systemic review of 15 RCTs that compared KMC and conventional neonatal care, found convincing evidence that KMC was associated with increase in weight-gain.[22] It was reported by a study done in Pakistan that KMC was beneficial for newborn care and should be adopted in the country to reduce the burden of neonatal mortality.[23]

Average length of hospital stay for KMC group was 18 days compared to 21 days in the conventional group. The finding is consistent with an international study.[24] The financial and psychosocial impacts of longer hospital stay are well-established, and the introduction of KMC in newborn care can help to keep the stay shorter.

According to the World Health Organisation (WHO), "two decades of implementation and research has made it clear that KMC is more than an alternative to incubator care". The benefits of KMC are multifaceted.[25]

The limitation of the current study is that it applied intermittent KMC instead of round-the-clock routine due to limited resources. There is a need for effective application of KMC in newborn care round-the-clock to get better results. Another limitation of the study is that it could not apply for RCT registration due to obliviousness.

Training of healthcare professionals, and proper allocation of resources for KMC are recommended. The education of the mother in this regard is also of critical importance. Larger longitudinal studies are recommended which may also shed light on impact on mother and the role of father in this regard.

## Conclusion

Intermittent KMC was found to be effective for improving weight-gain and shortening the length of NICU stay in addition to the conventional treatment and care.

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**Conflict of Interest:** None.

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