

Outcome of Intermittent Kangaroo Mother Care in Neonatal Intensive Care Unit

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ABSTRACT

Objective: To find out the outcome of intermittent Kangaroo Mother Care (KMC) in terms of weight-gain among low birth weight (LBW) neonates in Neonatal Intensive Care Unit (NICU).

Study Design: A randomized controlled trial.

Place and Duration of the Study: This study was conducted at Department of Pediatrics Gulab Devi Hospital, Lahore from March 2020 to February 2021.

Methodology: A total of 226 (113 KMC Group and 113 controls) neonates of both genders with birth weight between 1500 grams to 2499 grams admitted to NICU with their mothers available for KMC application were enrolled. KMC Groups received KMC whereas controls were given conventional care. KMC was started from 8th post-natal day and a separate block of NICU was dedicated for the implementation of KMC. Body weight of all the neonates was measured from day-zero (8th post-natal day) up to day-7 (15th post-natal day).

Results: Out of a total of 226 neonates, 121 (53.5%) were boys and 105 (46.5%) girls, Overall, mean gestational age was calculated to be 34.8±2.6 weeks. Most frequent main diagnosis at the time of admission was pneumonia, 64 (28.3%) neonates. Mean body weight was significantly increased among neonates of KMC Group in comparison to control at day-4, day-6 and day-7 ($p < 0.05$). Total weight gain from day-0 to day-7 was found to be 0.24±0.1 kg in KMC groups and 0.15±0.1 kg among controls ($p < 0.0001$). Mean duration of hospital stay was noted to be 17.5±2.9 days in KMC Group versus 20.7±3.4 days among controls ($p < 0.0001$).

Conclusion: In comparison to conventional care, intermittent KMC was found to significantly more effective in terms of improvement in weight gain and reduction in duration of hospitalization.

Keywords: Exclusive breast-feeding, Kangaroo mother care, neonatal intensive care unit, pneumonia.

INTRODUCTION

About 5 million children are calculated to die within 1st year of their lives and majority of these deaths are from developing nations. Rates of perinatal deaths are calculated to be around 42/1,000 live-births in Pakistan while preterm births is the most important cause behind these deaths.^{1,2} Around 25% of all preterm newborns attend neonatal intensive care units (NICUs). Among preterm newborns, failure to gain satisfactory weight during hospital stays and later is considered to be an important issue.³

Improper feeding practices and awareness along with delay in initiation of feeding, improper dilution, infections, digestion problems, longer duration of hospital stays and lack of resources are some of the major causes behind unsatisfactory weight gain in the neonatal period.^{4,5} To address these challenges, exclusive breastfeeding, "tube feeding with expressed milk (EBM)", kangaroo mother care (KMC) and "total parenteral nutrition (TPN)" where feeding is contraindicated are few of the most successfully utilized interventions.^{6,7} The KMC was 1st postulated in 1978 for ensuring warmth and early initiation of breastfeeding even in cases where newborns were on therapeutic oxygenation.⁸ The core principle behind KMC is "skin-to-skin contact (SSC)" between breasts of the mother and the baby in her clothes. Exclusive breastfeed, early discharge from hospitalization, continuity of KMC at home after early discharge from the hospital and close follow up are few of the factors credited to the successful outcomes in KMC.^{3,9} Boundy EO et al in their meta-analysis review revealed KMC to be associated with 36% decrease in neonatal mortality among low birth weight (LBW) neonates.⁷ Convenience about the execution of KMC as per need or throughout the day are some of the advantages attached to KMC.¹⁰ Local data from Lahore found KMC to result in decline in morbidity and mortality rates among neonates during NICU stay.¹¹

Conventional care of LBW neonates is costly and require skilled support and logistic assistance whereas interventions like KMC are not widely used at all healthcare settings. Limited literature is available showing effectiveness of KMC at NICU

settings so the present study was aimed at finding out the outcome of intermittent KMC in terms of weight-gain among low birth weight neonates in NICU. We hypothesized that in comparison to conventional cares, intermittent KMC might result in significant increase in weight gain in LBW neonates.

METHODOLOGY

This randomized controlled trial was conducted at Department of Pediatrics Gulab Devi Hospital, Lahore from March 2020 to February 2021. Approval from "Institutional Ethical Committee" was taken. Written and informed consent were taken from all parents/guardians. A sample size of 113 cases was calculated using formula: $n = z^2 * p * (1 - p) / e^2$ Where z was taken as 1.96 with confidence level of 95% and proportion of LBW infants admissions in ICU as 25%³ and margin of error as 8%. A similar number of controls were also enrolled for this study.

Inclusion criteria were neonates (term/preterm) of both gender with birth weight between 1500 grams to 2499 grams (regardless of gestational age) admitted to NICU with their mothers available for KMC application. All neonates with necrotizing enterocolitis or needing mechanical ventilation or those requiring surgical interventions were excluded. Neonates leaving against medical advice (LAMA) or whose parents/guardians refused to be part of the study were also excluded.

A total of 226 (113 KMC Group and 113 controls) neonates as per inclusion and exclusion criteria were enrolled. History was taken and physical examination was performed in all neonates at the time of enrollment. Randomization was done using lottery method. KMC Groups received KMC whereas controls were given conventional care. The KMC was described as a method of "continuously holding a partially wrapped baby to mother's chest, involving skin to skin contact". Intermittent KMC was performed at 4-hourly intervals for a total duration of 7 days. Mothers were trained for KMC application in terms of positioning, hygiene (hand-washing), exclusive breast-feeding and proper nutrition. All

questions from mothers involved in this study were addressed and answered up to their satisfaction. KMC was started from 8th post-natal day and a separate block of NICU was dedicated for the implementation of KMC. The body weight of all the neonates were measured employing an electronic weighing machine daily from day-zero (8th post-natal day) up to day-7 (15th post-natal day), same day each day among all cases and controls. Outcome of KMC was shown comparing mean body weights of KMC Group and controls on each study day from day zero to day-7 of the study. A special proforma was made to note all study data.

SPSS version 26.0 was utilized for data analysis. Qualitative data was shown as frequencies and percentages while quantitative data was presented as mean and standard deviation (SD). Between KMC Groups and controls, comparison of qualitative variables was done using chi-square test while independent

sample t-test was employed for comparing quantitative data. P value < 0.05 was taken as significant.

RESULTS

Out of a total of 226 neonates, 121 (53.5%) were boys and 105 (46.5%) girls, Overall, mean gestational age was calculated to be 34.8±2.6 weeks ranging between 30 to 39 weeks. Exclusive breast-feeding was noted among 32 (14.2%) neonates. Most frequent main diagnosis at the time of admission was pneumonia observed among 64 (28.3%) neonates. Table I is showing baseline characteristics of neonates in KMC Group and Controls. No statistically significant difference was noted in terms of baseline characteristics among neonates of KMC Group and controls.

Table I: Baseline Characteristics of KMC Group and Controls

| Characteristics | | KMC Groups (n=113) | Control Group (n=113) | P-Value |
|---|-------------------------------|--------------------|-----------------------|---------|
| Gender | Male | 62 (54.9%) | 59 (52.2%) | 0.6891 |
| | Female | 51 (45.1%) | 54 (47.8%) | |
| Gestational Age in Weeks as Mean±SD | | 35.0±2.7 | 34.6±2.3 | 0.2319 |
| Residence | Rural | 68 (33.6%) | 63 (55.8%) | 0.5004 |
| | Urban | 45 (66.4%) | 50 (44.2%) | |
| Exclusive Breastfeeding | | 18 (15.9%) | 24 (21.2%) | 0.3049 |
| Main Diagnosis at the Time of Admission | Pneumonia | 33 (29.2%) | 31 (27.4%) | 0.9887 |
| | Prematurity | 25 (22.1%) | 24 (21.2%) | |
| | Sepsis | 20 (17.7%) | 23 (20.3%) | |
| | Respiratory Distress Syndrome | 17 (15.0%) | 19 (16.8%) | |
| | Meconium Aspiration Syndrome | 12 (10.6%) | 10 (8.8%) | |
| | Others | 6 (5.3%) | 6 (5.3%) | |

Table II is showing comparison of body weight among neonates of KMC Group and controls. No statistically significant difference was noted in terms of mean body weight as day-0, day-1, day-2, day-3 and day-5 ($p>0.05$) while mean body weight was significantly increased among neonates of KMC Group in comparison to control at day-4, day-6 and day-7 ($p<0.05$). Total

weight gain from day-0 to day-7 was found to be 0.24±0.1 kg in KMC groups in comparison to 0.15±0.1 kg among controls ($p<0.0001$). Mean duration of hospital stay was noted to be 17.5±2.9 days in KMC Group versus 20.7±3.4 days among controls ($p<0.0001$).

Table II: Comparison of Body Weight among Neonates of KMC Group and Controls

| Days | Body Weight (kg) as Mean±SD | | P-Value |
|---------------------------------------|-----------------------------|------------------|---------|
| | KMC Group (n=113) | Controls (n=113) | |
| Day-0 | 2.34±0.8 | 2.19±0.8 | 0.1601 |
| Day-1 | 2.37±0.7 | 2.21±0.8 | 0.1110 |
| Day-2 | 2.41±0.8 | 2.23±0.7 | 0.0732 |
| Day-3 | 2.44±0.7 | 2.25±0.8 | 0.0587 |
| Day-4 | 2.48±0.7 | 2.27±0.7 | 0.0497 |
| Day-5 | 2.51±0.8 | 2.29±0.8 | 0.0534 |
| Day-6 | 2.54±0.7 | 2.32±0.9 | 0.0414 |
| Day-7 | 2.58±0.7 | 2.34±0.9 | 0.0262 |
| Total Weight Gain from Day-0 to Day-7 | 0.24±0.1 | 0.15±0.1 | <0.0001 |

DISCUSSION

In the present study, we noted that intermittent KMC resulted in significant increase in body weight in comparison to conventional care in the NICU setting while total weight gain from day-0 to day-7 during the study period was found to be significantly more among neonates of KMC care in comparison to conventional care (0.24±0.1 kg vs. 0.15±0.1 kg, $p<0.0001$). Researchers have found KMC to be a topic of keen interest in the recent years where more and more research is being done in the recent decades at different settings and subjects to find out the potential role of KMC among LBW and/or preterm newborns.^{7,10} As our study highlighted that KMC was beneficial among neonates admitted in the NICU setting, another important reason for considering KMC in NICU settings could be that as many of the neonates admitted in the NICUs are tiny, sick preterm or LBW, these neonates need some extra care at bedside in addition to standard care and therapeutic treatment. A recent study from China consisting of 8 NICU settings revealed that KMC was well embraced by the parents and resulted in anxiety reduction along with improved communication among parents and medical staff.¹²

A local study in NICU settings revealed that intermittent KMC was effective in improving weight-gain among neonates in addition to conventional care (average weight gain in grams per kg per day as 10.22±1.65 grams in KMC groups versus 7.87±1.71 grams among controls) but one of the limitation of that study was that body weight among neonates of KMC group was significantly higher at the start of the study period in comparison to controls (2.56±0.8 kg in KMC group versus 2.13±0.70 kg in controls).¹³ A randomized controlled trial from India by Suman RP et al evaluating KMC care among LBW babies revealed average weight gain of 23.99 grams among KMC group in comparison to 15.58 gram among controls.¹⁴ Vahidi RG et al from India also found KMC to be significantly effective among LBW neonates when compared to conventional care.¹⁵ As per World Health Organization, "two decades of implementation and research has made it clear that KMC is more than an alternative to incubator care" which shows that KMC has multiple benefits and research in the recent decades is showing it to be highly beneficial even in NICU settings.¹⁶ KMC seems to be well accepted and bears no adverse effects.^{12,17}

In this study, we found that duration of hospitalization was significantly less among neonates of KMC group versus controls

(17.5±2.9 days in KMC Group versus 20.7±3.4 days among controls, $p < 0.0001$). These findings are very consistent to local and international literature showing effectiveness of KMC.^{3,9,13}

Our study had some limitations as well. As this was a single center study, our findings cannot be generalized. We were unable to implement KMC for the whole day due to lack of resources and awareness at our setting.

CONCLUSION

In comparison to conventional care, intermittent KMC was found to significantly more effective in terms of improvement in weight gain and reduction in duration of hospitalization. KMC should be considered an effective way of improving weight gain in NICU settings.

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