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Effect of Kangaroo Mother Care on Weight Gain in Preterm Infants at Tertiary Care Hospital

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ABSTRACT

Objective: To ascertain effect of Kangaroo mother care (KMC) on weight gain in preterm infants at a tertiary care hospital.
Study Design: Quasi-experimental study
Place and Duration of Study: Neonatal unit of Combined Military Hospital, Lahore, Pakistan, from Oct 2022 to Mar 2023.
Methodology: Neonates were included in the study after obtaining approval from the institutional review board and consent from parents in both the Kangaroo Mother Care (KMC) Group (n=60) and the Control Group (n=60). Infants born between 30 and 35 weeks of gestational age and weighing between 1000 g and 2000 g were selected for the study and divided into two groups using a simple random approach.
Results: Out of the 132 newborns, 120(90.90%) were selected, with 60(50%) in each group. The KMC Group demonstrated a higher average weight gain from day 7 to day 14 (16.429±2.64gm g) compared to the Control Group (10.429±2.62gm g) with statistical significance (p<0.0001). The increase in weight each day did not show a statistically significant difference between the two groups (p>0.05). Subgroup evaluations of 41 infants (68.3%) in the intervention group showed that they exclusively breastfed at discharge, compared to only 23 infants (38.3%) in the Control Group who initiated breastfeeding at discharge.
Conclusion: In comparison to conventional mother care, Kangaroo mother care is a potent tool for improved weight gain in preterm babies in LMIC, along with its beneficial effect on establishing exclusive mother feed at discharge.

Keywords: Kangaroo mother care, preterm, weight gain in very low birth weight (VLBW) infants, RCT.

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INTRODUCTION

Preterm babies are infants born before completing 37 weeks of gestation. The worldwide occurrence of preterm births ranges from 4% to 16%, resulting in around 13.4 million births annually.[1] Pakistan has a high prevalence of preterm births, approximately 21.64%, which is the primary risk factor for infant mortality and morbidity.[2] This is primarily caused by issues related to prematurity. Both sick and healthy preterm newborns struggle to maintain their growth due to their physical state and nutritional needs.

Supportive care and proper feeding are essential for managing weight gain in unwell preterm infants. Underdeveloped countries need low-cost and practical solutions to achieve sustainable development goals and improve outcomes for ill newborns. Kangaroo mother care (KMC) is an alternative strategy to improve the outcomes of preterm newborns. Kangaroo Mother Care comprises exclusive breastfeeding, constant skin-to-skin contact between mother and newborn, health care workers aiding the mother with infant care at the hospital, and early discharge with ongoing KMC at home.[3]

Kangaroo Mother Care (KMC) was established by Martinez and Rey in 1978 as a specialized method for caring for oxygen-dependent infants aimed at regulating their body temperature and promoting early breastfeeding initiation. Kangaroo Mother Care provides various benefits for both the mother and the baby, including promoting early feeding, facilitating immediate breastfeeding, reducing infection rates, preventing apnea through continuous stimulation, improving long-term neurodevelopment outcomes, enhancing mother-baby bonding, and decreasing morbidity and mortality.[4,5]

Studies have shown that Kangaroo Mother Care promotes weight gain in infants by encouraging more frequent and prolonged breastfeeding sessions, regardless of the baby's gender, birth weight, gestational age, or delivery method.[6] Research based on a Cochrane review and meta-analysis indicates that Kangaroo Mother Care reduces the incidence of sepsis (RR 0.35-0.53), death (0.60-0.64), hypothermia (0.22-0.28), and the length of hospital stay (mean difference -1.61 days). Findings also suggest that delaying the start of feeding significantly impairs weight gain in

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preterm newborns.[7] Ethnicity and illness severity have been shown to influence the baby's weight gain differently. Research indicates that having a low BMI before pregnancy and gaining excess weight during pregnancy can result in babies being born with low birth weight.[8] The World Health Organization recommends starting Kangaroo Mother Care in neonates weighing 2000 grams or less once they are medically stable.[9]

This study aimed to examine the impact of Kangaroo Mother Care on weight gain and other benefits in preterm infants, considering factors that affect their growth and neurodevelopment. The results of our intervention are expected to differ from previous studies because of differences in patient illness severity, neonatal unit conditions, and the ethnic makeup of the study population.[10]

METHODOLOGY

The Quasi-experimental study took place at the Department of Neonatology, Combined Military Hospital (CMH), Lahore, Pakistan, following authorization from the Research and Ethics Board of CMH Lahore Medical College (Ref No.396/2022). The study was conducted from October 2022 to March 2023.

Inclusion Criteria: Newborns who were admitted to the Neonatal Intensive Care Unit (NICU). Preterm newborns with gestational age ranging from 30 to 35 weeks and birth weight between 1000 to 2000 grams were included in the study. (Figure-1)

Exclusion Criteria: Newborns not admitted to the Neonatal Intensive Care Unit (NICU), gestational age > 35 weeks, and weight either ≤ 1000 or ≥ 2000 grams were not suitable for the study. Babies with sepsis, hypothermia, requiring respiratory support, congenital malformations, chromosomal defects, surgical issues, NEC, severe hemodynamic instability, or those who left against medical advice (LAMA) before data collection was completed were excluded.

The sample size was determined using a procedure that considers an 80% power of the test, a 5% level of significance, and an anticipated 25% of cases in the NICU using n=Z^2(p) (1-p)/d^2 formula.[11] The study utilized a simple random sample strategy to select participants.

Block randomization was used to ensure an even distribution of the sample between the KMC and Control Group. Neonates in odd-numbered beds received Kangaroo Mother Care (KMC), while those in even-numbered beds received standard therapy. All premature newborns in the Neonatal Intensive Care Unit whose parents consented to participate in the study were enrolled.

KMC nurses instructed KMC providers to initiate KMC promptly after allocation. Mothers were encouraged to maintain continuous skin-to-skin contact with their babies for a total of 6 hours per day, divided into four sessions of 1.5 hours each, for seven consecutive days. The standard therapy was maintained throughout the research. Clinical reasons for discontinuing Kangaroo Mother Care (KMC) included hemodynamic instability, requirement for resuscitation, phototherapy, or blood transfusion, appearance of rash on the neonate or KMC provider, convulsions, apnea, and unavailability or rejection by the KMC provider. (Figure)

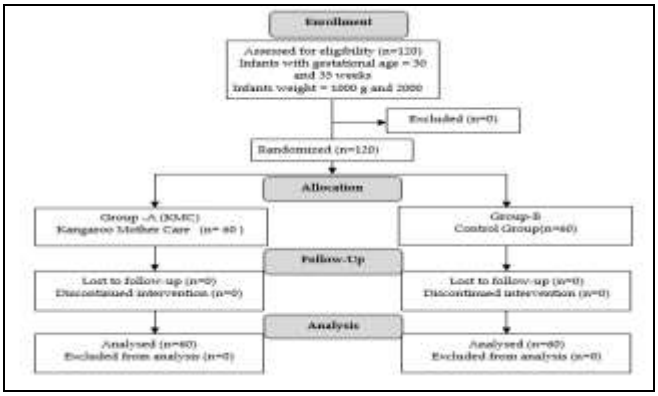

Figure: Patient Flow Diagram (n= 120)

Skin-to-skin contact involving the mother and the babies was maintained while the mother breastfed, with the baby wearing only a nappy and a cap under the mother's clothes. Every patient underwent a thorough history and examination. Mothers and at least one additional female relative were briefed on the technique and its benefits. Kangaroo Mother Care (KMC) was initiated in a KMC unit on the 7th day after birth and continued until the 14th day after birth. All infants in the research were receiving complete enteral nutrition at a rate of 180ml/kg/day, either from breast milk or formula, without any additional fortification. The body weight of naked neonates was checked daily using an electronic weighing scale (Infant Weighing Scale Digital, KINLEE) by the same individual in both groups. Neonates in the control category were kept in an incubator or under a non-servo-controlled radiant warmer (Infant Radiant Warmer-HKN-90) in the same room as the neonates

undergoing the intervention. The mother was able to hold and feed the baby, but kangaroo mother care (KMC) was not permitted.

Data was analyzed by Statistical Package for the the Social Sciences (SPSS) version 22:00. Descriptive statistics were used to analyze the demographic characteristics, diagnosis, and duration of stay of the neonates in order to determine the frequency and percentages of the two groups. An independent t-test was used to assess the difference between the KMC and conventional therapy groups. The chi-square test was utilized to assess the link between the groups and factors in neonates' profiles. The *p*-values ≤ 0.05 were considered statistically significant.

RESULTS

Of the 132 neonates, 120(90.90%) were included; 60(50%) in each group. Overall, 64(54.33%) subjects established exclusive mother feed; 41(68.33%) from KMC and 23(38.33%) from the control group. Gestational age of KMC neonates was 32.35±1.64 weeks, while it was 32.43±1.70 weeks in the control group. KMC neonates' mean stay in hospital was 18.92±2.57 days compared to 21.43±3.57 days in the Control Group (p<0.0001). The weight gain in the KMC Group was significantly more compared to the Control Group (p<0.0001) as shown in Table-I.

Table-I: Descriptive Profile of Neonates in Both Groups (n=120)

Characteristics	KMC Group (n=60)	Control Group (n=60)	*p*-Value
Gender			
Female Male	22(36%) 38(63%)	23(38.3%) 37(61.6%)	0.850
Mode of Delivery			
SVD LSCS	24(40%) 36(60%)	29(48.3%) 31(51.6%)	0.358
Gestational Age (in weeks)	32.35±1.64	32.43±1.70	0.550
Birth Weight (in grams)	1401.58±294	1405.58±295	0.743
Mean Age (in days)	10.966	10.683	0.419
Mean Hospital Stay (in Days)	18.92±2.57	21.43±3.57	0.2929
Average Weight Gain per Day	18.6100±2.64	7.7335±2.62	0.001
Mother Fed Exclusively at Discharge	41(68.33%)	23(38.33%)	0.001

**KMC – Kangaroo Mother Care*
SVD- Spontaneous Vaginal Delivery
LSCS - Lower Segment Caesarean Section

In the KMC Group, the average weight increase was 16.429±2.64 grams per day, while in the control group, it was 10.429±2.62 grams. (Table-II).

DISCUSSION

The study found that intermittent Kangaroo Mother Care (KMC) is a safe, effective, and practical method for caring for preterm and low birth weight infants in the Neonatal Intensive Care Unit (NICU). Neonates with low birth weight are more susceptible to complications such as poor weight gain, hypoglycemia,hypothermia, apnea, sepsis, nutrition issues, and fluid and electrolyte imbalances. This study examined the impact of kangaroo mother care on weight gain in very low birth weight infants in a resource-limited country like Pakistan.

Researchers found that newborns in the KMC Group had a higher weight gain of 16.429 gm/day compared to 10.429 gm/day in the Control Group in a randomized controlled experiment (p<0.0001).

In a 2014 study conducted in Nepal by Acharya et al., the median daily gain in weight was 10 gm in the KMC Group, while in the control group,it was 7 gm (p<0.001). The average weight gain was 12.11±9.04 gm in the KMC Group and 3.29±15.81 gm in the control group, showing a significant difference.They also noted additional positive impacts of KMC on preventing hypothermia and reducing the duration of hospitalization.[12]

Samra *et al.,* found that the average daily weight gain was considerably higher in the KMC Group (22.1 ± 2.5 g) compared to the Control Group (10.4 ± 2.5 g). This study also identified further potential for breastfeeding and recovery of newborn weight in the KMC Group.[13]

Recently, Obaid *et al.,* describe that babies who received KMC showed an average increase in weight of 10.22±1.65 grams/day, while the Control Group had an average weight increase of 7.87±1.71 grams/day (p=0.0001). This study also found that the average length of stay in the hospital was considerably shorter in the KMC Group than that of the Control Group (p=0.003).[14]

The findings of the current study align with a previous systematic review and meta-analysis conducted by Pravitasari *et al.*, which found that Kangaroo Mother Care (KMC) led to greater weight growth in preterm infants compared to those who received conventional care (p=0.004).[15]

Wang Y *et al.*, conducted a study in China in 2021 to examine the impact of KMC on the physical development and feeding schedules of infants in the NICU. The infants got Kangaroo Mother Care (KMC) for 2.5 hours daily, whereas the Control Group received routine care. The study concluded that there were improved results in growth, breastfeeding, and neurodevelopment outcomes.[16]

Table-II: Average Weight Gain of Neonates from the 7th To The 14th Day of Life (Grams) (n=120)

Neonatal Life in Days	Average weight gain KMC (n=60) Mean±SD (g)	Average weight gain Non-KMC (n=60) Mean±SD (g)	*p*-Value
D1	1406.58±308	1396.91±299	0.859
D2	1425.16±309	1407.83±300	0.725
D3	1444.00±301	1420.33±301	0.582
D4	1461.33±309	1432.33±303	0.459
D5	1480.58±309	1444.50±304	0.336
D6	1499.00±308	1623.25±1347	0.231
D7	1521.25±306	1469.08±308	0.129

**KMC – Kangaroo Mother Care*
D1 – D7 = Day 1 to Day 7

Literature has shown that Kangaroo Mother Care (KMC) promotes early initiation of breastfeeding compared to conventional care. These findings align with the results noted in our investigation.

A study conducted by Mekonnen et al. found that women who practiced Kangaroo Mother Care (KMC) in the Neonatal Intensive Care Unit (NICU) for their preterm infants had a greater rate of exclusive breastfeeding at discharge from the hospital (62.5% vs. 37.5%) compared to those who did not practice KMC. The research we conducted revealed similar findings: 41 babies (68.3%) were breastfed at discharge, while 23 babies (38.3%) in the Control Group were breastfed (p = 0.001).[17]

This study findings aligns with research of Subedi et al., indicating that KMC is beneficial for promoting early weight gain in low-birth-weight infants, encouraging exclusive breastfeeding, boosting mothers' confidence in caring for small babies, and nurturing a strong mother-infant bond.[18]

A study published in 2021 by Ahmad *et al.*, found that weight gain in the KMC Group was not significant at discharge and after a one-week follow-up, there was no significant difference; however, but showed a significant difference (p=0.036) at the 2-week follow-up. Kangaroo Mother Care (KMC) was found to decrease the duration of hospitalization for premature and low birth weight infants.[19]

Although KMC has advantages, women may encounter obstacles that hinder them from maintaining uninterrupted skin-to-skin contact with their newborns, a key aspect of KMC. A study by Ghavane et al., highlighted that 6.5% of mothers in India believed that Kangaroo Mother Care (KMC) could be provided for 12 hours or more per day, while 52% of mothers believed that KMC could be practically offered for 1 hour per day.[20]

Although not analyzed statistically, a few barriers to practicing KMC were observed in this study. The main obstacle was the absence of a suitable caregiver for the mother, such as a nurse or family member, to assist her during Kangaroo Mother Care practices, discomfort, and bathing. Kangaroo Mother Care (KMC) cannot be maintained without a consistent caregiver. Resistance to engaging in Kangaroo Mother Care (KMC) was addressed through persistent counseling. Inadequate supervision of KMC at home, lack of privacy for the mother, and her discomfort from sweating, especially during summer, were significant challenges to implementing KMC in this study.[21,22]

This study is unique because it focuses on preterm children, who are more common in this country. It was conducted at a tertiary care hospital in Pakistan that serves as a referral center for preterm babies from nearby districts. There is a shortage of costly incubators in this hospital and others. This study provides additional evidence of the effectiveness of KMC and encourages healthcare workers to adopt this simple, affordable technique in

their resource-limited health facilities. This could reduce neonatal morbidity and mortality.

LIMITATION OF STUDY

Due to resource constraints, the current study's limitation is that intermittent KMC was used rather than a 24-hour practice. To get better outcomes, KMC must be implemented in neonatal care unit round-the-clock.

CONCLUSION

Kangaroo mother care is a potent tool for improved weight gain in preterm infants in conjunction with exclusive mother feed at discharge, when compared with control group. KMC should be promoted in NICU settings in LMIC for improving weight gain in addition to other benefits as it is a low-cost intervention.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AR & TW: Data acquisition, data analysis, critical review, approval of the final version to be published.

AK & MR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AW: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. World Health Organization. Preterm birth [Internet]. Available from: https://www.who.int/newsroom/factsheets/detail/pretermirth#:~:text=An%20estimated%2013.4%20million%20babies%20were%20born%20too%20early%20in,of%20preterm%20birth%20 [cited 2023 Jun 10].
2. Hanif A, Ashraf T, Pervaiz M, Guler N. Prevalence and risk factors of preterm birth in Pakistan. J Pak Med Assoc 2020; 70(4): 577-582. https://doi:10.5455/JPMA.295022.
3. Chan GJ, Valsangkar B, Kajeepeta S, Boundy EO, Wall S. What is kangaroo mother care? systematic review of the literature. J Glob Health 2016; 6(1): 010701. https://doi:10.7189/jogh 06.010701
4. Koreti M, Muntode-Gharde P. A narrative review of Kangaroo Mother Care (KMC) and its effects on and benefits for low birth weight (LBW) babies. Cureus 2022;27: 14(11): e31948. https://doi:10.7759/cureus.31948.
5. Rasul N, Rashid M, Abbas A, Rubina S. First Experience of Implementation of Kangaroo Mother Care in Punjab- Pakistan to Reduce Morbidity and Mortality in Preterm Infants. Ann King Edw Med Univ 2017; 23(4): 496-502. https://doi.org/10.21649/akemu.v23i4.2197
6. Jafari M, Farajzadeh F, Asgharlu Z, Derakhshani N, Asl YP. Effect of Kangaroo Mother Care on hospital management indicators: A systematic review and meta-analysis of randomized controlled trials. J Educ Health Promot 2019; 8: 96. https://doi:10.4103/jehp.jehp_310_18.
7. Heidarzadeh M, Hosseini MB, Ershadmanesh M, Gholamitabar Tabari M, Khazaee S. The effect of Kangaroo Mother Care (KMC) on breast feeding at the time of NICU discharge. Iran Red Cres Med J 2013; 15(4): 302–306. https://doi:10.5812/ircmj.2160
8. Dingding D, Xifang R, Xiaofang H, Tian S, Shan L, Ying W, et al. A prospective cohort study on lactation status and breastfeeding challenges in mothers giving birth to preterm infants. Int Breastfeed J 2022; 10: 17(1):6. https://doi.org/10.1186/s13006-021-00447-4
9. Morisaki N, Kawachi I, Oken E, Fujiwara T. Social and anthropometric factors explaining racial/ethnical differences in birth weight in the United States. Sci Rep 2017; 7: 46657. https://doi:10.1038/srep46657
10. World Health Organization. Survive and thrive: transforming care for every small and sick newborn. [Internet]. Available from: https://www.who.int/publications/i/item/survive-and-thrive-transforming-care-for-every-small-and-sick-newborn. [Accessed on August 12, 2019]
11. Boyd KA, Briggs AH, Fenwick E, Norrie J, Stock SJ. Power and sample size for cost-effectiveness analysis: fFN neonatal screening. Contemp Clin Trials 2011; 32(6): 893-901. https://doi.org/10.1016/j.cct.2011.07.007
12. Acharya N, Singh R, Bhatta N, Poudel P. Randomized control trial of Kangaroo Mother Care in low birth weight babies at a tertiary level hospital. J Nepal Paediatr Soc 2014; 34(1): 18–23. https://doi:10.3126/jnps.v34i1.8960
13. Samra NM, Taweel AE, Cadwell K. Effect of intermittent kangaroo mother care on weight gain of low birth weight neonates with delayed weight gain. J Perinat Educ 2013; 22(4): 194-200. https://doi.org/10.1891%2F1058-1243.22.4.194
14. Rehman MOU, Hayat S, Gul R, Waheed KAI, Victor G, Khan MQ. Impact of intermittent kangaroo mother care on weight gain of neonate in nicu: Randomized control trial. J Pak Med Assoc 2020; 70(6): 973-977. https://doi: 10.5455/JPMA.45123.
15. Pravitasari IR, Widyaningsih V, Murti B. The Effect of Kangaroo Mother Care in Increasing Body Weight and Temperature in Premature Infants: Meta-Analysis. J Matern Child Health 2020; 05(05): 563-578. https://doi.org/10.26911/thejmch.2020.05.05.10.
16. Wang Y, Zhao T, Zhang Y, Li S, Cong X. Positive Effects of Kangaroo Mother Care on Long-Term Breastfeeding Rates, Growth, and Neurodevelopment in Preterm Infants. Breastfeed Med 2021; 16(4): 282-291. https://doi:10.1089/bfm.2020.0358.
17. Mekonnen AG, Yehualashet SS, Bayleyegn AD. The effects of kangaroo mother care on the time to breastfeeding initiation among preterm and LBW infants: a meta-analysis of published studies. Int Breastfeed J 2019; 14: 12. https://doi.org/10.1186/s13006-019-0206-0
18. Subedi K, Aryal D, Gurubacharya S. Kangaroo mother care for low birth weight babies: A prospective observational study. J Nepal Paediatr Soc 2009; 29(1): 6–9. https://doi:10.3126/jnps.v29i1.1593
19. Ahmad N, Gul SS, Khan MH, Hashmi F, Batool, Fatima A. Outcome of kangaroo mother care in preterm, low birth weight neonates; a randomized control trial. Ann Pak Inst Med Sci 2022; 18(3): 196–200. https://doi:10.48036/apims.v18i3.647
20. Ghavane S, Murki S, Subramanian S, Gaddam P, Kandraju H, Thumalla S. Kangaroo Mother Care in Kangaroo ward for improving the growth and breastfeeding outcomes when reaching term gestational age in very low birth weight infants. Acta Paediatr 2012; 101(12): e545-9. https://doi:10.1111/apa.12023.
21. Daga S. Reinforcing kangaroo mother care uptake in resource limited settings. Matern Health Neonatol Perinatol 2018; 4: 26. https://doi:10.1186/s40748-018-0091-3.
22. Parmar VR, Kumar A, Kaur R, Parmar S, Kaur D, Basu S, et al. Experience with Kangaroo mother care in a neonatal intensive care unit (NICU) in Chandigarh, India. Indian J Pediatr 2009; 76(1): 25-28. https://doi:10.1007/s12098-009-0024-2.