Effect of Kangaroo Mother Care on Weight Gain in Low Birth Weight Preterm Infants

Sahar Hassan[1*], Kareem Nasir Hussien[2], Mushtaq Talib Mahdi[3]

Abstract

Background: Preterm birth, defined as delivery before the 37th week of pregnancy, often results in low birth weight and complex medical issues, necessitating additional care. Kangaroo Mother Care (KMC), which involves skin-to-skin contact with the mother or caregiver, is a recommended care approach for stable low birth weight infants. This study aimed to assess the impact of KMC on the weight gain of low birth weight preterm infants. Methods: This quasi-experimental study was conducted at the premature care unit of Al-Zahraa Teaching Hospital in Al-Najaf, Iraq, from May 2023 to April 2024. The study included 25 mother-infant dyads, where infants were preterm (<37 weeks gestation) and had a birth weight of <2000 grams. The intervention involved mothers practicing KMC for ≥6 hours/day. Data on gestational age, birth weight, gender, mode of delivery, feeding type, and weight gain were collected. Infant weight was measured at enrollment and discharge. Statistical analysis was performed using Jamovi software version 25, with significance set at $P < 0.05$. Results: The mean age of infants in the KMC group was 13.6±5.7 days, with 56% males and 44% females. Most infants (92%) had a birth weight of <1500 grams. There was a significant weight improvement at discharge (1178.8 ± 239.6 g) compared to admission (1094.8 ± 270.6 g), with an average weight gain of 85 grams ($P < 0.001$). Additionally, 72% of infants in the KMC group were exclusively breastfed. Conclusion: KMC significantly improves weight gain and breastfeeding rates in low birth weight preterm infants. The findings support the implementation of KMC as an effective care strategy in resource-limited settings to enhance infant health outcomes.

Keywords: Kangaroo Mother Care (KMC), Low Birth Weight (LBW), Preterm Infants, Weight Gain, Neonatal Care

Significance | This study showed the impact of KMC on preterm infants' weight gain can inform neonatal care practices, improving outcomes in resource-limited settings.

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Introduction

Premature babies are neonates born before thirty-seven weeks of gestation (Saputri & Dwi Ernawati, 2019; Yang et al., 2023). An average weight at delivery of less than 2.5 kg is often associated with preterm birth and is termed "low birth weight" (Sabry et al., 2023; Thakur et al., 2020). The World Health Organization (WHO) classifies premature babies into three categories: extremely premature (less than 28 weeks), very premature (28-32 weeks), and moderately premature (32-37 weeks), (Rey, E. S., & Martinez, E. G., 1983). Babies born between 37 and 40 weeks are considered full-term. Despite extensive efforts to prevent preterm labor, the incidence of premature births remains high due to various health conditions, socioeconomic factors, and infertility management (Patel & Solanki, 2021). According to the WHO, more than fifteen million premature babies are born each year, and approximately thirty million infants require hospitalization annually due to low

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birth weight (LBW) or illness (Madiba & Sengane, 2021). In low-income countries, cause-specific mortalities are six times higher than in high-income countries, highlighting the disparity in access to basic neonatal care (Sabry et al., 2023; Shrivastava et al., 2013). In Iraq, the neonatal mortality rate (NMR) was 38 per 1000 live births in 2021, with low-birth-weight preterm neonates contributing significantly to neonatal deaths (Abdulrasol et al., 2024). Premature infants often face nutritional challenges, leading to long-term developmental issues. Contributing factors include oxygen requirements, congenital anomalies (Boo, N. Y., & Jamli, F. M., 2007), genetic disorders, neurological issues, developmental delays, speech-language delays, sensory processing disorders, vision impairments, and gastroesophageal reflux (Sangild, 2006). These complications necessitate specialized care and interventions to improve outcomes and reduce mortality rates among preterm and low-birth-weight infants. Kangaroo Mother Care (KMC) emerged as an alternative to standard hospital care for stable low birth weight infants. KMC involves skin-to-skin contact (Acolet, D. et al.,1989), replicating a "normal environment" and providing optimal care. This approach is especially beneficial in resource-limited settings, aiding in stabilizing respiratory, thermal, and feeding functions. Positive outcomes of KMC include improved mother-child bonding, facilitated early feeding, and enhanced weight gain (Jaywant et al., 2021). Studies have shown that KMC can significantly reduce mortality and morbidity rates, enhance breastfeeding rates, and improve neurodevelopmental outcomes in premature infants (Conde-Agudelo & Diaz-Rossello, 2016). The implementation of KMC faces several challenges, including lack of awareness, insufficient training of healthcare providers, and cultural barriers. Further follow-up and randomized control trials are essential to identify the main obstacles to KMC (de Leeuw, R. et al., 1991). Additionally, capacity-building training courses for nurses through continuous on-the-job training and public awareness campaigns are crucial. Educating families about the benefits of KMC can help support mothers and encourage its use (Acharya, N. et al., 2014).

This study aimed to assess the impact of KMC on the weight gain of low birth weight preterm infants. By evaluating the effectiveness of KMC in improving weight gain, this research seeks to provide evidence-based recommendations for healthcare providers and policymakers. The ultimate goal is to enhance the care and outcomes of preterm infants, particularly in low-resource settings where traditional neonatal care may be limited.

Materials and Methods

Study Design

This quasi-experimental study was conducted at the Premature Care Unit of Al-Zahraa Teaching Hospital in AL-Najaf AL-Ashraf City, central Iraq, between May 2023 and April 2024. The study focused on low birth weight (LBW) infants weighing less than 2000 grams at birth and with a gestational age of less than 37 weeks.

Study Population

The study population consisted of 25 mother-infant dyads. Dyads were included if the preterm infant met the following criteria: birth weight <2000 grams, gestational age <37 weeks, ability to feed via nasogastric tube or sucking, and stable condition without serious illnesses such as sepsis, pneumonia, meningitis, respiratory distress, or convulsions. Mothers needed to be in general good health, without major illnesses, willing to provide Kangaroo Mother Care (KMC), and willing to follow an appropriate diet.

Dyads were excluded if the infant had congenital anomalies, required respiratory support beyond nasal cannula oxygen, or if the mother had contraindications for KMC, such as illness or fever. A non-probability convenience sampling technique was applied.

Data Collection

For each enrolled mother-infant dyad, the following data were collected:

Gestational age (weeks), Birth weight (grams), Gender, Mode of delivery (vaginal or cesarean), Feeding type, Weight gain

Infant weight was measured at enrollment and at hospital discharge. Trained nurses weighed infants nude using a calibrated beam balance scale.

Intervention

The intervention group received KMC, defined as skin-to-skin contact between the infant and mother's chest. Mothers were instructed to practice KMC for a minimum of 6 hours per day, divided into multiple sessions lasting 2 hours each. KMC sessions began once infants were clinically stable and tolerating oral feeds. Mothers were instructed on proper KMC positioning and to practice proper hygiene before KMC sessions, including taking a daily shower or bath, changing into new clothes, washing their hands, and maintaining short, tidy fingernails. Nurses supervised them during sessions, and adequate privacy was ensured.

Maternal Health Education

Prior to initiating KMC, mothers received daily counseling and health education using materials from "Kangaroo Mother Care: A Practical Guide" by WHO (2003) and the Iraqi Ministry of Health's "Kangaroo Mother Care Pocket Guide for Health Care Providers" (Awqati et al., 2009). Additionally, video content demonstrating proper KMC technique was shown to mothers.

Ethical Consideration

Ethical approval was secured from the Ethics Committee of the Faculty of Medicine at the University of Kufa. All mothers provided informed consent after receiving a thorough explanation of the study's purpose, procedures, risks, and benefits. The study adhered to the principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines. Patient data confidentiality was strictly maintained, and mothers were assured that their participation was

Table 1. The baseline characteristics of studied premature infants who received KMC

Variables	KMC group (N = 25)
Age (days) Mean±SD	13.6±5.7
Sex of neonates	
Male	14 (56.0%)
Female	11 (44.0%)
Birth weight (g)	
<1500	23 (92.0%)
1500 to <2000	2 (8.0%)
Age of gestation	
< 32	12 (48.0%)
32 < 34	10 (40.0%)
34 ≤ 36	3 (12.0%)
Type of delivery	
Normal	5 (20.0%)
Cesarean section	20 (80.0%)

SD = Standard deviation.

Table 2. Birth weight changes from admission to discharge

Variable	KMC (number = 25)	
	Mean	Standard deviation
Birth weight at admission (g)	1094.8	270.6
Birth weight at discharge (g)	1178.8	239.6
Change (g)	84	77.7
P value	<0.001*	

P value calculated by Wilcoxon signed-rank test.

** p-value considered significant at <0.05*

Table 3. The feeding history of infants in both study groups

Variable	KMC group (N = 25)	
	N	%
Feeding type		
Exclusively breastfeeding	18	72.0%
Bottle feeding	2	8%
Mixed feeding	5	20%
Reasons for refusing to breastfeed		
My breast milk is not enough	4	57.1%
I do not stay with the baby throughout the day	1	14.3%
Mother has a fever	2	28.6%

Results

The characteristics of infants received KMC are summarized in Table (1). The mean age of infants in this group was 13.6±5.7 days. Regarding gender distribution, 56.0% of infants were male, while 44.0% were female. In terms of birth weight, the vast majority (92.0%) of infants had a birth weight of less than 1500 grams, with only a small proportion (8.0%) falling into the 1500 to <2000 grams weight category. Nearly half (48.0%) of infants in the KMC group born at less than 32 weeks and 40.0% born between 32 and 34 weeks. Regarding the mode of delivery, 80.0% delivered via cesarean section.

There was a significant improvement in weight at discharge among premature infants received KMC by 85 g ($P < 0.001$) comparing weight values at discharge (1178.8 ± 239.6 g) and admission (1094.8 ± 270.6 g). Table (2) shows the full details.

Table (3) illustrates the feeding history of infants in both groups. The results showed that most of the infants in the KMC group had exclusively breastfeeding (72%). The most common reason reported for refusing to breastfeed was "My breast milk is not enough," accounting for 57.1% of responses.

Discussion

This quasi-experimental study evaluated the effect of KMC on weight gain in preterm, low birth weight infants in a tertiary care hospital in Iraq. The majority of infants in the KMC group were very low birth weight (<1500g) and delivered preterm before 32 weeks gestation.

Effect of KMC on weight gain

The findings of the current study revealed that infants receiving KMC experienced a significant improvement in weight at discharge compared to admission weights. On average, infants gained 85 grams while practicing intermittent KMC sessions for at least 6 hours per day, (table 2).

Similarly, higher weight increase was reported by Cho et al. (2016), as they reported that the weight at discharge was 2164.00 ± 243.25 compared to their admission weight 1660.00 ± 225.20 (Cho et al., 2016).

Jaywant et al. (2021) conducted a research on 51 low birth weight infants (1000-1500 grams) with gestational ages ranging from 27 to 35.6 weeks. There was a significant difference in weight increase between the infants' baseline and final assessments ($P = 0.00481$) (Jaywant et al., 2021).

Additionally, El-nagger et al., reported that 56% of preterm infants in the KMC group had a weight gain at discharge between 50gm - 100gm, while 40% had a weight gain >100gm (El-Nagger et al., 2013). A cohort study involving 122 premature infants reported a significantly higher weight gain in the KMC group (1567.20±287.02g) compared to the control group (1440.59±277.64g, P=0.01) (Cristóbal Cañadas et al., 2022).

The improved weight gain seen with KMC can be attributed to its ability to facilitate the introduction of oral feeding, even dropper feeding, relatively quickly compared to conventional neonatal care approaches. The skin-to-skin contact, supportive positioning, and increased breastfeeding rates enabled by KMC likely contribute to optimizing nutritional intake and growth for preterm infants. KMC has also been shown to promote exclusive breastfeeding, which our results demonstrated was highly prevalent (72%) among KMC mother-infant dyads. Breastmilk provides optimal nutrition for preterm infants. Additionally, the psychological benefits of maternal-infant bonding fostered by KMC may contribute to physiologic stability and weight gain (Pathak et al., 2023).

Effect of KMC on breastfeeding

In the current study, exclusively breastfed infants were significantly higher in the KMC group (72%) compared to the control group (16%), (table 3). These findings corroborate existing literature demonstrating KMC's beneficial impact on breastfeeding outcomes.

For instance, a study by Campanha et al. (2024) reported that 65.4% of infants were exclusively breastfed at discharge in the KMC group versus only 8.1% in the non-KMC group. Their multiple regression analysis revealed the odds of exclusive breastfeeding at discharge were 23 times higher in the KMC group compared to non-KMC (Campanha et al., 2024).

A systematic review and meta-analysis by Conde-Agudelo and Diaz-Rosello (2016) including 21 studies with 3042 infants also found KMC was associated with increased likelihood of exclusive breastfeeding at discharge compared to conventional care (66.3% vs 56.3%; RR 1.16, 95% CI 1.07-1.25) (Conde-Agudelo et al.). Boundy et al. (2016) performed another systematic review and meta-analysis of 124 studies, demonstrating KMC increased exclusive breastfeeding rates compared to conventional care (RR 1.50; 95% CI 1.26-1.78) (Boundy et al., 2016).

Furthermore, the cohort study by Cristóbal Cañadas et al. (2022) found that the amount per feeding and the number of feedings increased in the KMC group compared to the control group. This aligns with the higher weight gain observed in the KMC group, as improved feeding likely contributed to better growth and weight gain (Cristóbal Cañadas et al., 2022).

Exclusive breastfeeding provides well-established short and long-term benefits related to immunological protection, nutritional status, and neurodevelopmental outcomes. It is considered the ideal nutrition for preterm and low birth weight neonates (Campanha et al., 2024). KMC has been linked with enhanced breastfeeding, which serves as an additional stimulus for oxytocin release and could potentially contribute to improved health outcomes in mothers practicing KMC. The positive impact of skin-to-skin contact on mother-infant bonding may have facilitated

breastfeeding initiation and promoted exclusive breastfeeding (Pathak et al., 2023).

The causes of refusal of breastfeeding like not staying with the baby through the day, having a fever, and due to culture causes were significantly increased among the control group (table 3).

Limitations

The study has several limitations. Firstly, the small number of beds in the KMC unit, limited to only three, led to a small sample size for the study. Additionally, the small size of the KMC unit contributes to sanitation issues, resulting in a foul odor in the room, and there is only one bathroom shared by nursing staff and patients. Furthermore, not all pediatricians were willing to admit children to the KMC unit. Lastly, the majority of mothers being illiterate required significant time and effort from the researcher to educate them about KMC.

Conclusion

In conclusion, this study demonstrates the positive impact of Kangaroo Mother Care (KMC) on weight gain and breastfeeding outcomes among preterm, low birth weight infants. Infants receiving KMC showed significant weight improvement from admission to discharge, with an average weight gain of 85 grams. This aligns with previous research indicating that KMC facilitates better nutritional intake, enhances breastfeeding rates, and fosters mother-infant bonding, contributing to the overall health and growth of preterm infants. The increased prevalence of exclusive breastfeeding in the KMC group underscores the importance of skin-to-skin contact in promoting successful breastfeeding, which offers critical immunological and developmental benefits for neonates. Despite the study's limitations, such as a small sample size and infrastructural challenges, the findings highlight the effectiveness of KMC as an essential care strategy in resource-limited settings. Future efforts should focus on expanding KMC implementation and addressing barriers to optimize neonatal care outcomes.

Author contributions

S.H. conceptualized and developed the methodology, K.N.H. prepared the original draft and collected data, M.T.M. reviewed and edited the writing.

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Competing financial interests

The authors have no conflict of interest.

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