



Original Article

Effect of Parental Education Programs on Kangaroo Care Practices and Infant Growth: Involving Fathers as Active Caregivers

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Article history:

Received: May 26, 2025

Revised: February 26, 2026

Accepted: March 15, 2026

ePublished: March 31, 2026

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Abstract

Introduction: Low birth weight (LBW) infants are a high-risk group vulnerable to growth and developmental disorders. The kangaroo method care (KMC) is an effective intervention to support the development of these infants, but its implementation at the community level remains low. Accordingly, this study aims to analyze the effect of spousal assistance in kangaroo care on the growth of LBW infants.

Methods: A quasi-experimental design with a pre-post test control group approach was used in this study. The sample consisted of parent-infant pairs with LBW, comprising 42 intervention groups and 42 control groups. The intervention involved education and assistance in KMC practices for the fathers of LBW infants through home visits. Data were collected through questionnaires, observations of KMC practices, and measurements of infant weight and length. Finally, the Wilcoxon and Friedman tests were employed for paired data analysis, and independent t-tests and Mann-Whitney tests were utilized to compare the average results between the two groups.

Results: Spousal support significantly improved fathers' knowledge and skills ($P < 0.05$), and KMC duration at measurements 2 and 3 demonstrated remarkable results ($P < 0.05$). The weight gain of the intervention group (685.71 g) was greater than that of the control group (647.62 g), and the length of the intervention group increased by 3.33 cm, while that of the control group increased by 3.12 cm during the study period.

Conclusion: Spousal assistance in KMC could improve home-based KMC practices, thereby having a significant impact on increasing the weight and length of LBW infants.

Keywords: Family involvement, Infant growth, KMC, Paternal education



Please cite this article as follows: Aslinda A, Masni M, Hadju V, Erika KA, Moedjiono AI, Riskiyan S, et al. Effect of parental education programs on kangaroo care practices and infant growth: involving fathers as active caregivers. J Educ Community Health 2026;13(1): 8-16. doi:10.34172/jech.4689

Introduction

According to the World Health Organization (WHO), low birth weight (LBW) is defined as a birth weight of less than 2500 g regardless of gestational age. The prevalence of LBW infants remains a serious public health problem both globally and in Indonesia, in particular. Internationally, approximately 15% of all born babies are classified as LBW, with estimates from the WHO, suggesting that nearly 20 million children are affected each year; almost

96.5% of LBW cases occur in developing countries (1). In Indonesia, the prevalence rate is also quite alarming, with data showing that LBW accounts for around 10.2–11.1% of all births. This issue places Indonesia among the countries with the highest LBW birth rates worldwide, specifically ranking second in the Association of Southeast Asian Nations region after the Philippines (2). Furthermore, LBW is a major contributor to perinatal and neonatal mortality, with maternal undernutrition,



inadequate antenatal care, and various socio-economic factors identified as the main causes (3).

Husband involvement in infant care, especially within the framework of kangaroo method care (KMC), has emerged as an crucial element in improving neonatal and paternal well-being. According to evidence, fathers strengthen emotional and physical bonds with their babies when they are actively involved in the care process, thereby contributing to better neonatal outcomes. Moreover, research indicates that structured education and mentorship in neonatal intensive care units significantly improve fathers' confidence and sensitivity to the needs of preterm infants (4). This increased confidence is particularly relevant during KMC, where skin-to-skin contact is central. Additionally, fathers who participate in KMC frequently report feeling "important and involved", which strengthens their paternal identity and initiates an early bond with their baby (5). This kind of involvement is particularly essential, as early paternal bonding has been associated with the increased physiological stability of the baby and reduced stress levels in fathers (6).

Likewise, husband involvement in KMC extends beyond emotional bonding. It plays a vital role in ensuring comprehensive infant care, especially in critical care environments, such as the neonatal intensive care unit. Research shows that traditional gender roles are expanded when fathers are involved in the care process; more precisely, fathers are no longer just by standers or financial supporters, but transition into active participants in care (7). This evolution of paternal roles contributes to a more balanced distribution of care responsibilities, ultimately improving the quality of care provided to the infant. In addition, planned teaching interventions aimed at increasing fathers' awareness and skills regarding KMC have positively impacted paternal participation, indicating that informed paternal involvement can enhance the overall dynamics of care (8).

Preliminary studies demonstrated that although KMC is implemented at home, its duration is still extremely low. The benefits of home-based KMC implementation are improving the growth and health of LBW and increasing the closeness of mothers and LBW babies. Furthermore, sources of support are obtained from husbands, mothers, relatives, and health workers, inhibiting factors from KMC in the form of lack of time, physical discomfort, lack of information, the condition of the baby, and difficulty performing KMC.

In addition to the emotional and psychological benefits, husband involvement in KMC practices may also contribute to a more balanced distribution of care responsibilities, leading to sustained skin-to-skin contact practices and adherence to KMC protocols even after the baby is discharged from the hospital. By reducing maternal stress and creating a supportive environment, partner involvement can also encourage sustained KMC practices, which is particularly important given the duration-dependent benefits of this technique for weight gain (9). Likewise, samily support is an essential factor

that facilitates the practice of KMC in the community, and household trials have revealed desirable acceptance and benefits, such as increased infant weight described by Mazumder et al (10). Therefore, this study aims to investigate the effect of husband assistance in the implementation of KMC on the growth of LBW infants, as measured by husband involvement, increase in weight, length, and duration, and frequency of KMC practices at the household level.

Materials and Methods

Research Location and Time

This study was conducted from March to December 2024 at RSIA Sitti Khadijah 1 Muhammadiyah Makassar, which is a leading hospital in Makassar, South Sulawesi, Indonesia, specializing in maternal and child health services. This hospital provides comprehensive services for high-risk pregnancies and newborn care, including care for LBW infants. Although RSIA Sitti Khadijah is not the primary referral centre for LBW infants, the hospital is equipped with adequate facilities for neonatal care programs, including the Kangaroo Care Program. Similar to RSIA Sitti Khadijah, there are other healthcare facilities in Makassar, such as RSUD Dr. Wahidin Sudirohusodo and Pertiwi Mother and Child Hospital, which serve as referral centres for maternal and child health. Babies born at this RSIA Sitti Khadijah 1 Muhammadiyah Makassa Hospital will receive home visits every 7 days, for a total of four visits.

Parents and babies born at RSIA Sitti Khadijah 1 Muhammadiyah Makassar were selected and included in this study. After leaving the hospital, home visits were conducted to educate fathers on KCMs through videos and KMC demonstrations and to monitor the implementation of kangaroo care and the growth of the baby. Moreover, home visits were performed by a trained research team, including nurses and midwives, in order to ensure that the provided interventions were consistent and effective. Furthermore, each visit was conducted by the same team to maintain continuity of care and build trust with the parents.

Research Design and Data Collection Procedure

This study used a quantitative approach with a quasi-experimental research design and a pre-post-test control group design to investigate the cause-and-effect relationship by comparing the intervention and control groups. The infants' weight and length were weekly measured for four consecutive weeks, while the knowledge and skill post-test was administered only once at the end of the intervention period.

Study Tools

This study employed educational videos, questionnaires, observation sheets, and tools to calculate the weight and length of infants. The educational videos contained KMC-related materials. In addition, the questionnaires were utilized to determine parents' knowledge of KMC,

including its benefits, implementation techniques, and other aspects of infant care (e.g., breastfeeding and hygiene). The questionnaires were administered at the beginning and end of the study to assess changes in parents' knowledge. Further, the knowledge and skills assessment tools used in this study were researcher-developed instruments based on national KMC guidelines and relevant literature. Additionally, the knowledge questionnaire consisted of structured multiple-choice items, while the skills evaluation sheet included a checklist of key KMC procedures. Both instruments underwent content validity assessment by a panel of experts and reliability testing prior to data collection. At the beginning of the study, the research team informed the parents in both the intervention and control groups of the recommended minimum and maximum daily duration of KMC and explained the recommendation directly to them.

To evaluate the validity and reliability of the knowledge questionnaire, a pilot test was conducted involving 30 respondents. Item validity was also assessed using Pearson product-moment correlation analysis. The critical r -value was 0.349 ($df=28$, $\alpha=0.05$). Moreover, all 11 items demonstrated correlation coefficients above the critical value ($r=0.364-0.733$), indicating acceptable item validity. In addition, internal consistency reliability was estimated using Cronbach's alpha coefficient, which yielded a value of 0.757, representing acceptable internal consistency.

Similarly, observation sheets were used by the health team to document the implementation of KMC during home visits. These sheets recorded the frequency, duration, position of the baby, parents' comfort, and the baby's response to KMC, thereby providing direct feedback to parents. Furthermore, the frequency and duration of each KMC session was self-reported by the parents using the monitoring form provided by the research team during subsequent visits. Infant weight measurements were also taken using a digital baby scale that provided accurate data on infant weight gain, while infant length was calculated by a measuring board equipped with head and foot positions in order to ensure consistent and accurate measurements.

Description of the Intervention

The samples were pairs of parents of LBW babies who met the inclusion criteria, including parents who had LBW babies with a birth weight less than 2500 g who lived in Makassar, South Sulawesi Indonesia, those who had LBW babies in stable conditions, and parents who had Android phones and were willing to become respondents. The exclusion criteria were parents who were unwilling to participate as respondents, as well as infants with medical conditions that required intensive care in the hospital, making it impossible to implement KMC at home. In addition, parents who did not have an Android phone to access educational videos and those who did not live in the same house were excluded from this study. Respondent

consent was obtained from parents at the hospital when the baby was about to go home.

The respondents were divided into an intervention group and a control group. The intervention group received the structured parental education program, which included an educational video and guided explanations delivered to both the mother and the father. Likewise, fathers in this group were actively involved and received the same educational exposure as mothers. In contrast, the control group received only the standard routine education provided by the hospital at discharge. However, they received no additional educational video, structured guidance, or father-focused involvement.

The educational video used in this study was produced by the research team, with specially designed material. It was created based on KMC implementation guidelines, incorporating motivational elements to encourage fathers to actively participate in infant care. Further, this educational video was approximately 13 minutes long and covered the benefits and procedures of KMC, as well as the importance of father involvement in the care process.

To ensure that participants had watched the video, a question-and-answer session was held after the video was shown during the first visit. Participants were asked to answer several questions related to the material in the video in order to check their understanding. If necessary, the research team also provided additional explanations about the important parts of the video to ascertain that participants fully understood the techniques and benefits of KMC. Furthermore, the mothers in the intervention group were given the opportunity to watch the KMC educational video.

It should be noted that the video link was provided only to mothers. Conversely, access to the video was restricted to confirm that fathers in the control group did not watch the educational video. Fathers in this group were not given direct access to the video nor any additional educational materials related to KMC. During each follow-up visit, the research team also confirmed adherence by asking whether fathers had viewed any KMC-related educational content outside the standard hospital program, thereby minimizing contamination between groups and maintaining the integrity of the intervention.

Sampling Procedure

Using the following formula (Lemeshow, 1998) to compare two means with two-sided testing, the sample size was computed to be 84. A two-sided alpha level of 0.05 ($Z_{1-\alpha/2} = 1.96$) and a statistical power of 90% ($\beta = 0.10$; $Z_{1-\beta} = 1.26$) were considered in the calculation.

$$n = \frac{\sigma^2 \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{\mu_0 - \mu_a} \right)^2}{(\mu_0 - \mu_a)^2}$$

The mean value of the KMC duration sample in the control group was 3.12, while it was 4.20 in the intervention group (Siagian et al, 2021). Nonetheless, a correction of 10% was made to avoid any dropout

samples. The minimum sample size was $38 + 3.8 = 41.8$, so it was rounded up to 42. The purposive sampling technique was used, with 42 respondents allocated to each of the intervention and control groups.

Data Analysis

Data were analyzed using IBM SPSS Statistics (version 24) and presented in narrative and tabular forms. Normality was assessed using the Kolmogorov–Smirnov test. Considering that several variables did not meet the assumptions of normality, non-parametric tests (Wilcoxon signed-rank, Friedman, and Mann–Whitney tests) were employed as they are appropriate for ordinal data and non-normally distributed continuous variables. However, repeated-measures analysis of variance or linear mixed models were not applied because the data did not satisfy parametric assumptions required for these methods. Bivariate analysis was conducted to evaluate differences in knowledge and KMC practices among mothers and fathers, as well as infant weight and length,

using the Wilcoxon signed-rank and Friedman tests. Moreover, comparisons between the intervention and control groups were conducted using the Mann–Whitney test and independent T-test.

Results

Respondent Characteristics

The initial sample size was set at 76 respondents, with an additional 10% to account for dropouts, resulting in a total sample size of 84 respondents. All respondents completed the study, so the final sample size remained at 84.

Table 1 summarizes the characteristics of LBW parents in the intervention and control groups. In terms of age, most fathers were in the middle adult group, with 45.2% in the control and 50% in the intervention group. As regards father's education, senior high school was equally predominant in the two groups. Likewise, fathers' occupations were mostly casual labourers (40.5% in the control group and 38.1% in the intervention group).

Concerning the characteristics of mothers based on age,

Table 1. Demographic Characteristics of LBW Parents

Characteristics	Control		Intervention		P-Value
	n	%	n	%	
Young adults (17-25 years)	6	14.3	8	19.0	0.632
Early adult (26-35 years)	17	40.5	13	31.0	
Middle adults (36-45 years)	19	45.2	21	50.0	
Education					
Junior high school	4	9.5	4	9.5	0.729
Senior high school	27	64.3	30	71.4	
College/university	11	26.2	8	19.0	
Occupation					
	17	40.5	16	38.1	0.575
Casual laborer	8	19.0	9	21.4	
Private employee	14	33.3	15	35.7	
Self-employed	3	7.1	1	2.4	
Civil servant	0	0	1	2.4	
Others (fishermen and motorcycle/ taxi drivers)					
Mother Old (years)					
Young adults (17-25 years)	9	21.4	15	35.7	0.302
Early adults (26-35 years)	16	38.1	15	35.7	
Middle adults (36-45 years)	17	40.5	12	28.6	
Education					
Junior high school	4	9.5	7	16.7	0.595
Senior high school	27	64.3	26	61.9	
College/university	11	26.2	9	21.4	
Parity					
1	14	33.3	17	40.5	0.518
2 – 4	27	64.3	24	57.1	
≥5	1	2.4	1	2.4	
Type of delivery					
Normal	18	42.9	17	40.5	0.825
section caesarean	24	57.1	25	59.5	
Total	42	100	42	100	

Note. LBW: Low birth weight.

most women were in the middle adult group (40.5% in the control group and 28.6% in the intervention group). Senior high school was the predominant level of education in the intervention and control groups. Regarding parity, the number of children 2–4 dominated in both groups, with 64.3% in the control group and 57.1% in the intervention group. Caesarean section was the most common mode of delivery in the intervention (59.5%) and control (57.1%) groups.

Father Involvement in Kangaroo Method Care

Figure 1 illustrates the pattern of father involvement in KMC across four measurements. Father involvement markedly increased in the intervention group, especially at measurements 2 and 3. In contrast, the control group followed the standard hospital practice in which only mothers performed KMC, and no paternal involvement was expected or assessed accordingly. The decline in father involvement at measurement 4 in the intervention group occurred because several infants had reached 2500 g, making KMC no longer required.

Knowledge and Skill of Fathers and Mothers

Table 2 presents a comparison of the mean knowledge and skills of fathers and mothers in the intervention and control groups, measured at pretest and post-test. Based on the results of the statistical tests for between-group comparisons at pretest, post-test, and delta values (changes between pretest and post-test), the intervention had a greater impact on improving fathers' knowledge and skills in the intervention group. This is reflected in the higher mean delta values in the intervention group (2.17 vs. 0.81 for fathers' knowledge and 0.95 vs. 0.64 for fathers' skills), accompanied by statistically significant differences between the groups. For maternal knowledge, although both groups demonstrated a remarkable improvement, the control group showed a larger delta mean (1.62 vs. 1.24), which was not significant ($P=0.104$). Similarly, there was a marked improvement in both groups in terms of maternal skills, with no significant difference between

them. In other words, no difference was found in the intervention treatment for mothers in the intervention and control groups.

Duration of Kangaroo Mother Care, Infant Weight, and Infant Length

The results (Table 3) confirmed significant changes in KMC duration, infant weight, and infant length in the intervention and control groups. In terms of KMC duration, the intervention group showed a significant increase from measurement 1 to measurement 4, as did the control group ($P<0.001$). Although the difference between groups did not reach statistical significance ($P=0.755$), the increase in duration was greater in the intervention group (4.93 ± 10.02) compared to the control group (3.19 ± 6.94).

Table 2. Knowledge and Skills of Fathers and Mothers

Variables	Pretest	Posttest	P-Value	Δ
	Mean (SD)	Mean (SD)		Mean (SD)
Knowledge (father)				
Intervention	7.90±1.51	10.07±0.97	<0.001*	2.17±1.25
Control	8.21±1.37	9.02±1.32	<0.001*	0.81±0.92
P-value	0.225**	<0.001**		<0.001**
Knowledge (mother)				
Intervention	9.21±0.91	10.45±0.74	<0.001*	1.24±0.85
Control	8.98±1.61	10.60±0.54	<0.001*	1.62±1.03
P-value	0.208**	0.498**		0.104**
Skills (father)				
Intervention	6.95±1.10	7.90±0.30	<0.001*	0.95±1.01
Control	7.02±1.07	7.67±0.57	<0.001*	0.64±1.01
P-value	0.766**	0.024**		0.136**
Skills (mother)				
Intervention	7.64±0.62	8.00±0.00	0.001*	0.36±0.62
Control	7.69±0.56	8.00±0.00	0.002*	0.31±0.56
P-value	0.770**	1.000**		0.70**

Note. *: Wilcoxon test; **: Mann-Whitney test; SD: Standard deviation.

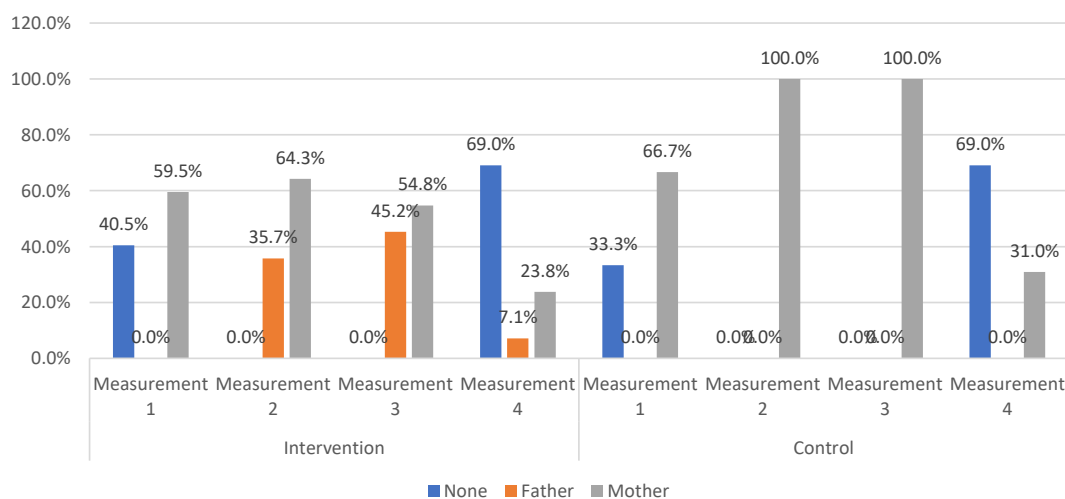


Figure 1. Father Involvement in KMC
Note. KMC: Kangaroo method care

Table 3. Duration of KMC, Infant Weight, and Infant Length

Variables	Measurement 1	Measurement 2	Measurement 3	Measurement 4	P-Value	Δ
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)
KMC Duration's (hours)						
Intervention	1.19±0.99	20.07±5.08	22.38±5.59	6.12±9.82	<0.001*	4.93±10.02
Control	1.33±0.95	17.55±3.62	17.12±3.06	4.52±7.01	<0.001*	3.19±6.94
P-value	0.500***	0.022**	<0.001**	0.673**		0.755**
Body weight (g)						
Intervention	2088.10±180.04	2308.33±185.75	2529.76±192.56	2773.81±217.87	<0.001*	685.71±151.53
Control	2089.29±173.04	2294.05±172.22	2497.62±188.04	2736.90±183.48	<0.001*	647.62±108.74
P-value	0.968**	0.694**	0.303**	0.224**		0.099**
Body length (cm)						
Intervention	45.69±1.55	46.83±1.70	47.79±1.89	49.02±2.11	<0.001*	3.33±1.05
Control	45.67±1.24	46.71±1.25	47.69±1.26	48.79±1.37	<0.001*	3.12±0.83
P-value	0.967**	0.960**	0.964**	0.881**		0.307**

Notes. *: Friedman test; **: Mann-Whitney test; ***: Independent T-test; SD: Standard deviation; KMC: Kangaroo mother care.

Likewise, infant weight in the intervention and control groups demonstrated a remarkable increase ($P < 0.000$), with a greater increase in the intervention group (delta mean: 685.71) than in the control group (delta mean: 647.62). However, between-group comparisons on each measurement and the ($P = 0.099$) displayed no significant difference in changes in infant weight between the groups. Similarly, infant body length substantially increased in both the intervention ($P < 0.001$) and control ($P < 0.001$) groups. Nevertheless, there was no significant difference between the groups at any each measurement point.

Discussion

Our findings demonstrated that spousal support plays an important role in enhancing the implementation of KMC at home and positively contributes to the growth of LBW infants. More precisely, the involvement of both parents increased the frequency and duration of KMC sessions, supported the consistency of practices, resulting in greater improvements in infant weight and length compared with infants whose parents received routine care without structured paternal involvement.

In addition, a notable finding of this study was the significant improvement in fathers' knowledge following the intervention, while mothers did not show a similar increase. Several factors may explain this difference. Fathers in the intervention group received structured education and direct guidance, which may have empowered them to take a more active caregiving role. Previous research indicated that positive social norms and community acceptance of paternal involvement can enhance fathers' motivation to learn and participate in newborn care activities, including KMC (11). In other words, as fathers take an increasingly active role in caring for infants, they may be more motivated to learn methods that increase their involvement, which could explain their greater increase in knowledge. Contrarily, the lack of significant change in mothers' knowledge may be related to their experience or exposure to KMC

prior to the intervention. Many mothers were already knowledgeable about infant care, especially if they had attended similar educational programs during prenatal care (12). Therefore, the KMC intervention may not have provided very new information for mothers, while it likely provided important insights for fathers, who may have had less exposure to such care techniques (13).

Furthermore, psychological factors may influence how parents receive and process educational content. According to previous research, maternal stress, anxiety, and fatigue, especially in the postpartum period, can limit cognitive engagement and reduce learning effectiveness (14). Fathers, on the other hand, may benefit from lower caregiving-related stress and more focused participation during the educational sessions, which may enhance their learning outcomes (15). Accordingly, these variations in prior knowledge, emotional conditions, and engagement during the intervention may explain the differences observed between mothers and fathers.

It is noteworthy that fathers' level of engagement in kangaroo care frequently correlates with their confidence and knowledge of neonatal care. Clarkson et al found that fathers who felt more involved and aware of their role were more likely to perform kangaroo care, suggesting that educational interventions can improve fathers' confidence and skills in this context and significantly contribute to optimal infant development (4).

Moreover, gender norms may influence how each parent receives and applies KMC education. Traditionally, childcare responsibilities have been more closely associated with mothers, which may result in differing levels of baseline familiarity with newborn care. Hence, these long-standing roles may help explain why the intervention led to greater increases in fathers' knowledge than mothers. For fathers, the emphasis on the emotional and physical benefits of KMC may enhance motivation and promote deeper learning and engagement (16).

Our statistical analysis revealed no significant differences between the intervention and control groups regarding

fathers' skills or mothers' skills. Although fathers' knowledge increased in the intervention group, this did not translate into statistically significant improvements in practical skills when compared to the control group. This aligns with the findings of previous studies, showing that improvements in parenting skills among fathers often yield small-to-moderate effect sizes, suggesting that broader psychosocial or contextual factors may limit the effectiveness of skill-building interventions (17). Similarly, Fagan et al noted that although interventions can enhance fathers' involvement, such improvements do not always lead to consistent or substantial changes across all caregiving domains (17). Ünal et al. also highlighted the importance of fathers' involvement in kangaroo care and its relationship with paternal-infant attachment (18). These findings underscore the need for further exploration into barriers affecting the translation of knowledge into sustained caregiving practices.

Statistical analysis yielded *P*-values of 0.136 and 0.770 for fathers and mothers, respectively, indicating no statistical significance in the improvements observed between the groups, emphasizing the need for further investigation into the factors that determine engagement in skill-building initiatives. This lack of difference supports findings which suggest that small-to-moderate effect sizes are common in interventions targeting fathers, implying that wider systemic issues may limit the effectiveness of the evaluated interventions (19).

Research shows that fathers who engage in kangaroo care repeatedly report positive transformations in their emotional and psychological well-being as they become more intimately involved with their babies. A qualitative study by Günay and Şimşek highlighted that fathers who engage in kangaroo care reinvent culturally defined gender roles, establish deeper emotional connections with their babies, and view their involvement as a highly important factor for the baby's well-being (20). Likewise, a systematic review by Pathak et al confirmed that fathers who were engaged in kangaroo care practices demonstrated higher emotional sensitivity and reciprocity toward their infants compared to those who did not (21).

In this study, the intervention group had a longer duration of care in the early weeks, and the involvement of the husband in KMC suggests that the husband's assistance can increase the duration of KMC, thereby maximizing the benefits of KMC. A systematic review and meta-analysis reported that KMC lasting longer resulted in significant improvements in various health parameters, including increased weight gain, breastfeeding duration, and overall infant survival rates. In particular, it was found that longer duration of skin-to-skin contact during KMC improves nutrition practices, contributing to infant growth and development (9).

The observed decline in KMC duration during the fourth measurement in the intervention group was due to several infants surpassing 2500 g at the third visit. According to existing guidelines, infants above this threshold no longer require KMC and can transition to

conventional care (22). Moreover, the higher duration of KMC noted during the second and third weeks reinforces the importance of ongoing guidance and structured implementation to optimize bonding and physiological stabilization during this critical developmental period (23). In general, these findings underscore the essential role of father involvement in increasing daily KMC duration and supporting the faster stabilization of LBW infants.

The results revealed that there were no significant differences between the two groups on any of the measures ($P > 0.05$); although the mean weight gain was greater in the intervention group, the differences were not sufficient to establish statistical significance. Previous studies have shown that KMC is generally beneficial for LBW infants, positively contributing to weight gain and overall health. For example, Handayani et al reported increased weight gain in infants receiving KMC, although their analysis suggested that results could vary depending on the specific conditions and methodologies used in the various trials (24). In addition, Jaywant et al found significant improvements in weight across multiple trials, though heterogeneity across samples remained a challenge (25).

It is worth mentioning that the design of the current study may have influenced the findings. The presence of confounding factors, such as infants' baseline health status, nutritional intake, and other supportive care measures provided to both groups, could play an important role in the observed weight trajectories. Cañadas et al emphasized how physiological parameters can differ among infants, even when exposed to similar interventions, thus suggesting that individual infant factors might reduce the apparent benefits of KMC in some cases (26). Additionally, infant characteristics (e.g., gestational age and birth weight category) may moderate the effects of KMC. Likewise, Pathak et al noted that infants weighing under 2000 g often respond differently to KMC compared to heavier LBW infants, indicating the need for tailored intervention strategies (21).

Kangaroo care has been shown to improve various aspects of physiological and psychological development in LBW and premature infants, such as increasing weight gain, reducing stress, and strengthening the mother-infant bond (21). Several studies have reported that infants receiving kangaroo care experience faster and higher weight gain compared to infants receiving conventional care (21). Although the focus of these studies on length revealed no significant differences, other parameters (e.g., weight gain and breastfeeding efficacy) might provide more favorable outcomes for infants undergoing kangaroo care (27). For example, a systematic review confirmed that kangaroo care had a considerable impact on weight gain and breastfeeding, both of which are critical for growth and health in early development (28). Additional evidence from an interventional study also supports these findings, showing that structured kangaroo care education improves infant weight gain and breastfeeding outcomes (29).

In addition, the absence of significant differences in length may be influenced by factors beyond the kangaroo care intervention itself. For instance, gestational age at birth, overall maternal health, and initial infant weight strongly influence length outcomes (21). Therefore, the substantial growth observed may not necessarily correspond to a linear increase in length at baseline when infants are still metabolically and physiologically adapting to the external environment. It is further important to note that maturation is a gradual process in infants, and significant physical changes may only become apparent later as they adapt (21).

Limitations

External factors affecting growth were not strictly controlled in this study, nor were factors influencing maternal support for KMC implementation, although the researchers prepared daily nutritional intake monitoring sheets and observation sheets for KMC implementation.

Conclusion

The results of this study revealed that husband's assistance in KMC had a significant effect on the growth of LBW. Compared to the control group, the intervention group that received husband's assistance showed an increase in parental knowledge, higher duration, and frequency of KMC implementation, as well as more optimal growth in infant body weight and length, indicating the effectiveness of the husband's assistance intervention in supporting KMC practices at home. Overall, husband involvement in the implementation of KMC could strengthen the role of the family in supporting the sustainable growth and development of LBW infants. Eventually, education and active involvement of husbands not only increased the success of KMC practices, but also contributed to improved infant growth outcomes after hospital discharge.

Authors' Contribution

Conceptualization: Aslinda Aslinda
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Competing Interests

There is no conflict of interest in this study.

Ethical Approval

Has received ethical approval from the Ethics Commission of the Faculty of Public Health, Hasanuddin University with recommendation number 761/UN4.14.1/TP.01.02/2024.

Funding

The research was funded by the Indonesian National Amil Zakat Agency Research Scholarship Assistance 2024

References

1. Maulana MI, Mauliza M, Mardiaty M, Zara N, Iqbal TY. The relationship of anemia in pregnant mothers to the event low birth weight in 2 Lhokseumawe city private hospital in 2020. *Averrous Jurnal Kedokteran dan Kesehatan Malikussaleh* 2022;8(1):45-53. doi:10.29103/averrous.v8i1.7172
2. Herawati S, Tridiyawati F. Risk factor analysis of low birth weight events (LBW) at Kartika Husada Hospital. *Int J Health Pharm* 2023;3(4):646-51. doi:10.51601/ijhp.v3i4.220
3. Pramanik S. Understanding low birth weight: causes, consequences, and interventions. *Int Res J Mod Eng Technol Sci* 2024(2):1607-17. doi:10.56726/irjmet49493
4. Clarkson G, Gilmer MJ, Moore E, Dietrich MS, McBride BA. Cross-sectional survey of factors associated with paternal involvement in the neonatal intensive care unit. *J Clin Nurs* 2019;28(21-22):3977-90. doi:10.1111/jocn.14981
5. Dong Q, Steen M, Wepa D, Eden A. Exploratory study of fathers providing kangaroo care in a neonatal intensive care unit. *J Clin Nurs* 2025;34(12):5157-68. doi:10.1111/jocn.16405
6. Dongre S, Desai S, Nanavati R. Kangaroo father care to reduce paternal stress levels: a prospective observational before-after study. *J Neonatal Perinatal Med* 2020;13(3):403-11. doi:10.3233/npm-180190
7. Opara PI, Alinnor EA. Experiences of fathers of babies admitted into a neonatal unit in a tertiary hospital in Port Harcourt, Nigeria. *J Adv Med Med Res* 2019;29(1):1-10. doi:10.9734/jammr/2019/v29i130058
8. Ghugare S, Sebastian T, Mahakalkar MG, Wankhede DD. Assess the effectiveness of planned teaching on knowledge regarding kangaroo mother care among husbands of primigravida mother. *J Pharm Res Int* 2021;33(47A):532-9. doi:10.9734/jpri/2021/v33i47a33043
9. Charpak N, Montealegre-Pomar A, Bohorquez A. Systematic review and meta-analysis suggest that the duration of Kangaroo mother care has a direct impact on neonatal growth. *Acta Paediatr* 2021;110(1):45-59. doi:10.1111/apa.15489
10. Mazumder S, Upadhyay RP, Hill Z, Taneja S, Dube B, Kaur J, et al. Kangaroo mother care: using formative research to design an acceptable community intervention. *BMC Public Health* 2018;18(1):307. doi:10.1186/s12889-018-5197-z
11. Ehtesham Kabir A, Afroze S, Amin Z, Biswas A, Lipi SA, Khan M, et al. Implementation research on kangaroo mother care, Bangladesh. *Bull World Health Organ* 2022;100(1):10-9. doi:10.2471/blt.20.284158
12. Mathew B. A study to assess the knowledge on kangaroo mother care among postnatal mothers of low-birth-weight babies at selected hospital of Vrindavan, Mathura, UP. *Int J Res Appl Sci Eng Technol* 2021;9(10):673-8. doi:10.22214/ijraset.2021.38480
13. Almutairi A, Gavine A, McFadden A. Parents' and healthcare providers' perceptions, experiences, knowledge of, and attitudes toward kangaroo care of preterm babies in hospital settings: mixed-methods systematic review. *Birth* 2024;51(4):690-707. doi:10.1111/birt.12859
14. Landry MA, Kumaran K, Tyebkhan JM, Levesque V, Spinella M. Mindful kangaroo care: mindfulness intervention for mothers during skin-to-skin care: a randomized control pilot study. *BMC Pregnancy Childbirth* 2022;22(1):35. doi:10.1186/s12884-021-04336-w
15. Kostilainen K, Partanen E, Mikkola K, Wikström V, Pakarinen S, Fellman V, et al. Repeated parental singing during kangaroo care improved neural processing of speech sound changes in preterm infants at term age. *Front Neurosci* 2021;15:686027. doi:10.3389/fnins.2021.686027

16. Hugoson P, Haslbeck FB, Ådén U, Eulau L. Parental singing during kangaroo care: parents' experiences of singing to their preterm infant in the NICU. *Front Psychol* 2025;16:1440905. doi:[10.3389/fpsyg.2025.1440905](https://doi.org/10.3389/fpsyg.2025.1440905)
17. Fagan J, Cherson M, Brown C, Vecere E. Pilot study of a program to increase mothers' understanding of dads. *Fam Process* 2015;54(4):581-9. doi:[10.1111/famp.12137](https://doi.org/10.1111/famp.12137)
18. Ünal Toprak F, Şentürk Erenel A. Impact of kangaroo care after caesarean section on paternal-infant attachment and involvement at 12 months: a longitudinal study in Turkey. *Health Soc Care Community* 2021;29(5):1502-10. doi:[10.1111/hsc.13210](https://doi.org/10.1111/hsc.13210)
19. Caldwell CH, Rafferty J, Reischl TM, De Loney EH, Brooks CL. Enhancing parenting skills among nonresident African American fathers as a strategy for preventing youth risky behaviors. *Am J Community Psychol* 2010;45(1-2):17-35. doi:[10.1007/s10464-009-9290-4](https://doi.org/10.1007/s10464-009-9290-4)
20. Günay U, Coşkun Şimşek D. Emotions and experience of fathers applying kangaroo care in the Eastern Anatolia region of Turkey: a qualitative study. *Clin Nurs Res* 2021;30(6):840-6. doi:[10.1177/1054773820937479](https://doi.org/10.1177/1054773820937479)
21. Pathak BG, Sinha B, Sharma N, Mazumder S, Bhandari N. Effects of kangaroo mother care on maternal and paternal health: systematic review and meta-analysis. *Bull World Health Organ* 2023;101(6):391-402g. doi:[10.2471/blt.22.288977](https://doi.org/10.2471/blt.22.288977)
22. World Health Organization (WHO). Perawatan Ibu Kanguru: Sebuah Inovasi Transformatif Dalam Perawatan Kesehatan. WHO; 2023.
23. Yildizdas HY, Erdem B, Karahan DY, Ozlu F, Sertdemir Y. Effect of whole-body massage on pain scores of neonates during venous puncture and comparison with oral dextrose and Kangaroo care, a randomized controlled evaluator-blind clinical study. *J Perinatol* 2023;43(5):590-4. doi:[10.1038/s41372-022-01570](https://doi.org/10.1038/s41372-022-01570)
24. Handayani AF, Dewi YL, Pamungkasari EP. The effect of kangaroo mother care on increasing the body weight in infants with low birth weight: a meta-analysis. *J Matern Child Health* 2021;6(6):70-18. doi:[10.26911/thejmch.2021.06.06.09](https://doi.org/10.26911/thejmch.2021.06.06.09)
25. Jaywant S, Chavan B, Mulye M, Sakpal S. Effect of kangaroo mother care on the weight gain of the low birth weight preterm infants. *Int J Appl Res* 2021;7(5):393-7. doi:[10.22271/allresearch.2021.v7.i5f.8611](https://doi.org/10.22271/allresearch.2021.v7.i5f.8611)
26. Cristóbal Cañadas D, Parrón Carreño T, Sánchez Borja C, Bonillo Perales A. Benefits of kangaroo mother care on the physiological stress parameters of preterm infants and mothers in neonatal intensive care. *Int J Environ Res Public Health* 2022;19(12):7183. doi:[10.3390/ijerph19127183](https://doi.org/10.3390/ijerph19127183)
27. Şimşek DC, Aydın M, Günay U. Does kangaroo care have an effect on transition time from gavage feeding to full oral feeding in premature babies? *Klin Padiatr* 2023;235(4):235-42. doi:[10.1055/a-1982-9599](https://doi.org/10.1055/a-1982-9599)
28. Sivanandan S, Sankar MJ. Kangaroo mother care for preterm or low birth weight infants: a systematic review and meta-analysis. *BMJ Glob Health* 2023;8(6). doi:[10.1136/bmjgh-2022-010728](https://doi.org/10.1136/bmjgh-2022-010728)
29. Samsudin S, Chui PL, Ahmad Kamar A, Abdullah KL, Yu CW, Mohamed Z. The impact of structured kangaroo care education on premature infants' weight gain, breastfeeding and length of hospitalization in Malaysia. *J Multidiscip Healthc* 2023;16:1023-35. doi: <https://doi.org/10.2147/jmdh.S403206>