The Effect of Kangaroo Care on Weight Gain in Low Birth Weight Infants at Assyifa Hospital, Sukabumi City

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Abstract. Low birth weight (LBW) infants are defined as newborns weighing less than 2500 grams, a condition that poses a high risk of various health complications. This study employed a quantitative approach with a pre-experimental design to examine the effect of Kangaroo Mother Care (KMC) on weight gain among LBW infants at Assyifa Hospital, Sukabumi City. The findings revealed that before receiving KMC, the majority of infants were categorized as LBW (10 respondents; 62.5%), while the remaining were very low birth weight (VLBW) (6 respondents; 37.5%). After the intervention, most infants remained in the LBW category (15 respondents; 93.8%), while one infant (6.3%) achieved a normal birth weight. Statistical analysis showed that the pre-intervention mean weight was 1658.50 grams with a standard deviation of 394.893. Following KMC, the mean weight increased to 2177.38 grams with a standard deviation of 239.806. Correlation testing indicated an r-value of 0.442 with a significance level of 0.087, while the paired sample test yielded a significance value of 0.000 (p < 0.05). These results indicate a significant improvement in infant weight after the implementation of KMC.Based on hypothesis testing, the null hypothesis (Ho) was rejected, confirming that Kangaroo Mother Care has a significant effect on the weight gain of LBW infants. This finding highlights KMC as a simple yet effective intervention to support the growth and health of LBW infants.
Keywords: Low Birth Weight, Kangaroo Method, Premature

Abstrak. Bayi dengan berat lahir rendah (BBLR) didefinisikan sebagai bayi yang lahir dengan berat kurang dari 2500 gram, suatu kondisi yang berpotensi menimbulkan berbagai komplikasi kesehatan. Dalam penelitian ini digunakan pendekatan kuantitatif dengan desain pra-eksperimental untuk mengidentifikasi pengaruh perawatan metode kanguru (PMK) terhadap peningkatan berat badan pada bayi BBLR di RS Assyifa Kota Sukabumi. Hasil analisis menunjukkan bahwa sebelum diberikan PMK, mayoritas bayi termasuk kategori BBLR sebanyak 10 responden (62,5%), sedangkan sisanya tergolong berat badan lahir sangat rendah (BBLSR) sebanyak 6 responden (37,5%). Setelah dilakukan perawatan dengan PMK, sebagian besar bayi tetap berada pada kategori BBLR yaitu 15 responden (93,8%), sementara 1 responden (6,3%) mengalami peningkatan hingga mencapai berat badan normal. Secara statistik, hasil tes awal memperlihatkan rata-rata berat badan 1658,50 gram dengan simpangan baku 394,893. Setelah intervensi PMK, nilai rata-rata meningkat menjadi 2177,38 gram dengan simpangan baku 239,806. Uji korelasi menunjukkan nilai r = 0,442 dengan signifikansi 0,087, sedangkan uji beda menghasilkan nilai signifikansi 0,000 (p < 0,05). Hal ini menandakan adanya perubahan yang signifikan pada berat badan bayi setelah PMK.

Berdasarkan pengujian hipotesis, Ho ditolak, yang berarti terdapat pengaruh nyata dari perawatan metode kanguru terhadap peningkatan berat badan bayi BBLR. Temuan ini menegaskan bahwa PMK merupakan intervensi sederhana namun efektif dalam mendukung perawatan bayi BBLR.

Kata Kunci: Berat Badan Lahir Rendah, Metode Kangguru, Premature

BACKGROUND

Low birth weight (LBW) is defined as a baby born weighing less than 2,500 grams. Low birth weight (LBW) is one of the risk factors contributing to infant mortality, especially during the perinatal period. Low birth weight has long-term effects on a child's future growth and development. The impact of low birth weight is that the infant's growth rate will be slow and they will tend to have poorer intelligence compared to infants born with normal birth weight. In addition, infants with low birth weight may experience mental and physical disorders in the final stages of growth and development, requiring high treatment costs (Amelia et al., 2021) .

Nationally, the Infant Mortality Rate (IMR) increased from 24 deaths per 1,000 live births (SDKI, 2017) to 16.85 deaths per 1,000 live births (Census, 2020). These results show a significant decline, even exceeding the 2022 target of 18.6% deaths per 1,000 live births. This rate must be maintained to support the 2024 target of 16 deaths per 1,000 live births and 12 deaths per 1,000 live births in 2030.

Based on the results of the "SRS" registration system model; Litbangkes In 2016, the three main causes of newborn deaths were birth complications (28.3%), respiratory and cardiovascular disorders ( ) (21.3%), and low birth weight and premature birth (19%). Meanwhile, based on data from the Perinatal Maternal Death Notification (MPDN) dated 21 September 2021, the three leading causes of newborn deaths were low birth weight (29.21%), asphyxia (27.44%), and infection (5.4%), with location being the highest.requiring hospitalisation (92.41%) (Mardiana, 2019) .

Based on data from the 2020 Indonesian Health Profile, the IMR reached 29,322 deaths in 2019. The highest cause of IMR was low birth weight (LBW) babies, with 7,150 deaths or 35.3%. Based on the results of the 2017 Indonesia Demographic Health Survey (SDKI), the IMR was 24 per 1,000 live births. It is hoped that the IMR can continue to be reduced through interventions that support child survival, with the aim of reducing the IMR to 16 per 1,000 live births by 2024 (Ministry of Health of the Republic of Indonesia, 2020).

Based on data from the 2018 Riskesdas, the low birth weight rate in Indonesia reached 6.2%, with the province with the highest low birth weight rate being Central Sulawesi at 8.9% and the lowest being Jambi province at 2.6% (Risiko, 2018). The World Health Assembly (WHA) aims to reduce the low birth weight rate by 30% by 2025. This will result in a relative decrease of 3.9% per year between 2012 and 2025. Therefore, to reduce neonatal and perinatal mortality and morbidity, it is essential to have accurate data on population prevalence and risk factors for low birth weight. This data can be used for health service planning and special care to prevent and treat low birth weight babies (WHO, 2019) (Astuti et al., 2023) .

The number of low birth weight cases in West Java in 2019 was 645 cases (1.5%). This number is higher than the number of LBW cases in 2015, which was 556 cases (1.2%) (Central Kalimantan Provincial Health Office, 2019). The exact cause of low birth weight is not yet known, but in countries such as Asia and Africa, it is believed to be due to nutrition during pregnancy, while in developed countries, the cause is the age of the mother at delivery, which is above 35 years. In developing countries in Asia and Africa, the high infant mortality rate among low birth weight babies is due to a lack of facilities to care for premature or low birth weight babies. Meanwhile, in European countries, the chances of survival for children with low birth weight are higher due to adequate medical facilities and infrastructure (Dhilon & Fitri, 2019) . A country's health indicators are always reflected in its infant mortality rate.

The high morbidity and mortality rates among low birth weight infants demonstrate how vulnerable life is at this stage. The transition from intrauterine to extrauterine life requires many biochemical and physiological changes. Infants with low birth weight are often prone to complications and the risk of infection. Problems encountered in low birth weight include metabolic disorders such as hypothermia, hypoglycaemia, hyperglycaemia, breastfeeding disorders, immune disorders, respiratory disorders, circulatory system disorders, heart disorders, fluid disorders, electrolyte disorders, and digestive disorders (Dhilon & Fitri, 2019) .

Based on the above common problems, it appears that women with low birth weight have special needs, including the need for stable body temperature and adequate nutrition, especially breast milk. The most important special care is to meet the

nutritional needs of low birth weight and stable body temperature to support the baby's weight gain (Proverawati, 2021) .

To date, low birth weight babies are still treated using incubators. The use of incubators to care for low birth weight babies is costly, and it is not uncommon for many children to have to use incubators in hospitals, thereby increasing the risk of nosocomial infections in newborns who require care. An alternative is kangaroo mother care (KMC), which is a treatment for low birth weight infants that involves direct skin-to-skin contact between the baby and the mother (Ministry of Health of the Republic of Indonesia, 2020). Kangaroo care is particularly beneficial for low birth weight babies, as it is the best way to keep the baby warm, while also creating conditions that support breastfeeding. It is also economically beneficial, inexpensive, practical, safe, and easy to implement. If the mother feels tired, the father, grandmother, or other family members can take over (Suarti, 2019).

In a study conducted at Assyifa Koa Sukabumi Hospital, there was an increase in weight of 54.25 grams per week and an increase in body temperature of 0.5ºC from 34°C in subjects using the kangaroo method, as well as an increase in weight of 29.25 grams per week. The body temperature increased by 0.05ºC from 34°C in subjects who did not use the kangaroo method. This study shows a relationship between stable temperature and increased breastfeeding frequency, which is evident in the duration of breastfeeding and weight gain in low birth weight babies.

Based on the results of a preliminary study conducted by researchers at the Neonatal Intensive Care Unit of Assyifa Hospital in Sukabumi, data on the birth weight of 38 newborns was collected cross-sectionally. On average, 18 babies were treated at the Assyifa Sukabumi NICU every month. All low birth weight babies were placed in incubators to keep their body temperature stable, but the weight of all low birth weight babies did not increase. Some babies with low birth weight experienced weight loss in the first week due to suboptimal kangaroo care and low birth weight. The babies' sucking reflexes were not yet strong. This was evident in all 38 low birth weight babies. Intensive kangaroo care 1-2 times/day for more than 120 minutes had the effect of warming the body weight of newborns and increasing the body weight of newborns with low birth weight.

The findings of this study on the importance of kangaroo therapy for weight gain in low birth weight infants are expected to be translated into hospital policies that can improve the survival of low birth weight infants and reduce the number of sick or deceased infants.

There are numerous benefits to be gained from kangaroo therapy, as described above, prompting researchers to conduct a study entitled "The Effect of Kangaroo Therapy on Weight Gain in Low Birth Weight Infants at Assyifa Hospital".

RESEARCH METHOD

This study is a quantitative study with a *pre-experimental* design. The population in this study consisted of 16 low birth weight newborns at Assyifa Hospital. The sampling technique used in this study was *total sampling*.

The inclusion criteria for the sample in this study were:

1. Infants weighing less than 2000 grams

2. Mothers in good health and with normal body temperature.

3. Mothers willing to receive health education related to PMK.

4. Mothers/families are willing and agree to be research respondents.

5. Mothers/families are able to communicate effectively.

6. The mother/family is able to perform kangaroo care.

Data collection was conducted using a questionnaire. Data analysis was performed using univariate and inferential analysis.

RESULTS AND DISCUSSION

Univariate Analysis of Research Variables

The results of the univariate analysis of the effect of kangaroo care on weight gain in full-term infants can be seen below:

1. **Univariate Analysis of Variables: Weight Before PMK**

Table 1. Univariate Analysis of Variables Weight Before PMK

Variable	Frequency	Percentage %
BB Before PMK LBW (1600-<2500)	10	62.5
BBLSR (1000–1500)	6	37.5

Table 1 shows that most of the babies' weight before kangaroo care was LBW (low birth weight), with 10 (62.5%) respondents, while the rest had VLBW (very low birth weight), with 6 (37.5%) respondents.

2. Univariate Analysis of Birth Weight Variables After KMC

Table 2 Univariate Analysis of Variable BB After KMC

Variable	Frequency	Percentage %
BB After PMK LBW (1600-<2500)	15	93.8
NORMAL (>2500)	1	6.3

Based on Table 2, it shows that most of the babies' weight after kangaroo care was LBW (Low Birth Weight), namely 15 (93.8%), and a small number of respondents with normal babies' weight after kangaroo care, namely 1 (6.3%) respondent.

3. Univariate Analysis of Normality Test

Table 3. Univariate Analysis of Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wil		k
	Statistic	df	Sig.	Statistic	df	Sig.
BB Before PMK	0.105	16	.200[*]	0.974	16	0.901
Body weight after PMK	0.138	16	,200[*]	0.899	16	0.076

*. This is a lower bound of the true significance. a. Lilliefors Significance Correction

Table 3 shows that the significance value (p) in the Kolmogorov-Smirnov test is 0.2 (p > 0.05), so based on the Kolmogorov-Smirnov normality test, the data is normally distributed. The significance value (p) in the Shapiro-Wilk test is 0.901 in BB Before PMK and 0.076 in BB After PMK (p > 0.05), so based on the Shapiro-Wilk normality test, the data is normally distributed.

Inferential Analysis

The results of the inferential analysis of the effect of kangaroo care on weight gain in low birth weight infants at Assyifa Hospital, Sukabumi City, can be seen in full in the Paired Samples Statistics Table, which shows the descriptive values of each variable in the paired samples as follows:

Table 4. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	**BB Before PMK**	1658.50	16	394.893	98,723
	BB After PMK	2,177.38	16	239,806	59,951

Based on Table 4, it can be seen that the Initial Test has a mean value of 1658.50 from 16 data points. The data distribution (standard deviation) obtained is 394.893 with a standard error of 98.723. The Final Test has an average (mean) value of 2177.38 from 16 data points. The data distribution (standard deviation) obtained is 239.806 with a standard error of 59.951.

This indicates that the final test data is higher than the initial test data. The range of the final test data distribution is narrower with a lower standard error.

Table 5. Paired Sample Correlation

		N	Correlation	Sig.
Pair 1	**Body Weight Before PMK & Body Weight After PMK**	16	0.442	0.087

Table 5 shows the correlation values indicating the relationship between the variables BB Before PMK & BB After PMK, which is 0.442 with a significance value of 0.087. This was obtained from the bivariate Pearson correlation coefficient (with a two-tailed significance test) for each pair of variables entered.

Table 6. Paired Sample Test

		Paired Differences					t	df	Sig. (2tailed)
			Std.	Std. Error	95% Confidence Interval of the Difference				
		Mean	Deviation	Mean	Lower	Upper			
Pair 1	**BB Before PMK – BB After PMK**	-518,875	360,261	90,065	-710,845	-326,905	-5,761	15	0.000

Paired Sample Test Table 5 is the main table of the output showing the test results. This can be seen from the significance value *(2-tailed)* in the table. The

significance value (2-tailed) of this case is 0.000 (p < 0.05). Thus, the initial test results, which were BB Before PMK, and the final test results, which were BB After PMK, experienced a significant (meaningful) change. Based on the rejection of the hypothesis, *Ho* is rejected, which states that there is an effect of the kangaroo method of care ( ) on weight gain in low birth weight babies at Assyifa Hospital in Sukabumi City.

Discussion

Univariate Analysis of Body Weight Before Kangaroo Mother Care

The results showed that most of the infants' weight before kangaroo care was LBW (low birth weight), namely 10 (62.5%) respondents, while the rest had VLBW (very low birth weight), namely 6 (37.5%) respondents.

The results of the study related to the weight of babies before being given kangaroo therapy are closely related to the occurrence of mothers giving birth prematurely, according to the data obtained in this study, mothers who have a pregnancy of less than 37 weeks will be at risk of giving birth to babies with LBW. This can occur because foetal growth in the intrauterine environment is not yet optimal. The development and growth of the foetus in utero requires approximately 38 weeks for the baby to be ready to be born and adapt to the environment outside the womb. In this study, the researchers found that some babies were born with LBW because they were twins. This can contribute to LBW because the babies have to share nutrients between the two foetuses, and the space for the babies to grow and develop is smaller because there are two foetuses in one womb.

The sex of the baby is not one of the factors that influence LBW babies. This may be because during the study, more male babies were born than female babies. This study was also reinforced by several previous studies related to the implementation of Kangaroo Therapy, a study conducted by Wahyuni in Surakarta in 2012, which involved providing kangaroo mother care for 4 hours a day to LBW babies. The study involved seven respondents, including mothers aged 22 and 44 years old, with high school (62%) and bachelor's degree (38%) education levels. The main variable in the study was the baby's weight, which ranged from 1500 to 2050 grams. The results of the study showed that the average weight before KMC was 1735.71 grams with a standard deviation of 172.516. Meanwhile, the study conducted by the researcher with 9 hours of kangaroo care showed that the average weight before kangaroo care was 1738.60

grams. Research also conducted by Yulistiani (2009) in Purwokerto compared kangaroo care with incubator care in terms of weight gain in infants, with the average weight of infants before kangaroo care being 1706.82 grams. This study was only conducted for 10 days, while the researcher's study was conducted for a longer period of 2 weeks.

Kangaroo Care (KM) is a supportive care method that replaces incubators by placing the infant between the mother's breasts so that there is direct skin-to-skin contact between the mother and the infant. KMC has advantages over incubators, namely improving the emotional bond between mother and child, stabilising the baby's body temperature, pulse, heart rate and breathing, reducing stress in the mother and baby, reducing the duration of crying in the baby, improving the emotional bond between mother and baby, and increasing weight gain due to reduced calorie or energy consumption. The process of weight gain is greatly supported by the fulfilment of the baby's nutritional needs. KMC allows babies to breastfeed longer and more frequently, so that they become calm and receive an adequate supply of breast milk. The energy obtained by the body is focused solely on growth. Babies who are given KMC have relatively normal temperatures, regular heart rates and breathing, sleep longer and cry less. KMC in LBW babies will cause an increase in glucose levels, which leads to good cell metabolism so that weight gain will also be better.

Univariate Analysis of Weight Variables After KMC

The results showed that most of the babies' weight after kangaroo care was LBW (low birth weight), namely 15 (93.8%), and a small number of respondents had babies with normal weight after kangaroo care, namely 1 (6.3%) respondent.

After kangaroo therapy, the researchers analysed that the increase in infant weight was closely related to several factors, one of which was the infant's ability to suckle breast milk. Breast milk is a very important component in infant growth. The breast milk consumed by infants must be in accordance with the infant's own needs. In kangaroo care, mothers feed their babies more regularly and on time. Because babies are always in their mothers' arms and when they feel thirsty and need breast milk, they will look for their mother's nipple themselves in their kangaroo clothes, which also helps babies meet their nutritional and fluid needs. This also helps the baby improve their breastfeeding ability because the baby's sucking reflex will always be honed and

trained, and the emotional bond between mother and baby will be even better due to the direct contact provided by the mother to her baby. Overall, the success of the Kangaroo Care Method itself is influenced by adequate nutrition for the baby, the emotional well-being of the baby and mother, and the position of the baby in the kangaroo care method, which will provide temperature stability for the baby and prevent the risk of hypothermia, as the mother's and baby's temperatures will support each other. Physiologically, the baby's weight gain is also influenced by the baby's age. In the first week after birth, the baby's weight gain is not yet optimal, and this also occurs in babies receiving kangaroo care. However, at the very least, kangaroo care can help babies stabilise their physiological functions (body temperature, breathing, pulse), which will aid in their metabolism.

A similar study was also conducted in Surakarta by Wahyuni in 2012, comparing kangaroo care for 4 hours a day with 2 hours a day. The study concluded that there was an increase in the baby's weight after 4 hours of kangaroo care a day for 2 weeks, with an average weight gain of 150.86 grams. The results of this study were lower than those of the researcher's own study. The researcher found that the babies' weight increased by 28.30 grams per day. Calculated over two weeks, the increase in the babies' weight was 396.2 grams, with an average increase of between 1500 and 2050 grams. The results of the study obtained an average value before KMC of 1735.71 grams with an SD of 172.516. Meanwhile, the study conducted by the researcher with kangaroo care for 9 hours had an average weight before kangaroo care of 1738.60 grams. Research was also conducted by Yulistiani (2009) in Purwokerto on the comparison of kangaroo care with incubator care on the weight gain of babies with a pre-kangaroo care weight of 1706.82. This study was only conducted for 10 days, while the researcher's study was conducted for a longer period of 2 weeks. The weight of infants with PMK was 214.54 during 10 days.

The difference in weight gain may be influenced by the age of the infant at the time of receiving KMC, which was less than 10 days, whereas according to Mutmainah (2015), normally, full-term infants and low birth weight (LBW) infants will experience weight loss of about 5-10% in the first 7 days of life, and their birth weight will return on days 7-10. According to the researcher, day 10 is the appropriate time to start KMC if one wishes to measure its effect on infant weight gain.

Inferential Analysis of the Effect of Kangaroo Care on Weight Gain in Low Birth Weight Infants

The significance value (2-tailed) of this case is 0.000 (p < 0.05). Thus, the initial test results, which are BB Before PMK, and the final test results, which are BB After PMK, show a significant (meaningful) change. Based on the rejection of the hypothesis, Ho is rejected, which states that there is an effect of the kangaroo care method on weight gain in low birth weight babies at Assyifa Hospital in Sukabumi City. The correlation value shows the relationship between the variables of BW Before PMK & BW After PMK, which is 0.442 with a significance value of 0.087. This was obtained from the bivariate Pearson correlation coefficient (with a two-sided significance test) for each pair of variables entered.

The results showed that the initial test had a mean value of 1658.50 from 16 data points. The data spread (standard deviation) obtained was 394.893 with a standard error of 98.723. The final test had a mean value of 2177.38 from 16 data points. The data distribution (standard deviation) obtained was 239.806 with a standard error of 59.951. This shows that the final test data is higher than the initial test data. The range of the final test data distribution became narrower with a lower standard error.

These results are in line with the research conducted by (Huniyah, 2018) , which showed that all respondents experienced an increase in weight ranging from 50-350 grams after undergoing PMK in the Hasyim Asy'ari Room at RSI Sakinah Mojokerto in July 2017. The results of the paired t-test yielded a p-value of 0.000, with the conclusion that there is a significant effect of PMK on weight gain in LBW infants. Different results were presented by (Anggraini, 2017) , who researched the effectiveness of PMK on weight gain in LBW infants at the Muhammadiyah Hospital in Palembang, which was administered for 10 days. Based on statistical tests, a p-value of 0.272 was obtained, which means that PMK had no effect on weight gain in LBW infants.

Based on the researcher's analysis, there is an effect of the kangaroo method on the baby's weight because during the implementation of the kangaroo method, there is close contact and interaction between the mother and the baby, which makes the baby feel comfortable and safe, and improves the baby's psychomotor development as a reaction to sensory stimulation from the mother to the baby. By performing PMK, the

breastfeeding process is more successful because the breastfeeding process becomes longer. Once the baby shows signs of readiness to breastfeed, by moving their tongue and mouth and showing a desire to suck, they can directly suckle the mother's nipple and obtain the breast milk they need. The more often the baby breastfeeds, the more breast milk will be produced, which can meet the baby's nutritional needs. Thus, through PMK, the baby's nutritional needs will be adequately met, ensuring optimal growth and development. This opinion is supported by a study conducted by (Syaiful et al., 2018) which states that KMC has a significant effect in increasing the success of breastfeeding in LBW babies. In addition, babies who receive kangaroo care have relatively normal body temperatures, heart rates and regular breathing, which can lead to higher glucose levels in babies. Increased glucose levels cause cells to metabolise properly, thereby improving cell growth. Infant weight gain also occurs because infants are relaxed in the kangaroo position, and the emotional bond between mother and infant reduces the infant's anxiety and stress, allowing the infant to rest/sleep more, thereby supporting the infant's growth and development. This is based on the researchers' observation that every infant given KMC will immediately fall asleep comfortably in their mother's arms.

CONCLUSION AND RECOMMENDATIONS

Based on the results of the study, it can be concluded that: 1) Most of the babies' weight before kangaroo care was LBW (low birth weight), namely 10 (62.5%) respondents, and the rest had VLBW (very low birth weight), namely 6 (37.5%) respondents. Meanwhile, most of the babies' weight after kangaroo care was LBW (low birth weight), namely 15 (93.8%) respondents, and a small number of respondents had babies with normal weight after kangaroo care, namely 1 (6.3%) respondent. 2) The initial test had a mean value of 1658.50 from 16 data points. The data spread (standard deviation) obtained was 394.893 with a standard error of 98.723. The final test had a mean value of 2177.38 from 16 data points. The data distribution (standard deviation) obtained was 239.806 with a standard error of 59.951. This shows that the final test data was higher than the initial test data. The range of the final test data distribution became narrower with a lower standard error. The correlation value showing the relationship between the variables of BW Before PMK & BW After PMK is 0.442 with a

significance value of 0.087. The significance value (2-tailed) of this case is 0.000 (p < 0.05). Thus, the initial test results, which were BB Before PMK, and the final test results, which were BB After PMK, showed a significant change. Based on the rejection of the hypothesis, Ho is rejected, which states that there is an effect of the kangaroo care method on weight gain in low birth weight babies at Assyifa Hospital in Sukabumi City.

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