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Effectiveness of kangaroo and nesting method on body temperature of low birth weight (LBW) babies in the perinatology room

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Abstract

Background: Low birth weight (LBW) is a condition in which a baby is born weighing less than 2500 grams. Low birth weight, a leading cause of neonatal mortality, is caused by unstable body temperature.

Purpose: to determine the effectiveness of the kangaroo and nesting methods on the body temperature of low birth weight infants in the Perinatology.

Method: This study used a quasi-experimental method and was conducted from March to April 2025. The sample consisted of 32 infants treated in the Perinatology Unit of KH. Hayyung Regional General Hospital, Selayar Islands Regency, from March to April 2025, using accidental sampling.

Results: The study showed that the kangaroo and nesting methods were effective in increasing body temperature in low birth weight infants, as indicated by a p-value <0.05.

Conclusion: This means that the kangaroo and nesting methods significantly influence the body temperature of low birth weight infants.

Suggestion: It is hoped that mothers who give birth to low-birth-weight babies will be able to use the kangaroo method and nesting methods in newborn care to maintain a stable body temperature.

Keywords: Kangaroo Method; Low-Birth-Weight; Nesting Method.

INTRODUCTION

One important indicator for evaluating the quality of health services in a country is maternal and child health. Low birth weight (LBW) is a leading cause of neonatal mortality. This condition occurs when a baby is born weighing less than 2,500 grams, regardless of gestational age. Oxygen supply from the placenta to the fetus is disrupted, which inhibits fetal growth. Efforts to reduce the incidence of LBW continue through pregnancy monitoring, prenatal education, premature birth treatment, and various conditions associated with LBW risk (Hadya, 2023). The Ministry of Health is one example of the government's commitment to achieving the Sustainable Development Goals, particularly reducing infant mortality (Hasriani, 2024).

Premature babies with low birth weight (LBW) significantly contribute to infant mortality, particularly during perinatal birth. This is due to their thinner subcutaneous fat, which causes excessive evaporation below the external temperature, leading to hypothermia (Suryani, Shifa, & Yuliza, 2023). Body temperature instability is the most common problem or complication in babies with low birth weight. Proper care is needed to prevent hypothermia and hyperthermia. To achieve this, body temperature must be maintained within the normal range (Sari, Salmarini, Meldawati, & Yuliana, 2024).

As reported by the World Health Organization, the prevalence of low birth weight (LBW) in babies worldwide is 15.5%, or approximately 20 million

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babies per year, with approximately 96.5% found in developing countries. The number of low-birth-weight babies has decreased by 2.9 percent compared to the previous year, 2012; data shows that from 2012 to 2019, there was a decrease from 20 million low birth weight babies to 14 million low birth weight babies. The LBW birth rate in 2019 was 14.9 percent, with a decrease in the percentage to 13.2 percent in 2020 and 12.7 percent in 2021 (Sari, Salmarini, Meldawati, & Yuliana, 2024).

According to Indonesian health profile data, in 2020, 72% (20.266) of all reported neonatal deaths occurred between 0 and 28 days of age. In contrast, 9.9 percent (2.506) of all deaths occurred between 12 and 59 months of age, and 19.1 percent (5.386) of all deaths occurred between 29 and 11 months of age. One of the leading causes of newborn mortality in 2020 was low birth weight; the following causes were asphyxiation, infection, congenital abnormalities, neonatal tetanus, and other factors (Ginting, Pasaribu, Sihombing, Manullang, & Gulo, 2023).

According to the Indonesian National Nutritional Status Survey (SSGI) conducted in 2022, low birth weight (LBW) babies accounted for approximately 6.0% of all births in Indonesia. Risk factors such as maternal health status, diet, and the type of prenatal care provided influence the prevalence of LBW (Ministry of Health of the Republic of Indonesia, 2023).

Data from the Directorate General of Public Health, Ministry of Health of the Republic of Indonesia, for 2023 showed that 34,226 infants aged 0-59 months died. The infant mortality rate in 2022 was only 21,447, but a significant number of deaths occurred in the neonatal period (between 0 and 28 days), reaching 27,530, and deaths in the postnatal period (29 days to 11 months) reaching 1.781 (5.2%). This represents a significant increase from the infant mortality rate in 2023, with the leading cause of death occurring in the neonatal period.

The 2023 live birth counts from 38 provinces showed that 84.3% of infants were weighed based on their birth weight, and 3.9% were low birth weight (LBW). This represents a significant increase compared to the 2022 count, where approximately 2.5% of infants were low birth weight (Ministry of Health of the Republic of Indonesia, 2024). Bulukumba City had the highest incidence of low birth

weight (LBW) in 2020, at 13.12% (Nisa et al., 2023), and Selayar Islands Regency ranked tenth with a low birth weight (LBW) percentage of 4.84% (South Sulawesi Provincial Health Office, 2021).

Data from Hayyung Hospital, Selayar Islands Regency in 2022 showed a total of 1,980 births, including 122 (6.1%) low birth weight babies. In 2023, the number of LBW births increased from 1,887 to 142 (7.52%) (Selayar Islands Regency Health Office, 2023). Meanwhile, data from KH. Hayyung Regional Hospital, Selayar Islands Regency in 2022 showed that the total number of births was 645 and 74 (11.47%) of them were LBW. Based on data from LBW babies in the Perinatology Room of the KH Hayyung Regional Hospital, Selayar Islands Regency, there was an increase in cases of LBW babies, namely in 2023 there were 109 (20.48%) LBW babies from 532 births and in 2024 it reached 178 (28.84%) LBW babies from 617 births. Newborns with low birth weight (LBW) typically have a low body temperature, ranging between 35.4°C and 36°C (Perinatology ward medical record data).

The hypothalamus is responsible for the balance between heat production and consumption, which determines the baby's body temperature. Babies lose body temperature rapidly due to their immature blood flow. Shock, infection, protein-energy malnutrition (PEM), metabolic disorders of the endocrine system, room temperature, and birth weight are some factors that can influence this. Babies must be able to maintain their body temperature to prevent hypothermia. The presence of subcutaneous fat that is not yet optimal affects this ability. Previous research investigating temperature changes caused by birth weight has shown that this ability is affected by an unstable vasomotor response. As a result, they cannot concentrate sufficiently to slow heat loss. They are also unable to generate sufficient heat due to their limited fat stores. Therefore, it is important to pay attention to the newborn's environment to ensure that the baby is not easily affected by changes in body temperature (Andari, Rohmah, & Anggraeni, 2022).

Conduction is how newborns lose heat when in contact with cooler objects. This is known as heat transfer. The respondent's body temperature may increase slightly after the 30-minute nesting method, but this is not significant. Babies are better able to maintain flexed positions such as shoulder and elbow

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adduction, hip and knee adduction, and head midline in this position. According to Wong (2015), infants can increase hand-to-mouth and grasping movements when they are in a flexed position, which can indirectly increase muscle contractions, which are correlated with metabolism and cause an increase in body temperature. The average body temperature of babies before nesting is 35.8°C, with the most frequent temperature being 36.0°C, with a minimum range of 35.2°C and a maximum of 37.3°C, according to research by (Azzahraa, Lestari, & Taslim, 2022).

This is consistent with previous research showing that respondents' pre-nesting body temperature averaged 36.3 degrees Celsius, with a standard deviation of 0.349, a minimum of 35.5 degrees Celsius, and a maximum of 37.1 degrees Celsius. The median temperature was 36.9 degrees Celsius, with a standard deviation of 0.268, and a minimum of 35.5 degrees Celsius (Nanang & Isti, 2018). Another study found that the average body temperature of infants before kangaroo care was 36.1°C, and after 37.2°C (Muhammad & Ali, 2022). This is in line with previous research showing that the average body temperature of infants before kangaroo care was 36.1°C (Hapriani, 2023). Body temperature results from the difference between the heat produced by the body and the heat released from the external environment. Heat loss in newborns is normal. The kangaroo care method allows skin-to-skin contact between the mother and the baby, preventing both conductive and radiant heat loss (Azzahraa et al., 2022).

RESEARCH METHOD

This study employed a quantitative method with a quasi-experimental design and a pre-posttest design for two groups. The purpose of this study was to determine the effectiveness of each method in maintaining the body temperature of low-birth-weight infants.

This study was conducted at the Perinatology Unit of the KH Hayyyung Regional Hospital in the Selayar Islands Regency in March and April 2025. This study involved 47 low-birth-weight (LBW) infants treated at the Perinatology Unit of the KH Hayyyung Regional Hospital in the Selayar Islands Regency from August to October 2024. The sample consisted of 32 low-birth-weight infants treated in the perinatal unit, divided into 16 respondents (the kangaroo method group) and 16 respondents (the nesting method group). The sampling technique used a non-probability sampling technique with accidental sampling that met the inclusion criteria at the time of the study, as follows.

Inclusion criteria: Low birth weight infants weigh <2500 grams, low birth weight infants present at the time of the study, infants in stable condition (not requiring respiratory support), parental consent or approval (informed consent). Exclusion criteria: Infants with severe congenital abnormalities, infants with severe sepsis, unstable maternal condition.

This research instrument used observation sheets and a digital thermometer to measure body temperature. Data analysis was conducted using univariate and bivariate analysis. The data presented consists of observations of infants from 32 respondents, both before and after the kangaroo method and the nesting method. Gender, low birth weight (LBW), infant body temperature before and after the kangaroo method and the nesting method, and infant body temperature before and after the kangaroo method and the nesting method are some of the patient characteristics described by the univariate analysis. Bivariate analysis to determine how the independent variables affect the dependent variable. Infant body temperature before and after the kangaroo method and the nesting method was measured to assess the independent and dependent variables. A paired sample t-test with a significance level (α) of 0.05 was used to assess the effectiveness of the kangaroo method and the nesting method.

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RESEARCH RESULTS

Table 1. Characteristics of Respondents (N=32)

Variable	Results
Gender (n/%)	
Male	13/40.6
Female	19/56.5
Low Birth Weight (n/%)	
1500 gram-2000 gram	10/31.3
2100 gram-2499 gram	22/68.7
Baby's Body Temperature Before Kangaroo Method (n/%)	
Normal (36,5°C-37,5 °C)	0/0
Abnormal (<36,5 °C)	16/100
Baby's Body Temperature After Kangaroo Method (n/%)	
Normal (36,5°C-37,5 °C)	16/100
Abnormal (<36,5 °C)	0/0
Baby's Body Temperature Before the Nesting Method (n/%)	
Normal (36,5°C-37,5 °C)	0/0
Abnormal (<36,5 °C)	16/100
Baby's Body Temperature Before the Nesting Method (n/%)	
Normal (36,5°C-37,5 °C)	16/100
Abnormal (<36,5 °C)	0/0

Based on table 1. it shows that from 32 respondents, the results obtained were that the majority of respondents were female, 19 (59.5%) and 13 (40.6%) were male. shows that there were 10 respondents (31.3%) who had a birth weight of 1500 – 2000 grams, while there were 22 respondents (68.7%) who had a birth weight of 2100 – 2499 grams. shows that of the 16 respondents who had an abnormal baby body temperature (<36.5°C), there were 16 respondents (100%) and those who had a normal temperature (36.5°C – 37.5°C) were 0 respondents. shows that of the 16 respondents who had a normal baby body temperature (36.5°C – 37.5°C), there were 16 respondents (100%) and those who had an abnormal temperature (<36.5°C) were 0 respondents. shows that of the 16 respondents who had an abnormal baby body temperature (<36.5°C), there were 16 respondents (100%) and those who had a normal baby temperature (36.5°C – 37.5°C) were 0 respondents and shows that of the 16 respondents who had a normal baby body temperature (36.5°C – 37.5°C), there were 16 respondents (100%) and those who had an abnormal temperature (<36.5°C) were 0 respondents.

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Table 2. Data Normality Test for Kangaroo Method and Nesting Method

Variabel	P-Value
Pre Test Metode Kanguru	0.255
Post Test Metode Kanguru	0.292
Pre Test Metode <i>Nesting</i>	0.142
Post Test Metode <i>Nesting</i>	0.331

Based on the Shapiro-Wilk normality test, the pre-test variable using the kangaroo method showed a normally distributed data with a p-value of 0.255 (>0.05). Meanwhile, the post-test variable using the kangaroo method also showed a normally distributed data with a p-value of 0.292 (>0.05). Based on the Shapiro-Wilk normality test, the pre-test variable using the nesting method showed a normally distributed data with a p-value of 0.142 (>0.05). Meanwhile, the post-test variable using the nesting method also showed a normally distributed data with a p-value of 0.331 (>0.05).

Table 3. Analisis Pretest and Posttest Metode Kanguru and *Nesting*

Variable	Group	Mean	SD	P-Value
Baby's Body Temperature	Pre Test Metode Kanguru	36.075	0.1342	0.000
	Post Test Metode Kanguru	36.738	0.1204	
	Pre Test Metode <i>Nesting</i>	36.169	0.1740	0.000
	Post Test Metode <i>Nesting</i>	36.494	0.1124	

Based on 3. it is known that the kangaroo method before the intervention the average value is 36.075. After the intervention, the average value is 36.738. This means that the average value of the intervention before and after there is an increase of 0.663. This shows that there is an effect of the kangaroo method after the intervention on the average intervention result of 0.663. While from 16 respondents the nesting method before the intervention the average value is 36.169. After the intervention, the average value is 36.494. This means that the average value of the intervention before and after increased by 0.325. This shows that there is an effect of the nesting method after the intervention with an average intervention value of 0.325. The results of the statistical test of the kangaroo method and the nesting method show a p value <0.05 (0.000), which can be concluded that H_a is accepted, which means there is a significant effect on the body temperature of babies in LBW babies before and after the kangaroo method and the nesting method.

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Table 4. Uji Efektivitas Metode Kanguru dan Metode *Nesting*

Variabel	Mean	SD	Std. Error Mean
Metode Kanguru	36.74	0.12	0.03
Metode <i>Nesting</i>	36.49	0.112	0.28

The table above shows the results of an effectiveness test using an independent t-test, which shows that the kangaroo method has an average score of 36.74, while the nesting method has an average score of 36.49. These results indicate that the kangaroo method is more effective than the nesting method, with a difference in average scores of 0.25.

DISCUSSION

The results of the study showed that the infant's body temperature before kangaroo care was 36.075°C, but the temperature increased by 0.663°C after the intervention. This indicates that the kangaroo care method had an effect on the average outcome of the intervention by 0.663°C after the intervention.

These results align conducted with research entitled "The Effectiveness of the Kangaroo and Nesting Methods in Increasing Body Temperature in Low-Birth-Weight Infants," where infants had an average body temperature of 35.580°C before receiving kangaroo care, and an average temperature of 36.176°C after kangaroo care. Body temperature is the difference between the amount of heat produced by the body and the amount of heat lost to the environment. Heat loss in newborns is normal. Kangaroo care can prevent heat loss in infants through skin-to-skin contact between mother and baby through conduction and radiation. This is because the kangaroo method requires direct skin-to-skin contact between the baby and the mother (Azzahraa et al., 2022).

Kangaroo care is a method of caring for a newborn in which the baby is placed between the mother's breasts, allowing direct skin-to-skin contact between the mother and the baby (Mirah et al., 2023). Kangaroo care increases the baby's body temperature and also enhances father-child and mother-child bonding (Azzahraa et al., 2022).

According to researchers, the body temperature of low birth weight (LBW) babies before kangaroo care is generally below normal (<36.5°C) because

low birth weight babies have less body fat, making it more difficult to maintain a warm body temperature. After kangaroo care, the baby's body temperature can increase because skin-to-skin contact between the mother and the baby maintains a stable body temperature. This position allows the mother to use her body temperature to warm the baby. The mother's skin also acts as a natural thermoregulator for the baby, preventing hypothermia and providing a sense of comfort, security, and necessary stimulation. Because not all low-birth-weight babies have access to advanced healthcare, kangaroo care is a free therapy that mothers can perform.

The results showed that the average body temperature of low-birth-weight babies before the intervention was 36.169°C, and after the intervention, the average was 36.494°C. This means there was an average increase of 0.325 between the intervention results before and after. This indicates that the nesting method after the intervention had an effect on the average intervention results of 0.325.

Hypothermia is caused by low birth weight. Incomplete organ function, such as thermoregulation, low subcutaneous fat, thin and transparent skin, and body surface area greater than birth weight, are signs of LBW. A poor ability to regulate heat production and loss is another condition that can lead to hypothermia (Suryani, Shifa, & Yuliza, 2023).

According to researchers, the body temperature of low-birth-weight babies is highly susceptible to hypothermia, leading many babies to be born directly in incubators. In this study, the use of nesting proved that it could support the baby's body and provide a comfortable space, preventing frequent movement, which ultimately helps maintain body temperature and calorie expenditure.

Effectiveness testing using an independent t-test showed that the kangaroo method had a mean value of 36.74°C, while the nesting method had a mean value of 36.49°C. Based on the results, the kangaroo method was more effective than the nesting method.

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This is indicated by the average values obtained, with a difference of 0.25.

Low Birth Weight (LBW) babies are susceptible to hypothermia because their subcutaneous fat is very thin, making them easily affected by environmental temperature. One way to maintain temperature stability in low-birth-weight babies is through Kangaroo Mother Care (Mirah, Udayani, & Karuniadi, 2023). The prevalence of premature birth and low birth weight (LBW) in Indonesia remains quite high, raising serious concerns. Babies weighing less than 2,500 grams are considered low birth weight. The quality of a child's growth and development is compromised due to impaired vital organ function caused by LBW. The nesting method is used to manage LBW (Ginting, Sari, Ginting, Tobing, Sigalingging, & Suri, 2023).

Bayi berat lahir rendah di Indonesia masih tergolong tinggi dan masih menjadi perhatian serius. BBLR mengakibatkan gangguan fungsi vital organ yang berahir pada penurunan kualitas proses pertumbuhan dan perkembangan anak. Penanganan BBLR yang dianjurkan adalah penggunaan nesting. Asuhan Keperawatan menggunakan Evidence Based Nursing Practice Terapi nesting ini bertujuan untuk mengetahui perubahan suhu tubuh, saturasi oksigen, dan frekuensi nadi bayi berat lahir rendah (Pratama & Sulistyawati, 2022).

Previous research results showed that based on the calculation of the Mann Whitney Test statistic with a significance level value of <0.05 , the result of $P = 0.330$ was obtained in the analysis of differences in oxygen saturation between nesting and the kangaroo method. Meanwhile, the analysis of differences in pulse frequency between nesting and the kangaroo method obtained a result of $P = 0.828$. Therefore, the provision of nesting intervention or the kangaroo method can be given in the care of LBW. Nesting intervention and the kangaroo method can also be given alternately to the same LBW, to obtain optimal results (Anggraini, 2021).

CONCLUSION

Based on the results of the univariate analysis, it was found that the baby's body temperature before the kangaroo method was 36.075°C , while the nesting method was 36.169°C . In addition, the baby's body temperature after the kangaroo method was

36.738°C , while the nesting method was 36.494°C . Based on the independent t-test, it showed that the kangaroo method had an average value of 36.74°C , while the nesting method had an average value of 36.49°C . The results showed that the kangaroo method was more effective than the nesting method.

SUGGESTION

This research is expected to help improve the knowledge and skills of midwives in nesting methods and kangaroo care for LBW babies.

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