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THE EFFECT OF KANGAROO MOTHER CARE ON BODY TEMPERATURE IN INFATS WITH LOW BIRTH WEIGHT

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ABSTRACT
The main problem experienced by babies born with low birth weight is due to the immaturity of the baby's organs as a whole. Infants who are unable to maintain body temperature due to lack of subcutaneous fat will experience hypothermia. Kangaroo mother care is an innovation with an approach between mother and baby. The purpose of this study was to determine the effect of KMC on increasing the body temperature of infants with LBW. Method: This research uses a quantitative method, Quasy Experiment design with One-group pretest and post test. Results: The results of temperature measurements after the kangaroo method intervention have increased in 30 respondents or all respondents and the ρ-value= 0.000 <0.05 from the table shows the Asymp. Sig 0.000 <0.05 which means H1 is accepted and H0 is rejected. Conclusions : Kangaroo Mother Care is done only once in low birth weight babies, there is a difference in body temperature before and after being given Kangaroo Mother Care which is done for 1 hour (60 minutes).

Keywords: hypothermia; kangaroo mother care (KMC); low birth weight (LBW)

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INTRODUCTION

World Health Organization (WHO) data shows that the prevalence of low birth weight babies in the world is 15.5% or around 20 million babies born each year, in developing countries around 96.5%. Indonesia is ranked 9th in the world with the incidence of Low Birth Weight (LBW) even more than 15.5% in every baby born every year. Indonesia is also ranked in the top 10 in the world for the highest number of low birth weight babies, while regions in South Asia such as India and Bangladesh have the highest cases.(WHO, 2023)Based on the 2018 basic health research report on the measurement of the proportion of birth weight in children aged 0-59 months, it is known that in Indonesia there are 6.2% of babies who have low birth weight <2500 grams and NTT province is in the top 5 provinces with the highest number of LBW with a percentage of 8.4%(Kementrian Kesehatan RI, 2018). Based on district or city health profile report data, it was recorded that the number of low birth weight babies (BBLR) was 3.3%, the highest presentation was in Sikka District 7.8%, the lowest presentation was in Manggarai and Sabu Raijua 1.0%.(Badan Pusat Statistik NTT, 2021)

Based on data from preliminary studies conducted at Mamami Hospital, the results obtained from the register book, especially in the NICU room, the number of infant patients in 2022, with a total of 400 and in 2023 with a total of 300 infant patients. While those who experienced Low Birth Weight (LBW) in the last 2 years where in 2022 the number of cases of Low Birth Weight Infants (LBW) was 130 cases, while in 2023 the number of cases of Low Birth Weight Infants (LBW) was 108 cases.Infants are a category of children with an age range of 0-12 months, infancy is included in the golden period as well as the critical period of a child's development. This is because the growth and development of neonates lasts very

short and cannot be repeated, so they are at risk of disease and can reach death. Infant mortality rate (IMR) is a commonly used indicator to determine the degree of public health, both at the provincial and national levels. One of the main causes of infant mortality is Low Birth Weight Infants (LBW).(Kurniawati, Lestari, & Saputri, 2023)

The main problem experienced by babies born with low birth weight occurs because of the overall immaturity of the baby's body. Babies born with LBW will experience disorders of the cardiovascular system, difficult breathing and disorders of the thermoregulatory system(Hapriani, Udiani, & Difha, 2023). Other causes of morbidity and mortality of LBW are asphyxia, infection and hypothermia(Y. Damayanti, Sutini, & Sulaeman, 2019). Hypothermia has also been shown to be a risk factor for neonatal sepsis, intra-ventricular hemorrhage, and necrotizing enterocolitis. Hypothermia in newborns is common worldwide with prevalence ranging from 32 to 85 percent. The incidence of neonatal hypothermia is much higher in developing countries. Hypothermia is a condition of body temperature below normal. The normal temperature of babies in neonates is 36.5oC-37.0 °C (axillary temperature) and hypothermia below 36.0.oC.(Parti, Malik, & Nurhayati, 2020)(Thakre & Murki, 2020)Hypothermia in infants occurs due to the inability to maintain heat production in the infant's body and shivering, at least inadequate subcutaneous fat (brown fat), and an immature body temperature regulating nervous system. In addition, the baby's surface area will decrease, accelerating heat loss. LBW infants have only thin adipose tissue and decreased flexibility, requiring a hotter environment to reach normal temperature.(Sapurtri, Handayani, & Nasution, 2019)

In 2014, the State of Vietnam introduced early essential newborn care (EENC), a package of evidence-based interventions in newborns including immediate thorough drying, sustained skin-to-skin contact, delayed cord clamping, promotion of early exclusive breastfeeding, resuscitation of non-breathing infants, and “Kangaroo mother care” (KMC). Central to this approach is sustained skin-to-skin contact between mother and baby (“first hug”), which provides warmth and encourages no separation.(WHO, 2023)Traditionally, interventions for LBW babies have mainly used expensive incubators. However, a recent innovation for LBW care that promotes closeness between baby and mother is kangaroo mother care (KMC). This method involves direct skin-to-skin contact between baby and mother, providing gentle and effective care that helps alleviate the various stresses that premature babies may experience during treatment in the intensive care unit. A baby finds its safest sanctuary in the arms of its mother, where her embrace provides great comfort, encouraging relaxation and a sense of well-being. Building a strong bond between mother and baby is very important during the early stages of a baby's life. (Mehrpisheh et al., 2022)(D. S. Damayanti, Deviana, & Primadani, 2024). The purpose of this study was to determine the effect of KMC on increasing the body temperature of neonates with LBW. Based on the above background, it can be concluded that the problem in this study is the effect of applying the kangaroo method on body temperature in infants with Low Birth Weight (LBW) in the NICU room of Mamami Hospital Kupang.

METHOD

The research method used is quantitative method, *Quasy Experiment*design al *One-group pretest and post test design* approach where in this study provides treatment and examines changes caused by the treatment given. The sample in this study were LBW babies <2500 grams and temperatures below 36.5 ° C in the NICU Room of Mamami Kupang Hospital with a total of 30 respondents. The sampling technique in this study using *accidental sampling* is *accidental sampling* by taking respondents who happen to be in a place that matches the

research site. This study only uses 1 group, namely the intervention group. Before the study, the test will measure the baby's body temperature in the axilla using a thermometer. After that, the researcher teaches and recommends mothers to do the KMC for 60 minutes. After the mother has done the KMC, the researcher will measure the baby's body temperature again. The interventions in this study each used standard operating procedures for measuring body temperature and the KMC.

This study uses standard operating procedures for kangaroo mother care and observation sheets which include baby weight, baby length, and body temperature measurements before and after KMC intervention. Data analysis used univariate and bivariate analysis. In the bivariate analysis, researchers first conducted a normality test with the Shapiro-wilk test because the sample in the study was relatively small. Researchers conducted a data normality test and the results showed that the data was not normally distributed so that the alternative test used was the Wilcoxon test to analyze the results of body temperature measurements before and after the KMC intervention. This study used the ethical principles of *Anonymity, Confidentiality, Justice, Benefincence* and *Non-maleficence.* Before conducting the study, the researcher provided an informed consent sheet. The inform consent sheet contained the purpose and benefits of this study for the respondents.

RESULT

Respondent Characteristics

Table 1.
Frequency distribution table of respondent characteristics

Classification	f	%
Gender		
Male	20	66.7
Female	10	33.3
Age at birth		
Infant 2 days	7	23.3
Infant 3-4 days	13	43.3
Infant 5-10 days	8	26.7
Infant 11-12 days	2	6.7
Body Weight		
1300-1400	2	6.7
1500-1900	16	53.3
2000-2300	11	36.7
2400	1	3.3
Body Length		
40-41	8	26.7
42-43	8	26.7
44-45	11	36.7
46-47	2	6.7
48	1	3.3

Based on table 1, the gender characteristics of male babies totaled 20 people (66.7%) and female babies totaled 10 people (33.3%). Characteristics of respondents based on age of birth, showing the majority of babies aged 3-4 days with a total of 13 people (43.3%) and a minority of babies aged 11-12 days totaling 2 people (6.7%). Characteristics of respondents based on body weight showed that infants with a body weight of 1500-1900 kg amounted to 16 people (53.3%) while infants with a body weight of 2400-<2500 kg amounted to 1 person (3.3%). Characteristics of respondents with a body length of 44-45 cm amounted to 11 people (36.7%) while respondents with a body length of 48 cm amounted to 1 person (3.3%).

Body temperature of infants before being given the KMC in the NICU Room of Mamami Hospital

Table 2.
Body temperature table before being given the KMC

	f	Mean	Median	Modus
Temperature before KMC	30	35.11	35.00	35

Based on table 2, it is known that the body temperature of 30 infants with LBW, before being given KMC is the mean or average value of body temperature, namely 35.11^{o}C, median 35.00 ^{o}C.

Body temperature after being given the KMC in the NICU Room of Mamami Hospital

Table 3.
Body temperature table after being given the KMC

	f	Mean	Median	Modus
Temperature after KMC	30	36.49	36.50	36

Based on table 3., it is known that the body temperature of 30 infants with LBW, after being given KMC is the mean value or general average body temperature of 36.49^{o}C.

Bivariate Analysis

Table 4.
Normality Test

Test Of Normality			
	Shapiro-Wilk		
	Statistic	N	Sig.
Before KMC	.640	30	.001
After KMC	.555	30	.000

Total respondents in this study was 30 respondents so the researchers used the Shapiro-wilk test to test the normality of the data because of the relatively small number of respondents.

Table 5.
Effect of KMC on Body Temperature in the NICU room of Mamami Hospital

		N	Mean Rank	Sum of Ranks	*P value*
Temperature after KMC - Temperature before KMC	Negative Ranks	0[a]	.00	.00	
	Positive Ranks	30[b]	15.50	465.00	0,000
	Ties	0[c]			

Based on the results of the analysis, there is an increase in body temperature characterized by an increase in the median value before and after as evidenced by the *Wilcoxon signed ranks test*, the results of this study have a *Positive ranks* value or the results of temperature measurements after the KMC intervention have increased in 30 respondents or all respondents and the *ρ-value*= 0.000 <0.05 from the table shows the Asymp. Sig 0.000 <0.05 which means H1 is accepted and H0 is rejected, it can be concluded that there is a difference before and after being given the KMC, meaning that there is a significant effect on changes in baby body temperature before and after being given the KMC.

DISCUSSION

Infant Temperature Before Being Given the KMC in the NICU Room

Based on the results of the study, it is known that the body temperature before being given Kangaroo Method Treatment in neonates with Low Birth Weight (LBW) as many as 30 respondents experienced hypothermic temperatures and the average body temperature of

infants is around 35.11 ºC. based on the classification of the severity of hypothermia, the average LBW baby in this study is included in moderate hypothermia. Babies with low body weight will also quickly experience hypothermia and are prone to infection. babies with low birth weight will be very vulnerable to disorders that will be very vulnerable to experiencing limitations in adjusting their body temperature, babies will also be very at risk of hypothermia this is because the subcutaneous fat tissue is still very low and the surface on the body is larger than in babies born with sufficient weight in general.(Hapriani et al., 2023)LBW infants often experience fluid and heat deprivation in the early days of life outside the womb, making them vulnerable to dehydration and hypothermia. The immaturity of the infant's skin leads to skin fluid deprivation or trans epidermal water loss (TEWL). Premature and LBW neonates are particularly susceptible to hypothermia due to their greater surface area to body mass ratio, lower body fat tissue and immature thermoregulatory mechanisms. Maintaining normothermia in LBW neonates involves reducing heat loss from convection, conduction, radiation, and evaporation.(Mishra, August, Walker, Jani, & Tracy, 2024)

In line with research conducted by Pertiwi (2022) which suggests that LBW babies cannot regulate temperature perfectly in the face of changes in the environment of intrauterine life to extrauterine life. The cold temperature causes LBW babies to use brown fat reserves to produce heat. LBW have low subcutaneous fat tissue, brown fat and glycogen storage and are therefore at risk of body temperature instability. LBW infants have less muscle mass, fewer brown fat reserves, less subcutaneous fat to store heat and less ability to control skin capillaries. This causes LBW to easily experience body heat loss and is at risk of hypothermia. Hypothermia is a danger sign because it can cause changes in body metabolism which will end in heart and lung function failure and death.(Pertiwi & Rizona, 2022) Researchers assume that low birth weight babies who weigh <2500 are very vulnerable to cold because low birth weight babies have thin skin fat so they are easily cold.

Temperature After Being Given the KMC in the NICU Room

Based on the results of the study, it is known that the body temperature of low birth weight babies who experience hypothermia after being given the kangaroo method by the mother for 1 hour, it is known that 30 babies experienced an increase in body temperature characterized by an average temperature value of 36.49ºC, thus proving an increase in body temperature from moderate to mild severity.In line with research conducted by Astuti (2021) also suggests that the KMC can be performed on infants who experience body temperature instability on average for one hour(Astuti & Suryatama, 2021). KMC method includes: give the baby clothes, hats, diapers and socks that have been warmed first, then position the baby on the mother's chest, with an upright position directly to the mother's skin making sure the baby's head is fixed on the mother's chest. The mother is expected to wear clothes with a size larger than the mother's body, and the baby is placed between the mother's breasts, cupped clothes, then the mother wears a scarf wrapped around the mother's stomach so that the baby does not fall. During the KMC, the mother can stand, sit or lie down. The mother can move freely, even if she is standing, sitting, walking, eating and chatting. At bedtime, the mother can be positioned half-sitting or by placing several pillows behind her back. If the mother needs to rest, she can be replaced by another person.(Narciso, Beleza, & Imoto, 2022) (Kavitha, 2021)

Several studies have assessed the efficacy and safety of KMC in infants born preterm before 28 weeks of gestation. Some studies have shown maintenance of normal temperature (0.2-0.3°C increase compared to conventional care in an incubator), hemodynamic stability, and safety during KMC in very preterm newborns.(Fernández-Medina et al., 2024)(Koreti & Muntode Gharde, 2022)Researchers assume that KMC has an influence in increasing body

temperature in neonates. Although this study only conducted a kangaroo method intervention for 1 hour, the results of measuring body temperature proved that there was an increase in temperature of ± 1.38° C. This is supported by the results of research conducted by Thidarat which suggests that the duration of KMC is at least 1 hour, depending on the stability of the baby's body temperature and the mother's endurance. Kangaroo care can make mothers close to their babies and feel warm with their babies after being separated from them after giving birth. Kangaroo care is good for the mother, as it helps support the relationship between mother and premature baby and also affects the secretion of oxytocin, which is the hormone of love, and causes the mother to accept the child, resulting in satisfaction in parenting.(Eksirinimit, Punthmatharith, Bansopit, & Kusol, 2023)

Effect of KMC Application on Infants with Low Birth Weight (LBW)

The results of the research analysis are an increase in body temperature characterized by an increase in the mean median mode value and high positive ranks after the KMC is performed. Infants with low birth weight will quickly lose body heat and become hypothermic, because the body heat regulation center has not functioned properly, the metabolism is low, and the body surface is relatively large. Therefore, neonates should be given the kangaroo method which is an appropriate therapy to stabilize the baby's body temperature.Research conducted by Nimblakar (2014) suggests that many newborns die before stabilization and acclimatization to the environment before the first 3 days of life. KMC is an alternative to incubators and radiant heating in reducing heat loss in stabilized newborns. Even where such resources are available, it may be a better alternative due to possible neurodevelopmental benefits. As early KMC reduces the incidence of hypothermia in newborns in the first 48 hours of life, it may contribute to reducing neonatal mortality from hypothermia.(Nimbalkar et al., 2014)(Kulkarni, 2021)

The timing of the start of Kangaroos Mother care is important as it is usually started after the baby is stabilized. WHO guidelines also recommend initiation of kangaroo mother care after clinical stabilization. However, stabilization of LBW infants can take anywhere from hours to days, depending on gestation, birth weight and general condition at birth. The average age at which kangaroo mother care is initiated varies widely from 3 to 24 days. KMC should be provided while the infant is still being cared for in a health facility or at home and started within the first 24 hours of life.(Sivanandan & Sankar, 2023)(Calibo et al., 2021) Infants with LBW have a need to maintain a warm body temperature and one way is by KMC. KMC is skin-to-skin contact between mother and baby which causes the baby to get a warm environment like in the mother's womb. KMC requires support from health workers to build the knowledge and motivation of mothers, husbands, and families so that mothers want to carry out this method properly according to the SOP. In KMC, if the baby is cold, the temperature will rise 2°C and if the baby is overheated, the temperature will drop 1°C. So it can be concluded that the mother is able to control the baby's body temperature better than the incubator. (Agusafutri et al., 2022).(Aggusafutri et al., 2022)(Cai et al., 2022)

The researcher assumed that KMC performed with the right procedure is very beneficial for increasing the body temperature of LBW babies. Some studies have shown that KMC performed 2-3 times a day can increase the body temperature of LBW babies, but in this study we want to show that even if KMC is only performed once, there is already a positive effect that can be felt by LBW babies and can be repeated every time the baby feels cold or the results of measuring the baby's body temperature show hypothermia.

CONCLUSION

It turns out that although KMC is done only once in LBW babies, there is a difference in body temperature before and after KMC is given for 1 hour (60 minutes). The implementation of KMC requires cooperation from various parties including health workers and families so that mothers are motivated to do KMC properly according to standard operating procedures so that the outcomes obtained are the baby's body temperature increases or within the normal range.

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