

The Effects of the use of Incubator, Kangaroo Care Method, Plastic Wrap, and Nesting on Increasing Temperature of Low Birth Weight Babies in NICU / NHCU Prof. Dr. W.Z. Johannes Regional Public Hospital Kupang in 2020

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ABSTRACT

Introduction: Hypothermia in low birth weight babies can increase the risk of morbidity and mortality in infants. Incubators can be used to maintain the body temperature of low birth weight babies, but not all health facilities have incubators or the number is limited. There are several other treatment methods to maintain the stabilization of low birth weight babies body temperature, including through the kangaroo care method, plastic wrap, and nesting. Objective: To analyse the effects of using an incubator, kangaroo care method, plastic wrap and nesting on the increase in body temperature of low birth weight babies in the NICU / NHCU Prof. DR. W.Z Johannes Regional Public Hospital Kupang.

Material and methods: The research design used was a quasi-experiment with pre and post-test without control with a 2x2 cross over design of 40 samples for 2 months. The bivariate data analysis technique used the Wilcoxon test.

Results: Bivariate analysis showed that the intervention for 2 hours increased body temperature by 0.60 ° C with incubator treatment, kangaroo care 0.40 ° C, plastic wrap 0.80 ° C, and nesting 0.30 ° C. The results of statistical tests on the four methods obtained the value of $p = 0.000$, so that there were differences in body temperature before and after treatment with the incubator, kangaroo care method, plastic wrap, and nesting.

Conclusion: There is an effect of increasing body temperature of low birth weight with incubator treatment, kangaroo care method, plastic wrap, and nesting. Suggestion: Treatment for prevention of hypothermia for low birth weight babies in Health Facilities that do not have an incubator can use the kangaroo care, plastic wrap, and nesting methods.

Keywords: Low Birth Weight, Body Temperature, Incubator, Kangaroo Care Method, Plastic Wrap, Nesting

there were 50 babies died (27.3%), out of 394 babies there were 70 babies died (17.8%), and out of 311 babies there were 66 babies died (21.2%). Based on medical record data at Prof. DR. W.Z Johannes Regional Public Hospital Kupang in 2018, 70 babies died and 58 babies with initial problems with hypothermia and continued to other complications. The use of incubators has many limitations, in addition to being limited in number, requiring high maintenance costs and having skilled workers capable of operating them, and also requiring trained nurses to care for babies.⁴

Low birth weight care in Indonesia still prioritizes the use of incubators, but their existence is still very limited. This causes the morbidity and mortality of low birth weight to be very high, not only due to the condition of prematurity, but also exacerbated by hypothermia and nosocomial infections. Hypothermia in low birth weight babies can increase the risk of death in infants. However, organ damage is also a factor in the high risk of morbidity in low birth weight babies with hypothermia, such as hyaline membrane disease, aspiration pneumonia, intraventricular bleeding, retrolental fibroplasia, retinopathy of prematurity (ROP), hyperbilirubinemia, and NEC (necrotizing enterocolitis). All complications that occur in low birth weight babies are preceded by hypothermia.⁵

Methods

This study used a quasi-experimental research method. The research design used was a quasi experiment with pre and post test without control with a cross over design. The cross over design is an experimental design where each experimental subject receives several treatments for different time periods. The experiment meant here is the use of an incubator, the kangaroo method, plastic wrap and nesting to increase body

INTRODUCTION

The results¹ show that the prevalence rate of low birth weight in Indonesia was 6.8% and varies greatly from province to province, ranging from 2.6 - 8.9%. The lowest prevalence was in Jambi at 2.6% and the highest was in Southeast Sulawesi at 8.9%. The prevalence rate of low birth weight in NTT in 2018 was 8.4%. This figure is quite high and shows that low birth weight is a major health problem.

Furthermore, according to data² the main causes of neonatal death were low birth weight (30.76%), asphyxia (26.6%) and infection (31.5%). Medical record data for the incidence of low birth weight³ in 2017, 2018, 2019 was out of 289 babies

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temperature in low birth weight babies (LBW) by comparing the pre-test and post-test values. The population in this study were all babies born with low birth weight who were treated in the NICU / NHCU ward at the Prof. = $r \geq 16$. In this study, 20% is anticipated so that $r \geq 16 + 20\% = 20$ samples for each group with the sampling technique used in this study is non probability sampling.

The research was conducted from April 2020 to June 2020 with the research location in the NICU / NHCU treatment room at Prof. DR WZ Johannes Kupang Hospital. The type of data used in this study is primary data with the independent variables being incubator care, kangaroo method, plastic wrap and nesting, while the dependent variable is body temperature of low birth weight. The instruments used in this study were a digital thermometer with a temperature of degrees Celsius, a stethoscope, paper and stationery, an incubator / baby box, a wall clock with a second hand, a baby scale with the research procedure consisting of experimental preparation and experiment implementation. The data analysis used was univariate analysis and bivariate analysis using the Wilcoxon statistical test. This study has passed the ethics test based on the decision of the health research ethics commission, Faculty of Medicine, University of Nusa Cendana Kupang with Number: 17 / UN15.16 / KEPK / 2020.

RESULT

A. Description of the Characteristics of Research Subjects
 Characteristics of research subjects include gender,

gestational age, type of delivery, Apgar Score assessment, and birth weight. The research subject referred to here is low birth weight babies. The results of the analysis are presented in the percentage table-1.

Table 1 show that most of the respondents were female which were 21 babies (52.5%), born with a gestational age <37 weeks (preterm) 34 babies (85.0%), 27 babies were born

Variable	n (40)	(%)
Gender		
Male	19	47,5
Female	21	52,5
Gestational Age		
Preterm	34	85,0
A term	6	15,0
Type of Delivery		
Spontaneous Vaginal Delivery	13	32,5
Caesarean section	27	67,5
Apgar Score Assessment		
Mild Asphyxia	36	90,0
Moderate Asphyxia	3	7,5
Severe Asphyxia	1	2,5
Birth Weight		
Low Birth Weight	28	70,0
Very Low Birth Weight	11	27,5
Extremely Low Birth Weight	1	2,5

Table-1: Characteristics of Respondents in the NICU / NHCU Prof. DR.W.Z. Johannes Regional Public Hospital Kupang in 2020

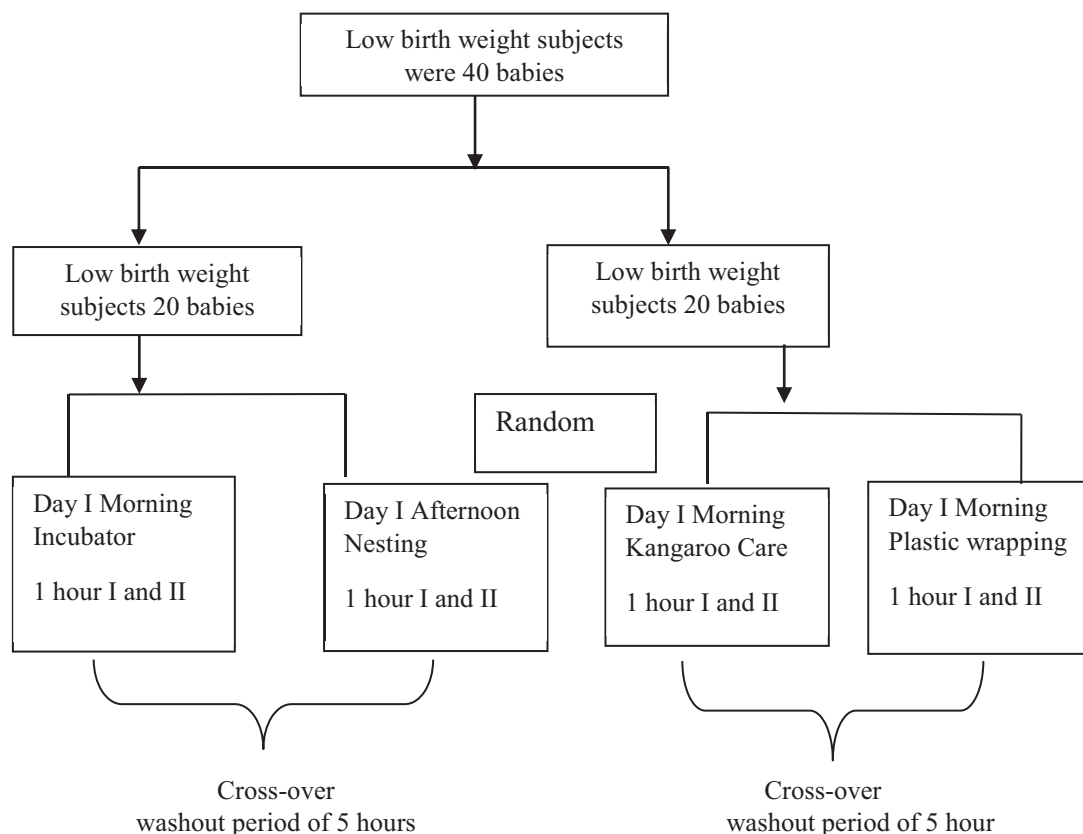
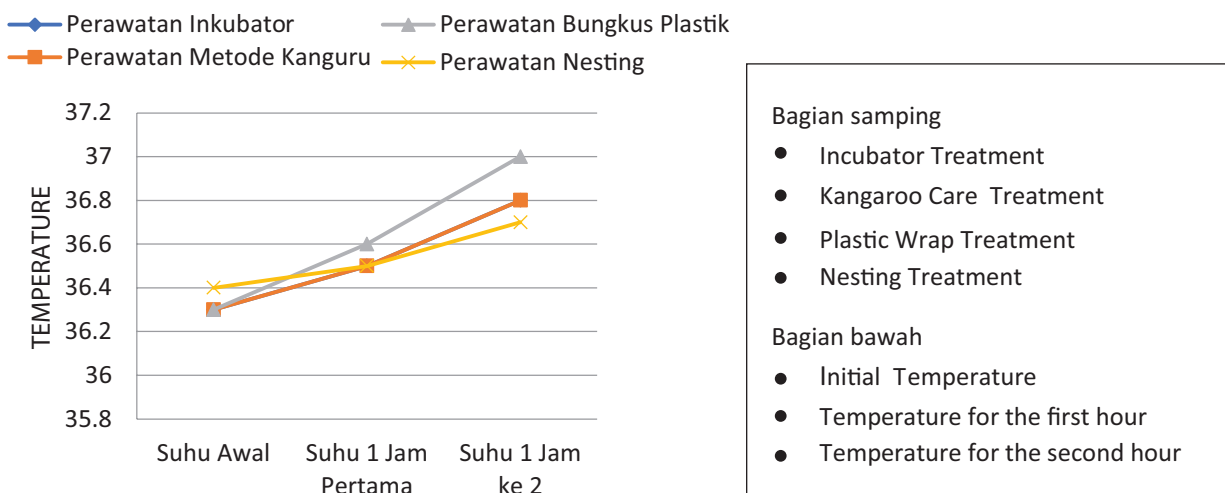


Figure-1: Types of research subject treatment



Graph-1: The body temperature average of low birth weight pre and post treatment

Variable	Average body temperature for the first hour (°C)		Average body temperature for the second hour (°C)	
	Pre	Post	Pre	Post
Low Birth Weight (n=28)				
Mild Asphyxia	36,5	36,8	36,8	37,2
Moderate Asphyxia	36,6	36,9	36,9	37,2
Severe Asphyxia	0	0	0	0
Very Low Birth Weight (n=11)				
Mild Asphyxia	36,1	36,3	36,3	36,7
Moderate Asphyxia	0	0	0	0
Severe Asphyxia	36,2	36,5	36,5	36,9
Extremely Low Birth Weight (n=1)				
Mild Asphyxia	0	0	0	0
Moderate Asphyxia	36,0	36,2	36,2	36,5
Severe Asphyxia	0	0	0	0

Table-2: Characteristics of Respondents Based on Body Weight and Apgar Value on the increase in body temperature in the NICU / NHCU Prof. DR.W.Z. Johannes Regional Public Hospital Kupang in 2020

Variable	n	Average (°c)	Minimum-Maximum Temperature (°C)
Temperature before treatment	80	36,3	35,6-37,0
Temperature 1 hour of treatment		36,5	35,9-37,2
Temperature 2 hours of treatment		36,8	36,2-37,5
Incubator Treatment	20		
Temperature before treatment		36,3	36,0-36,6
Temperature 1 hour of treatment		36,5	36,2-36,9
Temperature 2 hours of treatment		36,8	36,5-37,2
Kangaroo Care Treatment	20		
Temperature before treatment		36,3	35,6-37,0
Temperature 1 hour of treatment		36,5	35,9-37,1
Temperature 2 hours of treatment		36,8	36,3-37,3
Plastic Wrap Treatment	20		
Temperature before treatment		36,3	36,0-36,9
Temperature 1 hour of treatment		36,6	36,3-37,2
Temperature 2 hours of treatment		37,0	36,6-37,5
Nesting Treatment	20		
Temperature before treatment		36,4	36,0-36,7
Temperature 1 hour of treatment		36,5	36,2-36,8
Temperature 2 hours of treatment		36,7	36,2-37,2

Table-3: Distribution of the average temperature of respondents before and after being given treatment in the NICU / NHCU at RSUD Prof. DR.W.Z. Johannes Regional Public Hospital Kupang in 2020

Variable	Average temperature difference (pre-post)	Median (Minimum-Maximum (° C))	p-value
Incubator			0,000
Temperature before	0,6	36,3 (36,0-36,6)	
Temperature after (2 hours of treatment)		36,9 (36,5-37,2)	
Kangaroo Care Method	0,4		0,000
Temperature before		36,3 (35,6-37,0)	
Temperature after (2 hours of treatment)		36,7 (36,3-37,3)	
Plastic Wrap	0,8		0,000
Temperature before		36,3 (36,0-36,9)	
Temperature after (2 hours of treatment)		37,1(36,6-37,5)	
Nesting	0,3		0,000
Temperature before		36,5 (36,0-36,7)	
Temperature after (2 hours of treatment)		36,8 (36,2-37,2)	

Table-4: Results of the Wilcoxon test analysis

by cesarean section (67, 5%), experienced mild asphyxia 36 babies (90.0%), and low birth weight (LBW) 28 babies (70.0%).

Table 2. show that in low birth weight with mild and moderate asphyxia there is an increase in body temperature to 37.2 ° C after 2 hours of treatment.

Figure 1 show that there were 40 research subjects with each treatment, the incubator method was cross-over with the nesting method and the kangaroo care method was cross-over with the plastic wrap method. This cross-over process requires a 5-hour washout period, with details of the treatment in the incubator method starting at 09.00 WITA and the cross-over nesting method starting at 15.00 WITA, as well as the other methods.

Table 3 show that the average temperature of the respondents before treatment was 36.3 ° C, with the lowest temperature was 35.6 ° C and the highest temperature was 37.0 ° C. While the average temperature of the respondents after 2 hours of treatment was 36.8 ° C with the lowest temperature was 36.2 ° C and the highest temperature was 37.5 ° C. Of the four treatments, the plastic wrap treatment had the highest average temperature increase after 2 hours of treatment, which was 37.5 ° C from the average initial temperature before treatment, which was 36.3 ° C. For more details, see the line chart below (graph 1).

B. Analysis of Subject's Body Temperature (Pre-Post)

This analysis used a two-variable bivariate test, which were the subject's body temperature before treatment compared with the subject's body temperature after treatment. Furthermore, to perform a different test before and after treatment the Wilcoxon test was used. The results of the bivariate analysis are presented in table form as follows:

Based on table 4 the results of the study shows that of the four interventions carried out, the intervention with plastic wrap method for 2 hours succeeded in increasing the temperature between 36.6 ° C-37.5 ° C. The results of statistical tests obtained p-value 0.000 <0.05, therefore it was concluded that there were differences in body temperature before and after plastic wrap treatment in the NICU / NHCU Prof. DR.W. Z. Johannes Regional Public Hospital Kupang. In other words, the results of this study prove the effect of

plastic wrap treatment on the increase in body temperature of low birth weight.

DISCUSSION

The Effect of Incubator Treatment on Increasing Body Temperature of Low Birth Weight Babies

The results of this study indicate that incubator treatment can increase body temperature of low birth weight babies to normal with an average body temperature increase of 0.6 ° C with a value of p = 0.000. Based on the characteristics, there was an increase in body temperature of 0.5 ° C-0.9 ° C in low birth weight, very low birth weight, and extremely low birth weight babies after 2 hours of incubator treatment. The results of this study are in line with research conducted ⁶ which stated that the use of an incubator could increase a baby's body temperature, but in the increase in the temperature reached 1.08 ° C / hour (p <0, 01). This can occur due to the opening of the incubator and the length of the maintenance procedure performed. In this study the researchers performed the procedure according to the protocol and did not open the incubator. The difference in the increase in body temperature in this study with ⁶ may be due to gestational age and birth weight where there are babies with very low birth weight and extremely low birth weight. In babies with low birth weight problems, body temperature is unstable because of the ability to retain heat and the ability to increase heat production is very limited due to inadequate muscle growth, low subcutaneous fat, immature body temperature regulating nervous system, body surface relatively wider than body weight so it is easy to lose heat.⁷

The Effects of the Kangaroo Care Method on Increasing Body Temperature of Low Birth Weight Babies

The results of this study indicate that the average increase in body temperature with kangaroo care treatment is 0.4 ° C with a value of p = 0.000. Based on the characteristics, there was an increase in body temperature of 0.5 ° C-0.7 ° C for low birth weight and very low birth weight after 2 hours of treatment with the kangaroo care method.

The results of this study are in line with research conducted ⁸ which showed that kangaroo care treatment could raise a baby's body temperature to the normal by 0.27 ° C with a

value of $p = 0.000$. Research conducted⁹ on 56 low birth weight babies which significantly showed differences in babies body temperature between the control group and the intervention group with p value <0.001 . Another study that supports the increase in body temperature of low birth weight babies after being treated with the kangaroo care method was reported¹⁰ who performed kangaroo care treatment for 1 hour per day on 16 respondents. As a result, the average increase in body temperature was 0.3°C with a p value <0.001 . The results of this study which have been compared with the research⁹ and it shows that the trend towards the difference in temperature increase where this study is higher (0.4 VS $0.27, 0.3, 0.3$). This can be caused by various factors including environmental conditions and the thickness of the fabric. According¹¹ kangaroo care treatment can cause the mother's body temperature to increase by 2°C if the baby is cold and can decrease 1°C if the baby is overheated. In this study, the researchers did not measure the thickness of the fabric and the differences to the environment.

In this study, the kangaroo care treatment was carried out for 2 hours on low birth weight babies. After 2 hours, the temperature was taken again to see if there was an increase in temperature after kangaroo care. This kangaroo care treatment is carried out by the biological mother, but if the biological mother is not available when she will do this treatment, then it is replaced by the family, in this case the biological father, or other family who is willing and has been given an explanation of the kangaroo care method. The researchers concluded that the kangaroo care method can be implemented in the application of nursing care to neonates, especially in conditions of limited incubators.

The Effect of Plastic Wrap on Increasing Body Temperature of Low Birth Weight Babies

The results of this study indicate that the average increase in body temperature with plastic wrap is 0.8°C with $p = 0.000$. Based on the characteristics, low birth weight and very low birth weight treated with plastic wrap method and it turned out that the body temperature increased by 0.7°C after 2 hours of treatment. This means that there is a significant difference between the temperature of low birth weight babies before and after the plastic wrap method. The results showed that the temperature after being given plastic wrap had increased. This is because the heat loss in low birth weight babies can be reduced by giving plastic wrap. Plastic is a material that is included in the polymer class which is thermoplastic. In Alicia's (2013) study, babies were placed in a linear low-density polyethylene bag measuring $10 \times 8 \times 24$ with a 1.2 mm thick unit covering the body and extremities. The placement of plastic wrap in this study was carried out after brief drying on the mother's stomach and after the umbilical cord was cut. Babies remain in plastic wrap for at least 1 hour after birth, this can prevent heat loss and thus reduce the risk of hypothermia in the newborn.

Pronoto's¹² showed that there was a significant difference in the increased in low birth weight babies temperature given the plastic wrap method with the body temperature of babies who are not given plastic wrap. Treatment with plastic wrap

will reduce heat loss due to evaporation and the possibility that radiation will not pass through the plastic barrier which can increase the baby's temperature. This is in line with the results of current research. The plastic wrapped around the baby will be airtight so that it will prevent the loss of heat from evaporation, radiation, conduction, and convection so that it will generate heat and increase the temperature.

Research¹³ at the University Teaching Hospital, Lusaka, Zambia showed that plastic wrap could prevent hypothermia in preterm and low birth weight babies. The use of occlusive polyethylene or plastic bag wrapping used at birth in the delivery room reduces hypothermia in low and very low birth weight babies.⁴

The Effect of Nesting on Increasing Body Temperature of Low Birth Weight Babies

The results of this study showed that the average increase in body temperature with nesting treatment was 0.3°C with a value of $p = 0.000$. Based on the characteristics, low birth weight and very low birth weight babies treated with the nesting method, the body temperature increased by 0.1°C - 0.3°C after 2 hours of treatment. The results of this study are in line with research conducted¹⁴ showing that the average body temperature of the respondents before being given nesting was 36.3°C and became 36.8°C after nesting. This means that there is an increase in body temperature by 0.5°C . The statistical test results obtained a p -value 0.000, therefore it could be concluded that there were differences in the body temperature of the respondents before and after the use of nesting.

These results indicate that the use of nesting is effective to increase the body temperature of low birth weight babies within the normal body temperature range, which is 36.0°C - 37.2°C . The results of this study are supported by research¹⁵ where the research was conducted on 60 respondents who were divided into 30 case respondents and 30 control respondents. The results of his research proved that low birth weight babies which were given nesting for 9 hours per day for 5 days showed that posture, comfort and physiological parameters (axillary temperature, pulse and respiration) showed a value which means that in this study, the nesting method on low birth weight babies is proven to be effective in improving growth, demonstrating comfort and stabilizing physiological parameters such as temperature, pulse and low birth weight babies respiration. The existence of the effect of nesting on body temperature of low birth weight babies based on the assumptions of researchers because nesting is able to provide comfort to babies. When nesting, low birth weight babies are able to maintain a flexed position. This is explained¹⁶ where this position supports self-regulation and increases hand-to-mouth and hand-grasping activity. In¹⁷ it is suspected that the flexion position in newborns serves as a safety system to prevent heat loss because this attitude reduces the exposure of the body surface to environmental temperatures. Based on explanations from several sources, the researchers conclude that the use of nesting is effective in making babies flex, which in turn can increase comfort and minimize heat loss due to exposure to outdoor environmental

temperatures.

CONCLUSION

This study was conducted to determine the effect of using an incubator, kangaroo care method, plastic wrap, and nesting on the increase in body temperature of low birth weight babies in the NICU / NHCU of Prof. DR.W. Z Johannes Regional Public Hospital Kupang in 2020. The conclusions of the research results are as follows:

There is an effect of using an incubator on the increasing in body temperature of low birth weight babies in the NICU / NHCU of Prof. DR.W. Z Johannes Regional Public Hospital Kupang.

1. There is an effect of the kangaroo care method on increasing the body temperature of low birth weight babies in the NICU / NHCU of Prof. DR.W. Z Johannes Regional Public Hospital Kupang.
2. There is an effect of plastic wrap on increasing the body temperature of low birth weight babies in the NICU / NHCU of Prof. DR.W. Z Johannes Regional Public Hospital Kupang.
3. There is an effect of the nesting method on increasing the body temperature of low birth weight babies in the NICU / NHCU of Prof. DR.W. Z Johannes Regional Public Hospital Kupang.

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