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(RESEARCH ARTICLE)

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The effectiveness of using plastic wrap and cloth swaddle methods to increase the body temperature of low-birth-weight infants with hypothermia

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Abstract

Hypothermia is a problem that LBW infants often experience. Hypothermia occurs because the baby's ability to maintain heat is minimal. It may be due to nonoptimal muscle growth, thin subcutis fat, little brown fat reserves, not yet optimal temperature-regulating nervous system, and the ratio of body surface area is relatively larger than body weight. This study aims to determine the effectiveness of plastic wrap and cloth swaddles methods in increasing the body temperature of LBW infants with hypothermia. The method used is a quasi-experimental approach with a two-group pre-posttest design. The sample in this study amounted to 30 infants, with 15 infants with plastic wrap intervention and 15 infants with cloth swaddling intervention, taken with accidental sampling technique. The results of the Wilcoxon test with $\alpha = 0.05$ showed a p-value of 0.001 in the plastic wrap intervention group and a p-value of 0.001 in the cloth swaddling intervention. In the Mann-Whitney test with $\alpha = 0.05$, the results obtained a p-value of 0.850. It was concluded that there was a significant difference between the temperature before and after the intervention of plastic wrap and cloth swaddle, which meant that there was an effect of using plastic wrap and cloth swaddling on the increase in body temperature of LBW infants with hypothermia. Using plastic wrap and cloth swaddles can increase the body temperature of LBW infants with hypothermia. There is no significant difference in the increase in LBW infants' temperatures given the plastic wrap intervention and the cloth swaddle intervention.

Keywords: LBW; Cloth swaddle; Plastic wrap; Body temperature

1. Introduction

One of the causes of infant death is Low Birth Weight (LBW). More than 1 million babies die every year in the world due to premature and LBW. The severity of the LBW problem causes the baby to be treated for a long time in the hospital, leading to increased hospital costs and disruption of interactions between family members. Hypothermia is a problem often encountered in the care of infants with low birth weight (LBW).

Hypothermia is one of the causes of death in newborns and low birth weight infants worldwide, including in Indonesia. Hypothermia occurs due to a decrease in body temperature caused by various conditions, primarily due to the high demand for oxygen and a decrease in room temperature. Low birth weight infants have subcutaneous fat, brown fat, and low glycogen stores, so they are at risk of experiencing body temperature instability (Lawn, 2013).

Several treatments for hypothermia in LBW infants include the incubator method, the kangaroo method, and the plastic bag/wrap method. The incubator method has constraints, namely the limited number of equipment, minimal skin-to-skin contact, and high costs (Notoatmojo, 2012; Maryunani, 2013). Meanwhile, the kangaroo method has several obstacles; namely, mothers who are not healthy enough after giving birth will not be optimal in carrying out this method. In addition, mothers who have just given birth are generally reluctant to apply the kangaroo method. Methods to

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maintain the body temperature of LBW infants to prevent hypothermia still need to be developed, especially those that are low in cost. One method that can be developed is the use of wrappers or plastic bags, or skin wrap. Plastic is a material included in the thermoplastic polymer material. Plastic will reduce heat loss due to evaporation and reduce the possibility of radiation so that it can increase the baby's body temperature (Rosdahl & Kowalski, 2014; Pranoto et al., 2018).

In Indonesia, the incidence of LBW is still high. Based on observations, the plastic bag method has been used in several hospitals to treat LBW patients with hypothermia. However, whether this method can increase a baby's body temperature is not yet known (Ministry of Health of the Republic of Indonesia, 2016).

Based on the above background, this research focuses on uncovering the effect of using skin wrap in increasing body temperature in LBW infants who experience hypothermia.

2. Research methods

This study used a quantitative method with a Quasy experiment with two groups, applying pretest and posttest control designs. The population of this study was 30 LBW infants treated in the Perinatology room at the Jombang Public Hospital. An accidental sampling technique was applied to take the sample. The independent variables in this study were plastic wrap and cloth swaddles, while the dependent variable was body temperature. The collected data were then analyzed using the dependent sample t-test.

3. Results

Table 1 Average body temperature before plastic wrap and cloth swaddle intervention

	N	min	max	mean	SD
pre-test plastic wrap	15	34.60	36.40	36.00	0.50
pre-test cloth swaddle	15	35.80	36.40	36.30	0.17

Table 2 Average body temperature after the plastic wrap and cloth swadde intervention

	N	min	max	mean	SD
post-test plastic wrap	15	35.30	37.30	36.00	0.46
post-test cloth swaddle	15	36.40	37.30	36.70	0.26

Table 3 Differences in the average increase in body temperature of infants using plastic wrap and cloth swaddles in the Perinatology Room, Jombang Public Hospital, in 2021

	Group	N	Mean rank	Sum of rank	P-value
Post ext control	1	15	15.80	237.00	
	2	15	15.20	228.00	0.850
	Total	30			

4. Discussion

4.1. Average Body Temperature Before Plastic Wrap and Cloth Swaddle Intervention

Table 1 shows that before the plastic wrap intervention, the respondents' temperature ranged from 34.60 ℃ to 36.40 ℃ (36.05 ℃ on average) with a standard deviation of 0.5055. Meanwhile, before the cloth swaddle intervention, the respondents' temperature ranged from 35.80 ℃ to 36.40 ℃ (36.27 ℃ on average) with a standard deviation of 0.1799.

In LBW infants, the risk of hypothermia is higher because they lose heat more quickly (Trevisanuto et al., 2018). Hypothermia occurs because the baby's ability to retain heat is limited due to suboptimal muscle growth. Heat production is reduced due to thin subcutis fat, and brown fat reserves are small. The not-yet-optimal nervous system that regulates body temperature also affects the temperature instability of LBW infants. The ratio of body surface area, which is relatively more extensive compared to body weight, and the immaturity of the temperature control center causes LBW infants to lose heat quickly.

Based on the research results above, it is assumed that plastic wrap and cloth swaddle methods can be applied to increase the body temperature of hypothermic LBW infants. Plastic bags wrapped in LBW infants are also airtight and prevent heat loss - either due to evaporation, conduction, radiation, or convection - and produce heat and increase body temperature (Trevisanuto et al., 2018). Baby swaddle is a technique of wrapping a baby's body using a blanket or swaddle. It is said that this technique can make the baby's body comfortable, warm, and protected, like when it is in the mother's womb or being hugged tightly (Sunarsih, 2012).

4.2. Average Body Temperature After Plastic Wrap and Cloth Swaddle Intervention

Table 2 shows the results of interventions using the Skin wrap and cloth swaddle methods for LBW infants who experience hypothermia. After intervention with the Skin wrap method, the body temperature of LBW infants who experienced hypothermia was between 35.30 ℃ and 37.30 ℃, with an average of 36.73 ℃ and a standard deviation of 0.4624. The intervention of cloth swaddles also increases LBW infants' body temperature, namely between 36.40℃ and 37.30 ℃, with an average of 36.71 ℃ and a standard deviation of 0.3195.

The results of this study are in line with Nofda Lelisma's research (2019) which showed that body temperature after skin wrap intervention was between 36.3 ℃ and 37.8 ℃, with an average of 37.040 ℃ and a standard deviation of 0.3851. With cloth swaddle intervention, the infants' body temperature was between 35.8 ℃ and 37.0 ℃, with an average of 36.387℃ and a standard deviation of 0.35 ℃.

The study's results also show that hypothermia can occur at any time in LBW infants. Plastic wrap can also be used to increase body temperature apart from the kangaroo mother care method. Plastic has flexible, watertight, and airtight properties. In addition, plastic is usually transparent, making it easy to monitor infants. The use of plastic wrap effectively reduces evaporation in infants by providing epidermal protection so that the body area exposed to outside air is reduced. This effectively reduces the release of the baby's body heat because the type of plastic used is polyethylene (Trevisanuto et al., 2018; Bobak et al., 2007; Leadford, 2013).

Cloth swaddling in infants can also increase the body temperature of LBW infants with hypothermia. From the research results, cloth swaddles can gradually increase the body temperature of infants from 36.240℃ to 36.707℃. However, there are some drawbacks, namely that infants are more challenging to observe, for example, their skin color.

4.3. The effect of plastic wrap and cloth swaddles on increasing the body temperature of LBW infants with hypothermia

Table 3 shows the results of the Wilcoxon test in the experimental group using the plastic wrap method. The test results obtained a $p = 0.001$ ($\alpha = 0.05$), indicating that the use of plastic wrap increased the body temperature of LBW infants with hypothermia.

The results of this study align with the research of Heni Hirawati (2018), which states that there is a significant difference between the increase in body temperature of newborns who use the intervention method of plastic bags and those who do not use plastic bags. The provision of plastic bags to newborns is proven to reduce heat loss due to evaporation, and radiation may not be able to pass through the plastic barrier, so it can increase the infant's body temperature.

The Wilcoxon test in the group with the cloth swaddle intervention obtained a $p = 0.001$ ($\alpha = 0.05$), which means that the use of cloth swaddles also increased the body temperature of LBW infants with hypothermia. These results are in line with Nofda Lelisma's study (2019), which stated that cloth swaddling interventions significantly increased newborns' body temperature. Swaddle is a cloth wrap given to infants. Swaddling can make infants calmer and warmer

and limit the baby's space for movement. Swaddling the baby aims to prevent the baby from losing heat and stabilizes his body temperature (Casman, 2018; Sunarsih, 2012).

Using cloth swaddles for infants can increase the body temperature of LBW infants who experience hypothermia. However, there are several drawbacks, namely that it is more difficult to observe the baby, especially regarding skin color, baby's movements, breathing conditions, and whether there are seizures in the baby.

4.4. The average increase in infants' body temperature with the plastic wrap and cloth swaddle methods

The plastic wrap method intervention obtained a mean value of 80.47% (>76%). This shows that plastic wrap effectively increases the body temperature of LBW babies who experience hypothermia.

The use of plastic wrap is the cheapest innovation to prevent hypothermia in LBW. These plastic wraps can be widely used on limited resources due to their affordability and accessibility.

The American Heart Association recommends placing LBW babies born before 30 weeks gestation in polyethylene bags or wrapping them immediately after birth. These materials should cover the baby up to their neck without washing away the amniotic fluid on the body and retain the vernix to increase skin hydration. Furthermore, the baby's head must be covered using a hat. All subsequent resuscitation measures must be carried out through a plastic bag. This approach reduces heat loss and maintains adequate humidity (Roychoudhury, 2017).

The plastic wrap method should be considered to increase the body temperature of LBW babies with hypothermia. Plastic has flexible, watertight, and airtight properties. In addition, plastic is usually transparent, making it easy to monitor babies.

The Mann-Whitney U test results obtained a P-Value of 0.850 (p-<0.05). This shows no significant difference between the increase in infant body temperature when using plastic wrap and cloth swaddles. The use of plastic wrap is the cheapest innovation to prevent hypothermia in LBW. These plastic wraps can be widely used with limited resources because of their affordability and accessibility. The American Heart Association recommends placing LBW babies in polyethylene bags before 30 weeks gestation or wrapping them immediately after birth. These materials should cover the baby up to their neck without washing away the amniotic fluid in the body, and retaining the vernix can significantly increase skin hydration.

Furthermore, the baby's head must be covered using a hat. All subsequent resuscitation measures must be carried out through a plastic bag. This approach reduces heat loss and maintains adequate humidity (Roychoudhury, 2017).

Meanwhile, the second intervention is baby cloth swaddles. Swaddling is wrapping a baby's body, especially a newborn, using a blanket or swaddle (swaddle). It is said that techniques like this can make babies feel comfortable, warm, and protected, like when they are in the mother's womb or hugged tightly. Thus, your little one becomes calmer and sleeps better. But there is an impact caused by swaddling, namely sudden infant death syndrome. Swaddling also lowers a baby's arousal making it more difficult to get up (American Academy of Pediatrics, 2017).

The results of this study contradict the research conducted by Yusnika Damayanti, et All (2019) which showed that the average body temperature of infants before the swaddling intervention was 36.7℃ and the average after swaddling was 36.72℃, with a difference 0.02℃. The statistical test results obtained a ρ value <0.168, meaning there is no effect on body temperature before and after swaddling.

However, this study's results align with research conducted by Nofda Lelisma, where the swaddling method was effective in increasing body temperature. However, the body temperature increase is less compared to that produced by the skin wrap intervention.

Based on the results of the above study, it can be assumed that there is no significant difference in increased infant's body temperature when using plastic wrap or cloth swaddles. The results of this study contradict the research conducted by Yusnika Damayanti, et All (2019) which showed that the average body temperature of infants before the swaddling intervention was 36.7℃ and the average after swaddling was 36.72℃, with a difference 0.02℃. The statistical test results obtained a ρ value <0.168, meaning there is no effect on body temperature before and after swaddling.

However, this study's results align with research conducted by Nofda Lelisma, where the swaddling method was effective in increasing body temperature. However, the body temperature increase is less compared to that produced by the skin wrap intervention.

Based on the results of the above study, it can be assumed that there is no significant difference in increased infant's body temperature when using plastic wrap or cloth swaddles.

5. Conclusion

Based on the results of the above study, it can be concluded that using plastic wrap and cloth swaddles increases the body temperature of LBW infants who experience hypothermia. In the effectiveness test, the use of plastic wrap got a mean score of 80.47% (>76% effective category), while the use of cloth swaddles got a mean value of 69.93% (56%-75% quite effective category).

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest within this research.

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