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Analyzing Journal “*Plastic Bags to Prevent Hypothermia in Preterm and Low Birth Weight Infants*” as Viewed in Transcultural Nursing Practice

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Abstract - Introduction: This article analyzes journal related to hypothermia in neonates, which is a serious problem in both developed and developing countries. Heat loss through evaporation is the main cause of hypothermia in newborns during the first 30 minutes of life. There have been many studies regarding the use of plastic bags or polyethylene which is estimated to be able to reduce heat loss through evaporation, IWL, and metabolic requirements for heat production. **Journal essence:** Laying premature infants or LBW on plastic bags at birth compared to standard thermoregulation treatments can reduce the incidence of hypothermia without causing hypothermia, it is cheap, and does not require modern equipment. **Discussion:** Safety and effectiveness of using plastic bags have been tested to prevent hypothermia during neonatal resuscitation at LBW. There were no differences in axillary temperature or incubator temperature in the two groups that used plastic bags with or without previous drying. **Recommendation:** The culture of using plastic bag in Indonesia needs to be reduced. Plastic bag can be more useful to prevent hypothermia.

Keywords: *Plastic bag, hypothermia, preterm, transcultural nursing*

1. Introduction

Every year, about three million infants die during the neonatal period. More than 80% of neonates die of infection, neonatal asphyxia, complications of preterm birth, including hypothermia and congenital abnormalities. Hypothermia in neonates, especially in infants who are born with low and premature weight, is a serious problem both in developed and developing countries. Neonatal hypothermia is associated with an increased risk of infection, coagulation abnormalities, acidosis, circulatory failure, hyaline membrane disease, cerebral hemorrhage, increased oxygen demand, and increased mortality. Infants are more at risk of experiencing hypothermia in the first minute to one hour after birth. Hypothermia can occur in infants in all countries, including countries with tropical climates.

WHO recommends to prevent the occurrence of hypothermia in neonates by making the environment of the maternity room warm (25 0 C), drying directly, and doing resuscitation in radiant warmer, skin to skin contact with the mother, or by an incubator. Low-cost technology used to prevent hypothermia in premature infants and low-birth-weight infants in developed countries can be implemented in developing countries as well.

Heat loss through evaporation is the main cause of hypothermia in newborns during the first 30 minutes of life. In addition, insensible water loss (IWL) and immature baby skin also contribute to increasing the risk of hypothermia in infants. There have been many studies regarding the use of plastic bags or

polyethylene in the delivery room to reduce the incidence of hypothermia in low birth weight (LBW) and very low birth weight. It is assumed that the use of plastic bags can reduce heat loss through evaporation, IWL, and metabolic requirements for heat production. McCall et al. (2010), in the Cochrane study (there were 3 studies with polyethylene intervention used in the first 10 minutes of life to wrap infants with gestational age <32 weeks), concluded that the use of plastic bags decreases hypothermia as soon as the baby is born and recommended further research to determine whether it may be used in developing countries whose main problem is cost.

2. Research Question

Plastic bags are a possible choice for developing countries. This study was conducted to test the hypothesis whether the use of cheap plastic bags (polyethylene) after the baby is born can reduce hypothermia without causing hyperthermia within 1 hour of life in premature and LBW infants. In this study, samples taken were more mature and larger than previous studies to limit the high risk of hypothermia.

3. Methodology

The method used was a Randomized Control Trial (RCT) where the samples are infants with a gestational age of 26-36 weeks and / or with birth weight of 1000 - 2500 grams at Lusaka Education Hospital, Zambia. The random used a 1:1 allocation and parallel design for both the control group (standard thermoregulation treatment, using a blanket / radiant warmer) and in the intervention group (standard thermoregulation treatment and placing the baby in a plastic bag at birth). The instrument is to measure the axillary temperature by WHO standards (normal temperature 36.5-37.5 0C) at one hour after birth.

In this study, there were control and intervention groups. The control group was carried out according to standard of hypothermia treatment, i.e., immediately after birth, the baby is laid on the mother's abdomen and then dried by using a towel and stimulated (still on the mother's abdomen) when the umbilical cord was cut and the placenta was removed. Whereas, in infants born with SC, the baby is dried and then stimulated under the radiant warmer in the operating room. Infants who have been in the treatment room are then weighed, covered with a towel, using a hat, placed on radiant warmer and then measured axillary temperature with a digital thermometer that will be repeated in the next hour. Whereas in the intervention group, the newborns were laid on the mothers' abdomen (no more than 10 minutes) along with cutting the umbilical cord. Then the infant's body and extremities are covered with a plastic bag, measured the axillary temperature at regular intervals, and removing the plastic bag one hour later if the baby's temperature is in the normal range (36.5-37.5 0 C) or higher.

4. Research Result

Total samples were 104 randomized infants. At one hour after birth, infants in the intervention group (n = 49) were more likely to have normal temperature compared to infants in the control ones (n =55). The temperature of one hour after birth in infants in the intervention group was 36.5 ± 0.5 0C compared to 36.1 ± 0.6 0 C in the control group ($p < 0.001$). Hyperthermia (> 38.0 0 C) did not occur in the control group nor the intervention group. From these results, it can be concluded that putting premature infants or LBW on plastic bags at birth compared to standard thermoregulation treatments can reduce the incidence of hypothermia without causing hyperthermia, it is cheap, and does not require modern equipment technology.

5. Discussion

This study showed that by wrapping the body and extremities of a premature baby or LBW with a plastic bag at birth can reduce the incidence of hypothermia in the first hour of life without increasing the risk of hyperthermia. The statement was also supported by Gathwala et al. (2010) who conducted research on the safety and effectiveness of using plastic bags in preventing hypothermia during neonatal resuscitation at LBWS, where the results of the study reflected the use of plastic bags in LBW during resuscitation. Regarding procedures performed before wrapping premature infants using plastic bags, Cardona-Torres et al. (2012) conducted a study comparing the temperature adaptation response of premature infants using plastic bags with and without previous drying compared to using infant warmer. Two groups using plastic bags reached the axillary temperature an average of 36.5 0 C in the first 30 minutes, while in the first 75 minutes life was achieved by the control group (using infant warmer). At 120 minutes, the incubator temperature was higher in the control group than in the intervention group with and without previous drying. There were no differences in axillary temperature or incubator temperature in the two groups using plastic bags.

Similar to previous RCT studies, using a plastic bag has not reported the occurrence of hyperthermia. In addition, there is in vitro evidence that plastic bags cannot cause hyperthermia. However, in a study by McCarthy et al (2013), where the sample used was a baby with a gestational age of <31 weeks, this RCT study compared the use of plastic bags and exothermic mattresses combined with plastic bags simultaneously in the delivery room. In this study, it was concluded that, for infants born very prematurely, the use of plastic bags can effectively prevent hypothermia, but when its use is combined with an exothermic mattress, the baby will actually be at risk of developing hyperthermia.

This study does not contradict WHO's recommendations regarding skin-to-skin contact between infants and their mothers because the main goal is as a thermoregulated treatment and specifically because premature and low birth weight infants often have to be separated from their mothers immediately after birth. Data regarding the benefits of skin-to-skin contact with the mother in the first few hours of life for thermoregulation and early breastfeeding initiation have been numerous. However, most studies proved that hypothermia still occurs in 43% -49% in normal birth weight infants and 75% in low birth weight infants despite skin-to-skin contact with mothers during the first 24 hours of life.

The use of plastic bags or polyethylene wrappers in LBW in the delivery room is common in developed countries. Previous studies have shown that plastic bags reduce hypothermia in infants with gestational age of <29 weeks. Although infants with 26 weeks' gestation and 1000 grams of weight were included as samples in this study, few were compared with other samples with a gestational age between 31 - 36 weeks, and birth weight > 1500 grams. This study showed that plastic bags can also reduce the incidence of hypothermia in these infants without causing hyperthermia.

Limitations of this study include a short duration of intervention, where the duration of the intervention was chosen to prevent hyperthermia, as well as other hazards that may arise from wrapping the baby with a plastic bag, such as damage to the skin or suffocation. Another limitation arises from the inaccuracy of the HPHT time, so that estimates of birth weight and gestational age are sometimes inappropriate. Another limitation is the lack of control of the ambient temperature in the delivery room and resuscitation area. The hospital does not have air conditioning or heating equipment, so it is not possible to strictly control the environment. This can affect the temperature of the baby and the researcher

cannot control it. However, although environmental temperatures can affect the temperature of newborns, plastic bags can reduce hypothermia without causing hyperthermia in these stressful environments.

There are limited data on research results related to the use of plastic bags in developing countries. A randomized controlled trial of 110 infants with 24-34 weeks' gestation in an NICU in Malaysia, showed that although plastic bags could increase temperature, 78% of infants in the intervention group were still experiencing hypothermia. This shows that there is still a need for more controlled studies to prove the effectiveness of plastic bags in reducing the incidence of hypothermia in premature babies who have very low birth weights.

The history of plastic discovery began in the mid-19th century, which was on December 29, 1813 in England. Then developed plastic bags in the United States in 1966. In 1974 plastic bags began to be used on bread packaging. And in 1977 the supermarket shopping bag began to be introduced by the supermarket industry as an alternative to paper containers. Indonesia ranks second in the world as a plastic waste contributor and has long used plastic bags. National waste data is 65.8 million tons per year, of which 3.2 tons of waste are dumped into the sea, plastic bag consumption is more than 1 million per minute. Data from the Indonesian Retailers Association (Aprindo) has 32,000 outlets producing 9.6 million plastic bags per day or 21,024 hectares per year. The increase in plastic needs in the community is directly proportional to the growth of companies or producers of plastic products. The Ministry of Environment and Forestry, in July 2018 coincided with the Day without International Plastic Bags (Plastic Bag Free Day) conducting a Plastic Waste Control campaign. The government continues to strive to reduce plastic waste, especially plastic bags, namely by testing the concept of non-free plastic bags that successfully reduce plastic bag waste generation by 55%, which means saving 52 million pieces of plastic bags per month, inviting people to use recyclable materials, and began to re-approach local area wisdom, empowering local wealth such as the use of woven shopping bags (Hadi, 2018). And using plastic products for things that provide greater benefits, one of them in the world of health, especially to prevent hypothermia in newborns with premature and low birth weight or very low using environmentally friendly materials and with special designs. In addition, the culture of plastic use in Indonesia as a food container needs to be immediately reduced. This is because plastic materials that are harmful to one or the other, bifenil poliklorin (PCB) can cause tissue death, cancer, fertility disorders, ulcer pigmentation disorders, disability in babies born. Plastic bags that are difficult to manage and require a very long time to break down cause environmental sustainability, global warming, environmental pollution (Karuniastuti, 2012). Therefore, use must be wiser in considering the benefits.

6. Nursing Implication

With the existence of studies related to the use of plastic bags to prevent hypothermia in newborns with premature and low or very low birth weight, nurses can make hypothermia prevention protocols with one of them is by using a plastic bag. Thus, it can reduce the infant mortality rate as one of the 2015 MDG achievements. Anderson (2012) stated that an effective protocol to prevent hypothermia in infants with gestational age <29 weeks during resuscitation is by (1) increasing the delivery room temperature to 26 0 C; (2) putting the baby on a preheated radiant warmer; (3) putting the baby on a layer of portable heater on the resuscitation table; and (4) wrapping baby with polyethylene plastic.



Figure 1. Resuscitation protocol for infants with gestational age <29 weeks (Anderson, 2012)

This RCT study, supports the hypothesis that the use of plastic bags in preterm infants and low birth weight immediately after birth can reduce hypothermia and increase normothermia without causing hyperthermia or other complications. Because of the high incidence of hypothermia in the population studied, these results can be generalized to populations with high levels of hypothermia. The use of plastic bags to wrap premature and low birth weight infants immediately after birth is a cheap and promising intervention, especially in infants born in hospitals that have limited resources and equipment.

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