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PLASTIC BLANKETS AS TEMPERATURE STABILIZER FOR PREMATURE LOW BIRTH WEIGHT (LBW) BABY

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Case Study

A B S T R A C T

Introduction: *Low birth weight (LBW) babies born via deep transperitoneal cesarean section (SCTP) with a gestational age of less than 34 weeks are highly susceptible to hypothermia. Hypothermia poses a significant risk of neonatal mortality, with LBW being one of the contributing factors. Thus, it is crucial to implement strategies to minimize heat loss and provide warmth, such as using plastic blankets. This case study aims to present the outcomes of implementing plastic blankets to manage hypothermia in LBW babies post-SCTP in the IBS Room at RSUP Dr. Kariadi Semarang.* ***Methods:*** *The study employs a descriptive design with a nursing care approach. The subjects included premature babies born via SCTP < 34 weeks. Three infant patients according to the criteria were included in the study. The measurement tool used was an observation sheet to monitor axillary temperature. The intervention plan involved providing plastic blankets to all three subjects to prevent hypothermia. Following birth, the infants were placed in an infant warmer, cleaned of mucus, wrapped in a plastic bag with a cloth cap on the head, underwent neonate resuscitation, and then covered with cloth while awaiting transfer to the room.* ***Results:*** *The findings indicate that the plastic blanket intervention increased the post-SCTP LBW temperature by an average of 0.50°C based on thermometer measurements and an average increase of 0.48°C based on infant warmer measurements.* ***Conclusions:*** *Therefore, it is recommended that healthcare professionals, particularly perinatology nurses, consider employing the plastic blanket method in managing hypothermia in LBW babies post-SCTP to maintain thermoregulation.*

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INTRODUCTION

Hypothermia occurs due to an imbalance between heat loss and heat production. The World Health Organization (WHO) defines the normal axillary temperature range for newborns (BBL) as between 36.5 to 37.5°C, considering temperatures below 36.5°C as indicative of hypothermia. Babies with very low birth weight, specifically weighing less than 1500g, are at higher risk of experiencing post-birth temperature decrease. Therefore, measures should be taken to minimize heat loss and provide warmth (Cordeiro et al., 2022).

Hypothermia in newborns is associated with various morbidities, including hypoglycemia, hypoxia, metabolic acidosis, peri-intraventricular hemorrhage, necrotizing enterocolitis, sepsis, and bronchopulmonary dysplasia, thereby increasing the risk of death by 1.64 times upon admission to the Neonatal Intensive Care Unit (NICU) (Cordeiro et al., 2022). Hypothermia significantly contributes to neonatal mortality, particularly in cases of neonatal infection, prematurity, and asphyxia. Neonates born via cesarean section exhibit a higher incidence of hypothermia compared to those born vaginally. One study indicates that hypothermia in neonates is notably associated with those weighing 1000g (OR = 1.79) and requiring resuscitation (OR = 2.32) (Ng'eny & Velaphi, 2020).

Further research indicates a prevalence of hypothermia among neonates born via cesarean section, with 41% experiencing hypothermia at birth, of which 71% are mild cases, 27% moderate, and 2% severe (Patel et al., 2022). A study conducted by the Brazilian Network of Neonatal Research reports that 44% of babies born between 23 to 33 weeks of gestation experience hypothermia in the Delivery Room, with 5% encountering it upon admission to the NICU (Cordeiro et al., 2022).

Premature babies with LBW have an incompletely developed thermoregulation system, rendering them vulnerable to environmental temperature changes. Therefore, it is crucial to maintain their body temperature. The process of maintaining body temperature in LBW babies is complex and involves lipolysis and gluconeogenesis. The more energy expended to maintain a constant body temperature, the less energy is available for other essential processes such as growth, brain development, and lung maturation. Premature babies are highly susceptible to heat loss due to their thin subcutaneous fat layer, low insulating capacity, reduced adipose tissue, high rate of evaporative loss, high surface area to body weight ratio, and poorly developed vascular control in the skin during the first few days of life.

To reduce the mortality rate of premature or LBW babies and improve clinical outcomes, it is essential to prevent hypothermia by maintaining an optimal environmental temperature. Heat transfer processes and interactions between the body and the environment (e.g., related to room temperature, humidity, and airflow in the neonatal intensive care unit) can be managed using an adjusted distributed model (O'steen et al., 2021).

Physiological complications resulting from neonatal hypothermia include increased oxygen consumption, metabolic acidosis, hypoglycemia, decreased cardiac output, and increased peripheral vascular resistance. These factors contribute to the deterioration of newborns' condition, especially LBW babies. Newborn babies react differently to hypothermia than adults, with one typical phenomenon being the absence of shivering in LBW babies (Mansour Moustafa Mohamed et al., 2020).

The newborn's body responds to hypothermia by increasing sympathetic activity, resulting in elevated levels of noradrenaline and thyroid stimulating hormone, ultimately leading to increased levels of thyroid hormones T3 and T4. Thyroid hormone enhances the body's heat production by improving fat oxidation. In-hospital prevention of hypothermia begins with simple measures, including maintaining a higher temperature in the delivery room, promoting skin-to-skin contact between mother and baby, and placing a hat on the baby's head (Khan et al., 2021).

Preliminary study results conducted by the author in the IBS Room at RSUP Dr. Kariadi Semarang on June 15, 2023, indicate a significant increase in the number of births via Caesarean section (SC), averaging 62 patients per month. Most post-SC babies are LBW, with 15 babies in May 2023, 18 babies in June, and 32 babies in July. On average, there are 22 LBW babies post-SC per month. LBW babies typically experience hypothermia, necessitating heat provision. However, available warmers are insufficient to maintain their body warmth, especially considering the cold temperature in the operating room. Additional warmth, such as warmer blankets or plastic covers, is required.

WHO has identified thermal control of newborns as one of the ten recommendations to address premature births and reduce infant mortality rates. Several steps, including maintaining adequate delivery room temperature, careful assessment of the mother's temperature, and utilizing heat sources such as infrared rays, plastic bags, caps, and respiratory support with heated and humidified gas, are crucial for preventing hypothermia in LBW babies (Cordeiro et al., 2022). Research supports the effectiveness of plastic covers in regulating body temperature in premature babies born at 28-30 weeks of gestational age and weighing 800-1250 grams in the NICU on the 2nd and 3rd days of hospital treatment (McCall et al., 2018).

Plastic covers are inexpensive, effective, and simple devices that can be used without causing allergies or skin irritation. Other studies have also shown an increase in average temperature in the intervention group (polyethylene dressing method) in neonates (pre 34.8°C, post 36.4°C) compared to the control group (pre 33.3°C, post 34.9°C). Therefore, they are highly recommended as an alternative for preventing hypothermia in LBW babies. Subsequent research has demonstrated similar findings, showing that packaging made from polyethylene effectively achieves rapid and sustainable thermal control, as well as being effective in preventing hypothermia in premature babies. The average temperature reaches the normal range earlier and remains significantly higher in the treatment group for most of the time intervals. These differences are still noticeable after 24 hours. A significant reduction in hypothermia occurrences is observed in the intervention group compared to the control group (Nimbalkar et al., 2019).

Based on this study, the author aims to investigate nursing care for LBW babies post SCTP less than 34 weeks in the IBS Room at Dr. RSUP. Kariadi Semarang by implementing evidence-based practice in the form of plastic blankets to treat hypothermia. The author chose this intervention because it is easy to perform, the materials are readily available, and it provides significant effects on the stability of post-SC LBW babies less than 34 weeks. Research on plastic blankets to prevent hypothermia in newborns is also conducted by (Possidente et al., 2023), with the title "Evaluation of two polyethylene bags in preventing admission hypothermia in preterm infants: a quasi-randomized clinical trial". The purpose of this case study is to provide an overview of the results of elective nursing profession practice by applying a plastic blanket to address hypothermia in LBW babies post SCTP less than 34 weeks in the IBS Room at Dr. Hospital. Kariadi Semarang.

MATERIALS AND METHODS

The design utilized in this case study is a descriptive design with a nursing process approach. A descriptive design is a research method that aims to provide a more in-depth, detailed, and comprehensive description of the subject or object being studied. This method is employed to address or solve a problem by collecting data, conducting analysis, classification, drawing conclusions, and reporting findings.

The nursing process is a systematic method used by nurses to provide nursing care in collaboration with patients (individuals, families, communities). Its goal is to identify nursing assessments, diagnose problems, plan interventions, implement actions, and evaluate the outcomes of nursing care provided in a patient-centered, goal-oriented manner.

The study subjects were LBW babies post SCTP < 34 weeks. Subjects or respondents are the individuals used as samples in a study. Research subjects also involve discussing the characteristics of the subjects used in research, including explanations of populations, samples, and sampling techniques (random/non-random) employed. The number of study subjects was 3 infant patients. The subject of this case study has inclusion criteria, namely patients who are post-SCTP premature babies < 34 weeks. The sampling period commenced from September 21, 2023, to October 30, 2023.

The interventions provided adhere to the Nursing Intervention Standards Indonesia (SIKI) 2018 regarding the risk of hypothermia related to environmental adaptation (D.0140) . Nursing interventions based on formulated diagnoses include:

Hypothermia management: monitoring body temperature, observing signs and symptoms of hypothermia (mild hypothermia: tachypnea, moderate hypothermia: decreased reflexes, severe hypothermia: disappearance of reflexes), providing a warm environment (regulating environmental temperature, using incubators), and temperature regulation: monitoring body temperature until stability, observing skin color and temperature, immediately swaddling the baby after birth, placing LBW babies in plastic immediately after birth (polyethylene material), adjusting incubator temperature as needed, maintaining incubator humidity at 50% or above to reduce heat loss (I.14507). Outcome for hypothermia diagnosis includes decreased shivering, improved body temperature, and improved skin temperature (L.14134).

The measurement tools or instruments used in this case study include an observation sheet, a NeoHelpTM device (Vygon, France), and an axillary mercury thermometer. Research measuring instruments play a vital role in research activities as they are used to collect data, which is then analyzed to conclude research results. Errors in creating research measuring instruments may lead to inaccurate research data.

The three subjects received intervention in the form of providing plastic blankets to prevent hypothermia. The prevention of hypothermia was carried out by administering the NeoHelpTM device (Vygon, France), which consists of a sterile polyethylene bag with a double layer, available in three sizes (small, medium, and large), with internally prepared foam padding and a double adjustable plastic hood. A plastic blanket was provided five minutes after the baby's birth.

The baby was then placed in the bag, and the bag was closed with a hermetic Velcro seal. The baby's head was covered with the included plastic cap from the kit, and a woolen hat was placed on top. A radiation heater (target temperature 36-37°C) and a transport incubator (target temperature 35-37°C) remained ready for use 24 hours a day.

The continuously heated heater control button was attached to the sheet mattress using microporous plaster, and the temperature was regulated during stabilization according to the needs. The bags were placed on a heating mattress radiation before the baby's birth. The environmental temperature in the delivery room and stabilization room was maintained between 24°C to 26°C.

After birth, the baby was placed in an infant warmer, the face and body were cleaned of mucus, then the baby was placed in a plastic bag, the head was covered with a cloth cap, and neonatal resuscitation was performed. Subsequently, the baby was covered with a blanket while waiting for room transfer. The bag remained closed throughout this period and was only opened in the neonatal unit when the baby's body temperature reached >36.5°C. The right upper arm was left exposed, where a pulse oximeter sensor was attached.

The baby's temperature was measured in the axillary area using a thermometer and also with a baby temperature measuring device in an infant warmer, with a minimum temperature recorded of 32°C and a resolution of 0.1°C, at two times: immediately before leaving the stabilization room and upon entering the neonatal unit while still in the transportation incubator. In the final stage, the baby's temperature was measured 1 hour before leaving the stabilization room and upon entering the neonatal room while still in the transport incubator.

The plastic blanket could be removed if the baby's body temperature was stable (>36.5°C) or if the baby was not experiencing hypothermia (<36.5°C). Data from the case study will be presented in diagram/graphic form. This case study has obtained ethical clearance from the Ethics Commission of the Faculty of Nursing and Health Sciences with the number 034/KE/01/2024.

RESULTS

The results of the case study indicate that the three subjects were LBW babies aged 0 years, 0 months, and 0 days. Among the three subjects, two were female and one was male. The findings concerning the first subject revealed a history of labor (intranatal) birth by Caesarean section, indicating oligohydramnios. The amniotic fluid ruptured during delivery, with sufficient quantity, distinctive odor, and clear color. The placenta was delivered automatically after the Caesarean section, complete with cotyledons, on 10-7-2023 at 22:20. The baby was born indirectly crying with bluish skin. The baby's weight, length, and head circumference were 1320 grams, 39 cm, and 29 cm, respectively. The baby was treated in an infant warmer with apathy consciousness, weak appearance, adequate spontaneous breathing, and visible chest retraction. There was a history of desaturation twice. The baby's vital signs included a heart rate of 155 beats per minute, respiratory rate of 69 breaths per minute, axillary temperature of 36.2°C, and infant warmer temperature of 36.6°C. The oxygen saturation (SpO_2) was 97% on CPAP. The baby did not exhibit a suction reflex, had warm acral regions, and showed no urination or defecation. There was umbilical cord bleeding.

Regarding the second subject, the baby was born by Caesarean section, with the membranes rupturing 3 days before delivery. The placenta was born with complete cotyledons on 09-21-2023 at 11:45. The baby was born weakly crying, with skin suspected of harlequin syndrome. The baby's weight, length, and head circumference were 1650 grams, 35 cm, and 28 cm, respectively. The baby received lung maturation twice. The baby was treated in an infant warmer with similar characteristics to the first subject. There was no suction reflex, warm acral regions, urination, and defecation were present, and there was no umbilical cord bleeding.

For the third subject, the baby was born by Caesarean section due to preeclampsia. The amniotic fluid ruptured during labor, with sufficient quantity, distinctive odor, and clear color. The placenta was born complete with cotyledons on 10-3-2023 at 05:45. The baby was born crying with reddish skin. The baby's weight, length, and head circumference were 1120 grams, 34 cm, and 26 cm, respectively. The baby was treated in an infant warmer with similar characteristics to the other subjects.

Data analysis based on the study results revealed that the three subjects were LBW babies (1120-1650 grams) born prematurely (29-31 weeks) with hypothermic body temperatures (36.2-36.4°C). The author concluded that the main nursing diagnosis in the three case study subjects was the risk of hypothermia based on environmental adaptation (D.0140) (PPNI, 2017).

Nursing interventions based on the formulated diagnoses included monitoring body temperature, observing signs and symptoms of hypothermia, providing a warm environment, and regulating body temperature. The main nursing implementation involved providing a plastic blanket for stabilizing LBW thermoregulation post-SCTP following Evidence-Based Nursing (EBN). The procedure involved placing the baby in a sterile polyethylene bag, closing it with a hermetic Velcro seal, and covering the head with a plastic cap and a woolen hat. Radiant heaters and transport incubators were used to maintain the desired temperature. The plastic blanket was removed when the baby's body temperature stabilized (>36.5°C) and when hypothermia was not present (<36.5°C). Nursing implementation was carried out individually for each subject.

The baby's body temperature was measured three times: at minute 1, minute 10, and upon arrival at the Neonatal Resuscitation Team (NRT) using a thermometer and an infant warmer, following evidence-based practices (Possidente et al., 2023). The measurement results using the thermometer and infant warmer indicated an increase in the baby's body temperature after being given a plastic blanket. The measurement results are displayed in the graph 1.

Based on Graph 1, it is evident that there was an increase in body temperature observed in the three study subjects, with an average increase of 0.50°C in thermometer measurements and an average increase of 0.48°C in infant warmer measurements after the implementation of the plastic blanket intervention.

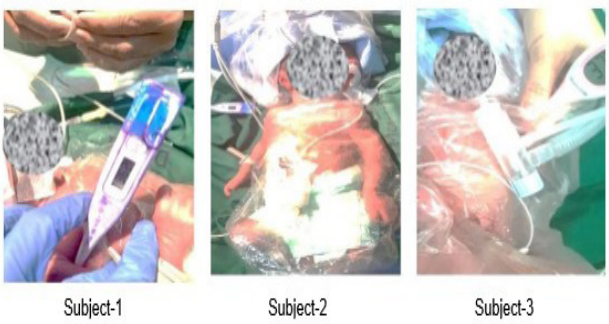
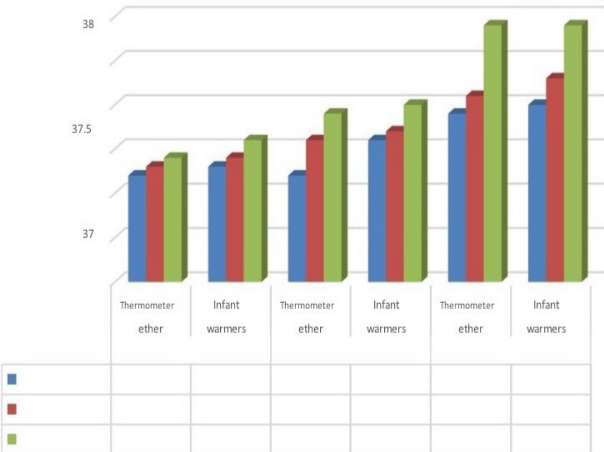


Figure 1. Instalattion of Plastic Blanket

Figure 2. Transportable Incubator



Graph 1. Baby's Body Temperature When Given a Plastic Blanket

DISCUSSION

The three post-SCTP LBW subjects under 34 weeks did not experience hypothermia due to the intervention provided by administering a plastic blanket. Some factors that make LBW babies more susceptible to hypothermia include a lack of fat layer, a reduced ability to generate heat, a body surface area greater than body weight, lack of environmental isolation, and medical care processes (Brambilla Pisoni et al., 2022; Ekawati & Nur Hadianti, 2022; Nguyen et al., 2022; Shi et al., 2023). Pregnancy maturity status and low birth weight (<2500 grams) significantly increase the risk of hypothermia (Nyandiko et al., 2021). Neonatal hypothermia is closely associated with an increased risk of mortality and morbidity (Phoya et al., 2020). LBW babies suffer from thermoregulation disorders because the ratio of skin surface area is not balanced with the baby's body weight, a decrease in subcutaneous fat, and a reduced shivering response (Lubkowska et al., 2019). LBW babies who experience a decrease in body temperature of every 1°C will increase the risk of death by 80% (Girma et al., 2021). Premature babies experience an inability to maintain normal body temperature because their heat loss is four times greater than that of babies with sufficient birth weight, and their body's heat regulation center does not function properly. LBW babies cannot adjust their body position and clothing properly independently to avoid getting cold (Bach & Libert, 2022).

Hypothermia is defined as a decrease in central temperature of less than 36.5 °C classified into three categories: mild (36.0–36.4°C), moderate (32.0–35.9°C), and severe (less than 32°C) (Alebachew Bayih et al., 2019). Risk factors for LBW experiencing hypothermia are low gestational age, asphyxia, method and location of childbirth, as well as inadequate breast milk (Tunta et al., 2024). Research results showing hypothermia in the mother will result in hypothermia in the baby doubling in the first five minutes after birth; this condition shows that maternal body temperature is also a major factor in preventing neonatal hypothermia (Cordeiro et al., 2022). The main intervention carried out to overcome hypothermia in LBW post-SCTP <34 weeks is by providing a plastic blanket.

The results of implementing the provision of plastic blankets show an increase in the average temperature in babies by 0.50°C on thermometer measurement and an average increase of 0.48°C in infant warmer measurements after administering the plastic blanket intervention. The difference in measurement results is caused by variations in the location of the thermometer sensor and infant warmer probe on babies. This statement is supported by research indicating significant variations in rectal and axillary temperatures in premature babies upon entering the NICU. The axilla is more sensitive in detecting temperature compared to the rectal area (McCarthy & O'Donnell, 2021). Measuring body temperature in newborn babies using an infant warmer aims to prevent hypothermia. Newborn babies, especially premature babies with low birth weight, are highly susceptible to hypothermia. There is no other equipment more closely associated with the special care of newborns than heating devices, namely incubators or infant warmers. When a baby's body temperature drops to 36.5°C, an Infant Radiant Warmer (IRW) is generally used, including a heating element canopy, mattress, and heater, to transfer heat through radiation and help the baby reach normal temperatures (36.5°C - 37.2°C) (Dey & Deb, 2021).

The thermometer sensor is placed in the baby's axilla, while the infant warmer probe is placed on the baby's stomach skin. This difference in position causes variations in the results of measuring the baby's body temperature. Although there is a discrepancy in the results between a thermometer and an infant warmer, there is still an increase in body temperature in babies after being given plastic blankets. Several factors contribute to differences in measurement results, including the location of the initial measurement. Temperature measurement using a thermometer is generally done in specific areas of the body, such as the armpits, mouth, ears, or forehead, while with infant warmers, the temperature is measured around the baby's body inside the device, creating a stable environment with regulated temperatures. Both measurement methods may vary depending on the type of thermometer used. For example, an infrared thermometer measures body temperature from a distance without physical contact, whereas in an infant warmer, the temperature is arranged and measured around the baby using an integrated probe or sensor (McCarthy & O'Donnell, 2021). Additionally, equipment calibration is crucial to ensure accurate results. Measuring the baby's body temperature with both methods, despite a difference in measurement results of 0.2°C, still indicates an increase in the baby's body temperature after being given a plastic blanket.

The baby's body temperature was measured three times: at 1 minute, 10 minutes, and upon arrival at the NRT using both a thermometer and an infant warmer, following evidence-based practices (Possidente et al., 2023). This procedure is supported by the theory that in the first 10-20 minutes after birth, without intervention to prevent heat loss, neonatal body temperature may drop by as much as 2-4°C (3.6-7.2°F). Therefore, various steps are taken in the NICU to prevent hypothermia in newborns, including controlling environmental temperature, using warm blankets, plastic wraps, hats, thermal mattresses, and skin care (Fukuyama & Arimitsu, 2023).

Plastic covers are a cheap, effective, and simple device used without causing allergies or irritation to the skin (Pujiani et al., 2023). The use of plastic covers is effective in regulating the body temperature of premature babies with a gestational age of 28-30 weeks and a birth weight of 800-1250 grams who were in the NICU on days 2 and 3 of their hospital stay (McCall et al., 2018).

Research shows an increase in the average temperature in the intervention group (polyethylene dressing method) in neonates (pre 34.8°C, post 36.4°C) compared to the control group (pre 33.3°C, post 34.9°C), so it is highly recommended as an alternative in preventing hypothermia in low birth weight babies. Similar research shows a significant difference between the temperature before and after intervention with plastic wrap combined with swaddle cloth, indicating that the use of plastic wrap and swaddle cloth affects increasing body temperature in low birth weight babies with hypothermia (Pujiani et al., 2023). The use of polyethylene plastic as one of the main interventions in preventing hypothermia in premature babies with low birth weight, experiencing dehydration and heat loss through convection, is supported by research (Pujiani et al., 2023).

Subsequent research has shown that packaging made from polyethylene successfully achieves rapid and sustainable thermal control, as well as being effective in preventing hypothermia in premature babies. The average temperature reaches the normal range earlier and remains significantly higher in the treatment group for most of the time intervals, and these differences are still visible after 24 hours. A significant number of premature babies experience less hypothermia in the intervention group compared to the control group.

Polyethylene plastic wrap can increase the internal temperature within 60 minutes and consistently maintain a temperature of >75% (Jani et al., 2023). Newborn babies' temperature should be maintained between 36.5°C - 37.5°C after birth (Aziz et al., 2020). Providing plastic blankets is one way of managing hypothermia for low birth weight infants, in addition to using special bundles for heaters, thermal mattresses, incubators, increasing room temperature, and using hats and heated blankets. Current resuscitation guidelines recommend reducing heat loss in low birth weight babies by placing the baby under a heating beam, drying the skin, placing the baby on a pre-warmed dry blanket, and removing wet linen (Liu et al., 2022). Newborn babies wrapped in polyethylene plastic can reduce heat and humidity loss by creating a microclimate around the baby's body. Another important consideration is maintaining the environmental temperature within the range of 36.5-37.5°C to minimize oxygen and calorie consumption by the body and to avoid using wet clothing or linen as this can affect the baby's body heat (Skrzetuska et al., 2021).

WHO has declared the thermal control of newborns as one of the ten recommendations proposed to address premature births in order to reduce the infant mortality rate. Several steps to prevent hypothermia constitute a pillar of care for newborns in the "Golden Hour," which refers to care within the first hour of life to stabilize patients quickly, thus positively impacting both short-term and long-term outcomes of neonates (WHO, 2022). Actions such as maintaining adequate delivery room temperature, carefully assessing maternal temperature, using heat sources such as infrared rays, plastic bags, and hats, providing respiratory support with heated and humidified gas, and utilizing incubators with adequate temperature control can help prevent hypothermia in low birth weight infants (Cordeiro et al., 2022).

CONCLUSIONS

The intervention of providing plastic blankets can increase the body temperature of LBW babies post-SCTP < 34 weeks and prevent hypothermia. Therefore, it is hoped that health workers, especially perinatology nurses, can apply the plastic blanket method to LBW babies post-SCTP to maintain the baby's thermoregulation. The measurement results showed an increase in body temperature in the three study subjects, with an average increase of 0.50°C in thermometer measurements and an average increase of 0.48°C in infant warmer measurements after the plastic blanket intervention.

REFERENCES

Alebachew Bayih, W., Assefa, N., Dheresa, M., Minuye, B., & Demis, S. (2019). Neonatal hypothermia and associated factors within six hours of delivery in eastern part of Ethiopia: a cross-sectional study. *BMC Pediatrics,* 19(1), 252. https://doi.org/10.1186/s12887-019-1632-2

Aziz, K., Lee, H. C., Escobedo, M. B., Hoover, A. V., Kamath-Rayne, B. D., Kapadia, V. S., Magid, D. J., Niermeyer, S., Schmolzer, G. M., Szyld, E., Weiner, G. M., Wyckoff, M. H., Yamada, N. K., & Zaichkin, J. (2020). Part 5: Neonatal Resuscitation: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*, 142(16_suppl_2). https://doi.org/10.1161/CIR.0000000000000902

Bach, V., & Libert, J.-P. (2022). Hyperthermia and Heat Stress as Risk Factors for Sudden Infant Death Syndrome: A Narrative Review. *Frontiers in Pediatrics,* 10, 1-15. https://doi.org/10.3389/fped.2022.816136

Brambilla Pisoni, G., Gaulis, C., Suter, S., Rochat, M. A., Makohliso, S., Roth-Kleiner, M., Kyokan, M., Pfister, R. E., & Schonenberger, K. (2022). Ending Neonatal Deaths From Hypothermia in Sub-Saharan Africa: Call for Essential Technologies Tailored to the Context. F*rontiers in Public Health,* 10, 1-10. https://doi.org/10.3389/fpubh.2022.851739

Cordeiro, R. C. O., Ferreira, D. M. de L. M., Reis, H. dos, Azevedo, V. M. G. de O., Protázio, A. dos S., & Abdallah, V. O. S. (2022). Hypothermia and neonatal morbimortality in very low birth weight preterm infants. *Revista Paulista de Pediatria*, 40, 1-8. https://doi.org/10.1590/1984-0462/2022/40/2020349

Dey, K., & Deb, U. K. (2021). Modeling and Simulation of Heat Transfer Phenomenon from Infant Radiant Warmer for a Newborn Baby. *Open Journal of Modelling and Simulation,* 09(02), 111–123. https://doi.org/10.4236/ojmsi.2021.92007

Ekawati, I., & Nur Hadianti, D. (2022). Evidence-Based Case Report (Ebcr) Pencegahan Hypotermi Menggunakan Plastik. *Jurnal Kesehatan Siliwangi,* 2(3), 811–821. https://doi.org/10.34011/jks.v2i3.773

Fukuyama, T., & Arimitsu, T. (2023). Use of access port covers in transport incubators to improve thermoregulation during neonatal transport. *Scientific Reports,* 13(1), 3132. https://doi.org/10.1038/s41598-023-30142-9

Girma, B., Tolessa, B. E., Bekuma, T. T., & Feyisa, B. R. (2021). Hypothermia on admission to a neonatal intensive care unit in Oromia, western Ethiopia: a case–control study. *BMJ Paediatrics Open*, 5(1), e001168. https://doi.org/10.1136/bmjpo-2021-001168

Jani, P., Mishra, U., Buchmayer, J., Walker, K., Gözen, D., Maheshwari, R., D'Çruz, D., Lowe, K., Wright, A., Marceau, J., Culcer, M., Priyadarshi, A., Kirby, A., Moore, J. E., Oei, J. L., Shah, V., Vaidya, U., Khashana, A., Godambe, S., … Satardien, M. (2023). Thermoregulation and golden hour practices in extremely preterm infants: an international survey. *Pediatric Research,* 93(6), 1701–1709. https://doi.org/10.1038/s41390-022-02297-0

Khan, G. A., Riaz, U., Aziz, T., Iqbal, S., Qureshi, T. A., & Shafaat, H. K. (2021). Effectiveness Of Polyethylene Skin Wrap In Prevention Of Hypothermia In Preterm And Low Birth Weight Neonates. *Pakistan Armed*

Forces Medical Journal, 71(3), 810–813. https://doi.org/10.51253/pafmj.v71i3.3569

Liu, J., Wu, S., & Zhu, X. (2022). Advances in the Prevention and Treatment of Neonatal Hypothermia in Early Birth. Therapeutic Hypothermia. *Therapeutic Hypothermia and Temperature Management*, 12(2), 51-56. https://doi.org/10.1089/ther.2021.0036

Lubkowska, A., Szymański, S., & Chudecka, M. (2019). Surface Body Temperature of Full-Term Healthy Newborns Immediately after Birth—Pilot Study. *International Journal of Environmental Research and Public Health*, 16(8), 1312. https://doi.org/10.3390/ijerph16081312

Luthfi, M. . (2020). Hubungan kualitas tidur dan siklus menstruasi pada mahasiswi tingkat akhir fakultas kedokteran universitas sriwijaya. *Sie-Pub,* 6(2), 139–141.

Mansour Moustafa Mohamed, S., Samir Ahmed El-husseiny, H., Mohamed Ahmed Ayed, M., El-Sayed El-Ghadban, F., & Mohamed Amin, F. (2020). Effect of Polyethylene Cap on Hypothermia Prevention among Low Birth Weight Neonates. *Egyptian Journal of Health Care*, 11(3), 1090–1098. https://doi.org/10.21608/ejhc.2020.243484

McCall, E. M., Alderdice, F., Halliday, H. L., Vohra, S., & Johnston, L. (2018). Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants. *Cochrane Database of Systematic Reviews,* 2018(2). https://doi.org/10.1002/14651858.CD004210.pub5

McCarthy, L. K., & O'Donnell, C. P. F. (2021). Comparison of rectal and axillary temperature measurements in preterm newborns. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 106(5), 509–513. https://doi.org/10.1136/archdischild-2020-320627

Ng'eny, J. C., & Velaphi, S. (2020). Hypothermia among neonates admitted to the neonatal unit at a tertiary hospital in South Africa. *Journal of Perinatology,* 40(3), 433–438. https://doi.org/10.1038/s41372-019-0539-y

N Girma, B., Tolessa, B. E., Bekuma, T. T., & Feyisa, B. R. (2021). Hypothermia on admission to a neonatal intensive care unit in Oromia, western Ethiopia: a case-control study. *BMJ Paediatrics Open,* 5(1), e001168. https://doi.org/10.1136/bmjpo-2021-001168

Nguyen, L., Mitsakakis, N., Sucha, E., Lemyre, B., & Lawrence, S. L. (2022). Factors associated with hypothermia within the first 6 hours of life in infants born at ≥340 weeks' gestation: a multivariable analysis. *BMC Pediatrics,* 22(1), 447. https://doi.org/10.1186/s12887-022-03512-x

Nimbalkar, S. M., Khanna, A. K., Patel, D. V, Nimbalkar, A. S., & Phatak, A. G. (2019). Efficacy of Polyethylene Skin Wrapping in Preventing Hypothermia in Preterm Neonates (<34 Weeks): A Parallel Group Non-blinded Randomized Control Trial. *Journal of Tropical Pediatrics,* 65(2), 122–129. https://doi.org/10.1093/tropej/fmy025

Nyandiko, W. M., Kiptoon, P., & Lubuya, F. A. (2021). Neonatal hypothermia and adherence to World Health Organisation thermal care guidelines among newborns at Moi Teaching and Referral Hospital, Kenya. PLOS ONE, 16(3), e0248838. https://doi.org/10.1371/journal.pone.0248838

O'steen, L., Lockney, N. A., Morris, C. G., Johnson-Mallard, V., Pereira, D., & Amdur, R. J. (2021). A Prospective Randomized Trial of the Influence of Music on Anxiety in Patients Starting Radiation Therapy for Cancer. International Journal of Radiation Oncology Biology Physics, 109(3), 670–674. https://doi.org/10.1016/j.ijrobp.2020.09.048

Patel, M., Ramagaga, N., Kruger, D., Lehnerdt, G., Mansoor, I., Mohlala, L., Rendel, D., Zaheed, F., Jordaan, M., Mokhachane, M., Nakwa, F. L., & Mphahlele, R. (2022). Hypothermia in neonates born by caesarean section at a tertiary hospital in South Africa. Frontiers in Pediatrics, 10. https://doi.org/10.3389/fped.2022.957298

Phoya, F., Langton, J., Dube, Q., & Iroh Tam, P.-Y. (2020). Association of Neonatal Hypothermia with Morbidity and Mortality in a Tertiary Hospital in Malawi. Journal of Tropical Pediatrics, 66(5), 470–478. https://doi.org/10.1093/tropej/fmz086

Possidente, A. L. C., Bazan, I. G. M., Machado, H. C., Marba, S. T. M., & Caldas, J. P. S. (2023). Evaluation of two polyethylene bags in preventing admission hypothermia in preterm infants: a quasi-randomized clinical trial. Jornal de Pediatria, 99(5), 514–520. https://doi.org/10.1016/j.jped.2023.04.004

PPNI. (2017). Indonesian Nursing Diagnosis Standards (SDKI).

Pujiani Pujiani, Ida Dwi Nur Islamiati, & M Zulfikar Asumta. (2023). The effectiveness of using plastic wrap and cloth swaddle methods to increase the body temperature of low-birth-weight infants with hypothermia. World Journal of Biology Pharmacy and Health Sciences, 13(1), 465–469. https://doi.org/10.30574/wjbphs.2023.13.1.0060

Rezky, Irmayanti, D. D. (2019). Level of Stress and Menstrual Disorders in Adolescent Girls : a. Jurnal Fenomena Kesehatan, 02(01), 243–251.

Shi, Q., Zhang, J., Fan, C., Zhang, A., Zhu, Z., & Tian, Y. (2023). Factors influencing hypothermia in very low/extremely low birth weight infants: a meta-analysis. PeerJ, 11, e14907. https://doi.org/10.7717/peerj.14907

Skrzetuska, E., Puszkarz, A. K., Pycio, Z., & Krucińska, I. (2021). Assessment of the Impact of Clothing Structures for Premature Babies on Biophysical Properties. Materials, 14(15), 4229. https://doi.org/10.3390/ma14154229

Tunta, T., Dana, T., Wolie, A., & Lera, T. (2024). Determinants of birth asphyxia among neonates admitted to neonatal intensive care units in hospitals of the Wolaita zone, Southern Ethiopia: A case-control study. Heliyon, 10(1), e23856. https://doi.org/10.1016/j.heliyon.2023.e23856

WHO. (2022). WHO recommendations for care of the preterm or low-birth-weight infant. World Health Organization.