



The Effectiveness of The Kangaroo Mother Care for Low Birth Weight Baby in Maintaining Thermoregulation Stabilization: a Case Study

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ABSTRACT

Low Birth Weight (LBW) is the condition when baby born weighing less than 2,500 grams. LBW is one of the public health problems that get special attention because effected short and long term problems. One of the problems is the infant's thermoregulation such as hypothermia which can cause infant's death. the interventions can be done is Kangaroo Mother Care (KMC) that chosen because able to increase temperature through heat transfer and enhance parent-baby bonding. The study aimed to analyze the Application of the KMC of low birthweight baby in maintaining thermoregulation stabilization. The research used an evaluative design is a case study with data analysis using descriptive analytic. The case study was conducted on one baby who was born at 32 weeks' gestation spontaneously and birth weight 1420 gr. The client has a risk of hypothermia so the kangaroo method is treated for 3 days. Evaluation from 3 days of implementation is the increase in body temperature before and after the KMC for 1st day was 36.4° C to 36.9° C, on 2nd day was 36.6° C to 36.8° C, on 3rd day was 36.8° C to 37.1° C. The KMC is recommended for increasing the baby's body temperature, so it is hoped this method can be carried out by health workers and the baby's parents.

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1. INTRODUCTION

The birth of a child is a dream for every married couple because children are the next generation of the nation with both physical and mental quality (Anggeriyane, 2019). Parents have hope that their children will grow up to be healthy, intelligent, creative, independent, faithful and devoted to God (Rahayu, Anggeriyane and Mariani, 2020).

Low birth weight babies are babies with birth weights less than 2500 grams regardless of gestational age (Rohmatin, Widayati and Narsih, 2018; Sembiring, 2019). Low birth weight babies are one of the public health problems that get special attention, because low birth weight babies will have short and long term consequences. The vast majority of low birth weight babies occur in low-middle income countries. The prevalence of low birth weight babies in the world in 2015 was 20.5 million babies, prevalence in Asia is 17.3% or 12.8 million (United Nation Children's Fund (UNICEF), 2019). The proportion of low birth weight babies in Indonesia from 2013-2018 was 6.2% (Kementrian Kesehatan RI, 2018). The number of low birth weight babies in South Kalimantan in 2017 was 3,676 babies, then increased to 3,728 babies in 2018. Data at the Idaman Hospital, Banjarbaru City, the number of low birth weight babies in 2018 was 280 babies, and in 2019 there were 268 babies.

Factors that influence the incidence of low birth weight babies can be from maternal, fetal, and placental factors. Maternal factors due to family history of giving birth to premature babies, socioeconomic status, educational status, age at pregnancy, stress, depression, smoking, pregnancy with low body mass index, infection, periodontal disease, uterine abnormalities, history of cervical surgery, vaginal bleeding, pregnancy double, polyhydramnios, short cervix (Frey and Klebanoff, 2016; Rosha *et al.*, 2018). Fetal factors include chromosomal abnormalities (autosomal trisomy), chronic fetal infection (cytomegaly inclusions, congenital rubella), familial dysautonomia, radiation, multiple/twin pregnancies; pancreatic aplasia (Proverawati and Ismawati, 2010). The presence of microbium in the placenta is also a contributing factor in low birth weight babies due to impaired oxygenation and nutrition to the baby (Zheng *et al.*, 2015).

Premature is the number 2 cause of infant mortality. Premature babies are at risk of causing medical problems or even health complications. Premature babies generally have low body weight and are at risk of having medical problems or disorders due to the immaturity of the baby's body functions. Medical problems of premature babies that may be found include instability of the baby's general condition and body temperature, respiratory arrest, limited endurance, incoordination of sucking, swallowing and breathing reflexes (Kamila and Elisa, 2020).

Newborns are usually very susceptible to hypothermia because the baby has a relatively large surface area compared to body weight, thin skin and easily passes heat, has little subcutaneous fat, has a limited capacity to generate heat, the ability to generate heat from poor sympathetic responses, premature babies are unable to lighten their bodies to reduce skin exposure (Lissauer and Fanaroff, 2013). According to WHO in Rosha *et al.*, (2018) 42% of new-born deaths are caused by hypothermia in the moderate to severe categories. Hypothermia occurs because the thermoregulatory mechanism is not perfect and the baby's body size is still small. This means that babies born prematurely and LBW are more prone to hypothermia problems. A study in Southern Nepal showed that children born weighing <2000 grams had a 4.32 times risk and children with a

birth weight < 1500 grams had an 11.63 times risk of suffering from hypothermia compared to children with a birth weight > 2500 grams.

Babies who are at risk for thermoregulatory disorders, include preterm and small babies, babies with congenital abnormalities, especially with imperfect skin closure, newborns with central nervous disorders, babies with sepsis, infants with prolonged resuscitation. One of the physiological responses of infants to cold exposure is the oxidation process of brown fat or brown adipose tissue. Brown fat tissue contains a high concentration of triglyceride content, is a capillary rich network and is tightly innervated by sympathetic nerves ending in the veins and in individual adipocytes. Normal temperature in neonates is between 36.5 to 37.5°C (Yunanto, 2013).

Research conducted by Rosha *et al.*, (2018) concluded that some of the treatments carried out by informants were either carried out in hospitals using conventional methods of care, skin to skin care methods (KMC and IMD treatment methods) and traditional methods of care. Body temperature is a balance between heat production and heat loss that is adjusted to the body's needs (Vaughans, 2013). Physiological and behavioral mechanisms regulate the balance between heat lost and generated, or more commonly referred to as thermoregulation. The hypothalamus detects small changes in body temperature. The anterior hypothalamus regulates heat loss, while the posterior hypothalamus regulates heat production (Potter, P. A., & Perry, 2010).

Babies who experience hypothermia will be susceptible to peripheral vasoconstriction, decreased peripheral perfusion, ischemia, metabolic acidosis, increased basal metabolic rate, respiratory distress, hypokalemia, increased bacterial infections, and heart pump disorders (Farhadi, 2014). There are so many dangers that will arise from hypothermia so as much as possible it is avoided. Treatment of low birth weight babies with the risk of hypothermia can be treated in an incubator, touch therapy, and Kangaroo Mother Care (Rosha *et al.*, 2018). While still in hospital treatment, the risk for hypothermia is closely monitored by nurses while the baby is in the incubator. But when they are at home, parents and families will do it, so they must be taught how to prevent hypothermia at home.

Kangaroo Mother Care is the treatment of premature babies or low birth weight babies by placing the baby between the mother's two breasts so that there is direct contact of the mother's skin to the baby's skin (Oktiawati and Julianti, 2017). There are two types of Kangaroo Mother Care, namely intermittent and continuous. The intermittent method is usually carried out in special and intensive care unit facilities, not done all the time but for a minimum of 60 minutes, carried out when parents or family visit, can be started on infants who are still in the treatment process. The continuous method can be carried out in the inpatient unit or at home, given around the clock, and the baby must be free from breathing problems (Maryunani, 2013).

The Kangaroo Mother Care is a bare-chested baby (only wearing diapers, hats, gloves, socks), placed face down on the mother's chest in an upright or diagonal position. The baby's body sticks or is in direct contact with the mother. Position the head, neck, and body properly to avoid obstructing the airway. Head turned sideways under the mother's chin (light extension). The baby's hands and feet are flexed like a "frog" position. Then "fixation" with a scarf. The mother wears loose clothes or blouses so that the baby is in the same clothes as the mother. If necessary, use a blanket (Kemenkes RI, 2012).

Babies who are cared for in an incubator will get warmth through heat transfer through conduction and radiation. The Kangaroo Mother Care has a working mechanism similar to care in an incubator. Heat transfer by conduction occurs when the skin is in direct contact with the mother and baby. While radiation heat transfer is when the baby and mother are in a blanket or special clothes (Thukral, Chawla, Agarwal, Deorari, dan Paul (2008) dalam Sari, Wardani, & Arismawati, 2018).

This study presents nursing care that focuses on KMC for LBW baby so that it becomes a superior intervention that health worker and also families can do in preventing the risk of hypothermia.

2. METHOD

Patient Information

The assessment was carried out at November 2020. Baby A, male, who was born on October 24, 2020, with a gestational age was 32 weeks, the mother gave birth to twins. The baby was born spontaneously behind the head with a birth weight was 1420 grams. The baby's age at the time of the assessment was 9 days and weighing 1350 grams and the medical diagnosis was LBW (Very Low Birth Weight Baby).

Clinical Findings

Based on assessment, the client has a risk for hypothermia with risk factors are 32 weeks gestation, birth weight 1420 grams while current weight is 1350 grams, baby's skin is thin, looks shiny, lots of lanugo in the face area, both upper arms and legs and also around the back, the nipples look thin, the scrotum looks shiny and smooth, the skin on the soles of the feet looks thin and the lines on the feet look few, the baby is cared for in an incubator with an incubator temperature of 32.9° C and body temperature: 36.5° C.

Diagnostic Assessment

The purpose of planning a nursing diagnosis of risk for hypothermia is after 60 minutes of action, risk for hypothermia does not occur with the outcome thermoregulation outcome: newborns (0801) remained in normal conditions at stable temperature parameters (normal 36.5–37.5°C), regular breathing (normal 40-60 breaths/ minute), changes in skin color, lethargy. The nursing action carried by Kangaroo Mother Care for 3 days on 3-5 of November 2020.

Therapeutic Intervention

The procedure for treating the method is asking the mother to take off the top clothes and then put on the special clothes provided, remove the baby from the incubator, measure the baby's body temperature after one minute after being at room temperature.

Implementation on the first to the third day obtained data that a baby was still being treated in an incubator with an incubator temperature of 32.3° C, monitored vital signs with a bedside monitor every hour, observed skin color and skin temperature by touching the client's spine, and taught KMC to the client's mother by measuring the client's body temperature before and after the procedure.

Follow-up and Outcomes

Evaluation on Wednesday, November 3, 2020, monitoring of vital signs was carried out before the Kangaroo Mother Care, pulse: 143 beats/ minute, respiratory rate: 40 breaths /minute, temperature: 36.4°C, SpO₂: 100% without oxygen. Vital signs after kangaroo mother care for pulse: 139 beats/minute, respiratory rate: 48 breaths /minute, temperature: 36.9°C, SpO₂: 100% without oxygen. Evaluation on Thursday, November 4, 2020, monitoring of vital signs before the Kangaroo Mother Care, pulse: 138 beats/ minute, respiratory rate: 45 breaths/ minute, temperature: 36.6°C, SpO₂: 99% without oxygen. Vital signs after kangaroo mother care are pulse: 141 beats /minute, respiratory rate: 42 times /minute, temperature: 36.8°C, SpO₂: 100% without oxygen. Evaluation on Friday, November 5, 2020, monitoring of vital signs was carried out before the kangaroo mother care, pulse: 145 beats/minute, respiratory rate: 42 breaths/minute, temperature: 36.8 oC, SpO₂: 100% without oxygen. Vital signs after mother care are pulse: 144 beats/minute, respiratory rate: 42 breaths/ minute, temperature: 37.1°C, SpO₂: 100% without oxygen.

Analysis of objective data is the risk for hypothermia does not occur. Interventions that need to be continued by nurses are monitoring vital signs, monitoring skin color and temperature, taking care in an incubator, maintaining the kangaroo mother care.

3. DISCUSSION

Analysis of Risk for Hypothermia with Case of Low Birth Weight Baby

Baby A has the physical appearance of a pure premature with a low birthweight baby with thin skin. The condition of premature baby has a large body surface area. The client is undergoing treatment in a room with central air conditioning so that when the baby is removed from the incubator, it will experience the risk for exposure to cold air. The researchers argue that these conditions can increase the risk for hypothermia, which if not immediately intervened properly will lead to a decrease in conditions and even death. The baby's thin skin is easy for air to pass, especially in a low-temperature environment with central air conditioning so that heat loss can occur from the client's body. The client's body surface area is large so it is easy for evaporation to occur.

Physical assessment carried out in a multisystem manner on the client obtained data that the baby's skin was thin, looked shiny, a lot of lanugo in the face area, both upper arms and around the back, the nipples looked thin, the scrotum looked shiny and smooth, the skin on the soles of the feet looked thin and tattoos on the feet a little. The author observed that the baby's condition is a clinical manifestation that will indeed appear in infants with pure prematurity, namely when observed the most obvious sign is the baby's thin and shiny skin. Meanwhile, the baby with dysmaturity has dry skin, thick nipples, rough scrotal skin, and lots of tattoos on the soles of the feet. Other opinions that are in accordance with the client's condition and the author's opinion are: Clinical manifestations of LBW are physical: small baby, less movement and still weak, head bigger than body, weight <2500 grams. Skin and genitals: thin and transparent skin, lots of lanugo, fine and thin hair, immature genital (Maryunani, 2013).

Newborns are particularly susceptible to hypothermia because they have a relatively large surface area compared to their weight, so there is an imbalance between heat release (related to

body weight) and heat loss (surface area); their skin is thin and heat passes easily; they have little subcutaneous fat to retain heat; they have a limited capacity to generate heat because they depend largely on non-shivering thermogenesis, using a special form of adipose tissue, brown fat scattered around the neck, between the scapula and around the kidneys and adrenal glands; their ability to generate heat from a non-shivering sympathetic response occurs only at ambient temperatures $< 16^{\circ}\text{C}$ in term infants and does not occur in premature infants until two weeks of age; premature babies are not able to lighten their bodies to reduce skin exposure (Lissauer and Fanaroff, 2013).

One of the baby's responses to cold exposure is the metabolism of brown fat by the oxidation process of brown fat or brown adipose tissue. Brown fat tissue contains a high concentration of triglyceride content, is a capillary rich network and is tightly innervated by sympathetic nerves ending in the veins and in individual adipocytes. Each cell has many mitochondria, but what is unique here is that the proteins consist of unpaired proteins which limit enzymes in the heat production process. Thus, due to the activity of this protein, when fat is oxidized there will be heat production, and not energy rich in phosphate bonds as in other tissues (Yunanto, 2013).

Analysis of the Effectiveness of the Kangaroo Mother Care on the Risk for Hypothermia

The results of data analysis show that the client has risk factors that can cause hypothermia in newborns so that interventions need to be given to prevent it. The researcher chose the kangaroo mother care to be a superior intervention because this method can later be done independently by parents at home, because it is difficult for parents to provide an incubator at home. The tools used are also quite easy to obtain, namely cloth to tie the baby and loose clothes for mothers or blankets for mothers. This method in addition to preventing hypothermia in clients is also useful for increasing the client's bonding with parents. The author's opinion is supported by statements about the benefits of the kangaroo method, including the benefits for babies, including: reduced calorie consumption; there is stabilization of breathing and heart rate; temperature stabilization occurs; reduced incidence of infection so as to reduce the risk of this death in infants; baby can suckle better and longer; baby's weight gain is better; baby's sleep time is longer; reduce baby's stress; decreased pain response; boost the immune system; better baby behavior; shorter treatment time.

The benefits of Kangaroo Mother Care for mother include: mothers become closer to their babies; mothers are more confident; mother and family are calmer; increase breast milk production; save on household expenses; mothers and fathers are better prepared to take care of their babies. reduce baby's stress; decreased pain response; boost the immune system; better baby behavior; shorter treatment time. The benefits of Kangaroo Mother Care include: mothers become closer to their babies; mothers are more confident; mother and family are calmer; increase breast milk production; save on household expenses; mothers and fathers are better prepared to take care of their babies. reduce baby's stress; decreased pain response; boost the immune system; better baby behavior; shorter treatment time. The benefits of Kangaroo Mother Care include: mothers become closer to their babies; mothers are more confident; mother and family are calmer; increase breast milk production; save on household expenses; mothers and fathers are better prepared to take care of their babies.

The benefits of Kangaroo Mother Care for fathers include: fathers have a greater role in caring for their babies; can improve the relationship between father and baby, especially playing

an important role in countries with high levels of violence against children. The benefits of the Kangaroo Mother Care for health workers include: energy efficiency because mothers tend to take care of their own babies more. The benefits of the kangaroo method of care for health care facilities include: shorter length of treatment so that babies can return home from health care facilities quickly; increased turnover, i.e. the place left by the baby to go home, can be immediately used by other babies who need it; budget efficiency due to the use of facilities such as electricity, incubators, and other sophisticated equipment. The benefits of the Kangaroo Mother Care for the country include: foreign exchange savings in imported formula milk due to increased use of breast milk; savings in health care costs (Maryunani, 2013).

The implementation of risk for hypothermia was carried out for 3 days, each time the action was approximately 60 minutes, then before and after the action. The Kangaroo Mother Care process which was carried out for 3 days did not experience any obstacles. The client's mother is very cooperative, the client also does not experience a worsening of the condition.

For 3 times the kangaroo mother care was treated, the client's body temperature increased after the procedure was carried out. In the study of Bera, Ghosh, Singh, Hazra, & Som (2014) proves that the kangaroo mother care is effective in preventing hypothermia in infants when removed from the incubator. The increase in body temperature after the procedure has been proven in research on kangaroo mother care proven to be able to increase body temperature. The study was conducted by 265 infants in West Bengal, India by providing intervention for 3 days. The average temperature increase on the first day is 0.34 C, the second day is 0.39 C, and the third day is 0.43°C.

Kangaroo mother care is able to raise the client's body temperature because this method is care for low birth weight babies or premature births by making direct contact between the baby's skin with the mother's skin or skin-to-skin contact where the mother uses her body temperature to warm the baby (IDAI, 2013). During the kangaroo treatment process, the mother was able to control body temperature better than the incubator so that there was an increase in body temperature. A warm body temperature in infants is needed for the efficiency of energy metabolism as measured by a reduction in calories. Saving calories is expected to improve physiological changes in the body, one of which is body temperature (Zahra, 2018).

Babies who are cared for in an incubator will get warmth through heat transfer through conduction and radiation. The kangaroo mother care has a working mechanism similar to care in an incubator. Heat transfer by conduction occurs when the skin is in direct contact with the mother and baby. While radiation heat transfer is when the baby and mother are in a blanket or special clothes (Thukral, Chawla, Agarwal, Deorari, dan Paul (2008) in Sari, Wardani, & Arismawati, 2018). Various benefits are obtained in carrying out kangaroo mother care for babies, mothers and fathers. Increasing physical contact with children can increase the attachment between children and parents (Muhsinin and Rahmani, 2021).

4. CONCLUSION

The data analysis that has been carried out has led to risk for hypothermia. Interventions of risk for hypothermia include monitor vital signs, monitor skin color and temperature,

hospitalization in an incubator, perform KMC. Researchers chose the superior intervention of KMC to prevent hypothermia when the baby was removed from the incubator as a preparation for the baby to adapt to the outside environment.

The implementation of KMC was carried out for 3 days with 60 minutes of each procedure. During KMC, there were no obstacles, cooperative mother and baby did not experience any deterioration in their condition.

The increase in the client's body temperature after KMC shows that this method is effective in preventing hypothermia in LBW. When done KMC heat transfer by conduction and radiation. Heat transfer by conduction when in direct contact with the skin of mother and baby. While radiation heat transfer is when the baby and mother are in a blanket or special clothes.

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