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Interventions to Reduce Bilirubin Levels in New Birth Babies: A Systematic Review

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Abstract. Hyperbilirubinemia in newborns requires accurate and prompt intervention. Many choices of interventions to reduce bilirubin levels in newborns make researchers feel the need to conduct a systematic literature review. This article reports on the results of a systematic review of articles published between 2009 and 2019 that specifically address interventions to lower serum bilirubin levels in newborns. Literature searches were performed on data based on reputations: PubMed, ProQuest, EBSCO, and Medline. The literature collection was conducted using the Joanna Briggs Institute Critical Appraisal tools. The selection of literature was performed using PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analysis. The results of the systematic literature review show that the intervention of infant massage, photo therapy, early initiation of breastfeeding and the use of biliblanket can reduce the total serum bilirubin levels of newborns and prevent kernicterus incidence. Health care workers must be competent in selecting the most effective interventions to rapidly reduce the serum bilirubin level of newborns.

Keywords: hyperbilirubinemia; infant massage; photo therapy; breast milk; biliblanket; newborns

1. Introduction

The health of newborns requires great attention from health workers. The extrauterine adaptability of newborns is influenced by many factors including organ maturity, gestational age, pregnancy history, childbirth history, maternal health history during pregnancy, genetic factors, and other factors. One of the health problems that often occurs in newborns is an increase in serum bilirubin levels to > 5 mg/dl in the hours to several days after delivery. Initial state of hyperbilirubinemia.

Hyperbilirubinemia is common in newborns because when maternal plasma levels are high, free or unconjugated bilirubin easily crosses the placenta from the mother to the fetus. Cunningham (2010) explains that between the second and fifth day of life about one third of all newborns experience physiological jaundice in the newborn (jaundice). The serum bilirubin level at birth is usually 1.8-2.8 mg/dl. This figure increases further over the next few days but varies from individual to individual. Between days three and four, the newborn's bilirubin exceeds 5 mg/dl, the level at which jaundice is usually seen. Most of the free bilirubin is unconjugated. In the liver, bilirubin is conjugated with glucuronic acid and excreted in the bile. In the immature liver, there is less bilirubin conjugated with glucuronic acid so that its excretion into bile is reduced. By alternative methods, reabsorption of free

bilirubin can be produced from bilirubin glucuronide enzymatically through conjugate activity in the newborn's gut. Hyperbilirubinemia in newborns at a later stage is called kernicterus

Kernicterus is a form of complication in newborns due to unconjugated hyperbilirubinemia in newborns, especially premature newborns. Kuzniewicz and Newman (2009) explained that in a follow-up study of the collaborative perinatal project, it was found that total serum bilirubin levels >25 mg/dl could cause kernicterus in infants with a positive Coombs test. This explains that all newborns with a positive Coombs test require immediate intervention to reduce hyperbilirubinemia to prevent kernicterus. Kernicterus is considered dangerous because it can cause spasticity, muscular incoordination, and mental retardation with varying degrees (Cunningham, et al, 2010).

The United Nations Inter-Agency Group for Child Mortality Estimation (2018) explains that . 2.5 billion deaths of newborns aged one month due to complications and 7000 newborn deaths occurred in the first week of life. Dewi (2014). explained that the causes of death for newborns aged 0-7 days were premature, low birth weight and asphyxia and the causes of death for infants aged 8-28 days were infection and feeding problems.

The United Nations Inter-Agency Group for Child Mortality Estimation (2018) explains that 75% of all infant and under-five deaths occur in the first year of life. The highest data on infant mortality in the first year of life is found in Africa, which is 55/1000 births. RISKESDAS (2013) explains that the infant mortality rate in Indonesia is 34 per 1000 births, of which the most deaths occur in newborns weighing <2500 grams, gestation period <37 weeks and experiencing jaundice in one week of delivery. RISKESDAS (2013) explains that the infant mortality rate has decreased compared to 2007 to 32 per 1000 live births and the most common cause is hypothermia (7%), hyperbilirubinemia (6%).

Data findings in the form of newborn deaths due to hyperbilirubinemia indicate the importance of interventions that need to be carried out by health workers to reduce serum bilirubin levels in newborns so that newborn complications do not occur. Hyperbilirubinemia is a yellow color that can be seen in the sclera, mucous membranes, skin or other organs due to the buildup of bilirubin. The increase in bilirubin levels occurs on the second and third days and reaches its peak on the fifth day to the seventh day, then decreases again on the tenth day to the 14th day (Dewi, 2014).

Cunningham (2010) explained that about one third of healthy newborns experience physiological jaundice on the second and fifth day after birth and the rest experience pathological jaundice. Jaundice is a yellow mark on the integumentary surfaces of the body including the sclera of the eyes and the surfaces of the palms and soles of the feet. Pathological jaundice is a condition to watch out for. Pathological jaundice is caused by several diseases such as hemolytic disease, metabolic disorders, endocrine disorders, liver disorders and infections. Data findings in the form of increased levels of bilirubin levels >20 mg/dl can cause bilirubin to penetrate the brain barrier and toxic to the brain. Physiological jaundice is different from pathological jaundice. In fact, what is dangerous is pathological jaundice. Pathological jaundice is called hyperbilirubinemia. The state of hyperbilirubinemia is characterized by bilirubin levels >5 mg/dl. At this level, the thing to watch out for is toxic events that can cause damage to the central nervous system in newborns. Severe hyperbilirubinemia can cause kernicterus. Kernicterus can cause encephalopathy and, in more advanced stages, cause death.

Based on a survey in several pediatric care rooms in several hospitals in Bandung, it is known that health workers have recognized the importance of immediate intervention to reduce serum bilirubin levels to prevent complications of newborns. The health worker in the pediatric ward said that one of the favorite interventions to reduce serum bilirubin levels was the provision of nutrition in the form of formula milk and the provision of phototherapy. According to the nurse, it was known that formula milk was given to hyperbilirubinemia babies because there was no breast milk bank available. Giving formula milk to newborns with hyperbilirubinemia causes an increase in the prevalence of non-exclusive breastfeeding babies and this can affect optimal baby growth and development. Based on this, the researchers felt the need to conduct a literature review study to find out other intervention options to reduce serum bilirubin levels in newborns.

2. Methods

The literature search was conducted from March-September 2020, based on reputable data based on Google Scholar, PubMed, ProQuest, EBSCO, and Medline using the keywords "Intervention AND to reduce bilirubin levels AND Newborn". The literature collection was carried out using the Joana Briggs

Institute Critical Appraisal tools for analytical cross sectional and analytical case control. The literature selection was conducted using PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analysis. Literature analysis and synthesis was organized using a matrix review table and a matrix synthesis table.

The literature inclusion criteria included the year published 2010-2020, the language used was Indonesian and English, the type of literature used to study medical and non-medical management of newborns with hyperbilirubinemia, population, and research samples in the form of newborns with hyperbilirubinemia. The flow diagram of the process is illustrated in Figure 1.

Figure 1. Flow process of literature collection.

3. Results

In the literature search stage, the researcher found 11,959 articles that matched the keywords. Furthermore, the article is filtered and identified which includes year of publication, number of samples, type of article, content of the article, criteria that have been determined and assessed for feasibility using the Checklist for Quasi-Experimental Studies instrument from JBI (Joana Briggs Institutes) (2017). So that 100 articles were obtained that matched the criteria. Then the next step was to synthesize literature using PRISMA and obtained 10 suitable articles.

4. Discussion

4.1. Baby Massage

Lei et al (2018) explained that baby massage in newborns can reduce total serum bilirubin and percutaneous bilirubin levels and increase defecation. Purnamasari, Rahayu, and Nugraheni, (2020) explained that baby massage is effectively used as an intervention to reduce serum bilirubin levels in newborns as evidenced by the results of the study in the form of average serum bilirubin levels after the intervention in the intervention group was 6.48 while the control group 9.32. The average decrease in serum bilirubin levels in the intervention group (7.21+2.59), while in the control group (6.51+3.30),

there was a difference between the two groups. Ambarita and Anggraeni (2019) explained that baby massage can be used as a nursing intervention in the management of hyperbilirubinemia infants in hospitals.

4.2. *Photo Therapy*

Indrayani and Riani (2019) explained that phototherapy had a meaningful relationship with a decrease in total bilirubin levels in hyperbilirubinemia newborns with a p-val value of 0.039. Wikanthiningtyas and Mulyanti (2016) explained that bed rest during phototherapy had a significant effect on bilirubin levels in neonatal jaundice in the Neonatus High Care Unit of RSUD Dr. Moewardi with a P-val of 0.00. The results of both studies have similarities with research conducted by Ughasoro, et al (2019) explaining that phototherapy is still effective in the management of neonatal hyperbilirubinemia, but the inclusion of UDCA (urso deoxycholic acid) accentuates the reductive effect of phototherapy on total serum bilirubin in neonates, reduce the duration of treatment and inpatient care

4.3. *Biliblanket Installation*

Ambarita and Anggraeni (2019) explained that bilirubin levels after using biliblanket for 24 hours and 48 hours had bilirubin levels > 10g/dl while using biliblanket for 72 hours showed 51.7% had bilirubin levels of 5-10 g/dl. The use of biliblanket can be considered as one of the nursing interventions so that nursing care is more optimal

4.4. *Early Initiation of Breastfeeding and Breastfeeding*

Breastfeeding is a natural way to provide optimal nutrition, immunity and emotional maintenance for the growth and development of babies. There is no artificial milk (Formula Milk) that can match breast milk both in terms of nutritional content, growth factors, hormones and especially immunity. Because the baby's immunity can only be obtained from breast milk. Early feeding causes bowel movements to occur and meconium to be excreted more quickly so that the enterohepatic circulation of bilirubin is reduced. In the intestine, direct bilirubin will be bound by food and excreted as stercobilin with feces. Conjugated bilirubin is transported to the intestine, when conjugated bilirubin reaches the terminal ileum and large intestine, intestinal bacteria secrete glucuronide enzymes and reduce the pigment to urobilinogen. Some of the urobilinogen is reabsorbed and re-excreted via the liver to form the enterohepatic urobilinogen cycle, and most of it is oxidized by the intestinal flora to urobilin and excreted in the feces.

Kamilah et al (2011) explained that colostrum has a laxative effect to help expel meconium in newborns and this indirectly helps remove excess bilirubin and prevent icterus in newborns. Babies who don't get colostrum have an impact on excess bilirubin in the baby's body that can't come out, so that at the beginning of the baby's birth the baby has jaundice.

Colostrum works as a vaccine that is 100% safe and natural and contains a number of immunoglobulin antibodies. Many mothers do not understand the benefits of colostrum and often throw it away when it comes out of the breast because they think it is dirty liquid. Giving early feeding that must be done as early as possible can prevent complications due to lack of fluid and calorie intake. With early feeding, there will be an increase in bowel movements and meconium will be excreted more quickly so that the enterohepatic circulation of bilirubin is reduced.

Herawati and Indriati (2017) explained that early breastfeeding initiation affects the incidence of jaundice in newborns aged 0-7 days as evidenced by a decrease in bilirubin levels of 7.17 mg/dl in newborns who are breastfed every day. 2 hours and a decrease in bilirubin levels of 7.01 mg/dl in newborns who are breastfed every 3 hours. This shows that breastfeeding every 2 hours is effective in reducing bilirubin levels with a p value of 0.000 (A: 0.05). Mahrshahi (2008) explains that breastfeeding can reduce infant morbidity and mortality, optimal breastfeeding can prevent 1.4 million under-five deaths worldwide every year.

Referring to these studies, it is known that breastfeeding is one of the efforts that can be done to prevent the occurrence of hyperbilirubinemia. Breastfeeding has also been recommended by WHO that the infants of 0-6 month should be exclusively breastfed. Riordan (2005) The baby's inability to suck and swallow breast milk from the mother's nipple on an ongoing basis can increase the risk of increased serum bilirubin levels, hypoglycemia, dehydration, and insufficient weight gain. Interventions for these infants should include skin-to-skin contact, keeping the baby warm, supporting the baby to have a longer

period of rest between feedings and limiting stimulation are all important to optimize the baby's ability to feed properly. when awake. This is evidenced by the research of Ridha (2014) explaining that breastfeeding every 2 hours for newborns can reduce serum bilirubin levels in hyperbilirubinemia. It is known that breast milk is the best nutrition and in accordance with the physiology of newborns. Breast milk contains nutrients that are easily metabolized by the baby's body. The more babies get breast milk, the more their metabolism increases. The state of high body metabolism in the digestive tract can increase the frequency of defecation in infants. When the baby defecates, the baby's stool also removes unconjugated bilirubin. Breastfeeding more often, can prevent the baby from dehydration and lack of calorie intake. A dehydrated body or a lack of caloric intake can contribute to the onset of jaundice.

4.5. Formula feeding

Formula milk is usually given as a substitute for breast milk to meet the food intake needs of infants from contraindicated mothers or mothers who are unable to breastfeed. In certain circumstances, formula feeding is an option, even though it is known that the content of formula milk is different from breast milk. Formula milk is given as a substitute for breast milk for mothers whose milk production is lacking, or mothers are still in intensive care or mothers who are contraindicated for breastfeeding, such as mothers with breast abscess, breast cancer, heart disease, mental illness, leprosy, tuberculosis, and mothers with HIV/AIDS. Formula feeding in newborns is conducted if the mother's health has contraindications to breastfeeding her baby or if breast milk production is inhibited, this intervention is performed to prevent hypoglycemic and kernicteric infants because of the binding process of indirect bilirubin by albumin and carried back to the liver by the baby's circulation when baby is hungry. This circuit is called the enterohepatic cycle (gut-liver chain).

In principle, it is important that adequate nutritional intake is immediately met for newborns with hyperbilirubinemia so that their serum bilirubin levels get lower immediately and kernicteric events do not occur. Not infrequently for several reasons where breast milk is not available or the quantity is lacking, health workers choose to give formula milk while trying to get breast milk from the mother of the baby they care for because after all, there are many studies that explain that breast milk can reduce the incidence of hyperbilirubinemia more effectively than water. Formula milk.

5. Conclusion

Newborns with hyperbilirubinemia need special intervention to reduce serum bilirubin levels and prevent kernicteric occurrence. Interventions to reduce serum bilirubin levels include infant massage, phototherapy, early initiation of breastfeeding, breastfeeding every 2 hours and the use of a biliblanket. In some circumstances, health workers may conduct these interventions in combination, adjusted to the condition of the newborn and the availability of facilities and infrastructure in the infant care room. Health workers need to improve their competence to select and determine the type of intervention that can be used to reduce the serum bilirubin level of newborns appropriately.

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