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Nutrition Management for Preterm Infants to Avoid Growth Faltering in Later Days

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***ABSTRACT*:** Premature babies have a high risk of experiencing growth retardation due to the inability of their organs to function optimally, including in absorbing nutrients. The early period of life is a critical period that requires proper nutritional management to support optimal growth and development. This study aims to provide recommendations for optimal steps for nutritional management in premature babies so that growth retardation can be avoided. The results showed that the basic principles of preterm infant nutrition management involve strategic steps to optimally meet nutritional needs. The first step is exclusive breastfeeding, which is the best source of nutrition. If breast milk is insufficient, specialized formula milk is an important alternative. Other nutritional management includes enteral and parenteral nutrition, tailored to the infant's condition. Monitoring growth and development, food tolerance and body composition are key elements to ensure the success of the intervention. Collaboration between the healthcare team, including doctors, nurses, nutritionists and parents, is essential in this process. With a careful approach and monitoring, nutritional management can address the challenges of premature infants, providing a better chance of achieving optimal health and development in the future.

Keywords- Nutritional Management, Premature Babies, Growth Faltering

INTRODUCTION

Prematurity is one of the main factors contributing to the high mortality and morbidity rates of neonates, and has a significant long-term impact on health. Babies born prematurely often have low birth weight, defined as a birth weight between 1,500 and 2,500 grams (WHO, 2018). Each year, an estimated 15 million babies are born prematurely worldwide, with rates continuing to rise. Indonesia has the fifth highest preterm birth rate in the world, with more than a third of neonatal deaths caused by prematurity. Socioeconomic factors and environmental conditions in residential areas also influence the

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occurrence of preterm birth (Marsubrin et al., 2024). The prevalence of LBW in Indonesia also showed an increase, from 5.7 per 10 births in 2013 to 6.2 per 10 births in 2018 (Wijayatri & Riana, 2021).

Premature babies have a high risk of experiencing growth retardation due to the inability of their organs to work optimally, including in terms of nutrient absorption. Early nutrition plays a crucial role in determining the health and well-being of premature infants throughout their lives. Various studies have shown that premature infants face a greater risk of mortality and various health problems, including impaired brain development (Septira & Angraini, 2016). Therefore, adequate nutritional support is a top priority. Research has underscored the importance of efforts to improve nutrition in very low or extreme birth weight infants. This support not only aims to improve their life chances, but also to improve the quality of life of preterm infants (Lapillonne et al., 2013).

Providing adequate nutrition to preterm infants with low birth weight (LBW) is essential to support their growth and development (Sulistijono, et al., 2016). The early period of life is a critical time that requires proper nutritional management, which can play a role in preventing growth retardation later in life. Providing proper nutrition is expected to enable preterm infants to achieve growth and development comparable to those born at full term and later have a good quality of life.

Previous studies have shown that nutrition in preterm infants is provided in two ways, namely parenteral and enteral. When the baby is unstable, nutrition is given parenterally through the blood vessels in the form of fluids, carbohydrates, proteins, fats, and vitamins (Wijayatri & Riana, 2021).

Parenteral nutrition should be given in the shortest time possible to reduce the risk of infection. In addition, the use of adequately fortified breast milk is highly recommended as it provides unique benefits, especially in terms of supporting the immune health, digestive system, and neurodevelopment of preterm infants (De Rose et al., 2024).

This review aims to give insight regarding nutritional management strategies that can support optimal growth of preterm infants and prevent developmental barriers that may occur later in life. The main focus of this review is to make a contribution to the field of nutrition, especially in the neonatal context, by expanding the understanding of the importance of proper nutrition to support the growth and development of premature infants. This review is expected to encourage hospitals to formulate standardized policies or protocols in the nutritional management of preterm infants, which includes the provision of necessary supplements and appropriate nutritional education assistance for parents and medical personnel, so that barriers to growth that can affect their quality of life in the future can be avoided.

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METHODS

This research uses the literature review method, which is carried out to identify, evaluate, and synthesize research results and thoughts from previous researchers and practitioners. The literature review aims to provide an overview of what has been done by others related to the issue to be studied (Tuginem, 2023). In this study, the literature review method is very relevant because it will help in understanding nutritional management for premature babies, so that their growth is not hampered in the future. By referring to previous studies, the researcher was able to gather information regarding best practices in nutrition for preterm infants, as well as the challenges that may be faced in ensuring that their growth is not impaired. The literature review also provides a solid foundation for further development of research methods in this topic, which is crucial to support the health and development of preterm infants.

DISCUSSION

Preterm infants are babies born before 37 weeks of gestation and often have low birth weight. Preterm birth is one of the leading causes of neonatal and under-five mortality globally, and has a major impact on unsustainable health care burden and nutrition-related morbidity (Akalay et al., 2024). Preterm infants' organs, including their digestive system, are not fully mature, so they face great challenges to survive and develop optimally.

Preterm infants are highly susceptible to various adverse effects, such as stunted growth, suboptimal neurodevelopment, and disorders of various body systems. To support organ maturation, healing, repair, and recovery to normal conditions, an approach that optimizes the nutritional intake of premature infants is needed (Bala et al., 2024). Nutritional deficiencies and growth retardation that occur during neonatal intensive care unit (NICU) and beyond are associated with poor neurodevelopmental outcomes (Consales et al., 2023). This is further complicated when nutritional deficits occur in early infancy and periods of rapid growth, which can increase the risk of preterm infants developing metabolic and cardiovascular disorders in the long term (Martínez-Jiménez et al., 2020). Therefore, nutritional management is of key importance in supporting the growth and development of preterm infants.

Nutritional management has the primary goal of supporting infants to reach their ideal age-appropriate weight, as well as promoting healthy growth. Good nutrition is essential as preterm infants require additional support to overcome the growth retardation caused by early birth. Nutritional deficiencies that persist into childhood can lead to malnutrition, which is globally recognized as one of the major risk factors for childhood morbidity and mortality (Prasadajudio et al., 2023).

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Proper nutrition also plays a role in improving the body composition of premature infants, ensuring a balance of fat and muscle growth to support optimal physical development. Providing proper nutrition in the newborn period is essential to maximize normal brain development. In addition, good nutrition also serves to prevent serious complications that often occur in premature babies, such as infections, CVC occlusion, hepatic cholestasis, and metabolic bone disease, which can arise due to the immaturity of the baby's organs (Mustapha et al., 2021).

Providing optimal nutrition early, not only helps lower the risk of poor health outcomes but also plays a role in improving cognition in adulthood (Kumar et al., 2017). Nutritional management is also very important to support the brain development of premature infants. Providing adequate nutrition is necessary for optimal cognitive development. Research shows that poor nutrition in premature infants can contribute to impaired head growth, which is often associated with poorer psychomotor and mental skills, as well as an increased risk of cerebral palsy and autism (Lee & Hayes, 2015).

The basic principles of nutritional management for preterm infants involve steps designed to fulfill optimal nutritional needs to support the growth and development of preterm infants. The first step in nutritional management is exclusive breastfeeding, which is the best food for babies, including premature babies. Breast milk contains nutrients that can meet the needs of children up to six months of age, as well as antibodies that help fight infection. Research shows that breastfeeding has significant benefits on postnatal growth and body composition development (Giannì et al., 2016). Breastfeeding is also known to reduce the risk of sepsis, improve feeding ability, support neurodevelopment, reduce the risk of metabolic syndrome, and reduce low-density lipoprotein levels in adolescence (Amissah et al., 2020).

If the mother is able to produce breast milk, exclusive breastfeeding is the best option. Breast milk can be given directly or expressed breast milk. However, premature infants often have difficulty with direct breastfeeding due to their physical immaturity (Susanto & Gessal, 2018). Under these circumstances, breast milk can be given through a Nasogastric Tube (NGT) or bottle to ensure adequate intake.

Subsequent nutritional management occurs when breast milk is insufficient, and specialized formula for premature infants becomes an important alternative. Many premature infants receive infant formula as their main source of nutrition during hospitalization, especially if breast milk is not available. Premature infant formula is designed with higher calorie, protein, mineral, vitamin and trace element content to meet their special nutritional needs (Su, 2014). These formulas aim to support ideal intrauterine nutrient accretion rates and are often used until the infant is ready for hospital discharge.

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The type of formula given is tailored to the infant's clinical condition, caloric needs and weight gain targets. In Indonesia, different types of formula such as standard formula (20 kcal/30 ml), preterm formula (24 kcal/30 ml), and 22 kcal/30 ml formula are used interchangeably based on medical evaluation. Monitoring of infants' growth is done using growth curves adjusted for their age, sex, and gestational age (Rohsiswatmo & Amandito, 2019).

Other nutritional management in preterm infants includes enteral and parenteral nutrition, each of which has an important role in supporting infant growth and development. Enteral nutrition involves feeding through the gastrointestinal tract, either orally or via NGT. Research shows that early enteral nutrition is associated with better weight gain. Factors such as gestational age, birth weight, intrauterine growth rate and the presence of comorbidities influence the success of enteral nutrition (Lubis & Suciati, 2016). This nutrition is usually given gradually, starting with small volumes that are slowly increased according to the infant's tolerance.

In contrast, parenteral nutrition is given directly into the bloodstream through an IV, especially for premature infants who are very sick or unable to digest food through the gastrointestinal tract. Total parenteral nutrition is particularly important for infants less than 32 weeks gestation or with limited enteral intake. Early administration of parenteral nutrition, ideally within the first 24 hours, helps to reduce intrauterine growth retardation, maintain a positive nitrogen balance and reduce postnatal weight loss. In addition, this approach can prevent complications such as bronchopulmonary dysplasia (BPD) and necrotizing enterocolitis (NEC), while improving infant neurodevelopment (Türkyılmaz et al., 2018).

However, the nutritional needs of preterm infants are unique due to variations in pathophysiology, metabolic requirements, and neuroendocrine regulation. Therefore, nutrition should be individualized based on each infant's condition (Hasenstab & Jadcherla, 2022). Factors such as gestational age, birth weight, and the presence of medical complications play an important role in determining the infant's need and tolerance for food. Infants who are born increasingly premature or with very low birth weight require higher nutrient intakes to support optimal growth and prevent long-term complications. With a careful and customized approach, nutritional feeding of premature infants can yield maximum results for their health.

The importance of monitoring is a key element in the nutritional management of preterm infants, as it ensures that nutritional interventions are fit for purpose and provide maximum benefit. Infant growth and development need to be monitored regularly, including weight, length and head circumference, as these indicators reflect the overall health and development status of the infant (Villar et al., 2018). In addition, changes in the infant's body composition are also a marker of the success or failure of nutritional

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interventions. The infant's tolerance to food should also be closely monitored; signs of intolerance such as diarrhea, vomiting, or bloating need to be identified and treated immediately to prevent further complications (Albraik et al., 2022).

Successful nutritional management of premature infants is inseparable from the collaboration of various parties in the healthcare team. Pediatricians play a central role in determining the diagnosis, designing an appropriate nutrition plan, and monitoring the baby's development. Nurses have the responsibility of providing direct care, including ensuring nutrition is delivered safely and on schedule. Nutritionists, on the other hand, are in charge of devising a specific and measurable diet plan based on the unique needs of each baby. Thus, nutritional management in premature infants is a complex process that requires special attention from various parties. Close collaboration between parents, doctors, nurses and nutritionists is essential to ensure that premature babies can grow and develop optimally. With careful monitoring and a holistic team approach, the challenges of providing nutrition to premature infants can be overcome, giving them a better chance of achieving good health and development in the future.

CONCLUSION

The results showed that nutritional management for premature infants is based on principles designed to optimally meet nutritional needs, so as to support maximum growth and development of infants. The first step is to provide exclusive breastfeeding, as breast milk is the best source of nutrition for infants. However, if breast milk is insufficient, special formulas designed for the needs of premature infants are an important alternative to ensure nutritional needs are met. In addition, nutritional management in premature infants also includes enteral and parenteral nutrition. Enteral nutrition is given through the gastrointestinal tract, while parenteral nutrition is given directly through the bloodstream for infants who are unable to receive enteral intake. Both approaches are complementary and tailored to the infant's health condition. Monitoring is a key element in the nutritional management of preterm infants. It is important to ensure that any interventions performed go according to plan and provide optimal benefits. With careful monitoring, doctors and the healthcare team can immediately address any challenges or issues that arise. Thus, nutritional management for preterm infants is a complex process that requires collaboration between doctors, nurses, dietitians and parents. This holistic team approach can overcome the challenges of providing nutrition so that premature babies have a better chance of growing up healthy and developing optimally in the future.

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