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Differences in enteral nutrition on weight gain and length of stay of premature LBW at Kraton Hospital, Pekalongan Regency

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ABSTRACT

Introduction: Premature birth and low birth weight are major risk factors for infant mortality. The lower the birth weight, the higher the risk of mortality. Providing nutritional intake is very important for the survival of premature babies. Types of enteral nutrition that can be given are breast milk, HMF breast milk, and formula milk. This study aims to determine the difference in enteral nutrition on weight gain and length of stay of premature LBW.

Method: This is a cross-sectional study with a simple random sampling technique—data from medical records of premature LBW babies from 2019 to 2023.

Results: There was no significant difference between the type of enteral nutrition given on weight gain, both in the type of enteral breast milk (p-value: 0.081; mean: 134.19; SD: 103.31), breast milk HMF (p-value: 0.081; mean: 119.36; SD: 157.94), formula milk (p-value: 0.081; mean: 163.32; SD: 120.51). There was no significant difference between the type of enteral nutrition provided and the length of stay in both types of enteral breast milk (p-value: 0.256; mean 12.26; SD: 9.61), breast milk HMF (p-value: 0.256; mean: 20.91; SD: 17.277), formula milk (p-value: 0.256; mean: 13.46; SD: 11.877).

Conclusion: The highest average weight gain of premature LBW infants was in HMF breast milk nutrition. The average length of the fastest period of care for premature LBW babies is on breast milk nutrition. Suggestions to provide education to pregnant women in optimizing breastfeeding through expressed breast milk for premature LBW babies who are being treated in the hospital. So that it can increase body weight and shorten the period of hospitalization.

Keywords: Enteral nutrition, LBW, Length of stay, Premature.

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INTRODUCTION

Stillbirth and low birth weight are major risk factors for infant mortality, the lower the birth weight, the higher the mortality risk.¹ In 2018, 2.5 million newborns died in the first month of life. The most common causes of neonatal deaths are complications of intrapartum events (28.3%), respiratory and cardiovascular disorders (21.3%), LBW and prematurity (19%), congenital abnormalities (14.8%), and infections (7.3%).²

Feeding intolerance (FI) is a common gastrointestinal complication in preterm infants. The incidence of feeding intolerance is about 60-70% in preterm infants with a birth weight of less than 2,000 grams. FI in preterm infants is mainly manifested by gastric retention, vomiting, abdominal distension, and feeding disorders. This often leads to inadequate nutrient intake

and postnatal growth retardation in premature infants. Preterm infants also have immaturity in mechanical functions such as sucking-swallowing coordination, gastroesophageal sphincter tone, gastric emptying, and intestinal motility. Due to the inability to drink, the achievement of full drinking in preterm infants may be hampered, which may result in nutritional disorders.³

Proper nutritional intake plays an important role in the intensive care of premature infants. Providing inadequate nutrition during the first weeks of birth can result in poor growth in deficient birth-weight infants.⁴ In general, the care of babies with premature LBW requires a long time and a lot of money. This is supported by research that states that on average, families spend 8.1% and 9.1% of their annual income on acute care for premature/BBLR infants and perinatal

asphyxia. The average expenditure for preterm/BBLR infants was \$147.6 (median \$101.8).⁴

Research on enteral and parenteral nutrition in premature LBW has been conducted by other researchers. Therefore, researchers are interested in conducting this research so that clinicians can predict the increase in body weight and length of stay of premature LBW.

METHODS

This study used a comparative analytic research design with a cross-sectional approach. A sampling of research from medical record data of patients with premature LBW babies at Kraton Hospital, Pekalongan Regency in 2019 - 2023. The population was 388. The sampling technique used in this study was simple random sampling. Then a sample of

Table 1. Frequency Distribution of Variables

Variable	Nutrition	Percent	Mean Min-max	Median	Std. Dev
Weight*	Breast milk		134.19 10 - 420		103.306
	Breast milk HMF		199.36 15 - 540		157.944
	Formula		163.32 0 - 570		120.509
Length of stay *	Breast milk		12.26 2 - 46		9.613
	Breast milk HMF		20.91 8 - 68		17.277
	Formula		13.46 2 - 61		11.877
Gestation **	Breast milk		30-35.2	34.00	84.718
	Breast milk HMF		27-30.6	32.00	105.097
	Formula		27-35.6	34.00	115.607
Type of Labor **	Cesarean section	Breast milk	27.7		0.452
		Breast milk HMF	18.2		0.405
		Formula	38.0		0.487
	Spontaneous Birth	Breast milk	72.3		0.452
		Breast milk HMF	81.8		0.405
		Formula	62.0		0.487

* Numerical data is presented with mean, min, max, SD

** Categorical data is presented in percentages, SD

197 with the Slovin formula. Sampling was increased by 10 percent to 217 with the possibility of incomplete prediction data from the sample. The sample was taken randomly. From the sample of respondents, data filtering was then carried out according to the inclusion and exclusion criteria. However, there were 2 incomplete medical records. So the final sample that can be processed in this study is 195.

Data collected included gestational age, type of delivery, birth weight, discharge weight, diagnosis, type of enteral nutrition (breast milk, HMF breast milk, formula milk), and length of stay. Inclusion criteria included infants with birth weight < 2500 grams, single infants or twins, premature infants (< 37 weeks), and infants born at Kraton Hospital or referred at the age of ≤ 1 day. Exclusion criteria were infants who died while being treated, infants who returned home at their request (APS), infants referred to other health facilities, and treatment costs with the Pekalongan District Health Office Guarantee. Sample calculation using the Slovin formula and 197 respondents were obtained. However,

Table 2. Kruskal Wallis Test

Variable		>Median	<=Median	Median	P-Value
Length of Stay	Breast milk	23	24		
	Breast milk HMF	7	4		
	Formula	56	81	10.00	0.256
Weight	Breast milk	18	29		
	Breast milk HMF	8	3		
	Formula	71	66	136.00	0.081

there were 2 incomplete data, so the sample was 195.

The implementation of the study began with the researcher submitting a research permit application to the LPPM Universitas Muhammadiyah Pekajangan Pekalongan, Bappeda, and Pekalongan District Health Office. Furthermore, researchers conducted research at Kraton Hospital, Pekalongan Regency from November to December 2023. Data processing of the research results used the SPSS 27 series software program.

RESULTS

This study used the Kolmogorov-Smirnov test to test the normality of the data and found that the data were not normally

distributed because <0.05. So the bivariate analysis used is the Kruskal Wallis Test with a significance level of 95%.

In **Table 2**, the p-value is 0.081 > 0.05, so there is no significant difference or H₀ is accepted and H_a is rejected. Thus, it can be concluded that there is no significant difference between the types of enteral nutrition given to increase the weight of premature LBW babies. The test results were obtained on the length of stay with a P-value of 0.256 > 0.05, so there is no significant difference or H₀ is accepted and H_a is rejected. Thus, it can be concluded that there is no significant difference between the type of enteral nutrition given to the length of stay of premature LBW babies.

DISCUSSION

The results of this study state that in terms of frequency, the type of enteral nutrition given to premature LBW babies is formula milk as much as 70.3%, followed by breast milk at 24.1% and breast milk HMF as much as 5.6%. After the delivery process is complete, the pain caused will cause various problems and affect lactation. In addition, in SC delivery there is also a decrease in the let-down reflex which can inhibit colostrum production. Cesarean delivery may not release colostrum within the first 24 hours after delivery, sometimes it takes up to 48 hours. Colostrum is usually released immediately after delivery and will increase in volume after two days postpartum. Sectio Caesarea surgery in labor will cause pain and result in changes in tissue continuity due to surgery.⁵ Infants who are not in direct contact with the mother at the time of birth may inhibit normal milk production. The mother's stress level is quite influential when separated from her baby and knowing that her premature baby needs further treatment in the high-risk care room. So many mothers or families with premature LBW babies who are treated in the perinatology room agree to give premature formula to their children who are being treated. Early enteral nutrition is better than delayed enteral nutrition in infants.⁶

The results of this study concluded that there was no significant difference between the types of enteral nutrition given to the increase in body weight of premature LBW babies. As with other studies that mention that there is no significant difference in weight gain ($P > 0.05$) in the HMF group and the premature formula group. Early enteral feeding should be given soon after birth to promote gastrointestinal maturation, growth, and functional development. Continuous or short-interval intermittent feeding appears to provide better gastrointestinal tolerance and faster achievement of full enteral feeding. Increasing feedings by 20-30 ml/kg/day in LBW infants $\geq 1,000$ g and 15-25 ml/kg/day in LBW infants is a reasonable strategy. One should always strive to maintain at least minimal enteral feeding, rather than stopping enteral feeding completely.⁶

Minimal enteral nutrition improves mineral absorption, increases serum calcium and alkaline phosphatase activity, and decreases the incidence of pyloric gastric residue and food intolerance in preterm infants.⁸ Nutrition in this critical stage of life should focus on providing optimal calorie and protein content and focus on optimizing individual macronutrients, micronutrients, and electrolytes.⁹

If breast milk and the addition of HMF cannot meet the nutritional needs to achieve the baby's growth (ideal weight), then premature infant formula can be given.¹⁰ According to research by Jing Sun, et al (2017) explained that probiotics in the form of breast milk and premature formula have a significant effect on increasing weight gain.¹¹ Recommended enteral nutrition is breast milk as the best source of nutrition for premature babies. Breast milk cannot fully meet the nutritional needs of premature infants. The addition of HMF to breast milk is useful to increase the nutrient content, in this case protein, to meet the nutritional needs of premature babies.¹⁰ To handle further nutritional problems, after the preterm breast milk turns into mature breast milk, it is recommended to add HMF to the breast milk. If breast milk fortifiers (HMF) are not available, preterm breastfeeding may be justified, especially for preterm infants born with a gestational age of less than 32 weeks or a birth weight of less than 1500 grams. Carlson and Ziegler (2022) argue that Human Milk Fortifier (24 kcal/oz) is indicated for all breastfed infants weighing less than 2000 grams.¹²

Based on the results showed that the most increase in body weight was 100 grams, namely there were 16 samples (8.2%). There was also no increase in body weight, namely between birth weight and return weight there was no difference. Initially, there was a decrease in the baby's weight, but with optimal care and handling the weight could increase again but not more than the weight at birth. A parallel study states that the age of recovery back to birth weight $[(10.13 \pm 4.03) \text{ d vs } (8.03 \pm 3.28) \text{ d}, P = 0.002]$ in the HMF group was longer than in the premature formula group, there was no significant difference between the two groups during

hospitalization in the hospital and the age of drinking time.⁷

According to Anggraini and Septira (2016), a newborn's weight can drop up to 10% below birth weight in the first week due to excessive extravascular fluid excretion and possibly insufficient food input. The baby's weight should increase again or exceed body weight again at 2 weeks of age and should grow approximately 30 g / day during the first month.¹⁰ The insignificant results of the study are possible because the infants whose data were taken mostly experienced complications such as asphyxia, RDS, hypoglycemia, and hyperbilirubin. Afian et al (2021) also explained the results of the presence of complications related to the increase in body weight of LBW babies, where LBW babies without complications will be able to grow according to the chart compared to babies with complications. As many as 97% of birth cases at RSCM are unplanned pregnancy cases. The study sample had an average gestational age of 34.03 (± 2.93) weeks, with the youngest gestational age of 27 weeks and the oldest of 41 weeks. The study sample consisted of 112 (75.7%) preterm pregnancies and 36 (24.3%) full-term pregnancies. Almost all of them had poor prenatal care so the babies born will have various nutritional, respiratory, digestive, and various other problems. Due to these complications and the underlying conditions of premature babies, doctors tend to delay breastfeeding, resulting in EUGR.¹³

At birth, a baby's weight contains a lot of body fluids that will be lost within a few days. Most babies lose 1/10 of their body weight during the first five days and regain weight within the next five days (IDAI, 2016). Newborn weight can drop 10% below birth weight in the first week due to excessive extravascular fluid excretion and possibly insufficient food intake.¹⁰ Infants born with low birth weight are slower to return to birth weight than infants with normal birth weight. The goal that needs to be realized is linear growth and avoiding flat growth or stagnant growth, as well as returning to the initial birth percentile or at least the 10th percentile.¹⁴

In this study, the average gestational age when the baby was born was 33.14 weeks. At this age, the baby's organs are

immature, especially the lungs. Yadav, et al (2023) stated that the lower amount of surfactant in premature infants also experienced a decrease in surfactant activity due to its composition. The most important risk factors are prematurity and low birth weight. In one study of infants born between 2003 and 2007 at various National Institute of Child Health and Human Development (NICHD) Neonatal Research Network centers, infants born at 34 weeks, the risk of RDS was 5%.¹⁵ So the gestational age that is safe enough for termination is more than 34 weeks because the risk of RDS that occurs due to surfactant deficiency can be minimized. In infants aged less than 28 weeks, the incidence is 60-80%, age 32-36 weeks is 15-30%, and age less than 37 weeks is 5%. This condition mainly occurs in premature babies less than 32 weeks old.¹⁶

The results of the bivariate test showed no difference between the type of enteral nutrition and the length of stay of premature LBW. Because several factors are more dominant in influencing external factors including patient age, type of disease and degree of disease, and comorbidities (comorbidities). In this study, the average length of stay in this study was 13.59 days. In line with the results of research by Suryadi and Fitri (2019) conducted in 2014 in the Perinatology Room of Arifin Achmad Pekanbaru Hospital, it was explained that the average length of stay for respondents who experienced complex morbidity was 15.81 days of stay, while the minimum length of stay was 2 days and the maximum was 75 days.¹⁷

Numerous studies have shown the benefits of breastfeeding in preterm infants, reducing hospital days, reducing the incidence of necrotizing enterocolitis (EKN), and reducing the incidence of advanced sepsis, all of which are of great significance to the care of young infants in Indonesia. Therefore, it is necessary to provide colostrum (breast milk) especially when caring for infants in the first days. Breast milk for preterm infants is higher in content than breast milk for mature infants, but at 3-4 weeks the breast milk changes to mature breast milk so that preterm infants < 34 weeks have unmet needs after 3 weeks after birth.¹⁸ Breastfed infants have a lower incidence

of infections, and gastrointestinal and respiratory disorders. However, in certain conditions that result in contraindications to breastfeeding, there is an alternative in the form of formula milk. However, early formula feeding in LBW infants can increase morbidity.¹⁰

The condition in the field is that when the baby is in certain conditions such as brown mucus discharge through the OGT tube or the baby vomits brown, enteral feeding is stopped if there is significant abdominal distension or signs of NEC. However, if breast milk is available and the baby has feeding intolerance, the pediatrician will continue to provide breast milk nutrition to prevent the stomach from being empty for too long which can cause other problems in the baby. According to Amalia (2022), no nutrition is given at the beginning of life, which means that the baby is fasting first because of respiratory or digestive problems. The role of nutrition early in life is critical, as it can lead to stunted growth and development in infants born with very low birth weight.⁴

Discharge planning for babies returning home from the hospital is when the baby is in a stable breathing condition, has stable body temperature when at room temperature, able to suck and swallow well, no vomiting or choking response when feeding.¹⁹ This is the same as what is applied by the perinatologist room at Kraton Hospital which also uses the same standards in the patient discharge plan, especially for patients with premature LBW.

CONCLUSION

The average weight gain of premature LBW infants was 134.19 grams in breast milk enteral nutrition, 199.36 grams in HMF breast milk enteral nutrition, and 163.32 grams in formula milk enteral nutrition. The average length of stay of premature LBW infants was 12.26 days in breast milk enteral nutrition, 20.91 days in HMF breast milk enteral nutrition, and 13.46 days in formula milk enteral nutrition. There was no significant difference between the types of enteral nutrition of breast milk, HMF breast milk, and formula milk given to the increase in body weight of premature LBW babies with a P-value of 0.081 >

0.05. There was no significant difference between the types of enteral nutrition provided by breast milk, breast milk HMF, and formula milk on the length of stay of premature LBW infants with a P-value of 0.256 > 0.05.

ETHICAL STATEMENT

Then the researcher applied for ethical clearance obtained from the Health Research Ethics Commission of Muhammadiyah Purwokerto University with Registration Number KEPK/UMP/25/XI/2023.

CONFLICT OF INTEREST

None.

FUNDING

None.

AUTHOR CONTRIBUTION

All authors contributed equally to this study.

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