



Analysis of Body Weight in Low Birth Weight Infant Based on Breastfeeding and Formula Milk for Two Weeks Nursing in Santa Elisabeth Hospital Medan

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Abstract

Low Birth Weight (LBW) is infant born with less than 2500 grams without looking at pregnancy gestation. Breastfeeding is the best nutrition for the infants. However, for some reasons mothers opt to add or replace breastmilk. As an alternative for breastfeeding, there is formula milk with different specifications adapted to the infants' needs or condition. This research aims to analysis the difference in body weight of LBW infants fed by breastfeeding or formula milk in the first two weeks of care at Santa Elisabeth Hospital Medan. This research is using cross-sectional design. Samples are 56 LBW infants without infectious disease and nursing for two weeks in Santa Elisabeth Hospital Medan. This research is conducted using secondary data of medical record documentation in the perinatology room. Data analysis was performed using Independent Samples T-Test. The results shows that there is significant difference between the increase in weight of breast-fed babies who were given with the increase in weight babies fed milk formula with p value 0,00.

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Researchers suggest that in order to further improve the service to the handling of the problem of low birth weight, especially in the provision of nutrition for infants of low birth weight hospital institutions, nurses who worked in chambers of perinatology should be support and motivate mothers to breastfeed their infants and consider the condition of an infant during the maintenance.

Keywords: low birth weight; breastfeeding; formula milk; body weight.

1. Introduction

Low birth weight (LBW) prevalence according to WHO [1] in 2011 is 15% of all births in the world with a range of 3.3% -38%, which is more common in developing countries or low socioeconomic countries. The prevalence of LBW in Indonesia varies from one region to another. The incidence of LBW in Indonesia is quite high at 10.5%, still above the 9.6% Thailand and Vietnam 5.2%. One of the circumstances that led to high infant mortality rate was low birth weight. Infant mortality under 1 year in LBW babies 17 times greater than the babies of normal weight. In addition, most of LBW baby less than 2000 grams died in the neonatal period [2]. National Economic Survey in Indonesia in 2005 [3], stated that 38.85% of neonatal deaths are caused by LBW. These LBW infants have greater morbidity and mortality than infants with age appropriate growth [4].

Infant feeding is crucial to the growth and development of infants. Breast milk is the main food for the baby to meet the nutritional needs of infants [5]. Nutritional content of breast milk is appropriate to support the growth and development of a healthy baby. Only breast milk known as exclusive breastfeeding is recommended as baby food from birth until the age of 6 months without any other food. Formula is an alternative that is given if the mother cannot breast feed. The problems in low birth weight infants who cannot given breast milk are breast milk has not come out, the baby's body small and weak that it cannot suck the mother nipple, or because infants require intensive medical care because of the low weight. Baby's weight is one indicator of infant growth is determined by the intake of baby food. Some studies [6, 7, 8] stated there was no difference in the nutritional status of infants breast-fed and infants formula milk, but little study to analyzed the difference in body weight of low birth weight infants who are breastfed and low birth weight infants who received milk formula.

Based on data from medical records Santa Elisabeth hospital Medan is known that in 2011 there were 22 low birth weight infant, in 2012 there were 42 low birth weight infant, in 2013 there were 46 low birth weight infant, and in 2014 there were 28 low birth weight infant which concluded that low birth weight remains high every year. Low birth weight infants are usually hospitalized for two weeks in the hospital to monitor the health and growth of the body in order to survive. This study aimed to analyze the differences in weight gain low birth weight infants fed breast milk by weight low birth weight infants fed formula.

2. Material And Method

2.1 Study Area and Research Design

This study is an observational survey with cross sectional design to analyzed the differences of body weight between LBW infant giving breast milk and LBW infant giving formula milk. The study began in September

2014 to April 2015.

2.2 Population and Sample

The populations in this study were all LBW infants in Santa Elisabeth Hospital Medan from the year 2011-2014 is 138 infants. Samples are section of the population with the inclusion criteria: no infectious disease, were treated for 2 weeks in the hospital, given breast milk or formula. The samples are 56 babies divided in 32 babies given formula milk and 24 infants given breast milk.

2.3 Data Collection Methods

This study used secondary data from medical record documentation studies in neonatus room. Data captured includes the date of infant birth, sex, gestational age, body length, birth weight and body weight after two weeks were given nutrition (breast milk or formula milk) were obtained from medical records.

2.4 Data Analysis

Analysis of data to determine the difference in average weight gain LBW infants given breast milk or formula milk using test Independent Sample T-Test. Data presented in the form of a frequency distribution table.

3. Results

3.1 The Characteristics of Sample

Santa Elisabeth Hospital Medan is located at Jalan H. Misbah 7 Medan. This hospital has been equipped with various infrastructures consisting of Poly General, Specialist, Emergency Room (ER) and Intensive Care Unit (ICU), and Neonates Intensive Care Unit (NICU). Each unit is equipped with facilities according to the needs of the service. Based on research conducted at the Hospital Santa Elisabeth Medan, showed that the majority of LBW babies are female, 31 infant (55.4%) and men 25 infant (44.6%).

The average gestation either LBW infants fed breast milk or formula is 33 weeks, that means have a normal gestational age. The youngest gestational age was 24 weeks and the oldest was 40 weeks. The average age of mothers was 32 years. The youngest maternal age was 22 years old and the oldest was 42 years old.

From Table 2 it seen that in breast-fed babies mostly who were born with low birth weight (66.7%) came from mothers with preterm gestational age (<37 weeks), which means not yet gestational enough to have a normal birth. It is also known that in infants category aterm (38-42 weeks) had a normal gestation there is no category of babies born with very low birth weight (weighing 1000 to 1500 g). Conversely in preterm infants who have abnormal gestational age (<37 weeks) contained 31.2% by weight category born with very low birth weight (1000-1500 g). It is concluded that gestational age associated with birth weight.

From Table 3 it seen that in formula milk babies mostly who were born with low birth weight (68.8%) came from mothers with preterm gestational age (<37 weeks), which means not yet gestational enough to have a

normal birth. It is also known that in infants aterm (38-42 weeks) had a normal gestation there are 10% babies born with very low birth weight (weighing 1000 to 1500 g). Conversely in preterm infants who have abnormal gestational age (<37 weeks) contained more than aterm that 31.2% born with very low birth weight (1000-1500 g). It is concluded that low gestational age at risk for low birth weight.

Table 1: Characteristic of LBW Infant

Characteristic	Breast milk		Formula Milk		Total	
	n	%	n	%	n	%
Sex						
Boy	9	36.0	16	64.0	25	44.6
Girl	15	48.4	16	51.6	31	55.4
Body Weight (g)						
Low Birth Weight	19	42.2	26	57.8	45	80.4
Very Low Birth Weight	5	50.0	5	50.0	10	17.9
Extremely Low Birth Weight	0	0.0	1	100	1	1.8

Table 2: Distribution of Breast-fed Infant According to Gestational Age

Gestation Age (week)	Infant Breastfeeding						Total	
	Low Birth Weight (1501 - < 2500 g)		Very Low Birth Weight (1000 - 1500 g)		Extremely Low Birth Weight (< 1000 g)		n	%
	n	%	n	%	n	%		
Aterm (38-42 week)	8	100.0	0	0.0	0	0.0	8	33.3
Preterm (<37 week)	11	68.8	5	31.2	0	0.0	16	66.7
Total	19	79.2	5	20.8	0	0.0	24	100.0

3.2. The Weight Gain of LBW Infant

Based on Table 5 average body weight after 2 weeks of treatment LBW infants who were breastfed was 2234 grams and formula-fed was 2150 grams. The average weight very low birth weight in breast-fed infants is 1900

grams and formula-fed is 1730 grams. The average weight infants fed formula milk in extremely low birth weight is 1400 grams. It can be concluded from the results that breast milk is more quickly in raising the baby's weight both in infant with low birth weight and in infant with very low birth weight.

Table 3: Distribution of Formula Milk Infant According to Gestational Age

Gestation (week)	Formula Milk						Total	
	Low Birth Weight (1501 - < 2500 g)		Very Low Birth Weight (1000 - 1500 g)		Extremely Low Birth Weight (< 1000 g)		n	%
	n	%	n	%	n	%		
Aterm (38-42 week)	9	90.0	1	10.0	0	0.0	10	31.2
Preterm (<37 week)	17	77.3	4	18.2	1	4.5	22	68.8
Total	26	81.2	5	15.6	1	3.1	32	100.0

Table 4: The Average Body Weight After 2 Weeks Based on Birth Weight Category

Birth Weight Category	Infant Body Weight (g)	
	Breast feeding	Formula Milk
Low Birth Weight	2234	2150
Very Low Birth Weight	1900	1730
Extremely Low Birth Weight	0	1400

3.3. The Average Body Weight of Infant 0 Days and 14 Days

All babies will gained their weight after birth as an indicator of good growth. In baby that born with low birth weight category after 2 weeks of gaining weight is 376 grams of 1908 grams at birth (day 0) to 2284 g at 14 days. In infants born with very low birth weight categories have the weight gained of 425 grams at 14 days, and in children born with extremely low birth weight category have the weight gained of 500 g at 2 weeks of age the weight of 800 grams at birth become 1300 g after 14 days. It concluded that the largest weight gain seen in babies born with the lowest weight. This can be seen in Figure 1.

3.4. The Weight Gain of Infants after 14 Days Based on Breastfeeding and Infant Formula Milk Giving

At low birth weight infants breast-fed after 14 days gained weight 413 grams, while in babies fed formula milk

378 g. As well as in infants born with very low birth weight categories have weight gain was higher in breast-fed infants compared to formula-fed infants, namely 420 g in breast-fed infants and 400 g in infants who received formula milk. Based on the results of this study concluded that breastfed infants faster weight gain than infants fed with formula milk. This is showed in Figure 2.

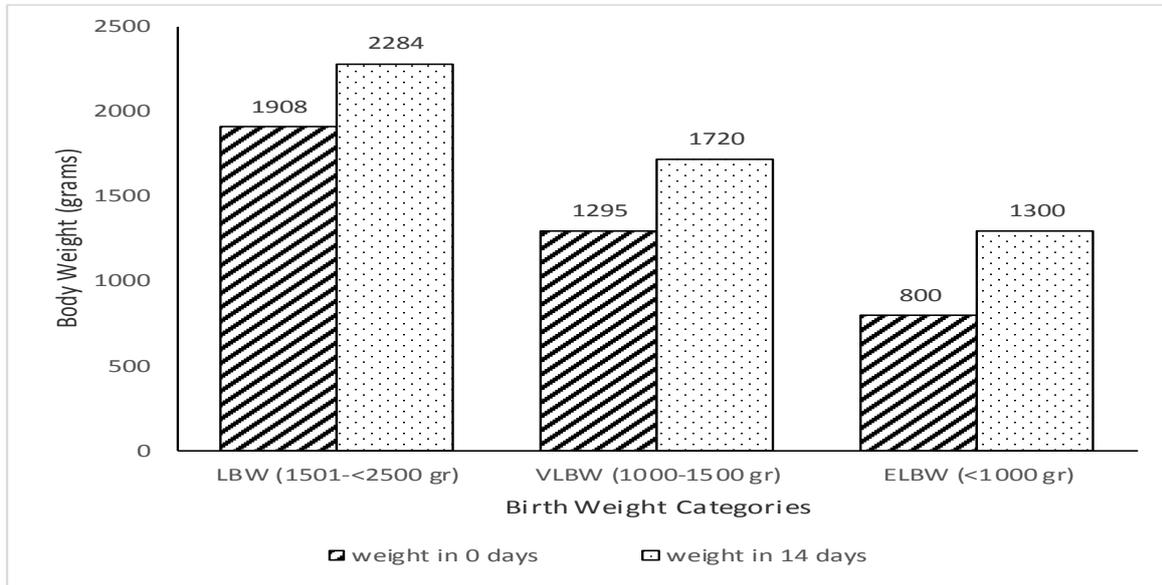


Figure 1: Average Body Weight in Baby 0 Days and 14 Days Based on Birth Weight Category



Figure 2: Weight Gain Infant after 14 Days Based on Breastfeeding and Infant Formula Milk Giving

3.5. Different Test Body Weight of Infant 0 Days and 14 Days on Breastfeeding and Infant Formula Milk Giving

Statistical test results using the Independent Sample T-Test weight of infants aged 0 days between breast-fed infants with formula milk obtained p value 0.364 and weight after two weeks obtained p value 0.324. It can be concluded that there was no significant difference between the weight of infants aged 0 days and after two weeks. This suggests weight infants breastfeeding and infant formula milk giving in aged 0 days is same (no difference) and after two weeks of the weight both infants fed breast milk or formula statistically is the same too.

Table 5: Different Test Body Weight of Infant 0 Days and 14 Days on Breastfeeding and Infant Formula Milk Giving

Age (Day)	Body Weight (g)		p
	Breastmilk	Formula Milk	
0	1727.08 ± 326.03	1818.75 ± 400.95	0.364
14	2279.17 ± 286.24	2190.63 ± 358.18	0.324

3.6. Different test of Differences in Weight Gain between Babies Given Breast Milk and Formula Milk

The average difference in weight breastfed infants is 552.08 g with a standard deviation of 80.05 g. As for infant formula, the average difference in weight is 371.88 g with a standard deviation of 64.68 g. Statistical test results using the Independent Sample T-Test p value = 0.00, meaning statistically at alpha 5% seen that there was a significant difference in average weight difference between babies fed breast milk with formula milk.

Table 6: Different test of Differences in Weight Gain between Babies Given Breast Milk and Formula Milk

Variable	Weight Gain Difference (g)	p
Breastfeeding Infant	552,08 ± 80,05	0,000
Formula Milk Infant	371,88 ± 64,68	

4. Discussion

The weight gain of breast-fed babies is higher than formula-fed infants in infants born with low birth weight category as well as babies born with very low birth weight categories as shown in Table 5. This is because breast milk contains all the nutrients which are important for infant growth, namely carbohydrates, proteins, fats,

and micro nutrients that the baby needs to support the baby's weight gain. Especially in infants who are born with low weight, the appropriate nutritional needs are crucial to rapid weight gain so that babies born with low birth weight can reach a normal weight. Besides milk to newborn babies rich with antibodies contained in the colostrum. Antibodies in the colostrums are Sig A, IgM, IgG, lactoferrin, lysozyme, lymphocytes, macrophages, etc. [5,6]. In newborns are generally susceptible to disease because immunity the baby is still not well formed so that the antibody is paramount so the baby can be potent against various germs [1].

Especially in infants born with low weight, immune systems are worse than normal birth weight babies. Based on this, the nutritional needs in babies born with low weight really should be taken to ensure that the immune system and better weight gain that can quickly spur growth approaching normal weight. Breast milk contains all the nutrients that are appropriate and necessary for the baby's weight gain and the formation of the immune system better so it's important to be given, especially in low birth weight babies. The growth pattern of infants with low birth weight categories, very low birth weight, or extremely low birth weight babies usually will decrease the weight by 10-15% in first 7-10 days but will increase after 14 days [2].

At the age of 0 days, the weight of breast-fed babies weigh less than babies fed formula as shown in Table 6. Weight difference test in 0 days showed that statistically no difference in birth weight baby based on their food. Likewise, weight different test in baby age 14 days (two weeks) showed that statistically no difference in birth weight infants with $p > 0.05$. A result of this study is same with Soetjningsih study [6] which states statistically no difference growth in breastfed babies exclusively with breast-fed infants are not exclusive. Similarly with Fitrah study [8], which states there is no difference in the nutritional status of infants breast-fed exclusively with breast-fed babies are not exclusive.

Nevertheless it is apparent that infant weight gain after 14 days greater in infants fed breast milk rather than formula-fed babies. Statistically different test of baby gaining weight showed highly significant differences in weight gain among breast-fed babies with formula-fed infants with a p-value of 0.000. It is concluded that breast milk is better food to increase the weight of babies that born with low weight compared to formula.

It is also the same as Whardani study [9] which states that there are real differences in weight gain of low birth weight infants breast-fed than formula-fed after the age of 2 weeks, namely the increase in infants breastfed 255 grams and 71 grams of infant formula. The weight gain in this research greater than weight gain in Whardani study. It is concluded that breastfeeding is statistically more quickly gain weight than formula in infants born with low weight. It could be caused of breast milk.

Breast milk contains a variety of nutrients very important role in weight gain, namely energy, protein, omega 3, omega 6 and omega 9, as well as other micro-nutrients are very complete and perfect in number and quality. Unlike the formula cannot match the existing content of nutrients in breast milk, especially the amount and quality of nutrition. In addition immunity substances that exist only on breast milk such as colostrum, the antibody immunoglobulin and other components are also not included in the formula of complete and perfect as in breast milk. Antibodies are very supportive to the growth of the baby because of their role in the occurrence of infectious diseases as one of the decisive factors for weight gain. In babies that born with low weight have a

rudimentary immune system so that human milk is very important to build up immunity [5]. Likewise, to increase the weight then the milk also no doubt to reach a normal weight in infants of low birth weight after 2 weeks.

Weight gain by birth weight category as shown in Figure 2 also shows that weight gain was higher in breast-fed infants than formula milk in infants that born with low birth weight category or categories of very low infant birth weight. A large increase in low birth weight infants is relatively similar to weight gain very low birth weight infants.

5. Conclusion

1. Statistically, there are significant differences in weight gain after two weeks between breast-fed babies with formula-fed infants.
2. Breast milk faster weight gain after two weeks in infants that born with low weight compared to infants fed milk formula in infants born with low birth weight category or categories of very low infant birth weight.
3. The weight gain after two weeks in breast-fed infants was 552 grams and in infants fed formula was 371 grams.

6. Suggestions

1. Low birth weight infants should be given breast milk, because breast milk faster in weight gain than formula milk.
2. For an institution Hospital in order to further improve the service to the handling of the problem of low birth weight, especially in the provision of nutrition for infants of low birth weight.

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References

- [1] World Health Organization (WHO). 2011. Optimal Feedig of Low Birth Weight Infants. Download in March 11 2015. <http://www.who.int/child-adolescent-health>
- [2] Ministry Health in Indonesia. 2008. Module (Reference Books) Management of Low Birth Weight Babies (LBW) For Village Midwives. Jakarta. Health Department of Indonesia
- [3] Ministry Health in Indonesia. 2005. Nutrition in Fact. Jakarta: Directorate of Community Nutrition
- [4] Susanti, Hasanah and Utami. 2013. Comparison of Weight Increase LBW was given breast milk and formula

milk On First Two Weeks Skincare. Thesis Nursing Graduate Program. University Riau

[5] Arisman, MB. 2004. Nutrition in the Life Cycle. Jakarta. EGC

[6] Pudjiadi, Solihin. 2000. Science Clinical Nutrition in Children. Jakarta. Medical Faculty University of Indonesia

[7] Merzalia, Nita. 2012. Determinants of Low birth weight (LBW) in East Belitung Regency Bangka Belitung Islands in year 2010-2011. Thesis Faculty of Public Health University of Indonesia

[8] Suradi,Rulina. 2002. Hot Topics in Pediatric II. Jakarta. Medical Faculty University of Indonesia

[9] Wardhani, Kristina. 2009. Comparative Analysis of Weight Gain of Low Birth Weight Infants That Were Given Exclusive Breastfeeding and Formula Milk Age 0-2 Weeks in Peristi Room Pantl Wilasa Citarum Semarang. Thesis Nursing Graduate Program. Medical Faculty University Diponegoro. Semarang.