Blood Glucose Level in Low Birth Weigth Preterem and Low Birth Weigth Aterm: Comparasion Study in Ambarawa Hospital

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Abstract

Case of Low Birth Weight (LBW) in Semarang regency is still quite high, in 2016 as many as 44 (29.14%). LBW in Ambarawa Regional Hospital in 2017 as many as 120 (38,71%). Preterm and aterm LBW have differences in the organ that is not fully formed and causes susceptible to decreased blood glucose level. The purpose of this study is to find the difference in blood glucose level inlow birth weight preterm baby and low birth weight aterm baby in Ambarawa public hospital.The research method used descriptive comparative with cross study approach, the population 141 babies and samples 59 babies. The Mann-Whitney test was used to examine the hypothesis in this study. Using Mann-Whitney stastical test, it is obtained that p value= 0,001 or p-value < 0,05 which meant that the Ha was accepted. There is difference inblood glucose level in low birth weight preterm baby and low birth weight aterm baby in Ambarawa public hospital. LBW preterm babies have abnormal blood glucose as much as 27 babies (67, 5%), where normal blood glucose levels were 13 babies (32, 5%). LBW aterm babies had abnormal blood glucosa as many as six babies (31, 6), normal blood glucose levels were 13 babies (68.4%). This shows the difference in blood glucose levels between LBW preterm babies and LBW aterm babies at Ambarawa Regional Hospital. It is expected that health staffs increase awareness of blood glucosa levels in preterm LBW because it is more at risk of hypoglycemia.

Abstract

Kasus Berat Badan Lahir Rendah (BBLR) di Kabupaten Semarang masih cukup tinggi, pada tahun 2016 sebanyak 44 (29,14 %). BBLR di RSUD Ambarawa tahun 2017 sebayak 120 (38,71%). BBLR preterm dan aterm mempunyai perbedaan pada organ yang belum terbentuk sempurna dan menyebabkan rentan terjadi penurunan kadar gula darah sewaktu. Tujuan penelitianini untuk mengetahui perbedaan kadar gula darah sewaktu antara bayi BBLR preterm dengan bayi BBLR aterm di RSUD Ambarawa. Metode yang digunakan dalam penelitian ini deskriptif komperatif dengan pendekatan cross sectional, menggunakan teknik purposive sampling dengan jumlah populasi141 bayi danjumlah sample 59 bayi. Teknik

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yang digunakan untuk menguji hipotesis penelitian ini adalah uji Mann Whitney. Hasil uji statistik menggunakan Mann Whitney didapatkan p value = 0,001 atau p value < 0,05 yang artinya Ha diterima. Ada perbedaan kadar gula darah sewaktu antara bayi BBLR preterm dengan bayi BBLR aterm di RSUD Ambarawa. Dengan hasil bayi BBLR preterm mempunyai gula darah sewaktu tidak normal sebanyak 27 responden (67,5%), kadar gula darah sewaktu normal sebanyak 13bayi (32,5%). Bayi BBLR aterm mempunyai gula darah sewaktu tidak normal sebanyak 6 bayi (31,6), kadar gula darah sewaktu normal sebanyak 13 bayi (68,4%)Hal ini menunjukkan adanya perbedaan kadar gula darah sewaktu antara bayi BBLR preterm dengan bayi BBLR aterm di RSUD Ambarawa. Diharapkan petugas kesehatan lebih meningkatkan kewaspadaan terhadap kadar gula darah sewaktu pada BBLR preterm karena lebih beresiko mengalami hipoglokemia

Introduction

The more development of science and technology in the health sector, more problems faced in the health sector are also increasing. If you die well, with the increase in knowledge and technology in the health sector, the health problems that arise will also decrease. However, in the Republic of Indonesia, health problems have not been well resolved even though science is advancing (Proverawati, 2010).

The results of the 2015 Inter-Census Survey show that the IMR in Indonesia in 2015 is 22.23/1000 KH, this figure is still far from the SDGs target in 2030, neonatal mortality is at least 12/1000 Live birth (LB). (Ministry of Health, 2016). IMR (Indant mortality rate) in Central Java in 2015 was 10/1000 LB. IMR in Semarang Regency in 2016 was 11.15/1000 LB. Of the various causes of infant mortality (IMR) in Semarang Regency in 2016, LBW had the highest number, namely 44 cases (29.14 %), followed by asphyxia 29 cases (19.20 %), diarrhea 13 (8.61 %), pneumonia 11 cases (7.29 %), aspiration 11 cases (7.29 %), congenital abnormalities 8 cases (5.30 %), infection 6 cases (3.98%), heart abnormalities 6 cases (3.98%), DHF 1 case (0.67 %), illeus 1 case (0.67%), other 21 cases (13, 91%) (District Health Office Semarang, 2016).

Babies with LBW tend to have lower body resistance compared to babies born with normal weight so that it becomes one of the important factors in infant mortality in the neonatal period. Babies with LBW also have irregular organ system functions so that they can adapt to the environment. The level of morbidity and mortality in infants does not only depend on body weight, but also on the level of infant maturity (Rahayu, 2010).
The World Health Organization (WHO) estimates that worldwide the LBW rate reaches 16%. Perinatal mortality in LBW infants is 8 times greater than in normal infants. The highest infant mortality rate occurs in the first 24 hours of birth by 65% (Behrman RE et al, 2009). The LBW frequency 90% comes from developing countries and 3.6-10.8% from developed countries. LBW is more common in developing countries and has low socioeconomic status (Pantiawati, 2010). The 2016 United Nations International Children's Emergency Fund (UNICEF) stated that the number of LBW in Southeast Asia such as Singapore, Malaysia, Thailand and Vietnam, and Bruney was 12%. The LBW rate in Indonesia in 2013 was

10.2% (Kemenkes RI, 2014). Meanwhile, the proportion of low birth weight babies (LBW) in Central Java in 2015 was (5.1%). The percentage of LBW in Semarang Regency that was handled in 2016 was 4.4%. In Semarang Regency, LBW is still one of the problems of concern. Care and supervision of LBW infants must be improved as an effort to minimize short or long-term problems that occur in LBW (Semarang District Health Office, 2016).

Problems that occur in general in LBW, namely the increase and decrease in blood sugar is a metabolic disorder that often occurs in LBW. Blood sugar serves as brain food and carries oxygen to the brain, if glucose intake is insufficient, nerve cells in the brain die and affect the baby's intelligence. Lack of handling of healthy newborns will cause abnormalities that cause lifelong disability and even death of more than 50% in the neonatal period. It is very important to pay attention to the physiological adaptations that occur in the newborn. In the first hours of life, energy is obtained from the conversion of carbohydrates. Carbohydrates are oxidized as glucose. Glucose has an important role in brain metabolism. Carbohydrates are stored as glycogen in the liver and muscles, making up no more than 1% of body weight. Since the infant liver size is 10% of the adult liver size and the muscle mass is 2%, the infant's glycogen stores constitute a fraction (about 3.5%) of the adult fraction. In other words, the capacity of the BBL brain to take up and oxidize ketones is about 5 times that of adults, but the capacity of the liver to produce ketones is limited (Berhman, 2009).

Glucose levels in infants should be maintained between 75-100 mg/dL checked with a reagent strip (glucose oxidase), glucose used by infants as an adequate substrate for the brain (Ballard, 2005). Levels that are too high can cause an increase in lactate in the brain so that it will damage brain integrity, increase edema, and interfere with vascular automatic regulation. Low levels will cause excitotoxic amino acids so that it will expand the infarct (Mertil, 2015).

Based on a preliminary study at the Ambarawa Hospital as of August 2017. There were 120 LBW babies (38.71%). The number of infant deaths due to LBW in 2017 was 13 babies died, in 2016 there were 108 LBW babies and 7 babies died due to LBW. From a preliminary study of 34 LBW infants, it was found that 18 infants (53%) of term LBW with blood sugar results were in accordance with the return reference of 12 infants (66.7%) and less than the return reference value of 6 infants (33.3%). There were 16 infants (47%) of preterm LBW with blood sugar results when in accordance with the reference found 5 (31.3%) infants and less than the reference value found 11 infants (68.7%).

Based on the above background, researchers are interested in conducting research on "Differences in Blood Sugar Levels Between Term LBW Babies and Preterm LBW Babies in Ambarawa Hospital"

Method

This type of research was conducted using a comparative descriptive research design and using a cross sectional approach. The sampling technique used is purposive sampling. total population of 141 infants. Inclusion criteria in this study included Apgar Score > 7 and exclusion criteria for infants with a history of diabetes mellitus and infants with a history of obesity. Of the 141 respondents the number of respondents who met the inclusion and exclusion criteria in the study were 81 respondents. From the results of the number of calculations using the sample solvin formula required is 59 respondents. Then 81 were taken at simple random (using simple random sampling) to get 59 respondents. Data analysis used Univariate and Bivariate data analysis. Univariate analysis was used to describe

the characteristics of each research variable, namely preterm LBW, term LBW and blood sugar levels. Bivariate analysis was used to analyze differences in blood sugar levels during term and premature infants using the Mann-Whitney test.

Results and Discussion

Blood sugar for preterm LBW babies at Ambarawa Hospital, Semarang Regency.

Table 1 Distribution of blood sugar frequency during preterm LBW infants in Ambarawa Hospital, Semarang Regency

Blood sugar	Frequency	Precentage (%)
Abnormal (≤75mg/dL or >100 mg/dL)	27	67,5 %
Normal (>75mg/dL-100 mg/dL)	13	32,5 %
Total	40	100,0 %

Based on table 1, it can be seen that most of the preterm LBW infants had abnormal blood sugar levels (≤75mg/dL or >100 mg/dL) as many as 27 respondents (67.5%) and normal blood sugar levels (>75mg /dL). -100 mg/dL) as many as 13 respondents (32.5 %). Insufficient glycogen stores are more at birth (preterm) and more reserves at term (term). Preterm LBW babies have more risks, such as a decrease in body temperature due to the relatively large surface area of the baby's body compared to the baby's weight. Furthermore, it causes cold stress which can cause a decrease in the baby's blood sugar and cause brain damage, the next result is brain bleeding, shock, some parts of the body harden (Saifuddin, 2009).

Blood sugar at term LBW infants at Ambarawa Hospital, Semarang Regency

Table 2 Distribution of blood sugar frequency at term LBW infants in Ambarawa Hospital, Semarang Regency.

Blood sugar	Frequency	Precentage (%)
Abnormal (≤75mg/dL or >100 mg/dL)	6	31,6 %
Normal (>75 mg/dL -100 mg/dL)	13	68,4 %
Total	19	100,0 %

Based on table 2, it can be seen that most LBW infants have blood sugar levels when blood sugar levels are normal (>75 mg/dL -100 mg/dL) as many as 13 respondents (68.4%) compared to abnormal blood sugar levels (75 mg/dL). dL or > 100 mg/dL) as many as 6 respondents (31.6 %). The normal value of blood sugar levels in term LBW babies is due to the more stable condition of term LBW babies and less glucose expenditure of term LBW babies, although term LBW babies are more stable, term LBW babies need supervision from medical personnel. Joyce Lee Fever (2007) states that glucose in the blood is formed from carbohydrates in food and stored as glycogen in the liver and skeletal muscles. In the blood the main product of carbohydrate metabolism is glucose. The glucose produced once it enters the cell will be phosphorylated to form glucose 6 phosphate, which will be assisted by the hexokinase enzyme as a catalyst and form glycogen as a form of glucose that can be stored. Glycogen storage in liver and skeletal muscle in LBW depends on gestational age. The more mature the gestational age of LBW babies, the more savings because the liver is more mature and the skeletal muscles are fully formed, while the glycogen needs of LBW babies are less.

Differences in blood sugar for premature LBW and term LBW babies in Ambarawa Hospital, Semarang Regency.

Table 3 Differences in Blood Sugar Levels between premature LBW infants and term LBW infants in Ambarawa Hospital, Semarang Regency.

LBW type	Blood sugar				Total		*P* value
	Abnormal		Normal				
	f	%	f	%	f	%	
LBW preterm	27	67,5	13	32,5	40	100	
LBW aterm	6	31,6	13	68,4	19	100	0,010
Total	33	55,9	29	44,1	59	100	

Based on table 4.3 shows that the respondents of abnormal preterm LBW infants were 27 respondents (45.8%) while the respondents of abnormal term LBW infants were 6 respondents (31.6%). Based on the results using the Mann-Whitney test, it was found that the p value was 0.010 < = 0.05, which means that there was a difference in Blood Sugar Levels between preterm LBW infants and term LBW infants at Ambarawa Hospital, Semarang Regency.

Most of the preterm LBW babies had blood sugar levels below normal (hypoglycemia) as many as 25 babies (93%) while babies with blood sugar levels when they were above normal (hyperglycemia) were 2 babies (7%). This is because the condition of the baby is unstable and the fetal organs are not fully formed due to the gestational age of the premature baby. Blood sugar levels in preterm LBW babies often decrease, this is due to preterm factors limiting tissue nutrient storage, abnormalities genetics on enzymes or hormones. Causes of low blood sugar that occur in neonates are categorized according to the accompanying disturbance in one or more of the processes required for normal hepatic production. In preterm infants, hepatic glycogen storage is limited and does not have an adequate supply of substrate supplies for glycogen synthesis and experiences a period of rapid accumulation during late gestation which will result in a risk of lowering blood sugar (Berhman, 2009).

According to Maria Pia's research (2015) with the title Hypoglycemia and Hyperglycemia in Extremely Low Birth Weight Infants, there are several factors related to the increase in blood sugar that occurs in preterm LBW infants, namely related to the mother's last consumption before delivery, fluids obtained by the mother before delivery, levels of mother's blood sugar. According to Als, et al. (1986) in Symington & Pinelli (2006) physiological stress that occurs in preterm LBW infants can be seen from 3 things, namely body temperature, heart rate and O2 saturation. Stress conditions trigger the body's biochemical reactions through 2 pathways, namely neural and neuroendocrine. The first reaction to the stress response is the secretion of the sympathetic nervous system to release norepinephrine, which causes an increase in heart rate. This condition causes blood glucose to increase as an energy source for perfusion. The effect of stress on increasing blood sugar levels is related to the neuroendocrine system, namely through the Hypothalamus-Pituitary-Adrenal pathway.

Conclusion and Suggestions

Conclusion

Most of the preterm LBW infants had abnormal blood sugar levels, namely 27 respondents (67.5%) while normal blood sugar levels were 13 respondents (32.5%). Most term LBW infants had normal blood sugar levels, namely 13 respondents (68.4%) while abnormal blood sugar levels were 6 respondents (31.6%). This study shows that there is a

difference in blood sugar levels between premature LBW infants and term LBW infants with a p value of 0.010.

Suggestions

Conduct further research on other factors such as gender, body temperature of the new baby, type of mother's last meal, duration of delivery, and the type of intravenous fluid obtained before blood sugar levels can cause a decrease in blood sugar levels in premature LBW infants and terms LBW infants.

The conclusion should be in this section, Font Size 11, Times New Roman, single spaced. State the level of achievement of research/activities, accuracy or suitability between problems and needs with the methods applied, impacts and benefits of activities, recommendations for subsequent research/activities.

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