Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Routine hematology and blood sugar profile in premature infants with low birth weight at Dustira hospital in 2021

Anastasia Yani Triningtyas[1], Yoke Ayukarningsih[2], Deanita Savira Ramdan[3]
[1,2]Departemen Ilmu Kesehatan Masyarakat, Fakultas Kedokteran, Universitas Jendral Achmad Yani, Cimahi
[3]Program Studi Sarjana Kedokteran, Fakultas Kedokteran Universitas Jendral Achmad Yani, Cimahi

Article Info
Keywords:
Premature baby,
Low Birth Weight Baby,
Hematology Profile

ABSTRACT
Premature babies are babies born at a gestational age of less than 37 weeks. Low birth weight babies (LBW) are babies born with a body weight of less than 2500 grams. Premature babies face various risks of morbidity and death after birth. Various health problems that arise occur because premature babies are born with organs that have not been fully formed, causing problems or disorders of the body's system. One of the problems that often occurs in premature infants is disorders of the hematological system. Some of the hematological disorders that often occur in premature infants include hemolysis, anemia, polycythemia and thrombocytopenia. . In addition, premature babies also have a limited supply and source of carbohydrate production for metabolism because the organs involved in metabolic processes such as the liver, pancreas, brain and endocrine glands are not yet fully formed. Therefore, premature babies are prone to experiencing hyperglycemia or hypoglycemia. This research is a type of quantitative descriptive research using secondary data originating from medical records to determine hematological examinations in premature infants with LBW babies at Dustira Hospital in 2021 which consists of examination of hemoglobin, hematocrit, erythrocytes, leukocytes, platelets, erythrocyte index values and blood sugar. when. Sampling used the total sampling method with a sample size in this study taken based on data on premature babies with low birth weight at Dustira Hospital in 2021, totaling 38 babies. An overview of hemoglobin, platelet levels, erythrocyte index values and blood sugar during the study subjects most of these have normal values while others have decreased values of erythrocytes, leukocytes, hematocrit. Further research was carried out to identify the etiology and risk factors for premature birth defects with LBW starting from intrauterine as well as extraluterine and differentiate between sick premature babies and healthy premature babies.

Corresponding Author:
Anastasia Yani Triningtyas
Departemen Ilmu Kesehatan Masyarakat, Fakultas Kedokteran, Universitas Jendral Achmad Yani, Cimahi
yanianastasia2@gmail.com

INTRODUCTION

Preterm infants according to WHO are infants born at a gestational age of less than 37 weeks calculated from the first day of the last menstruation, regardless of birth weight. Gestational age can be assessed based on the calculation of the Naegel formula or by

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

performing a Ballard examination. The incomplete intrauterine development of premature babies can cause complications in the post natal period, even though their weight is in accordance with their gestational age ((Stark, 1982); (Gomella, Eyal and Zenk, 2004)).

Low birth weight babies (LBW) are babies born weighing less than 2500 grams. Low birth weight babies can be categorized based on their birth weight into very low birth weight babies (BBLSR), (birth weight 1000-<1500 grams) and very low birth weight babies (BBLASR) (birth weight <1000 grams). Both are associated with increased neonatal morbidity and mortality ((Stark, 1982); (Gomella, Eyal and Zenk, 2004)).

According to the WHO in 2017, more than 60% of preterm births occur in Africa and Southeast Asia, making preterm birth a global problem. Low-income countries typically experience 12% preterm births, compared to 9% in high-income countries (Althabe, 2012). In Indonesia in 2020, the incidence of preterm birth reached 675,700 or about 15.5% of the 10 countries with the highest preterm birth rates. Based on the Central Bureau of Statistics in 2020, the incidence of preterm birth in Indonesia is at 29.5% of the accumulated 93,620 baby births. West Java's own prematurity birth rate is at 23.6% (Badan Pusat Statistik (BPS), 2020).

The incidence of LBW in Indonesia is around 6.2% of 47,011 births in Java, especially in West Java, the incidence of LBW has increased from 20.2% in 2013 to 22.6% in 2018 (Badan Pusat Statistik (BPS), 2020). The results of preliminary tests conducted by researchers in the Perina Room of Dustira Hospital in 2021 obtained data on 236 babies with LBW, of which 38 were underweight babies (BKB), 198 babies were full-term babies (BCB).5

Preterm birth is the leading cause of neonatal mortality and morbidity worldwide and the second leading cause of death after pneumonia under the age of 5 years. Preterm infants face various risks of morbidity and mortality after birth. Various health problems that arise occur because preterm infants are born with organs that are not fully formed, causing problems or disorders of body systems. One of the problems that often occur in premature babies is hematologic system disorders (Wisgrill et al., 2014).

Many factors contribute to hematologic disorders in premature infants. One cause is the disruption of the hematopoiesis process. Preterm birth causes hematopoieisis to be depressed as early as 6-12 weeks. Some changes in the number and function of hematopoietic stem cells and variations in various blood cells (red blood cells, white blood cells and platelets). The results of research conducted by Roudil et al., hematology levels in premature infants can decrease but some are in accordance with gestational age with average hematology levels such as Hemoglobin (Hb) 16.4 g/dl, Hematocrit (Ht) 47% g/dL, Erythrocytes 4.49 million/µl, Leukost 12.600 million/µl, Platelets 240,000/mm, MCV 105% g/dL. In addition, premature babies also have limited supplies and sources of carbohydrate production for metabolism because the organs involved in metabolic processes such as hepar, pancreas, brain and endocrine glands are not yet fully formed. Therefore, premature babies are prone to hyperglycemia or hypoglycemia. According to research conducted by Yoon et al., who examined 37 premature babies, 18 of them experienced hypoglycemia

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

with the lowest blood sugar level being 66 g/dL and 2 of them experienced hyperglycemia with levels <50 g/dL (Roudil *et al.*, 2017).

Some hematological disorders that often occur in premature infants include hemolysis, anemia, polycythemia, thrombocytopenia, and G6PD Rh deficiency disease. Several blood tests are performed to support the diagnosis, including hemoglobin (Hb) test to see physiological or non-physiological decrease in Hb levels, hematocrit test to show the percentage of red blood cells to blood volume, mean corpuscular value, leukocyte, erythrocyte and platelet tests (Deng et al., 2008). Hematologic values in newborns differ from those of children and adults. Qualitative and quantitative differences arise as a reflection of the developmental process during the fetal hematopoiesis phase which correlates with gestational age. At birth, hemoglobin, MCV and white blood cells in mature newborns are higher than in older children and adults. In preterm infants this difference is even more pronounced (Deng et al., 2008). Hematology values provide important information both qualitatively and quantitatively. Normal reference values for aterm infants and children are widely available. Until now, not much data can be found as reference values or parameters for preterm infants as a whole (Cruz-leal Y, Marjoram D, 2017).

Different hematological conditions in premature babies born with LBW conditions cause the need for several adjustments and additional management for LBW babies. The case of premature babies with LBW at Dustira Hospital in 2021 is quite high, out of 1695 LBW patients totaling 236, 38 of them are premature babies and there has been no research on premature babies with LBW. Therefore, the authors are interested in discussing the hematological picture in preterm infants with LBW conditions.

METHODS

This study is a type of quantitative descriptive research using secondary data derived from medical records to determine the hematological examination of premature infants with LBW at Dustira Hospital in 2021, The study population was all babies born prematurely with low birth weight at Dustira Hospital in 2021. The object of the study was the medical record data of 38 premature babies with LBW at Dustira Hospital in 2021. The variables measured in this study were the hematological picture consisting of Hemoglobin, Erythrocytes, Leukocytes, Platelets, Hematocrit, Mean Corpuscular Hemoglobin, Mean Corpuscular Volume, Mean Corpuscular Hemoglobin Concentration and Timed Blood Sugar in Premature Babies with LBW at Dustira Hospital in 2021. Data analysis in this study was univariate. Univariate analysis is a way to analyze each variable from the research results. This analysis was conducted to describe the characteristics of respondents and the characteristics of each variable. The data that has been obtained will be presented descriptively in tabular form in grouping the variables of body weight and gestational age with hematological examination variables. Instrumental in this study are SLS-Hemoglobin examination method for Hemoglobin examination, then Sheath Flow DC Detection method for Hematocrit, Erythrocytes, Platelets and Erythrocyte Index Value examination, Flow Cytometry for Leukocytes examination and Spectophotometry for Timed Blood Sugar examination.

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

RESULTS AND DISCUSSION

Hematologic examination of a newborn baby is done by taking the baby's blood. Generally, babies with low birth weight tend to have disorders in their circulatory system, so the results of their blood tests are generally below normal. This study was conducted in January 2021 in the Dustira Hospital Medical Record Room on 38 data from medical records which aims to determine the description of hematological examinations in preterm infants with low birth weight. .

Table 1 Respondent's Characteristic

Characteristics	n	%
Gender	20	52.6%
Male	18	47.4%
	38	
Female	5	13.2%
	19	50%
Gestational Age	14	36.8%
	38	
32-33 weeks	31	81.6%
34-35 weeks	7	18.4%
	38	

Based on table 1, it can be seen that the description of gender is the number of babies who are male as many as 20 babies (52.6%) The prevalence of babies with LBW based on the results of this study is more common in male babies. This is not in accordance with other studies by Bae et al. (2018) which found that LBW babies in South Korea were dominated by female gender with a total of 52% (Perumal *et al.*, 2021). It can be seen that the picture of premature babies with LBW amounted to 38 people with many premature babies who had a gestational age of 33 - 34 weeks as many as 19 people with a percentage of 50%. This gestational age is the age at which many preterm births occur. The results of research by Perumal et al. (2021), where premature gestational age in babies with LBW generally occurs between the 35th week to the 37th week (Perumal *et al.*, 2021). The results obtained for the criteria for LBW babies at Dustira Hospital in 2021 were the most, namely there were 31 babies with a birth weight < 2500 gr with a percentage of 81.6%, not the same as research conducted by La ke E et al. (2019) describes the number of LBW babies born with a birth weight < 2500 gr only 15.8% and the rest were very low birth weight babies (< 1500 gr). Some aspects that cause differences in these numbers come from maternal factors such as diseases that mothers suffer during pregnancy, Antenatal Care (ANC) checks, alcohol consumption during pregnancy, gestational age, etc.

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Table 2 Overview of Hemoglobin Screening Results

Hemoglobin	n	%
Decreased	8	22%
Normal	30	78%
Increased	0	0%
Total	38	100%

Based on table 1.2, it can be concluded that 8 premature babies (22%) experienced a decrease in hemoglobin levels with a value of less than 16.4 g/dL. This result is lower when compared to research conducted by Bae et al. (2018) showing 149 premature babies 39% of whom had decreased hemoglobin. Research conducted by Roudi et al. (2017) as many as 120 premature babies with gestational age <32 weeks 44% of them have hemoglobin levels with less than 16.44 g/dL. This study is in line with the theory that explains the decrease in hemoglobin caused by the immaturity of erythropoietin so that inadequate erythrocyte production ((Deng *et al*., 2008); (Bae *et al*., 2008)). Preterm infants with LBW in this study had normal hemoglobin counts.

Table 3 Overview of Erythrocyte Screening Results

Erythrocytes	n	%
Decreased	35	92,2%
Normal	3	7,8%
Increased	0	0%
Total	38	100%

Based on table 3, it is known that the description of erythrocyte examination in premature babies with low birth weight at Dustira Hospital in 2021 can be concluded that of the 38 premature babies, 35 of them experienced a decrease in the number of erythrocytes at birth. This result is much higher than the research conducted by (Roudil *et al*., 2017) as many as 120 premature babies with gestational age < 32 weeks as well as 39% of them had decreased erythrocyte levels. In addition to (Roudil *et al*., 2017), research conducted by (Bae *et al*., 2008) also obtained the results of 149 premature babies 41% who experienced a decrease in erythrocytes.10 The value of erythrocytes in premature babies is 4.6-5.3 million / µ, this study is in line with the theory that explains the decrease in the number of erythrocytes caused by the immaturity of erythropoietin so that the production of erythrocytes is inadequate and jugal due to the transfer of conditions from intrauterine to extrauterine which causes the baby's condition to take a while to catch up to a sufficient amount of erythrocytes (Roudil *et al*., 2017). Premature infants with LBW in this study had a low number of erythrocytes.

Table 4 Overview of Leukocyte Screening Results

Leukosit	n	%
Declining	26	67,6%
Normal	12	31,2%

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Leukosit	n	%
Increasing	0	0%
Total	38	100%

Based on table 4, it can be concluded that 12 premature babies (31%) experienced a decrease in leukocyte levels. The results of the study are in accordance with research conducted by Bae et al. (2018) which found that out of 149 premature babies 28% experienced a decrease in leukocytes (Perumal *et al.*, 2021). However, this is different from the research conducted by Roudi et al. (2017) as many as 120 premature babies with gestational age < 32 weeks 49% of them had leukocyte levels < 12,400 million/µ (Roudil *et al.*, 2017). Leukocyte levels in premature infants tend to be low because the formation process also experiences prematurity due to inadequate leukocyte production. Premature infants with LBW in this study had low leukocyte counts.

Table 5: Overview of platelet examination results

Trombosit	n	%
Declining	5	13%
Normal	33	87%
Increasing	0	0%
Total	38	100%

Based on table 5, it is known that the description of platelet examination in preterm infants with low birth weight at Dustira Hospital in 2021 can be concluded that 5 preterm infants (13%) experienced a decrease in platelet levels with a value of less than < 217,000/mm. This study is similar to research conducted by (Bae *et al.*, 2008) as many as 149 premature babies with gestational age < 32 weeks 18% of them had decreased platelet levels. This is slightly different from research conducted by (Roudil *et al.*, 2017) as many as 120 premature babies with gestational age < 32 weeks as many as 33% of them had decreased platelet levels (Roudil *et al.*, 2017). Low platelet production tends to occur in premature infants due to immaturity of production so that also premature infants will experience several conditions such as respiratory distress syndrome or other conditions that are a sign that there is an increase in platelets (Bae *et al.*, 2008). Preterm infants with LBW in this study had a normal platelet count.

Table 6 Overview of Hematocrit Screening Results

Hematokrit	n	%
Declining	23	61%
Normal	15	39%
Increasing	0	%
Total	38	100%

Based on table 6, it can be concluded that 23 premature babies (22%) experienced a decrease in hematocrit levels with a value of less than 44% g/dL. The picture of hematocrit

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

in LBW babies in this study shows that the research subjects were dominated by LBW babies who experienced a decrease in hematocrit with an average hematocrit level of 42%, this is in accordance with research conducted by (Roudil *et al.*, 2017)and (Bae *et al.*, 2008), each of whose research results showed that of 120 and 149 premature babies, 86% and 70% of them experienced a decrease in hematocrit. This study is in line with the theory that explains the decrease in hemoglobin caused by the immaturity of erythropoietin so that the production of hematocrit is not adequate.

Table 7 Overview of the Erythrocyte index value examination results

Value	MCH	%
Declining	17	44,2%
Normal	21	55,8%
Increasing	0	0%
Total	38	100%
Value	MCV	%
Declining	15	39%
Normal	23	61%
Increasing	0	0%
Total	38	100%
Value	MCHC	%
Declining	18	46,7%
Normal	20	53,2%
Increasing	0	0%
Total 1	38	100%

Based on table 7, it is known that the examination of erythrocyte index values consisting of MCH, MCV, and MCHC examinations in premature babies with low birth weight at Dustira Hospital in 2021. It can be concluded that the MCH examination which has decreased is 17 people (55.8%), for MCV which has decreased by 15 people (39%) and for MCHC which has decreased by 18 people (46.7%). The picture of MCH, MCV, and MCHC in LBW babies in this study showed that the research subjects were dominated by LBW babies whose MCH, MCV, and MCHC conditions were normal. This is in accordance with research conducted by (Roudil *et al.*, 2017) as many as 120 premature babies with gestational age < 32 weeks only 5% of them experienced a decrease in MCV levels with an average of 105% g/dL. In contrast to the research of (Bae *et al.*, 2008), the results showed 52% of 149 premature babies experienced a decrease in MCV levels, 54.% experienced a decrease in MCH and 78% of them experienced a decrease in MCHC, which means that quite a lot of premature babies whose Erythocyte Index levels decreased ((Roudil *et al.*, 2017); (Bae *et al.*, 2008)). However, in this study all MCV, MCH, and MCHC indices were normal.

Jurnal eduHealt
Volume 15 , Number 01, 2024, DOI 10.54209/eduhealth.v15i01
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Table 8: Overview of blood sugar test results

GDS	n	%
Normal	27	71,4%
Decreased	10	26%
Increasing	1	2,6%
Total	38	100%

Based on table 8, it is known that the description of the examination of blood sugar during preterm infants with low birth weight at Dustira Hospital in 2021 who experienced a decrease in blood sugar during the number of 10 people (26%) and who experienced an increase was 1 baby (2.6%). These results are in accordance with research conducted by Yoon et al. who examined 37 premature babies, the lowest blood sugar level was 66 g/dL and the highest with a level of 115 <50 g/dL, in the first 1 hour of 141 premature babies studied 12.8% of them experienced hypoglycemia while only 1.4% experienced hyperglycemia. Blood sugar levels in premature babies tend to be low because babies do not have glucose reserves in their bodies so that they are still through the mother's placenta, this is why some premature babies can experience hypoglycemia conditions when they are just born (Yoon *et al.*, 2015). This study shows that the subjects of this study were dominated by infants who did not have abnormalities in GDS.

CONCLUSION

In this study entitled Routine hematology and blood sugar in preterm infants with low birth weight can be concluded that: The picture of hemoglobin levels, platelets, erythrocyte index values and current blood sugar in the subjects of this study mostly have normal values while others have decreased erythrocyte, leukocyte, hemaltocrit values.

REFERENCE

Althabe, F. (2012) *Born too soon: the global action report on preterm birth*. World Health Organization.

Badan Pusat Statistik (BPS) (2020) *Profil Kesehatan Ibu dan Anak 2020*, *Badan Pusat Statistik*.

Bae, S.-Y. *et al.* (2008) 'Hematological profile of Korean very low birth weight infants', *Journal of perinatal medicine*, 36(3), pp. 248–252.

Cruz-leal Y, Marjoram D, L.A. (2017) *Prevention of Hemolytic Disease of the Fetus and Newborn*.

Deng, Z.-H. *et al.* (2008) 'Haemolytic disease of fetus and newborn caused by ABO antibodies in a cisAB offspring', *Transfusion and Apheresis Science*, 39(2), pp. 123–128.

Gomella, T.L., Eyal, F.G. and Zenk, K.E. (2004) *Neonatology management, procedures, on-call problems, diseases, and drugs*. The McGraw-Hill Companies, Inc.

Perumal, N. *et al.* (2021) 'Effect of correcting the postnatal age of preterm-born children on

measures of associations between infant length-for-age z scores and mid-childhood outcomes', *American Journal of Epidemiology*, 190(3), pp. 477–486.

Roudil, P. *et al.* (2017) 'Blood parameters of preterm neonates: postnatal evolution according to gestational age', *International Journal of Laboratory Hematology*, 39(3), pp. 317–328.

Stark, A.R. (1982) *Manual of neonatal care*. Little Brown.

Wisgrill, L. *et al.* (2014) 'Hematopoietic stem cells in neonates: any differences between very preterm and term neonates?', *PLoS One*, 9(9), p. e106717.

Yoon, J.Y. *et al.* (2015) 'Blood glucose levels within 7 days after birth in preterm infants according to gestational age', *Annals of Pediatric Endocrinology & Metabolism*, 20(4), p. 213.