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Hematology profile of under five years old children suffered from acute diarrhea at Idaman Banjarbaru Hospital, Indonesia



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ABSTRACT

Introduction: Acute diarrhea is fecal discharge >3 times in 24 hours occurring <14 days. Diarrhea is still a health problem in Indonesia. This study aimed to determine the hematological profile in cases of acute diarrhea in children under five. The hematological profile can help diagnose acute diarrhea.

Methods: This research method is a descriptive retrospective with data from the medical records of patients with acute diarrhea in children under five at Idaman Banjarbaru Hospital in July - October 2018. The sampling technique was carried out using consecutive sampling.

Results: In this study, a sample of 109 children, 65 boys and 44 girls, were obtained. The results showed that 69.72% of the patients had anemia, and 62.39% had iron deficiency anemia (IDA). Leukocytosis and thrombocytosis were found in 16.51%, 23.85% of patients. Basophilia, eosinopenia, band neutropenia, segmented neutropenia, normal, lymphocytosis, monocytosis were found in 100%, 67%, 99%, 67%, 66%, 60%, respectively. IDA is found in 62.39% of children under five who suffer from acute diarrhea.

Conclusion: Typical lab results are the presence of basophilia, eosinopenia, band neutropenia, lymphocytosis, and monocytosis.

Keywords: acute diarrhea, under-five child, hematological profile.

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INTRODUCTION

Acute diarrhea is diarrhea that occurs for <14 days.¹ Worldwide death among children under five due to diarrhea was 15% or 1600 children under five per year.² According to the results of the Basic Health Research (RISKESDAS) of the Indonesian Ministry of Health in 2018, the prevalence of diarrhea in children under five was 11%.³

Despite preventive measures such as immunization, acute diarrhea still has a wide range of effects toward children physiology.⁴ Water loss could increase the hematocrite which represent dehydration status. Also, the electrolyte imbalances could also lead to change in erythrocytes morphology and leukocytes behaviour. Therefore, even the simplest test such as routine haematological tests can be varied.⁵ However, there are almost no

studies regarding this area and the effect of diarrhea toward haematological profile is still obscure.

Therefore, the purpose of this study was to determine the hematological profile of acute diarrhea in children under five, which is expected to be used to help diagnose acute diarrhea so that the management of acute diarrhea will be better and more focused.

METHODS

The research method used in this research was retrospective descriptive using the consecutive sampling technique. The research sample was under-five child patients diagnosed with acute diarrhea recorded in medical records from July to October 2018 who received treatment at Idaman Banjarbaru Hospital.

The inclusion criteria were patients

with acute diarrhea, children aged 0-5 years, and a complete blood count had been carried out, while the exclusion criteria were if the complete blood count results in the medical record were not complete. Nutritional status is assessed based on body weight-for-age, divided into normal-weight and under-weight. In this study, the normal-weight if the z-score of -2 SD to +1 SD. The Under-weight if the z-score -3 SD < z <-2 SD.⁴ All data were analyzed descriptively. This study has obtained ethical clearance from the FK ULM Research Ethics Commission with Letter No. 503/KEPK-FK ULM/EC/1/2021.

RESULTS

In this study, 109 patients with acute diarrhea in children under five. Most of the children were aged 12-36 months old

and male. Regarding the nutritional status, almost 75% of the subjects were well nourished. Patient characteristics can be seen in Table 1.

Regarding the hematological characteristics, most subjects had low hemoglobin concentration (69.72%) as well as low hematocrit. Sixty two (56.88%) children had low MCV values (microcytic) and 44 (40.37%) patients had low MCH values (hypochromic). The rest of the

characteristics were mostly normal.

Regarding the leukocyte profiles, despite the normal tendency of leukocyte count, there were 16.51% of subjects experienced leukocytosis. Moreover, low eosinophils, band neutrophils, and segmented neutrophils were prominent in our subjects. Meanwhile, lymphocytes and monocyte were increased in more than half of our subjects.

DISCUSSION

In Table 1, it can be seen that acute diarrhea is found in children under the age of 12 - <36 months; this is because children > 12 months of age have received complementary foods (complementary foods) that have a lower level of hygiene than breastfeeding alone, especially on the cutlery's hygiene.⁶ According to Sigmon Freud's development theory, ages 0-2 years are the oral phase. The child gets pleasure by putting everything in the mouth, making it easier for various antigens to enter the child's body through the mouth, which can cause diarrhea.⁷ The results of this study are consistent with Imanadhia et al.⁸ and Adhiningsih et al.,⁹ which stated that acute diarrhea affects children under five years of age.

Based on gender, it appears that acute diarrhea was more prevalent in males under five, as many as 65 (59.60%) children. This study's results are suited to research conducted by Pertiwi et al.,¹⁰ which states that boys mainly experience acute diarrhea; this can occur because the activities of boys who are more outside the house.¹¹

According to nutritional status, most children under five who suffer from acute diarrhea have normal weight, namely 81 (74.31%) children. This study's results are consistent with Pertiwi et al.,⁹ where children with sufficient body weight more often experience acute diarrhea. On the other hand, Patel et al.¹² showed that most toddlers aged 6-59 months who suffered from diarrhea had less than normal body weight. Underweight children tend to be more susceptible to infections, especially gastrointestinal tract infections.^{13,14}

Table 2 shows 76 (69.72%) children suffering from anemia. Based on the RDW value, the Mentzer index (MCV: RBC), and the RDW index (MCV: RBCxRDW), out of 76 children suffering from anemia, 68 (62.39%) children had IDA. The Mentzer index and RDW index are used as indicators for ADB.^{15,16} The Mentzer index value <13 indicates that anemia occurs due to minor thalassemia, and if the Mentzer index value is ≥13, then the anemia that occurs may be due to iron deficiency. The RDW index value ≥220 indicates anemia caused by iron deficiency.^{15,16} The highest prevalence of anemia is found in

Table 1. Characteristics of children under five with acute diarrhea at Idaman Banjarbaru Hospital for the period July-October 2018.

Characteristics (n=109)	Sum (n)	Percentage (%)
Age (Months)		
0 - <6	9	8.26
6 - <12	26	23.85
12 - <36	55	50.46
36 - <60	19	17.43
Gender		
Boys	65	59.60
Girls	44	40.40
Nutritional status (Weight-for-age)		
Under-Weight	28	25.69
Normal-Weight	81	74.31

Table 2. Hematological profiles of patients with acute diarrhea in children under five based on erythrocyte index.

Hematological profiles	< Normal	Normal	> Normal
Hemoglobin	76 (69.72%)	33 (30.27%)	-
Hematocrit	76 (69.72%)	32 (29.36%)	1 (0.92%)
RBC	12 (11.01%)	92 (84.40%)	5 (4.59%)
MCV	62 (56.88%)	47 (43.12%)	0 (0.00%)
MCH	44 (40.37%)	65 (59.63%)	0 (0.00%)
MCHC	15 (13.76%)	90 (82.57%)	4 (3.67%)
RDW	0 (0.00%)	46 (60.53%)	30 (39.47%)
RDW Index	16 (21.05%)	-	60 (78.95%)
Mentzer Index	8 (10.53%)	-	68 (89.47%)

Footnote:

RBC: Red Blood Cell, MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW: Red blood cell Distribution Width.

Table 3. Hematological profiles of patients with acute diarrhea in children under five based on leukocytes and leukocyte count.

Hematological profiles	< Normal	Normal	> Normal
Leukocytes	7 (6.42%)	84 (77.06%)	18 (16.51%)
Basophils	0 (0.00%)	100 (100.00%)	0 (0.00%)
Eosinophils	67 (67.00%)	32 (32.00%)	1 (1.00%)
Band neutrophils	99 (99.00%)	0 (0.00%)	1 (1.00%)
Segmented neutrophils	66 (66.00%)	9 (9.00%)	25 (25.00%)
Lymphocytes	19 (19.00%)	15 (15.00%)	66 (66.00%)
Monocytes	2 (2.00%)	38 (38.00%)	60 (60.00%)

children under 24 months of age; this is because, at that age, there is rapid physical development with high iron metabolism so that when iron intake occurs less, the child is prone to developing IDA.¹⁷ In diarrhea, the absorption of iron in enterocytes is reduced. Research by Das et al.¹⁸ and Rahmani et al.¹⁹ stated that iron deficiency could affect cellular immunity and antibacterial activity of neutrophils. Iron deficiency can lead to an increased risk of infection. This study's results are suited to Amalia et al. who found that 83% of children with acute diarrhea suffer from anemia.²⁰ The research of Chandyo et al. states that 52% of children suffer from anemia children with acute diarrhea.²¹

Table 2 showed that 76 (69.72%) children had a decrease in hematocrit levels. In general, children with diarrhea admitted to the hospital are immediately given intravenous fluids for rehydration as soon as possible. The next day after rehydration, the patient has a complete blood count so that there may have been excess fluid marked by reduced hematocrit from ordinary. This study's results are different from the research of Rottie et al., wherein children with acute diarrhea, and it was found that 74.27% of children had normal hematocrit values.²²

Table 3 shows that 84 (77.06%) children had normal leukocyte counts; this is in accordance with the research of Rottie et al., whereas 81.16% of children with acute diarrhea had normal leukocyte counts.²² On the leukocyte count, all patients had normal basophil values. Eosinopenia was found in 67 (67.00%) children. Eosinopenia is often associated with a viral infection.²³ A virus generally causes diarrhea.

Band neutropenia was seen in 99 (99%) children and segment neutropenia in 66 (66%) children. Neutropenia is found in conditions of viral infection, chemotherapy, and autoimmune diseases.²³ Research by Al-Asy et al.²³ states that in conditions of diarrhea caused by bacteria, segmented neutrophils values tend to be higher than in diarrhea that is not caused by bacteria.

Lymphocytosis was found in 66 (66%) children. Secondary lymphocytosis can occur as a physiological or

pathophysiological response to infections, toxins, cytokines, and drugs. Research by Al-Asy et al. stated that the percentage of lymphocytes was much higher in diarrhea caused by non-bacterial causes than diarrhea caused by bacterial infection.²⁴

Monocytosis was found in 60 (60%) children. Monocytes play a role in all types of infections and inflammation, so their value is increased in conditions such as autoimmune diseases, gastrointestinal diseases, and viral and bacterial infections. This study is consistent with Rumokoy et al. that most children (59.60%) with acute diarrhea had high monocyte values. A high monocyte value indicates that the infection is still ongoing, either by bacteria or viruses.²⁵ In this study, 81 (74.31%) of the 109 children had normal platelet values. Thrombocytosis was found in 26 (23.85%) children.

CONCLUSION

A significant portion of the children with diarrhoea showed a tell-tale signs of iron deficiency anemia. Other typical lab results are the presence of basophilia, eosinopenia, band neutropenia, lymphocytosis, and monocytosis. Further study is needed to confirm these findings and to identify the cause of anemia related to diarrhoea.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare that are relevant to this article's content.

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No funds, no grants, or other support was received.

ETHICS STATEMENT

This case report has been approved by The Ethical Committee of Medical Research, Medical Faculty, University of Lambung Mangkurat, Banjarmasin – Indonesia, No. 503/KEPK-FK ULM/EC/I/2021.

AUTHOR CONTRIBUTION

All authors contributed equally in the research process and the writing of this article.

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