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The Complete Blood Count Profile in Patients Under Five Who Suffer From Simple Febrile Seizures At Idaman Hospital Banjarbaru

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ABSTRACT

Simple febrile seizures account for 80% of all febrile seizures. Simple febrile seizures are characterized by a generalized seizure that lasts less than 15 minutes and does not recur within 24 hours. The study aims to know the complete blood count (CBC) profile in pediatric patients under five who suffer from simple febrile seizures. The study is a descriptive observational method by collecting medical records of children under five who suffer from simple febrile seizures at Idaman Hospital Banjarbaru from October 2020 to September 2022. The study found 51 children, 31 (60.80%) boys and 20 (39.20%) girls. The results showed neutrophilia at 68.20%, eosinopenia at 56.80%, lymphopenia at 50.00%, and anemia at 25.50%. Conclusion: The CBC profile of patients under five who suffer from simple febrile seizures showed neutrophilia, eosinopenia, lymphopenia, and anemia, respectively.

1. Introduction

Febrile seizures are convulsive seizures that occur at an increase in temperature above 380C in children aged six months to 5 years which are not caused by intracranial processes. Simple febrile seizures account for 80% of all febrile seizures. Simple febrile seizures are characterized by a generalized seizure that lasts less than 15 minutes and does not recur within 24 hours [1- 3].

Febrile seizures can occur in all ethnic groups, but there are ethnic groups that have a higher prevalence, for example, Guam (14%), Japanese (6%-9%), and Indians (5% -10%) [4]. Simple febrile seizures are frequent in boys and are usually between 1 and 2 years of age [5].

Causes of febrile seizures are related to fever due to infection (upper respiratory tract infection, otitis media, pneumonia, urinary tract infection, gastroenteritis, etc.) [6]. The inflammatory response is activated during inflammation by releasing leukocytes, such as macrophages and neutrophils, to fight infection [7]. The interaction between activated neutrophils and platelets also occurs during the inflammatory response in the blood [8]. Systemic inflammation and febrile seizures are closely related [9]. In addition, decreased hemoglobin level, which disrupts the stability of the nerve cell membrane, results in an increase in intracellular Na ion concentration resulting in depolarization. Excessive depolarization followed by a febrile condition can cause seizures [10]. Hematological examination is one of the supporting examinations in simple febrile seizures to find the source of the infection causing the fever [11], [12]. The study aims to know the complete blood count (CBC) profile in pediatric patients under five who suffer from simple febrile seizures.

Materials and Methods:

Study Population

The study is a descriptive observational method by collecting medical records of children under five who suffer from simple febrile seizures at Idaman Hospital Banjarbaru from October 2020 to September 2022. The inclusion criteria in this study were: 1. Pediatric patients with simple febrile seizures aged 6 months-5 years and no recurrence in 24 hours. 2. The medical record contains the results of a CBC examination. The exclusion criteria in this study were: 1. The patient has a previous history of epilepsy. 2. Patients experiencing intracranial infection, head trauma, electrolyte disturbances, hypoxia, or hypoglycemia.

Statistical Analysis

Data on the CBC profile of children with simple febrile seizures at Idaman Banjarbaru Hospital were processed using SPSS version 26 from IBM. Data is displayed descriptively in the form of narration and tables.

2. Findings And Discussion

The characteristic of patients can be seen in Table 1. The sex of the children with simple febrile seizures in this study was predominantly male (60.80%). This data is suited to other studies, which found that most simple febrile seizures occurred in males [9], [13], [14].

Table 1. The characteristics of children suffering from simple febrile seizures at Idaman Banjarbaru Hospital

Parameters	N (%)

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Gender, n (51)	
Boys	31 (60,80)
Girls	20 (39,20)
Age (Months), n (51)	
< 24	33 (64,70)
24-60	18 (35,30)

The most common age of pediatric patients with simple febrile seizures was in the age group < 2 years (64.70%). The results of this study are similar to other studies, which found that the most simple febrile seizures occurred in the age group under two years [13- 15]. The above research results follow the theory, which states that under two years of age is the development window period (organizational phase of brain development). During this time, the brain was immature, and the regulation of Na+, K+, and Ca2+ ions was imperfect, resulting in post-depolarization repolarization disturbances and increased neuronal excitability. In addition, the levels of Corticotropin-releasing hormone in the hippocampus are high when the brain is immature, so it is prone to seizures when triggered by fever [13], [15], [16].

Table 2 The complete blood count (Erythrocyte Index) in children with simple febrile seizures at Idaman Hospital Banjarbaru

Parameters	N (%)
RBC (10^6/μL) n (51)	
Increased	4 (7,80)
Normal	46 (90,20)
Decreased	1 (2,00)
RDW (fL) n (51)	
Decreased	2 (3,90)
Normal	48 (94,10)
Increased	1 (2,00)
Hb (g/dL) n (51)	
Decreased	13 (25,50)
Normal	37 (72,50)
Increased	1 (2,00)
Ht (%) n (51)	
Decreased	7 (13,70)
Normal	43 (84,30)
Increased	1 (2,00)
MCV (fL) n (51)	
Decreased	2 (3,90)
Normal	45 (88,20)
Increased	4 (7,80)
MCH (pg) n (51)	
Decreased	2 (3,90)
Normal	48 (94,10)
Increased	1 (2,00)
MCHC(g/dL) n (51)	
Decreased	3 (5,90)
Normal	48 (94,10)
Increased	0 (0,00)

Trombosit (10^3/uL) n (51)	
Decreased	1 (2,30)
Normal	50 (97,70)
Increased	0 (0,00)

In Table 2, it can be seen that most of the children have normal RBC values. RBC has many critical physiological functions, including blood and microvascular tissue oxygen delivery [17]. Most children have normal RDW values. Therefore, RDW is an indicator used to determine the etiology of anemia and variations in the distribution of erythrocyte sizes [18]. In addition, RDW is positively correlated with inflammatory markers [9], [14]. There is a relationship between IL-1β, IL-6, and TNF-α and disturbances of oxidative balance and RDW in chronic inflammatory processes. Research by [19] showed a higher RDW value in the incidence of complex febrile seizures than simple febrile seizures.

Most of the children in this study had normal hemoglobin values, but some children were found to have anemia (25.50%). Anemia in children is generally caused by iron deficiency. Iron deficiency anemia can be assessed by reticulocyte hemoglobin [20]. Iron deficiency anemia plays a role in the development of febrile seizures. For example, one study showed that patients with iron deficiency anemia (IDA) were at the double the risk as those without IDA [10]. In contrast, other studies have not shown a significant relationship between iron deficiency anemia and febrile seizures [21]. Most of the children in this study had normal hematocrit, MCV, MCH, MCHC, and platelet values.

Table 3. The complete blood count (leukocyte index) in children with simple febrile seizures at Idaman Hospital Banjarbaru

Parameters	N (%)
leukocytes (10^3/µL) n (51)	
Decreased	4 (7,80)
Normal	39 (76,50)
Increased	8 (15,70)
Basophils (10^3/µL) n (44)	
Decreased	1 (2,30)
Normal	43 (97,70)
Increased	0 (0,00)
Eosinophils (10^3/µL) n (44)	
Decreased	25 (56,80)
Normal	19 (43,20)
Increased	0 (0,00)
Neutrophils (10^3/µL) n (44)	
Decreased	0 (0.00)
Normal	14 (31,80)
Increased	30 (68,20)
Lymphocytes (10^3/µL) n (44)	
Decreased	22 (50,00)
Normal	22 (50,00)
Increased	0 (0,00)
Monocytes (10^3/µL) n (44)	
Decreased	3 (6,80)
Normal	29 (65,90)
Increased	12 (27,30)

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Most of the children in this study had normal hematocrit, MCV, MCH, MCHC, platelets, and leukocytes. The study by [22] showed that most patients with febrile seizures had normal leukocyte levels (72.5%), 23.8% leukocytosis, and 3.7% leukopenia. In contrast, other studies have shown that febrile seizures are more common in patients with leukocytosis of 47.8% and leukopenia of 45.5%. A bacterial infection does not always cause leukocytosis. Leukocytosis can be caused by neutrophilia, eosinophilia, basophilia, and lymphocytosis [23]. The most common abnormalities in the leukocyte count found in this study were eosinopenia, neutrophilia, and lymphopenia. Neutrophilia can be caused by bleeding, metabolic disorders, bacterial and parasitic infections, and myeloproliferative disorders. Neutrophilia in the peripheral blood is associated with increased adrenaline, proinflammatory cytokines, and cortisol during seizures [19]. Yoldas' study showed high neutrophil values in cases of simple febrile seizures [10]. Eosinopenia can occur due to increased production of glucocorticosteroids (when the body responds to stress) [24].

3. Conclusion

The CBC profile of patients under five who suffer from simple febrile seizures showed neutrophilia, eosinopenia, lymphopenia, and anemia, respectively.

Ethical Clearance:
This study attained ethical clearance from the Research Ethics Commission of the Medical Faculty of the University of Lambung Mangkurat No. 435/KEPK-FK ULM/EC/X/2022.

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