



Received: 16-10-2023
Accepted: 26-11-2023

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Influence of Parasit Number on Trombosit Capacity in Patients with Tropical Malaria (*Plasmodium falciparum*) in Timika Papua

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Abstract

Malaria parasites are in the blood for most of their life cycle thus inducing changes in the blood, malaria affects almost all blood components. The purpose of this study was to determine the effect of the number of parasites with platelet levels in Tropical Malaria (*Plasmodium falciparum*) sufferers. This type of research is cross sectional, the population of this study was positive patients with Tropical Malaria (*Plasmodium falciparum*) at the Timika Papua Hospital as many as 33 respondents. The number of samples was determined by the Solvin formula so that 30 samples were obtained. The analysis method uses the mann whitney

u test. The results showed that the effect of the number of parasites with platelet levels obtained a decrease in platelet levels where in mild malaria with an average value of 98 parasites obtained an average value of platelets 130,000 / μ l while severe malaria obtained the number of parasites with an average value of 480 or severe category and obtained an average value of platelet levels 116,000 / μ l. The effect of the number of parasites with platelet levels in patients with tropical malaria (*Plasmodium falciparum*) shows the results that the higher the number of parasites obtained, the lower the platelet levels.

Keywords: Tropical Malaria (*Plasmodium falciparum*), Number of Parasites and Platelet Levels

Introduction

Malaria is caused by plasmodium infection from the Anopheles mosquito. The disease often occurs during the rainy season and can cause illness and death to humans. Based on data from the Ministry of Health, there were 304,607 cases of malaria in Indonesia throughout 2021. This number increased by 19.9% compared to the previous year, which was 254,050 cases.

Papua became the province with the highest malaria cases in Indonesia in 2019, with 216. 380 cases of malaria infection then in 2020 malaria cases increased to spread across 28 districts and one city including Yahukimo Regency 941.47 sufferers, Mimika Regency recorded 359.39 cases, Keerom Regency 359.09 cases, Sarmi Regency 351.91 cases, Membramo raya Regency 233.56 cases, Jayapura Regency 170.49, Asmat Regency 87.31 cases, Boven digoeel there were 115.11 cases and Jayapura City there were 89.35 cases of malaria infected patients (DHO, 2021). The growing problem of malaria is related to the weak efforts to reduce the incidence of malaria, such as the existence of breeding places for Anopheles mosquitoes that spread and difficult locations that do not meet health requirements, the behavior of people doing activities outside the house at night and before dawn. In addition, there are demographic factors that can affect the environment, and socio-economic factors that can affect the incidence of malaria (Lewinsca *et al.*, 2021) ^[14].

The malaria parasite is in the blood for most of its life cycle, inducing changes in the blood, and malaria affects almost all blood components. Several mechanisms have been postulated to cause thrombocytopenia, including abnormalities in the structure of parasite-invaded platelets, platelet apoptosis. Several receptors that can bind to the PFEMP (Plasmodium falciparum erythrocyte membrane protein) protein found on parasite-infected erythrocyte knobs. One of them is the CD36 receptor found on platelets and blood vessel endothelium. Clumping of parasite-infected erythrocytes, which is related to disease severity, is mainly mediated by receptors produced by platelets. Platelet attachment and aggression can lead to organ perfusion failure and tissue hypoxia, platelet activity in falciparum malaria (Natalia, 2014) ^[18].

The normal platelet count in the blood is 150,000-450,000 cells/ul. Thrombocytopenia is a decrease in platelet count to <150,000 cells/ul in the blood. Malaria infection causes abnormalities in platelet structure and function. The decrease in platelet count in malaria is related to various causes including immune-mediated lysis, sequestration in the spleen, disorders in the bone marrow and fogocytosis by macrophages but the cause in thrombocytopenia in malaria is not yet known for certain because immune mechanisms and oxidative stress can also cause thrombocytopenia in patients with malaria (Kustiah *et al*, 2020).

Methods

The type of research used in this study is analytical observation with Cross sectional research design, Sampling is done by measuring the number of parasites and platelet levels in patients with Tropical Malaria (*Plasmodium falciparum*). The population of this study were positive patients with tropical malaria (*Plasmodium falciparum*) totaling 33 people and the sample in this study amounted to 30 samples. Make a smear for further reading under a microscope with an objective lens magnification of 100x, and identify and determine the plasmodium species and the number of parasites.

Measurement of Platelet Levels:

Samples that tested positive for Plasmodium falcifarum, homogenized the tube for a while, measured using a Hematology Anayzer tool, opened the EDTA tube and inserted the tube into the Hematology Analyzer needle to suck the sample, pressed the suction button pulled the tube when the needle finished sucking, waited a while until the results of the Hematology Analyzer reading came out and recorded the results of Platelet readings by the Hematology Analyzer tool.

Post Analytical:

Interpretation of Platelet examination results: Platelet count level: 150,000 - 450,000 µl/blood.

Data Analysis

The data obtained were then analyzed in Univariate and Bivariate.

Result

Univariate Analysis

Table 1: Characteristics of Respondents Based on Age

S. No	Age	Total	Precentage (%)
1	5 – 11 Children	3	10 %
2	12 – 16 Early adolescence	2	6,7 %
3	17 – 25 Late teens	9	30 %
4	26 – 35 Early adulthood	5	16,7 %
5	36 – 45 Dewasa akhir	5	16,7 %
6	46 – 55 Late adulthood	3	10 %
7	56 – 65 Late elderly	2	6,7 %
8	>65 Old age	1	3,3 %
	Total	30	100.0

The data shows the results of the characteristics of respondents based on the age of the patient, the most in the age group 17-25 years of late adolescence with 9 respondents (30%), second in the age group 26-35 years of early adulthood and the age group 36-45 years with each

totaling 5 respondents (16.7)%, and the least in the age group >65 years of seniors with 1 respondent (3.3%).

Table 2: Characteristics of Respondents Based on Gender

S. No	Gender	Total	Presentase (%)
1	Male	16	53,3
2	Female	14	46.7
3	Total	30	100.0

Table 2 shows that out of 30 respondents, the highest number of respondents affected by falciparum malaria was found in males 16 respondents (53.3%), and the least was found in females with a total of 14 respondents (46.7%).

Analisis Bivariat

Based on the results of statistical tests using the *mann whitney test* on Hematology examination samples, namely platelet levels and examination of the number of parasites in 30 respondents suffering from tropical malaria (*Plasmodium falciparum*), the results are shown in the table below.

Table 3: Statistical test results of the number of parasites in patients with tropical malaria

Malaria category	Number of Parasites			
	n	percent	Rate average	P. value
Lightweight 2%	14	46,7 %	85.000/ul	
Weight 5%	16	53.3 %	490.000/ul	0,000
Total	30	100,0 %		

Table 3. Shows the results of statistical tests that of the 30 respondents the number of parasites affected by tropical malaria showed the least category of mild malaria totaling 14 respondents (46.7%) and the most in the category of severe malaria with a total of 16 respondents (53.3%).

Table 4: Statistical test results of platelet levels

Malaria category	Kadar Trombosit			P. value
	Normal	Abnormal	Rate average	
Lightweight 2%	4	10	192.000/ul	
Weight 5 %	3	13	99.000/ul	0,000
Total	7	23	30	

Table 4. shows the results of statistical tests of platelet levels of 30 respondents, the least normal platelet levels showed a severe malaria category of 3 respondents and the least abnormal platelet levels in the mild malaria category with 10 respondents, and more in the severe malaria category as many as 13 respondents with an average value obtained of 99,000/µl.

The Mann Whitney test results show a P.value of 0.000 <0.05, indicating that there is a relationship between the number of parasites and platelet levels in patients with tropical malaria (*Plasmodium falciparum*).

Discussion

Malaria infection is caused by plasmodium parasites that live and multiply in the blood transmitted by the bite of Anhopeles mosquitoes so that it can cause changes in the number of blood cells, symptoms of malaria infection generally begin with weakness, a slow rise in body temperature to reach a temperature of 38-39oC and followed by chills, usually accompanied by headaches nausea vomiting. Sickness in people who are first exposed to untreated malaria can last up to one week or more than one

month.

This study was conducted in the laboratory of RSUD Timika Papua by taking samples and collecting data on patients suffering from tropical malaria (*Plasmodium falciparum*). A total of 30 respondents, Based on the results of the study showed the results of the characteristics of respondents based on the age of the patient the most were in the age group 17-25 years late adolescence with a total of 9 respondents (30%),

The results showed that of the 30 respondents examined who were affected by falciparum malaria, 16 respondents were male and 14 respondents were female. Malaria has become one of the infectious diseases that has a wide spread in endemic areas such as in eastern Indonesia, one of which is Timika City. Where the development of malaria continues to grow with weak efforts to reduce the incidence of malaria such as the existence of Anopheles mosquito breeding sites and supported by poor environmental conditions, as well as many puddles, and most people affected by malaria do not comply with taking medicine until completion, as well as very high community morbidity and there is no public awareness about PHBS (Clean and Healthy Living Behavior) and 3M (Draining, covering and burying). The results of the examination of 30 samples infected with Plasmodium falciparum showed the results of statistical tests that of the 30 respondents the number of parasites affected by tropical malaria showed the least category of mild malaria 2% 100 parasites totaling 14 respondents (46.7%) and the most in the category of severe malaria 5% 250 parasites with 16 respondents (53.3%), This is different from the research of Jhustina (2020). Shows the highest average parasite density level of 1,895 / μl and the lowest level density with an average of 94 / μl .

The results of the examination of 30 respondents infected with tropical malaria (*Plasmodium falciparum*) with platelet levels there were the least normal platelet levels showing the category of severe malaria as many as 2 respondents and the least abnormal platelet levels in the mild malaria category with 10 respondents, and more in the severe malaria category as many as 13 respondents with an average value obtained of 99,000/ μl . The results of the Mann Whitney test in Table 8 obtained a Sig value of 0.000 can be concluded that the value is not normally distributed which means it is smaller than the value of 0.05, so the hypothesis is accepted so it can be concluded that there is an effect of the number of parasites with platelet levels in patients with tropical malaria (*Plasmodium falciparum*), at the Regional General Hospital (RSUD) Timika Papua.

The decrease in platelet count in malaria patients can be caused by increased absorption in the spleen where the spleen itself has two functions, namely as a blood filter and secretes old red blood cells that produce lymphocytes that secrete antibodies and help the immune system, the spleen is also a place of destruction and storage of platelets, stored platelets can be released into circulation as needed. Due to the infection of erythrocytes by malaria parasites, parasitized erythrocytes increase as well as platelets, resulting in a sequestration process into vital organs such as the spleen and liver, when parasitized erythrocytes enter along with healthy erythrocytes and platelets, there will be destruction by macrophages in the spleen so that many healthy erythrocytes and platelets are destroyed, causing a decrease in platelet levels and unable to exit due to loss of elasticity due to parasite infection. So that there is a

blockage that results in enlargement of the spleen (Afdal, 2014).

The results of this study are in line with the research of Zulfian and Ery (2017) [23] using the results of the Mann whitney u test with an error rate of 5% with a p-value of 0.00 less than 0.05 which means there is a relationship between parasite index and platelet levels. There is a significant correlation between malaria parasite index and platelet count with a p-value of 0.00 which means there is a relationship between parasite index and the number of parasites in patients with malaria. The decrease in platelet count is also related to various causes including immune-mediated lysis, sequestration in the spleen, disorders in the bone marrow and phagocytosis by macrophages. Malaria infection causes abnormalities in platelet structure and function, when platelets fall below normal this includes superficial bleeding that appears like a rash on the skin (Diana, 2014) [18].

Clotting blood pieces (Platelets) that have an improper shape. Its function is for blood clotting with a number of $\pm 150,000 - 400,000 / \text{nm}^3$ by being made with bone marrow (megacaryocytes). If a person is injured, keeping blood will flow with the wound blood, when it touches the wound surface, it will break and form thrombokinase, with the help of calcium ions will convert prothrombin (in blood plasma) into thrombin. The thrombin formed will convert fibrinogen into fibrin (fine threads) which will close the wound so that the bleeding stops (Putra and Hery, 2014).

Conclusion

Based on the conclusion of this study that the number of tropical malaria parasites as many as 30 respondents with mild malaria category 2% as many as 14 and severe category 5% 16 respondents, the number of platelet levels as many as 30 respondents with normal platelet values as many as 7 respondents and abnormal values as many as 23 respondents and there is an influence of the number of parasites with platelet levels in patients with tropical malaria (*Plasmodium falciparum*) as many as 30 respondents at the Regional General Hospital (RSUD) Timika Papua.

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