Malaria Density in Peripheral Blood Smear on Positive Cases of Malaria on Residences of Jaro South Kalimantan

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Article Info

ABSTRACT

Malaria, a severe infectious disease caused by Plasmodium parasites, remains a significant health challenge in endemic regions of Indonesia, particularly in areas with favorable environmental conditions for Anopheles mosquitoes. The liver is a critical organ involved in the early stages of malaria infection. This study investigates malaria density in confirmed malaria cases in Jaro District, South Kalimantan. The aims of this study was to determine the parasitemia density in individuals diagnosed with malaria in the Jaro District, contributing to the understanding of malaria severity in this region. A descriptive survey approach was employed to measure malaria density in 15 respondents with confirmed Plasmodium falciparum infections. Total sampling was used, and blood specimens were collected and analyzed in the clinical pathology laboratory of RS Badaruddin Kasim. Blood smears were stained using 3% Giemsa stain, and parasitemia density was determined microscopically following the Ministry of Health's 2012 guidelines. The study identified varying levels of parasitemia density among the respondents: 33.3% had a low parasitemia density (+), 20% had moderate densities (++ and +++), and 26.7% exhibited high density (++++). The highest proportion of cases showed a low parasitemia density. The analysis of malaria density in the Jaro District reveals significant variability in parasitemia levels among patients. This variability highlights the importance of continuous monitoring and tailored interventions to manage malaria effectively in endemic regions. Understanding parasitemia density is crucial for assessing disease severity and implementing effective treatment.

INTRODUCTION

Malaria is an acute infectious disease caused by protozoa from the genus Plasmodium (Sandjaja, 2007; Sucipto, 2015). The natural spread of the malaria parasite is due to female Anopheles mosquitoes (Puasa, Andi, & Arfa, 2018). Until recently, only four types of Plasmodium were known to infect humans, but in the past few decades, a new type of Plasmodium that usually infects monkeys has been found to also infect humans. The latest case involves infection caused by Plasmodium cynomolgi (Ta, et al., 2014; Hartmeyer, et al., 2019). Several monkey malaria parasites have been reported to infect humans both naturally and experimentally (Ompusunggu, et al., 2015). One such species is Plasmodium knowlesi, which is considered the fifth Plasmodium parasite capable of infecting humans

(Paisal, 2014). Malaria cases in Indonesia are still concentrated in the eastern regions. The data shows that several areas in Indonesia are malaria-endemic, including Papua, East Nusa Tenggara, Maluku, Bengkulu, Sulawesi, and Kalimantan. This is closely related to the natural environment, which strongly supports and influences malaria vectors such as climate, temperature, and rainfall (Naully, Khairinisa, & Saputri, 2018). Malaria, categorized as a vector-borne disease, is one of the communicable diseases targeted for reduction as part of the international commitment to the Millennium Development Goals (MDGs) (Owens, 2014). Besides causing anemia, malaria also results in dysfunction of several organs, such as the brain, liver, and kidneys (Harijanto, 2006). The liver is the first organ involved in the reproduction of the malaria parasite (Darmawaty, Fitriani, & Hardjoeno, 2018).

After being infected by mosquitoes, malaria sporozoites are released within a few minutes and invade Kupffer cells, directly attacking liver cells. Some sporozoites are destroyed by phagocytes, but many succeed in reaching the liver parenchyma. Within 6-16 days, infected liver cells containing parasites will rupture and enter the bloodstream to attack erythrocytes. Liver function is disrupted during the acute phase due to anoxia and reduced blood flow to the organ. The first changes in liver cells occur in the mitochondria, disrupting glycogenesis and phosphorylation. These changes are irreversible and lead to cellular destruction (Darmawaty, Fitriani, & Hardjoeno, 2018). Liver involvement in malaria is common in patients and can manifest as jaundice, hepatomegaly, and increased liver enzymes such as aspartate transaminase. This study aims to determine the malaria density in positive malaria cases found in Jaro District, South Kalimantan.

MATERIALS /METHOD

This type of research is a descriptive survey that measures the variable of malaria density in respondents with positive malaria cases. The sampling technique used in this study is total sampling. The research instruments used include a 3cc syringe, tourniquet, blood collection tubes, centrifuge, and microscope. The materials and reagents used in this study are absolute methanol, Giemsa stain, and buffer solution with a pH of 7.2. The research was conducted in the clinical pathology laboratory of RS Badaruddin Kasim, Tabalong Regency. The study was carried out over a period of 1 month. Venous blood specimens were collected using a syringe and blood smears were prepared on glass slides. The blood smears were fixed by adding absolute methanol and stained with 3% Giemsa stain. The determination of malaria density was conducted microscopically in a semi-quantitative manner using the guidelines from the Ministry of Health in 2012. Data were analyzed descriptively using MS Excel software.

RESULTS AND DISCUSSION

The research was conducted in Jaro. Fifteen respondents with positive cases of Plasmodium falciparum malaria were identified. The respondents had not yet received or undertaken malaria treatment. The calculation of malaria density yielded results as shown in Table 1.

Tabel 1. Densitas malaria pada responden dengan malaria positif

No.	Malaria Density	N	%
1.	+	5	33.3
2.	++	3	20.0
3.	+++	3	20.0
4.	++++	4	26.7
	Total	**15**	**100,0**

Based on the research results, the parasitemia density in malaria patients was as follows: 5 people (33.3%) had a parasitic count of (+), 3 people (20.0%) had a count of (++), 3 people (20.0%) had a count of (+++), and 4 people (26.7%) had a count of (++++). The highest parasitic count in malaria patients was (+) with 5 people (33.3%). Malaria infection can cause clinical symptoms that affect a person's hematological system. The calculation of parasite density in the blood serves as a tool to predict the severity of malaria infection. Parasitemia density is the percentage of individuals in a population whose blood smears show parasites, also known as parasite density in blood cells. The level of parasitemia is used to assess the severity of malaria. The severity of the disease is more determined by the number of parasites sequestered in tissues compared to the number of parasites in circulation. Parasitemia density is the percentage of individuals in a population whose blood smears show parasites, also known as parasite density in blood cells. The level of parasitemia is used to assess the severity of malaria (Sorontou, 2014).

High parasite density is influenced by factors such as asymptomatic malaria infection, allowing Plasmodium to replicate more within the human body, and drug resistance. In contrast, low parasitemia density is influenced by factors such as patients undergoing treatment (Shridar, Goel, Farooq, & Mashkoor, 2017). Malaria parasites are present in the blood for most of their life cycle, inducing changes in the blood. Malaria affects almost all blood components. Blood abnormalities associated with malaria infection include anemia, thrombocytopenia, splenomegaly, mild to severe lymphocytosis, and (in rare cases) Disseminated Intravascular Coagulation (Natalia, 2014). Although malaria is an infection of erythrocytes, the main pathophysiology in the development of severe malaria is the interaction between infected cells and the microvascular endothelium, where platelets and their activation products are involved in the sequestration of infected erythrocytes to capillary and venous endothelium. Jaundice can appear as a sign of severe malaria infection, either due to severe hemolysis or liver involvement.

This is consistent with research by Vasa, Paturi, Penumatsa, & Haranadh (2019), indicating that liver dysfunction is a symptom of severe malaria, causing increased liver enzymes and jaundice. Jaundice occurs due to intravascular hemolysis, which results in liver injury. Research by Sariyanto (2018) states that the increase in SGPT/SGOT levels occurs due to malaria transmission through the bite of Anopheles mosquitoes that inject sporozoites into human blood. In hepatocytes, sporozoites are transformed into schizonts, which eventually produce a large number of merozoites. The involvement of the liver in the reproduction of Plasmodium, the malaria-causing agent, leads to increased activity of

Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) as markers of liver dysfunction

CONCLUSIONS

Based on the research results, it can be concluded that there were 15 positive cases of Plasmodium falciparum malaria. The malaria density in the blood was found to be (+) in 33.3% of cases, (++) in 20%, (+++) in 20%, and (++++) in 26.7%.

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