

# Identify of *Plasmodium* Malaria, Parasite Density, and Associated with Demographic Factors of Kanda Community Health Center, Waibu, Jayapura District, Papua Province

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**Abstract:** Background: Malaria is poses of major public health problem in Papua. Bite by Anopheles Mosquito carried Plasmodium species which was transmitted into human body. Objective of this study is to determin malaria cases based on parasite density and demographic factors in Kanda Community Health Center Waibu, Jayapura. Methods: type of study is descriptive research which used cross sectional design. Result: Total sample of this research were 118 positive involve falciparum malaria as much 80 (67.80%) more higher than vivax malaria as much 30(25.43), malariae malaria as much 5(4.24%) and mix malaria of (Pf +Pv) patients, respectively. Conclusion: Falciparum malaria was found higher than vivax malaria, malariae malaria and malaria with mix infection (Pf+Pv) at Sosiri village higher than Doyo lama. The age of incidents were 0-9 years old, 10-20 years old more over 20 years old with genders of male generally. Most of them having parasite density level +1 more higher than level +4,+3 dan +2. There is significant relationship between malaria cases with parasite density and demographic factors except gender as cause of malaria can attack both male and female.

**Keywords:** *P.falciparum*, *P.vivax*, *P. malariae*, Malaria with mix infection (Pf+Pv), Kanda Community Health Center

## 1. Introduction

Malaria represent as major public health problem in Papua who are transmitted by Anopheles mosquitoes to the human as malaria vectors. The *Anopheles mosquitoes* generally live in a humidity puddle, in rice fields, forests, and stagnant water in contact with the soil [1]. The resting places of Anopheles mosquitoes are located inside the house and outdoors. It is usually bites in the afternoon until evening period [2,3]

Malaria is an infectious disease caused by *Plasmodium* parasite that can infect red blood cells. It causes anemia. The symptom of malaria includes cycles of chills, fever, sweats, muscle aches, and headache that recovery every few days. There can also be vomiting, diarrhea, coughing, and severe falciparum malaria can develop bleeding problems, shock, kidney and liver failure, central nervous system problems, coma and die [4,5]

The morbidity and mortality rates of malaria cases are particularly increased, especially in areas where the range of malaria, which can lead complications such as cerebral malaria, severe anaemia, acute renal failure, pulmonary edema, circulation failure, spontaneous hemorrhage, hepatic abnormalities, recurrent seizures and spleen rupture whose can affect the quality of life of patients [6]

Complaints and clinical signs are important clues in Malaria diagnosis. Clinical symptoms are influenced by the type or stains of *Plasmodium* malaria, body immunity and the density of *Plasmodium* parasites that infect a person. The timing of infection until with of clinical symptoms is known as the incubation time, where as the time between the occurrences of the infection until the discovery of the parasite in the human blood is called prepaten period [4]

Malaria is a disease who still high prevalence in Papua Province which are 100 people there are 43 people that suffers of malaria. While for more than 100 people there are 27 people who infected parasite of malaria [7]. The Annual Parasite Incidence from Jayapura that still was 200 per 1000 populations who suffer of malaria [8]

In Jayapura District, a total of 75.346 cases of malaria from patients with peripheral blood were taken and blood examined microscopically and RDT examination was 2.511 positive malaria preparations [9]

Anopheles mosquitoes that exist in Indonesia amount 80 species, but until now in Indonesia have found 24 species of Anopheles that can cause malaria diseases. The life of a mosquito is greatly determin by temperature, humadity, rainfall and so on. High transmission depends on parasitic density. Bite frequency, length of vector life, sporogon life cycle, sporozoid number and presence of parasites in human blood [4]

## 2. Material and Method

### Description of Study

This study was conducted in March, 2018. Jayapura District is located in the northeastern part of Papua Province, its wide territory covering 442,540 km<sup>2</sup>. It is located in the 137° to 141° Eastern Longitude and 1° to 3° Southtern latitude. Kanda Primary Health Center is a Place in Waibu subdistrict of Jayapura. The Kanda Community Health Center area aproximately 2.700 m<sup>2</sup> with a building area of 180 km2. The sub-district is borded in the nort by Ravenirara sub-district, in south by Kemtuk sub-district, in the West by Kemtuk sub-district and in the East by East Sentani. The Kanda Community Health Centers usually

serves seven working areas with a population around 8,256 people in seven villages; ie; Doyo Baru, Doyo Lama, Sosiri, Yakonde, Kwadeware, Dondai and Bambar. Topography of working area of Kanda Community Health Center varies from flat land and mountains. The populations of Jayapura District are mainly Papuan namely Sentani ethnic majority. The climate is typically tropical by average temperature between 25 - 35 °C. The dry and wet seasons are not distinctly separated, with drier season between May to November and the monsoon between December to April. The majority of the population work as farmer and fisherman.

**Sample collection.** A malariometric survey was conducted during March 2017 in Kanda Community Health Center. The target population was the village inhabitants that joined voluntarily and blood sample which taken through finger prick. It prepared for thick and thin blood smear. The patient were located around Kanda Community Health Center like Sosiri, Doyo lama, Doyo baru, Dondai and Yakode villages which were at Waibu sub-district. This study was carried out with the approval by the Ethics Committees at the Faculty of Medicine, University of Hasanudin 2017.

**Parasite Detection:** Thick and thin blood smears taken during the malariometric survey were stained with Giemsa, and subsequently examined by light microscopy. Parasite density was determined by counting the number of parasites per leucocytes of 100-high power microscopic fields in a giemsa-stained thick film, field and 8000 leucocytes/μL of blood. Slides were declared negative if parasite could not be detected in 100 microscopic fields. The parasite count was classified such as: (+) if 1-10 parasites were found per 100 thick film fields, (++) if 11-100 parasites per 100 parasites per 100 microscopic thick film fields, (+++) if 1- 10 parasite per one thick film fields and (+++++) if more than 10 parasites per one thick film fields [10,11,12].

### 3. Results

#### Malariometric surveys

This study was conducted in Laboratory of Kanda Community Health Center, Waibu Sub-district, during three weeks on March, 2018. Total of samples obtained through passive case detection as much 479 patients involved in the survey of 5 villages. 118 patients were found to be positive for malaria, consisting 80 (67.80%) patients carried by *P. falciparum*, 30 (25.42%) patients carried by *P. vivax*, 5 (4.24%) patients carried by *P. malariae* and 3 (2.54%) patients carried with mix infection of *P. falciparum* and *P. vivax* (Table 1). Based species of parasite, *P. falciparum* was found higher than *P. vivax*, *P. malariae* and mix infection of *P. falciparum* and *P. vivax*.

**Table 1:** Frequency of malaria patients based on species of *Plasmodium* was treated at Kanda Community Health Center on March 2018

Species of Plasmodium	Malaria cases	Percentage (%)
<i>P. falciparum</i> (Pf)	80	67,80
<i>P. vivax</i> (Pv)	30	25,42
<i>P. malariae</i> (Pm)	5	4,24
Mix infections (Pf +Pv)	3	2,54
Total	118	100,0

The result of this study shown that frequency of *Plasmodium* species based on the patients residence as follow; *P. falciparum* and *P. vivax* were found in the village of Sosiri 50 (62.5%) patients rather than in Doyo lama as much 25(31.2%) patients and Yakonde village 10(33.3%) patients and only in Yakonde village were found *P. Malariae* of 5(100%) patients and malaria cases with mix infection between *P. falciparum* (Pf) and *P. vivax* (Pv) as much 2(100%) patients (Table 2). Based on *Chi Square test* was obtained (*P. value* = 0.000<0,05, CI:95%). There is significant relationship between residence of patients and malaria cases was found in Kanda Community Health Center at Waibu sub-district, Jayapura District.

**Table 2:** Frequency of malaria cases based on residence of patients, who is treated in Kanda Community Health Center, Waibu sub-district, Jayapura on March 2018

Village	Malaria Cases				Frequency (%)	P. value
	Pf	Pv	Pm	Mix infection (Pf+Pv)		
Doyo Baru	3 (3.8)	0	0	0	3 (1.7)	0,000
Doyo Lama	25 (31.2)	0	0	0	25 (21,2)	
Dondai	2 (2,5)	0	0	0	2 (1,69)	
Sosiri	50 (62,5)	20 (66,7)	0	0	70 (59,32)	
Yakonde	0	10 (33,3)	5(100)	2(100)	17 (14,41)	
Total	80	30	5	2	118	

The result study shown that based on age groups the majority of *P. falciparum* infection occurred at age groups decrease 10 years old as much 30 (37.5%) patients than *P. vivax* 20 (66.6%) patients and mix infection (Pf+Pv) as much 2(66.7%). The age groups 10 -20 years old and over 20 years old who was infected through *P. falciparum* the same as much 25(31.25%), than by *P. vivax* as much 6(20.0%), *P. malariae* as much 4 (80.0%) and mix infection (Pf+Pv) 1(33.3%), respectively. (Table 3). Based on Chi-square test shown (*P. value* = 0.016<0,05, CI:95%) There is significant relationship between ages group and species of *Plasmodium* was found in Kanda Community Health Center, Waibu Sub-district, Jayapura District.

**Table 3:** Frequency of *Plasmodium* species based on age groups in Kanda Community Health Center on March 2018

Age (years)	Malaria cases				Frequency (%)	P. value
	Pf	Pv	Pm	Mix infection Pf+Pv		
	%	%	%	%		
0-9	30 (37,5)	20 (66,6)	0	2 (66,7)	52 (44,1)	0,016
10-20	25 (31,25)	6 (20,0)	4 (80,0)	1 (33,3)	36 (30,5)	
>20	25 (31,25)	4 (13,4)	1 (20,0)	0	30 (25,4)	
Total	80	30	5	3	118	

The result of study below shown that based on gender was infected through *P. falciparum* for Male and female are the same as much 40 (50.0%) patients, respectively than *P. vivax* and Mix infection by (Pf+Pv) as much 3(100%) patients and except of *P. malariae* as much 2(40.0%) for male slightly more whereas female was infected by *P. vivax* as much 10(33.3%) patients more than by *P. malariae* as much 3(60.0%) patients, respectively. (Table 3). Based on Chi-square test shown that (*P value* = 0.147, CI: 95%), there is no significant relationship between genders with species of

*Plasmodium* in blood patients were treated in Kanda Community Health Center, Waibu sub-district, Jayapura District.

**Table 3:** Frequency of malaria cases based on gender in Kanda Community Health Centers, Waibu sub-district, Jayapura on March 2018

Gender	Malaria cases				Frequency (%)	P. value
	Pf	Pv	Pm	Mix infection (Pf+Pv)		
	%	%	%	%		
Male	40 (50,0)	20 (66,7)	2 (40,0)	3 (100)	65 (55,1)	0,147
Female	40 (50,0)	10 (33,3)	3 (60,0)	0	53 (44,9)	
Total	80	30	5	3	118	

The result study shown that malaria cases with density parasite was found *P. falciparum* +1 as much 32 (40%) patients more high than *P. falciparum* +4 as much 20 (25%) patients, and *P. falciparum* +3 as much 15 (18,75%) patients and *P.falciparum* +2 as much 13 (16,25%) patients. Whereas malaria cases more is as cause infection *P. vivax* with density parasite +1 as much 24 (80%) patients but for *P.vivax* +2 and +3 as much 3(10.0%), respectively and for *P.malariae* +2 slightly was found as much 4( 80.%) patients slightly high than *P. malariae* +1 as much 1(20%). (Table 5).

**Table 5:** Frequency of malaria cases based on parasite density in Kanda Community Health Center, Waibu sub-district, Jayapura District on March 2018

Parasite Density (per µL)	Malaria Cases				Frequency (%)	P.value
	Pf	Pm	Pm	Mix infection (Pf+Pv)		
	%	%	%	%		
40- 400 (+1)	32 (40)	24 (80)	1 (20)	3(100)	60 (50.85)	0,000
401-4000 (+2)	13 (16,25)	3 (10)	4 (80)	0	20 (16.95)	
4001-39.999 (+3)	15 (18,75)	3 (10)	0	0	18 (15.25)	
≥40.000 (+4)	20 (25)	0	0	0	20 (16.5)	
Total	80	30	5	3	118	

Based on Chi-squared test shown that  $Pvalue = 0.000 < 0.05$ , CI:95%), There is significant relationship between malaria cases and density parasite ( parasitemia) was found in Kanda Community Health Center, Waibu subdistrict, Jayapura District.

#### 4. Discussion

Malaria cases was found in patients at treated in Kanda Community Health Center, Waibu sub-district shown that patients were infected through mosquitoes *Anopheles* bite which carried by *P. falciparum* higher than *P.vivax* , *P. malariae* and parasite malaria with mix infection (*Pf+Pv*). Those malaria cases can be caused by mosquitoes *Anopheles* bite such as *Anopheles punctulatus*, *An.koliensis* and *An farauti* which is a secondary vectors in Papua Province. It can also cause bleeding place as Sentani lake, dense forest, sago forest, fish ponds, irrigation channels with slow flow and puddle of household waste disposal [3,4]

Frequency of malaria cases based on residence of patients was treated at Kanda Community Health Center, Waibu shown that malaria cases was higher found in Sosiri village than Doyo lama even other villages. This cases as cause almost Sosiri village is located on the waters of Sentani lake but Doyo lama village is close to dense forest and sago forest. There were still puddles and household waste [12, 13]

Frequency of malaria cases based on age's group was treated at Kanda Community Health Center in Waibu Sub-district shown that the majority of falciparum malaria and vivax. Those were found of ages 0-9 years old higher than mix infection. Malaria cases cause children of the ages group do not have immunity system perfectly so that they were have opportunity tend to malaria. Malaria infection in infant and young children are mostly associated with local transmission as they generally s living at home and have not frequently traveled as that elder age [11]. Whereas the age's group 10-20

years old was infected by *P. falciparum* more higher than *P.vivax*, *P. malariae* and mix infection (*Pf+Pv*) and ages group over 20 years old was infected by *P. falciparum* more high than *P.vivax* and *P. malariae*. This malaria cases as cause of immunity system decreased, working in located that bleeding place of mosquitoes *Anopheles sp* vectors [14]. The pattern of life of a person or group fo people will affect the occurrence of transmission of malaria such as sleeping habits without using mosquito nets, and often outdoors at night without wearing a shirt, can be a risk factor for transmission of malaria [5]

Frequency of malaria cases based on gender in Kanda Community Health Center, Waibu sub-district showm that male patient more infection by *P. falciparum* than *P. vivax*, *P.malariae* and malaria with mix infection (*Pf+Pv*) this cases as cause basically everyone has an opportunity for malaria but with gender differences are related to personal immunity and nutritional status. Males are more likely to be at risk for malaria infection because their activities are related to physical, chemical and biological enviroments such as; farming, raising, farming ponds, which is the habitat of *Anopheles* mosquitoes vector [15]

The parasite density and the presence of malaria are symptom such as fever, chill, headache, vomiting and nausea. Based on parasite density, the majority of the patients that carry malaria symptom in falciparum malaria +1 more higher than *Pf* +4, *Pf* +3 and *Pf* +2 was from the group harbor low parasitemia whereas in vivax malaria, the patients having malaria symptom are found in all parasite density low levels +1 was found more higher than the other lever and also for malariae malaria was found level +2 more higher than level +1. The cases happened because of difference immunity body of a patients that influence by nutritional status and different age's group [10,11,12]

## 5. Conclusion

Based on malaria survey the result study shown that the majority patients was infected through *P. falciparum* more higher than *P. vivax*, *P. malariae* and mix infection (*Pf+Pv*) and they were residing in Sosiri village higher than infected *P. falciparum* than Doyo lama village and the other place at around working areas in Kanda Community Health Center, with gender male more than female that having age groups 0-9 years old more higher was infected of *P. falciparum* and *P. vivax* than *P. malariae* and mix infection (*Pf+Pv*) and the ages groups 10 -20 years old with parasite density of *P. falciparum* and *P. vivax* more higher than *P. malariae* and mix infection (*Pf+Pv*) more of level plus =1 than plus +4, +3 and +2 and There is significant relationship between malaria cases and demographic factors and parasite density except because of malaria can be attack both male and female.

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