Case Study of Malaria Patients: Distribution of Cases and Maps of Anopheles sp. Breeding Place in Kaligesing Sub-district, Purworejo District
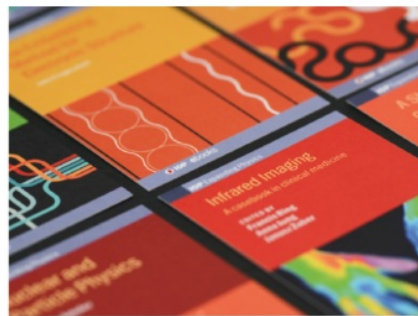
by Sri Yuliawati

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Abstract. Malaria has been a health problem in Indonesia, including in sub-district Kaligesing, district Purworejo of Central Java Province. Malaria has also been identified as an endemic especially in the villages of Jatirejo, Kaliharjo, and Somongari. The purpose of this study was to describe the epidemiology of malaria incidence based on distribution of cases, surrounding house related cases, and the *Anopheles* breeding place of malaria vectors. This descriptive based research with a case study approach investigated 61 malaria cases as respondents from 2016-2018 in Jatirejo, Kaliharjo and Somongari Villages sampled using total population method. The chosen variables were behaviour and environment of the respondents in relation to the presence of Anopheles vector breeding grounds. Data were analyzed descriptively and displayed in tables and maps. The results of the analysis showed that the average age of the malaria sufferer was 34 years old, male (60.7%), and most of them (45%) were coconut farmers. The most common symptoms of malaria experienced by respondents were fever, chills, headaches, and night sweats. In addition, 24.6% did not use insecticide-treated netting while sleeping. Spatially, the highest distribution of malaria cases was identified in Jatirejo Village, as its topography is plateau with a plantation area. Meanwhile, the existence of breeding places was found surrounding respondents' houses. To prevent from having malaria, people have been advised to take precautions by wearing long clothes when going out at night, using repellents/anti-mosquito treatments, providing larvicides at breeding sites around their house.

1. Introduction

Until now malaria is still a health problem in the world [1], including in Indonesia. Malaria is a disease caused by *Plasmodium sp* transmitted by bites of female *Anopheles spp*, and is a reemerging disease that causes morbidity and death especially in the tropical zone. According to the World Malaria Report issued in November 2018, no significant progress in relation to reducing global malaria cases from 2015 to 2017. In 2016, 217,000,000 cases with an estimated mortality due to malaria were 445,000 (0.2%) [2]; meanwhile, in 2017, an estimation of 219,000,000 cases of malaria causing mortality were 435,000.

In Central Java Province, Indonesia, malaria incidence is still quite high, especially that taking place in several districts. Provincial Health Service of Central Java reported that in 2018 three districts considered to be endemic areas were Purworejo, Banjarnegara and Blora [3], with Purworejo was the largest contributor to malaria cases in Central Java Province. In 2015, Annual Parasite Incident (API) in Purworejo district was 0.16 per 1,000 population and increased by 0.59 per 1,000 population with 423 cases in 2016. Sub-districts with malaria cases are found in Kaligesing, Bagelen, Purworejo, Loano, Bener, Kemiri, Pituruh, Bruno and Gebang [4].

Kaligesing is a sub-district located in a hillside of Menoreh with many plantations and forests [5]. This sub-district has a wet tropical climate, temperature between 19^0C-28^0C, humidity ranging from 70% -90%, and average rainfall of 311 mm [5, 6]. The Health Center Kaligesing is the one that its working areas are being identified to be malaria endemic and having high malaria cases. In 2016, the API in Kaligesing Sub-district was 5.23% though decreased to 1.18% in 2018. The working areas of this health centre cover 21 villages, among which found to be malaria endemic are Jatirejo, Somongari, and Kaliharjo villages. These villages have hilly topography with an average slope of 45% and average altitude of 400-700 above sea level.

The incidence of malaria in an area is determined by three factors; Host (human and mosquito), Agent (*Plasmodium*), and environment [7]. Environmental factors influencing the occurrence of malaria cases in terms of the growth and the development of malaria vectors *Anopheles Spp* are temperature, humidity, wind speed, and rainfall. The malaria vectors *Anopheles Spp* requires a suitable environment for breeding and resting sites as well as bite behaviour. These three essentially important factors are to be considered in determining the most effective interventions to control *Anopheles Spp* malaria vector [8].

Controlling malaria has been carried out in areas having potentials or opportunities for transmission to occur. Geographical information systems might inform a description of public health issues, especially for area-based health problems. Therefore, the aim of this study was to describe the distribution of malaria cases, behaviour cases, environment and the existence of breeding sites around the cases. The distribution and proximity of breeding sites were spatially analyzed using geographic information systems.

2. Research methods

The descriptive study with a case study approach was conducted in the villages of Jatirejo, Somongari and Kaliharjo; areas under the administration of Kaligesing Health Center of Purworejo Regency. The sample chosen was 61 malaria sufferers recorded at the Kaligesing Health Center during 2016-2018.

Observation was carried out upon physical condition of the houses and their environment related to the presence of *Anopheles sp.* breeding ground. The survey on the existence of the *Anopheles sp.* vector breeding sites being observed covered an area of approximately 500 meters from the malaria sufferers' houses.

In addition, the presence of vegetation around the *Anopheles* mosquito breeding sites was also observed. Meanwhile, the behaviour of malaria cases related to malaria incidence was recorded using interview techniques based on the guideline of questionnaire.

The data obtained were analyzed descriptively with tabulation and spatial analysis (mapping). This study obtained ethical approval from KEPK FKM Undip number 313 / EA / KEPK-FKM / 2019

3. Results and discussion

The characteristic of malaria incidence (respondent of the research) in Kaligesing sub-district of district of Purworejo, in general, is that 75.4% respondents suffering from malaria belongs to productive age category, 15-64 years, adolescent to adult, and 24.6% are children; male (60.7%); graduated from elementary school (49.2%); and coconut farmer (31.1%), (Table 1).

Table 1. Respondents characteristics

No.	Respondent Characteristic	f	%
1	Age Category		
	a. Productive	46	75.4

			f	%
	b.	Not productive	15	24.6
2.	Gender			
	a.	Male	37	60.7
	b.	Female	24	39.3
3.	Education			
	a.	Not attended school	9	14.8
	b.	Not graduated from elementary school	30	49.2
	c.	Graduated from Middle School	17	27.9
	d.	Graduated from high school	3	4.9
	e.	Completion of Higher Education	2	3.3
4.	Job			
	a.	Housewife	13	21.3
	b.	Coconut Farmers	19	31.1
	c.	Labor	9	14.8
	d.	Entrepreneurs	2	27.9
	e.	Army	1	1.6
	f.	Others	17	3.3

Age was one of the characteristics of a host that could affect the condition of a health problem or disease, as age is very influential on the level of exposure of a certain risk and nature of resistance [9], while in term of gender, males are 10 times higher to be exposed to malaria than female are [10]. For malaria vectors were active in the night, adult-male were more vulnerable to be exposed compared to children and female, specifically vectors having behaviour to bite outside the house. Adults mostly have outdoor activities, so the chance to contact with mosquitos is higher [11], especially in Southeast Asia [12]. In fact, all age groups might be exposed to malaria, but the one makes them different is body's immunity against malaria itself. The immunity inherited by a baby from his/her mother protected the baby against malaria incidence.

In term of education, 92% of the sufferers had less or equal to 9 years of schooling. Education was closely related to persons' ability to absorb and receive health information related to malaria prevention. Low education, less than junior high school, is a risk factor to malaria [13], as people with low levels of education have a 1.8% chance of being exposed to malaria compared to those having high education [14]. Meanwhile, jobs causing malaria cases were palm tree tappers and palm tree sugar makers whose activities were mostly outdoor. Those causing respondents deal with high risks of being exposed to malaria [7, 8]. Vectors causing outdoor activities to bite is *Anopheles maculatus* mosquitoes, one of the vectors in Java Island that is closely related to vegetation in rivers around the forest [15].

More than 50% of the respondents suffering from malaria used mosquito net when sleeping at night, yet the malaria cases still occurred, as they did not use the net correctly or there were some holes allowing *Anopheles* sp. mosquitos to enter and bite people inside. In addition, houses having open-air ventilation (without being closed with gauze) allowed mosquitos to interact with respondents using no repellent of any types. *Anopheles* actively bite at night; the first peak activities is before midnight and the second one comes close to early morning [16].

Table 2. Respondents' behavior of malaria cases in kaligesing sub-district of porworejo district

No.	Respondents' Bahavior	f	%
1	The Used of Insecticide-Treated Netting		
	a. Yes	46	75,4
	b. No	15	24,6
2.	The Used of Repellent		
	a. Yes	7	11,5

	b. No		54	88,5
3.	Going out at night			
	a. Yes		17	27,9
	b. No		44	72,1
4.	Going out to endemic area			
	a. Yes		5	8,2
	b. No		56	91,8

Furthermore, the use of repellent is a way that can be used to prevent from mosquitos' bite [17]. In this study, 88.5 respondents did not use repellent on the ground that they assumed there were no mosquitos inside their house, and they did not like the smell and the smoke of repellent. A study conducted in Sungai Ayak village found that people being reluctance to use repellent have 2.17 higher risks to be exposed to malaria that those who use it [17,18].

Malaria incidence in Purworejo district showed the indigenous infected incidence, as 91.8% respondents interviewed stated that they had visited malaria endemic areas, and 28% had activities at night such pond keeper, fishing, *kenduri*, or neighbourhood watchers. The behaviour of going out at night was a risk action leading to possibility to be bitten by mosquitos. In term of epidemiology, malaria is a local specific infectious disease. Several areas in Purworejo districts were endemic that potentially spread malaria out [7]. The dissemination of malaria cases is exhibited in Figure 1.

Breeding place is a place used by mosquitos to breed, and 29.5% of which were found nearby respondents' houses either rivers, wellsprings, or abandoned ponds; rivers were identified to be the most favourite place for mosquitos to breed. Meanwhile, no breeding place found in paddy field, lagoon, fishpond, shrimp pond, mining, and mangrove forest due to the locus of the research was in high altitude area; thus, no mining or fishpond were to be found. In addition, for this study was conducted during dry season, water current was not racing along the river to make a puddle where mosquitos used it for breeding place. The breeding place found to be higher was located in buffer zone 100-400 m. Distribution spots of the breeding places of *Anopheles* mosquitos are presented in Figure 2.
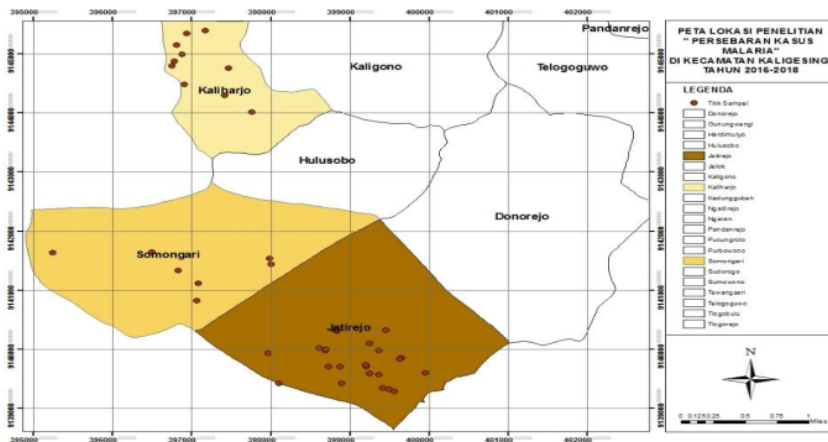

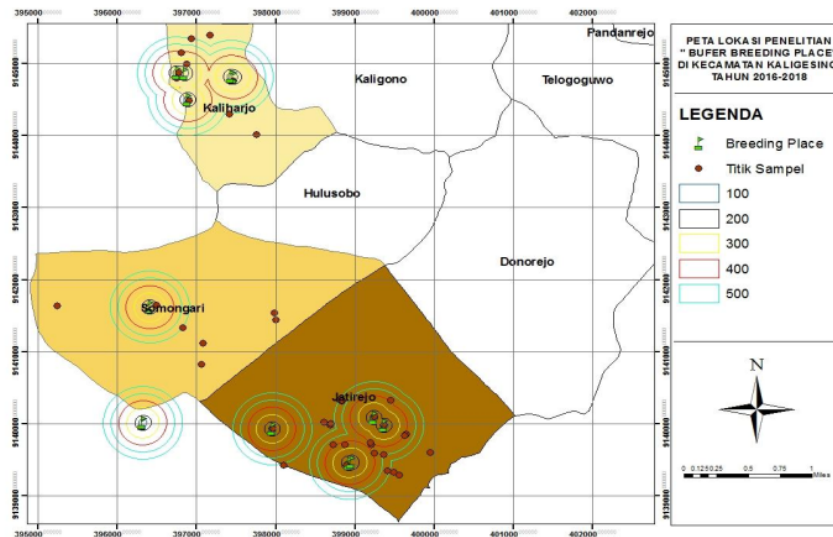**Figure 1.** Distribution of malaria cases in 2016 – 2018

Figure2. Distribution spots buffer of *anopheles sp* mosquitos' breeding place

4. Conclusion

Malaria incidence in Purworejo District is indigenous cases by virtue of respondents' characteristic, behaviour increasing risks to have contacted between hosts and vectors, physical condition of houses and their surrounding supporting vectors to breed, and cases of not conducting mobilization in the malaria endemic zones. Risked behaviour of the cases is having jobs as coconut farmers being active at night and not using mosquito net while sleeping (25%). Efforts to prevent malaria are dissemination information related to decreased contact with vectors by using mosquito net while sleeping, using ventilation gauze, using repellent, and wearing long sleeve while going out at night.

Acknowledgements

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