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The impact of the environment and community habits on malaria knowlesi post-elimination of malaria in UPTD Puskesmas Jaboi's work area in Sabang City

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Abstract

Purpose: Malaria has spread to over 100 countries with tropical and subtropical climates globally. Around 35% of the population in Indonesia lives in areas at risk of malaria infection, and 38 thousand people die each year from severe malaria caused by *Plasmodium falciparum*. Malaria outbreaks occur almost annually in Indonesia's various endemic areas. The purpose of this study was to ascertain Malaria Knowledge following Malaria Elimination in the Jaboi Health Center's UPTD Work Area in Sabang City. **Methods:** *This research is descriptive by design Case-Control*. The number of samples in this study was 7 people and 23 people as controls with chi-square test analysis. **Results:** According to the study's findings, there was *a relationship* between four broods and malaria (P = 0.014), no relationship between the habit of going out at night (P = 0.190), and a relationship between the use of repellents (0.009) and malaria following malaria elimination in the work area of UPTD Puskesmas. Jaboi, post-elimination cases of malaria knowlesi continue to occur due to an environment that is still conducive to mosquito breeding sites and as a result of the population's geographical location in an area with a high concentration of wild animals. **Conclusion:** There is a correlation between breeding sites and repellent use and malaria in the work area of the Jaboi Health Center UPTD Sabang City, but there is no correlation between the habit of going out at night and malaria in the work area of the Jaboi Health Center UPTD Sabang City.

Keywords: community habits; environment; malaria knowlesi

INTRODUCTION

Malaria is a fatal disease transmitted by the female *Anopheles* mosquito. In 2016, an estimated 216 million malaria cases were reported in 91 countries, increasing 5 million cases from 2015. Malaria claimed 445,000 lives in 2016. *Malaria* is a parasitic infection caused by the *Plasmodium parasite*. The parasite spreads to people through the bite of an infected female *Anopheles* mosquito called the “malaria vector.” Five parasitic species cause malaria in humans: *P. falciparum*, *P. malariae*, *P. ovale*, and *P. knowlesi*, with *P. falciparum* and *P. vivax* being the most numerous and virulent. This disease is prevalent throughout the tropics and subtropics, particularly in the broadband around the equator. This area encompasses a large portion of Sub-Saharan Africa, Asia, and Latin America. Malaria killed 214 million people worldwide in 2015. Malaria is frequently linked to poverty and has a significant negative impact on economic development. Malaria is estimated to cost Africa billions of dollars each year

due to rising health costs, loss of workability, and adverse effects on tourism [1].

Malaria is one of the ten deadliest diseases in Aceh, with over 4,700 people testing positive for the disease. Malaria elimination efforts in Aceh Province have yielded significant results. Each year, the number of positive malaria cases has decreased by 50% in several districts in Aceh Province; thus far, there have been 470 malaria cases in Aceh Jaya district, down from 859 cases in the January-December 2014 period, while there were 105 positive malaria cases in Aceh in 2009. Timur, in 2014 (6 cases), 2015 (3 cases), and 2016 (1 case), all of which were not indigenous cases (indigenous), but instead were imported cases [2].

According to the annual report of the Sabang City Health Office, the number of malaria cases in each village has decreased. Although the number of malaria sufferers has decreased year after year, there are several villages where malaria cases occur every year. As evidenced by the 2014 report data, the total number of malaria cases was 18. Malaria cases totaled three in 2015. In 2016 the number of malaria cases was 1 case, and in 2017 there were 17 new cases [3].

The results of the report from the Sabang City Health Office in 2018 positive knowlesi malaria patients found in the UPTD work area of the Jaboi Health Center were 8 cases. The Plasmodium species that cause malaria in humans are well-known. They are *P. falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*[4]. However, now, it is known that another type of Plasmodium can infect humans, namely *P. knowlesi*. Therefore, Plasmodium is considered the fifth cause of malaria in humans.

The results of the authors' observations thus far indicate that the geographical location of Gampong Jaboi, Sabang City is exceptionally conducive to Anopheles mosquito breeding. There are also numerous wild animals in the area, such as monkeys, due to the geographical features of the area, which include hills, forests with thickets, and puddles or puddles of animals. Additionally, it is located along the coast, featuring brackish water ponds. Many studies relate to zoonoses in malaria knowlesi is an environmental change that impacts the distribution and behavior of monkey hosts and mosquito vector species, but the behavior of the human population in Sabang creates new opportunities for transmission of P. knowlesi. The overall objective of this study was to ascertain the effect of the environment and community habits on Malaria Knowlesi in the UPTD Working Area following malaria elimination. Jaboi Health Center in Sabang City in 2018, namely the breeding site's characteristics, the habit of going out at night, and the use of repellants in cases of malaria knowlesi.

METHODS

This study is a descriptive study using a *Case-Control* design. The population studied in this study was a case population of seven knowlesi malaria patients, all of whom lived in the working area of the UPTD Jaboi Health Center in Sabang City. Moreover, the control population was 23 people as control people who did not suffer from knowlesi malaria in the working area of the Jaboi Health Center UPTD Sabang City. This research will be conducted in July 2018 in the Jaboi Health Center's UPTD work area in Sabang City, using PCR to diagnose malaria knowlesi.

RESULTS

Result of research The researchers obtained the following results from data collection conducted from June 12 to June 23 in the working area of UPTD Puskesmas Jaboi, Sabang City. **Table 1** shows the characteristics of interviewed respondents, including 21 men (70%) and 9 women (30%). While the respondents' primary occupation, as many as 12 people (40%), is gardening, the least common occupation, as many as two people, is the civil servant (6%). The majority of respondents were in the 36-45 year-old group, as many as 15 people (50%), and the least was in the 17-25 year age group and the 56-65 year age group, which were 2 people each. Table 2 below summarizes the findings from observations made at the Anopheles mosquito breeding grounds in the working area of the Jaboi Health Center UPTD, Sabang City.

In **Table 2**, nine houses (9%) out of thirty respondents have a breeding place, while twenty-one houses do not have a breeding place (70%). Additionally, Table 2 indicates that there are 17 respondents (56.7%) who do not have a habit of going out at night and 13 respondents (56.7%) who do (43.3%). Additionally, 12 respondents (40%) do not use repellents, while 18 respondents do (60%). The following table illustrates the relationship between variables.

Table 1. Frequency distribution of respondents' post-elimination malaria characteristics in the UPTD Puskesmas Jaboi Sabang City Working Area in 2018 (N=30)

Characteristics	Case		Control		Total	%
	Total (n=7)	%	Total (n=23)	%		
Age						
17-25 years old	2	100,00	0	0,00	2	6,67
26-35 years old	1	20,00	4	80,00	5	16,67
36-45 years old	3	20,00	12	80,00	15	50,00
46- 55 years old	0	0,00	6	100,00	6	20,00
> 55 years old	1	50,00	1	50,00	2	6,67
Job						
Farmer/Gardener	3	25,00	9	75,00	12	40,00
Fisherman	4	36,36	7	63,64	11	36,67
Private job	0	0,00	5	100,00	5	16,67
PNS	0	0,00	2	100,00	2	6,67
Gender						
Man	6	28,57	15	71,43	21	70,00
Woman	1	11,11	8	88,89	9	30,00

Table 2. Frequency Distribution of Breeding Sites Following Malaria Elimination in the Jaboi Health Center Sabang City's UPTD Work Area in 2018 (N=30)

Variable	Total	%
Breeding place		
Yes	9	30
No	21	70
Out of the house habits		
Yes	17	56,7
No	13	43,3
Out of the house habits		
Yes	17	56,7
No	13	43,3

Table 3. The relationship between breeding sites and the occurrence of malaria following malaria elimination in the Jaboi Health Center Sabang City's UPTD work area in 2018.

Variabel		Malaria disease				Total	%	p-value	OR
		Positive		Negative					
		F	%	F	%				
Breeding Place	Yes	5	17	4	13,3	9	30	0,014	11,875
	No	2	6,7	19	63,3	21	70		
Out of the House Habits	Yes	5	17	8	26,7	13	43,3	0,19	4,688
	No	2	6,7	15	50	17	56,7		
Using Repellent	Don’t use	6	20	6	20	12	40	0,009	17
	Use	1	3,3	17	56,7	18	60		

Table 3 demonstrates a significant relationship between the variables "breeding sites," "habits outside the house," and "use of repellants" and the incidence of knowlesi malaria transmission (*p value* < 0.05). The respondent's house with mosquito breeding sites can significantly increase the risk of contracting malaria knowlesi by 11,875 times compared to the respondent's house without mosquito breeding sites. Respondents who frequently venture out at night have a 4.688-fold increased risk of contracting malaria knowlesi than respondents who do not venture out at night. Respondents who did not use the repellant had a 17-fold higher risk of contracting malaria knowlesi than those who did.

Table 4. Description of the Logistics Analysis of the Independent Variables Researched in the City of Sabang in 2018

Variable	*β*	*Sig.*	*Exp (β)*	95% *CI*
Step 1[a]				
Using repelant	2,83	0,01	17,00	1,68- 171,70
Step 2[b]				
Mosquito breeding place	2,75	0,03	15,67	1,24-196,73
Using repelant	3,09	0,02	21,97	1,39-346,02

Table 5. Calculation of Goodness of Fit using -2 log-likelihood, Nagelkerke, Cox, and Snell R squares, and p (Value) for Multivariate Analysis Models

Logistic	*-2 log*	Nagelkerke R square	*Overall percentage*	*Cox & Snell R square*	Df	P (*value)*
Model 1	24.36[a]	0.36	5.81	0.24	1	0.01
Model 2	18.47[b]	0.56	5.81	0.37	1	0.01

From the previous bivariate test results, it is clear that all variables meet the criteria for inclusion in the multivariate analysis. After performing the logistic regression test, using the *backward stepwise* (*conditional*) method, from the initial stage (model 1) to the final stage (*model 3*), the results obtained are in **Table 4** as follows. The *Goodness of Fit* with *-2 log-likelihood*, Nagelkerke, *Cox & Snell R square*, and p (*Value*) values calculated in **Table 5** are as follows. Logistic regression analysis After ordering the significance values (p) from smallest to most significant, it is clear that there are two statistically significant variables, namely: 1) use repellant (p=0.028), Exp(ß) = 21.974, and 95% confidence interval (CI): 1.573 OR 7.513; 2) variable mosquito breeding sites (p=0.033), Exp(ß) = 15,679 and 95% CI: 11,249 OR 196.738. By examining the Exp(ß) value, it is possible to deduce that the use of repellants increases the risk of contracting knowlesi malaria by 21,974 times.

The relationship between the independent and dependent variables is determined using a *-2 log-likelihood* of 18.479[b], a *Cox & Snell R Square* of.375, and an *overall percentage* of 5.814% in this analysis. The ability of this study to predict the incidence of knowlesi malaria was 5.8 percent based on the *overall percentage* value, and other factors caused 94.2 percent of cases.

DISCUSSION

The city of Sabang has shifted to the maintenance phase of malaria elimination, and Plasmodium knowlesi outbreaks need continuous monitoring. Because there is still knowlesi malaria transmission, and vector control seems to end the outbreak. The results of previous observations describing a history of malaria in an individual suggest that non-zoonotic transmission may have occurred [6].

After elimination, there are still cases of knowlesi malaria if seen from the many breeds found around the house, and there is still stagnant water, sewers that do not meet the requirements, and swamps around the house, which will make it easier for mosquito larvae to breed. Places like this are rarely noticed by homeowners, not cleaned, and without realizing it directly, have provided breeding places for mosquito breeding place. Species of mosquitoes that become vectors of *P. knowlesi* are different for each region, and the difference seems to be related to the number of the mosquito species population. The more there are, the more likely it is to act as a vect [7]. Environment physique influence place develop breed Anophelses. Condition environment own influence big to There is whether there is malaria in a particular area area . The presence of brackish water, forest puddles, rice fields, ponds fish, opening forests and mining in a area will increase possibility the occurrence of malaria due to places the is place develop breed malaria mosquito [8].

Furthermore, in an environment generally located in an area close to a forest or garden where many monkeys visit. This condition enables transmission via mosquito vectors found in the household. Infection requires only one mosquito bite in monkeys, but two mosquito bites do not always result in disease in humans. Additionally, a study conducted in Vietnam discovered that an *Anopheles mosquito* could carry three distinct types of

sporozoites, namely *P. knowlesi*, *P. falciparum*, and *P. vivax* [9].

As with other types of human malaria, prevention of P. knowlesi infection is based on avoiding mosquito bites and if indicated then taking preventive medication. the vector behaves like vectors of other Anopheles species, and general precautions to avoid Anopheles mosquito bites may apply. However, preventing zoonotic transmission of malaria by vectors primarily avoids mosquito bites in the forest [9, 10]. Similar to P. falciparum, P. knowlesi can cause more severe and even fatal cases of disease than those caused by other Plasmodium species. Polymerase chain reaction is valuable for diagnosis because P. knowlesi infections are easily misdiagnosed as less dangerous diseases. Plasmodium malariae infection under conventional microscopy. P. knowlesi infection should be suspected in malaria-infected patients in Southeast Asia. If human-mosquito-human transmission occurs, the disease could spread to new areas where the mosquito vector lives, such as popular tourist areas in western India [10-12].

There was no correlation between going out at night and the incidence of knowlesi malaria in this study, as each species of the *knowlesi* vector mosquito has unique characteristics. Although they bite most frequently at night, the peak of the bite occurs at a different time. In addition, vector mosquitoes are generally more exophagic, so they bite people outdoors at night [6]. People in Jaboi generally go out at night to conduct activities such as buying and selling, as the city market is closed during the day, but night activities continue in Sabang City.

The level of public awareness about the dangers of malaria will affect the community's willingness to eradicate malaria, such as environmental sanitation, using mosquito nets, installing wire netting at home and using mosquito repellent/anti-mosquito lotion [13]. One of the factors that transmit malaria is physical, biological and socio-cultural environmental factors, namely community behaviour related to malaria transmission [14]. 80% of people in the Jaboi Health Center UPTD work area sleep with mosquito nets, and after researching the community houses in the Jaboi Health Center UPTD work area, we discovered that many of the ventilations used wire netting. Furthermore, there are some houses that, even though they have used wire netting and mosquito nets, also use mosquito repellent, which they spray every room before resting. This matter in accordance with research in Sabang with results of knowledge, attitudes, and skills mother too _ significant influence malaria incidence. Factor the dominant one that influences the most Malaria cases in Sabang is environment physical, that is place breeding mosquitoes (water depth, water temperature, area, clarity, lighting, and water flow). The occurrence of human exposure to zoonotic malaria is driven by various complex factors, namely environmental, social and economic factors, and covers all crosses on the scale of individuals, households, communities to landscape conditions in certain areas [15-17]. The impact of social issues on transmission, what rural communities understand about malaria, preventive practices [5], challenges in controlling *P. knowlesi* malaria, for it to work well there needs to be community participation and whether the persistence of knowlesi malaria transmission is caused by various factors related to human behavior, vectors, ecology.

CONCLUSION

There is a correlation between breeding sites and repellent use and malaria in the work area of the Jaboi Health Center UPTD Sabang City, but there is no correlation between the habit of going out at night and malaria in the work area of the Jaboi Health Center UPTD Sabang City.

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