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Risk factors related to malaria incidence at Santu'un village, Tabalong District, South Kalimantan Province

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ABTRACT

Santu'un Village is one of malaria endemic areas in Muara Uya Sub district, Tabalong District, South Kalimantan Province, Indonesia. Annual Parasite Incidences (APIs) from 2007 to 2009 were 11.4, 82.9, and 25.8‰ respectively. The majority of Muara Uya population are rubber tappers, gold miners and loggers in the forest. Moreover, most of the Muara Uya population do not use mosquito nets when sleeping at night. These occupations and community habits may contribute in high malaria incidence in Muara Uya. However, study concerning risk factor of malaria has not been performed yet. The study was conducted in order to evaluate risk factors that might correlate with malaria incidence in Santu'un village, Muara Uya subdistrict. Two hundred and ninety one subjects were enrolled in this study. Those consisted of 70 people whom microscopically malaria positive and 221 people whom malaria negative. Household visits were conducted to each subject to perform interviews. Data collection of malaria risk factors was obtained using questionaire. The results indicated that three main occupations, loggers, gold miners and rubber tapper, were significantly represent risk factors of malaria incidence. The community habits that also significantly correlated with malaria incidence were the not using of mosquito repellents and not using bed nets. Two clustering cases were also observed during the year of 2010. The coordinate of the first cluster was 1.863500 S and 115.606700 E with diameter of 0.65 km and the coordinate of the second cluster was 1.838667 S and 115.607200 E with diameter of 0.67 km. In conclusion, in Santu'un village, the risk factor that correlated with the malaria incidence were loggers, gold miners, rubber tappers. In addition the not using of mosquito repellents and not using bed nets were also risk factors of malaria incidence.

Key words: malaria -risk factors-annual parasite incidence-Muara Uya-South Kalimantan

ABSTRAK

Desa Santu'un merupakan salah satu daerah endemis malaria di Kecamatan Muara Uya. Kabupaten Tabayong, Kalimantan Selatan. *Annual Parasite Incidence* (API) selama 2007-2009 berturut-turut 11,4, 82,9 dan 25,8‰. Sebagian besar penduduk Muara Uya bekerja sebagai buruh penderes karet, penambang emas dan penebang kayu di hutan. Selain itu hampir semua penduduk Muara Uya tidak menggunakan kelambu ketika tidur di malam hari. Jenis pekerjaan maupun kebiasaan ini kemungkinan berperan dalam tingginya kejadian malaria di Muara Uya. Namun demikian penelitian tentang faktor risiko terjadinya malaria di Muara Uya belum pernah dilakukan. Penelitian ini dilakukan untuk mengevaluasi faktor risiko yang kemungkinan berhubungan dengan kejadian malaria di desa Santu'un, Kecamatan Muara Uya. Sebanyak 291 subjek yang terdiri dari 70 orang terbukti positif malaria dan 221 terbukti tidak terinfeksi malaria berdasarkan pemeriksaan mikroskopik terlibat dalam penelitian ini. Kunjungan ke rumah setiap subjek dilakukan untuk mengadakan wawancara. Pengumpulan data faktor risiko malaria diperoleh dari kuesioner hasil wawancara. Hasil penelitian menunjukkan bahwa tiga pekerjaan utama yaitu penebang kayu, penambang emas dan penderes karet menunjukkan faktor risiko bermakna terhadap kejadian malaria. Kebiasaan masyarakat yang berhubungan bermakna dengan kejadian malaria adalah kebiasaan tidak menggunakan antinyamuk dan kelambu tidur. Dua kluster malaria dijumpai selama tahun 2010 yaitu kulster pertama di 1,863500 S dan 115,606700 E dengan radius 0,65 km dan kluster kedua 1,838667 S dan 115,607200 E dengan radius 0,67 km. Dari hasil penelitian dapat disimpulkan bahwa faktor risiko yang berkaitan erat dengan kejadian malaria di desa Santu'un adalah pekerjaan sebagai penebang kayu, penambang emas dan penderes karet. Selain itu kebiasaan tidak menggunakan antinyamuk dan kelambu tidur juga merupakan faktor risiko kejadian malaria.

Kata kunci: malaria –factor risiko-*annual parasite incidence*-Muara Uya-South Kalimantan

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INTRODUCTION

Santu'un Village is one of malaria endemic areas in Muara Uya Sub district, Tabalong District, South Kalimantan Province. In 2009, the Community Health Center of Muara Uya reported that the rate of APIs in Muara Uya from 2007-2009 were 11.4, 82.9, and 25.8%, respectively.[1] Geographically, Santu'un Village is an agricultural area with oil palm and rubber tree as the majoring plantation and it's border on with forest. These geographical conditions could support the mosquito breedings. Most of Santu'un villagers work as farmer and laborer. While waiting for the planting season, most of Santu'un villagers are seeking income by becoming loggers, gold miners, and rubber tappers. Most of Santu'un villagers usually do not use mosquito bed nets when sleeping at night. They build the wall of their houses from boards which there are gaps in the wall that allow mosquitoes to enter houses. Those conditions could be the risk factors for malaria in that area.

Until recently, data analysis of malaria in Tabalong District was performed manually by descriptive and graphics analysis. Those analyses did not describe the distribution of malaria cases based on the position of the house of malaria patients and could not describe risk factors that might be associated with malaria.

Based on the description above, it is necessary to determine risk factors associated with malaria incidence and malaria distribution cases in Santu'un Village. The purpose of this study was to identify risk factors that influenced the incidence of malaria and to map risk factors at Santu'un Village, Muara Uya Sub district, Tabalong District, South Kalimantan Province.

MATERIALS AND METHODS

This was an analytical (observational) study using a case control study design. The study was conducted by collecting secondary data of patients who were diagnosed positive and negative malaria at Muara Uya Community Health Center and were registered in the laboratory inventory in the period of January – December 2010. The malaria diagnosis was established by the results of laboratory examination. Questionnaire was used to interview the patients and Global Positioning System (GPS) was used to determine the coordinates of malaria patients and the Anopheles breeding places. The protocol of the study has been approved by the Medical and Health Research Ethics Commiittee Faculty of Medicine, Gadjah Mada University.

Data analysis was performed by bivariate analysis using chi square test (X^2) and multivariate analysis using logistic regression. Spatial analysis using SaTscan software was performed to determine the cluster of malaria cases.

RESULTS

Two hundred and ninety one subjects were involved in this study. The number of villagers who were infected and not infected with malaria based on their occupation, education, use of bed nets and repellents and also the distance of livestock cages from their houses is shown in TABLE 1.

Using GPS, the coordinates of the house of malaria patients and the *Anopheles* breeding places has been determined (FIGURE 1). Two clustering cases were observed in 2010. The coordinate of the first cluster was 1.863500 S and 115.606700 E with diameter of 0.65 km and the coordinate of the second cluster was 1.838667 S and 115.607200 E with diameter of 0.67 km.

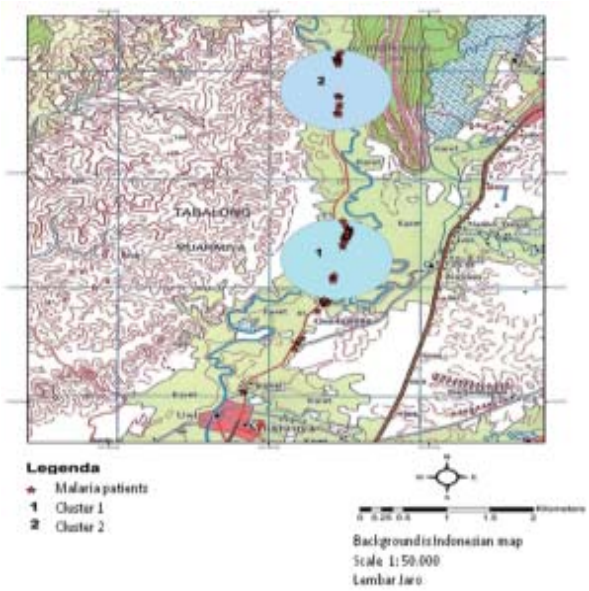

FIGURE 1. Map of cluster of malaria cases at Santu'un Villages, Muara Uya Sub District, Tabalong District, South Kalimantan Province in 2010

TABLE 1. Analysis of the association between the independent variables and the dependent variable

Variable	Bivariat					Multivariat			
	Malaria		OR	CI	p value	B	Sig	Exp (B)	CI (5%)
	Positive	Negative							
Jobs									
• High Risk	52	99	3.50	1.958-6.474	0.00	1.095	0.001	2.990	1.564-5.717
• Low Risk	18	122							
Education									
• Low	58	211	0.22	0.094-0.557	0.00				
• Hight	12	10							
Repellent use									
• No	31	38	3.82	2.128-6.884	0.00	1.483	0.000	4.408	2.299-8.451
• Yes	39	183							
Bed net use									
• No	25	202	3.82	2.997-11.640	0.00	1.654	0.000	5.226	2.490-10.966
• Yes	45	19							
Distance of livestock cage									
• < 10 meters	5	185	0.39	0.149-1.050	0.05				
• > 10 meters	65	36							
Constant								-0.070	

DISCUSSION

A significant association between high risk occupation with the incidence of malaria has been observed in this study (TABLE 1). Individual with high risk occupation had higher risk of malaria compared to individual with low risk occupation. The higher risk of malaria in villagers with high risk occupations such as logging and gold mining was because they had to spend the night for several days in the forest without using the mosquito bed nets or repellents. Meanwhile, villagers who works as rubber tappers usually work at dawn, which meant that contact with mosquitoes, especially *Anopheles*, might occur.

Thang *et al.*[3] reported that working and spending the night in the forest could increase the risk for malaria by 2.70 times. Harijanto[4] also reported the risk of malaria infection in loggers who lived in base camp and had to sleep or rest without protective mosquito bed nets. Moreover, Sarumpaet *et al.*[5] reported an association between high risk occupation with the incidence of malaria with OR of 3.1.

This study reported that education was not a risk factor of malaria incidence. Similar result was also reported by Darundiati.[6] However, other study reported a conflicting result. Sarumpaet *et al.*[5] reported that there was an association between low education level with the incidence of malaria (OR 4.4). It might be due to better malaria control activities, therefore the knowledge of the society was better. Education level did not directly affect the incidence of malaria, but education could influence occupation and level of knowledge of some one in the protection of malaria infection.

Statistical analysis showed a significant correlation between the utilization repellent with malaria incidence. Erdinal *et al.*[7] also reported an association between the use of repellent with malaria incidence (OR 2.3). However, contradictory result was reported by Yawan.[8] This conflicting result might be due to the presence of gaps on the walls

of the houses and the nature of *Anopheles* which were exophagic.

Statistical analysis also showed significant association between the utilization of mosquito bed nets when sleeping at night with the incidence of malaria at Santu'un Village. This study reported that people who did not use mosquito bed nets when sleeping at night had 5.9 times higher risk to be infected with malaria than people who used mosquito nets when sleeping at night. Yawan[8] also reported that there was an association between the incidence of malaria with the utilization of bed nets (OR 5.1). Simsek and Kurcer[9] suggested that the utilization of bed nets could prevent malaria. Therefore regular utilization of mosquito bed nets when sleeping at night could reduce the incidence of malaria.

This study showed that the distance of houses with the cage of large livestocks was not risk factor for malaria. In this study, most of the houses of malaria patients were far from the cage of their livestocks. This condition caused the increase in human-biting activity of *Anopheles*. Puspawati[10] reported that several species of *Anopheles*, such as *An. vagus* and *An. kochi* which are zoophilic, were found to bite human. Barodji[11] reported that the presence of livestock such as cow, buffalo, and goat might affect the frequency of human-biting activity of mosquito. The greater proportion of livestock, the smaller frequency of mosquito contacts with humans.

Similar with the results of this study, Yawan[8] also reported that the cage of large livestock did not have significant correlation with the incidence of malaria. However, this study was contradictory with the results of Erdinal *et al.*[7] This difference might be due to the small number of large livestocks at Santu'un Village, thus affecting the number of cage of those large livestock's at Santu'un Village.

In 2010, two statistically significant clusters of malaria cases ($p = 0.0001$) were observed (FIGURE 1). A person who live within the radius 0.65 and 0.67 km from that malaria-infected person, had high risk to be infected with malaria (OR 3.18).

CONCLUSION

This study concluded that high risk occupations (logger, gold miner, and rubber tapper), not using repellent, and not using anti-mosquito bed nets were the risk factors of malaria in Santu'un Village, Muara Uya Subddistrict, Tabalong District, South Kalimantan Province. Use bed nets while sleeping for community and use repellent when working for logger, gold miner and rubber tapper were suggested. Moreover, improvement of the health education and health promotion on malaria in order to raise public awarness on the importance of malaria prevention is needed.

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