Malaria and Malaria Control Program in Coastal and Mountainous Areas in Lombok and Sumbawa, Indonesia

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〔抄　録〕

本稿は，2005年にマラリア・アウトブレイクの発生したインドネシア，西ヌサテンガラ（NTB）州ロンボク島とスンバワ島における，自然環境が異なる山岳奥地部と沿岸島嶼部の4村（1019サンプル），すなわち，前者の東ロンボク Perigi 村（298名）Sepit 村（198名），後者の北スンバワ Bungin 村（325名）東ロンボク Pemongkong 村（198名）で実施した『マラリア血液検査データ』と『マラリアに関する住民意識と行動に関する社会疫学調査』（CBDESS II, 2007）のデータ解析し，「マラリアとマラリア対策」に関する地域間比較研究を行う。

同調査によると，アウトブレイクが発生した4つの地域では，マラリア知識の不足が顕著であり，その基因として極めて劣悪な教育レベルが存在する。対象者の20%もが全くの無就学（非識字）状態で，マラリア知識と教育水準には相関がみられる。男女間での教育格差は地域間で相違がある。ジェンダー差別が母子マラリアの感染拡大と関連することを考えると，マラリア教育とともに女性地位の向上はマラリア対策にとって重要である。マラリア情報源をみると，情報通信網が完備していない対象地域では，新聞，ラジオ・テレビよりも地域リーダー，とくに宗教指導者の役割が重要である。地域活動と地域紐帯には相関がみられ，かつ地域間相違がある。マラリア感染拡大の地域間比較を目指した本研究は，マラリア教育や地域活動，地域紐帯のような社会学的要因とそれに基づく社会的解決の重要性を示唆している。

キーワード：マラリア，社会疫学研究，アウトブレイク，ロンボク島，スンバワ島，インドネシア

1. INTRODUCTION

Preventing and controlling malaria in WNT remain a challenge. It is related to different characteristic of malaria in coastal and mountainous area. A study conducted in Lombok in 1991 identified 9 species of anopheline mosquitoes in the province. *Anopheles balabacencis, Anopheles sundaicus* and *Anopheles subpictus* are the main vectors related to malaria transmission. The last to specieses are particularly responsible for the transmission in coastal area while *An. balabacencis* relates to malaria in mountainous and forest area (Miyagi, I 1994). Different habituation and biting time of these species poses a challenge in providing control efforts. In addition, weak government financial resources and community economic resources, as well as low human development index further hamper the prevention and control efforts.

As part of the efforts to control malaria, the global society addresses the need to mobilize and empower the community to deliver preventive and control measures. Understanding social structure and network as well as other determinants for community preference of malaria control measure is mandatory for successful implementation of integrated malaria control program. Considering the different residences and mosquitoes characteristics in coastal and mountainous areas, a study called collecting baseline data and epidemiological/sociological survey (CBDESS) funded by JSPS was conducted to assess social aspects of malaria control program. It was a collaboration study between Faculty of Sociology, Bukkyo University, Kyoto, School of Medicine, Mataram University, WNT and provincial and district health offices.

2. POPULATION AND AREA CHARACTERISTICS

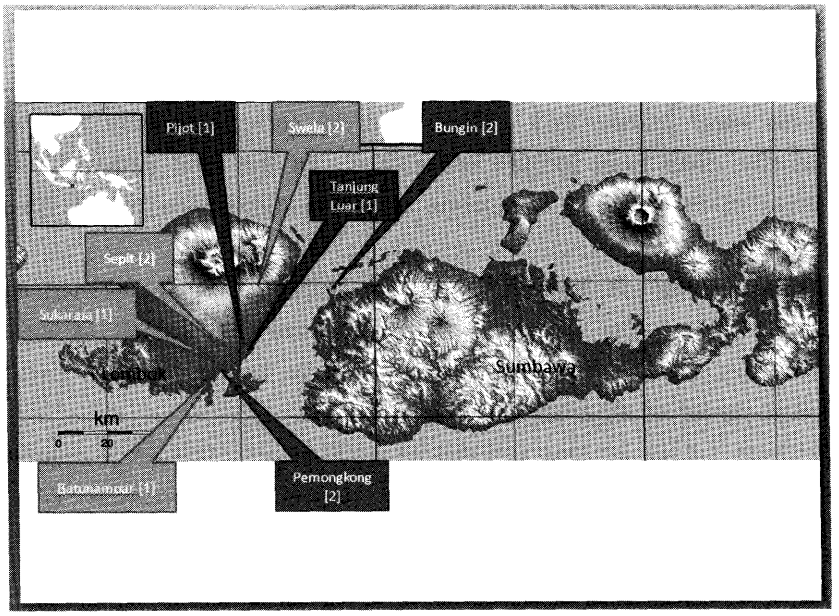
WNT Province is composed of two main islands, i.e., Lombok and Sumbawa islands with total area 20,153.15 square kilometer inhabited by 4,257,306 people in the year of 2006. The archipelago stretches along the equator between longitude 115 o 46' and 119 o 5 ' east and latitude 8 o 10' and 9 o 5 ' south.

There are seven districts, 103 sub-districts, and 838 villages in the povince. Sumbawa Island is almost three times as big as Lombok Island, but inhabited by one third as many residents as Lombok Island. Sumbawa Island is approximately 14,386 square kilometers with 1,242,061 populations, while Lombok Island is approximately 5,435 square kilometers with population of 3,015,245.

Population at risk of acquiring malaria and targeted by this project are in the Sepit village in Keruak sub-district, Prigi village in Swela sub-district,

Pemongkong village of Jerowaru sub-district of East Lombok, and Bungin Island village in Alas sub-district of Sumbawa.

East Lombok covers a total area of about 3,498.5 square kilometers, nearly 1,605.5 square kilometers land and 1,654.15 square kilometers sea with 220 kilometer coastline. East Lombok has a tropical climate with highest rainfall of 281 mm in



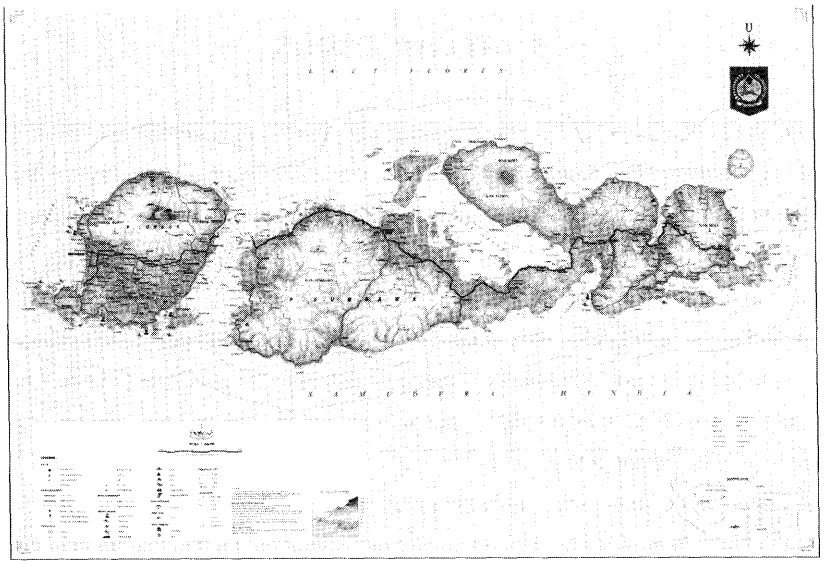


Figure 1 Map showing locations of CBDESS I and II in Lombok and Sumbawa Islands

December and lowest rainfall of 2 mm in August. Mean annual rainfall is 1,218.50 mm. East Lombok population increased from 370.92/km^2 in 1995 to 598.16/km^2 in 2000. Annual income per capita is approximately USD 300 which mainly came from the agricultural sector in 2006.

Sepit village is one of four villages in Keruak sub-district of East Lombok. Sepit village is approximately 17.96 km^2 inhabited by 12,779 people, with covers no coastal region. Perigi village is one of six villages in Swela sub-district of East Lombok. Swela sub-district covers a total area of about 115.01 km^2 and about 90% of Swela sub-district is hilly land. Malaria outbreak occurred in Perigi village of Swela in the early March, 2007. There were 90 patients positive suffering from malaria, mostly came from Jeringo sub-village. Of the total patients, 85 patients were positive of Plasmodium falciparum and 5 patients positive of Plasmodium vivax.

Pemongkong village is approximately 83.95 km^2 inhabited by 14,119 people. Pemongkong village is the widest village in Jerowaru sub-district (58.79% of total area of Jerowaru sub-district). Pemongkong village is the southern part of East Lombok with almost of all areas is a coastal region.

Bungin Island village in Alas sub-district of Sumbawa District is approximately 2 km^2 inhabited by 2,941 people (BPS, 2006). Bungin is an artificial island made by local people. Bungin, in Bugis language means white sands island in the sea. Bungin villagers are Bugis ethnicity that started moving from Selayar, South Sulawesi as early as 1815.

3. STUDY DESIGN

A comparative study will be made using primary data obtained from a survey to explore all community aspect information such as its history, demographic data. This cross sectional study uses the geographic characteristics, i.e., coastal vs. hilly areas as dependent variable. The independent variables are social, economic, cultural, and religious aspects of the community.

The CBDESS II analysis will consist of malaria trends, socio-demographic, economic, cultural, and religious characteristics, community involvement in previous programs and community knowledge and behavior related to malaria transmission in the study area.

The socio-economic data will include population demographics: number, age, sex, level of education, occupation, health indexes, social activity, income, expenditure, ownership, and migrant laborers activity. Knowledge of malaria is determined based on three constructs, i.e. recognized malaria symptoms, prevention and

treatment. Composite frequency of the three constructs is then used to divide the knowledge into three categories, including good (know malaria symptoms, prevention and treatment), moderate (know at least two constructs), or poor (know only one construct or none).

Malaria, in general, manifests as fever which is resulted from simultaneous rupturing of red blood cells following large-scale parasite multiplication. Chills and sweating are often accompanied by a fever. Other symptoms may be headache and joint pains. Fever accompanied by periodic chills and sweating is the classic symptom of malaria. Respondents will be asked to mention any malaria symptoms they know. Knowing three of those symptoms is cutoff point for knowledge of malaria symptom.

Prevention, as the second construct, involves a wide range of prevention method, including human behavior modification, environmental management and vector control. Certain habits or behaviors make human become more vulnerable, i.e. travelling to endemic areas, outdoor activities during mosquito's biting time at night, wearing without any cloth to protect against mosquitoes and so forth. Modifying these behaviors has been effective in preventing malaria. Furthermore, managing the environment by creating an unfavorable milieu for anopheles mosquito is another important means of prevention. This may include environmental modification, environmental manipulation, and human habitual modification. To combine vector control method such as biological predator with chemical control, it is believed to provide a paramount malaria control. Knowing two of the three malaria prevention methods is used as the cutoff point.

Knowing the treatment of malaria is the last construct of malaria knowledge. Whenever respondent can mention at least one malaria medication, then he or she is considered to have a good knowledge of malaria treatment.

Local custom, culture and religion of the community will be observed to reveal the possibility of developing new approach to implement the preventive measures in the community. Key persons who have potential ability to influence community toward better malaria behavior will be identified. Community events will also be identified as a baseline to develop community malaria events.

This study will use two stage stratified random sampling with endemicity as cluster. In precision rate 1%, confidence level 99% and proportion 0.0172, the minimal samples is 936.

4. RESPONDENT'S CHARACTERISTICS

4. 1. Demographic characteristics

A total of 1019 respondents from 4 malaria endemic villages, i.e. Pulau Bungin Island (325 respondents), Perigi in Swela (298 respondents), Sepit (198 respondents) and Pemongkong (198 respondents) participated in the study. In general, the ratio of respondents in this study is that 60.2% (613) are men and 39.8% (406) are women. The median of respondent's age is 40 years old and most of them (86.9%) are in their most productive middle ages. More than 90 percent of respondents in West Nusa Tenggara (WNT) are Muslim and the major ethnic group is Sasak in Lombok and Sumbawa except Bungin island which is dominated by migrants from Sulawesi such as Bajo, Bugis and Mandar. Table 1 is summarized the socio- demographic characteristics of respondents in the four villages.

The majority of respondent's education level (54.7%) is elementary school. However, there are a considerable number of respondents (22.5%) that never attained at any formal education. There are very fewer respondents that continued studying at a higher level of education, i.e. junior high school, senior high school and so forth. Moreover, there is a gender bias on educational

Table 1 Respondent's socio-demographic characteristics

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN (%)	PERIGI (%)	SEPIT (%)
Age				
- < 20 year old	6 (3.0)	4 (1.2)	5 (1.7)	3 (1.5)
- 20 - 30 year old	34 (17.2)	57 (17.5)	64 (21.5)	34 (17.2)
- 30 - 40 year old	59 (29.8)	94 (28.9)	87 (29.2)	59 (29.8)
- 40 - 50 year old	50 (25.3)	78 (24.0)	63 (21.1)	50 (25.3)
- 50 - 60 year old	33 (16.7)	54 (16.6)	35 (11.7)	33 (16.7)
- > 60 year old	16 (8.1)	38 (11.7)	44 (14.8)	16 (8.1)
Sex				
- Male	119 (60.1)	210 (64.6)	139 (46.6)	210 (64.6)
- Female	79 (39.9)	115 (35.4)	159 (53.4)	115 (35.4)
Religion				
- Islam	190 (100.0)	324 (100.0)	291 (99.7)	197 (100.0)
- Hindu	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)
Education				
- No formal education	83 (41.9)	12 (3.7)	96 (32.2)	38 (19.2)
- Uncompleted elementary school	61 (30.8)	57 (17.6)	86 (28.9)	19 (9.6)
- Elementary school	32 (16.2)	159 (49.1)	88 (29.5)	55 (27.8)
- Junior high school	16 (8.1)	72 (22.2)	16 (5.4)	19 (9.6)
- Senior high school	3 (1.5)	18 (5.6)	10 (3.4)	37 (18.7)
- College	2 (1.0)	3 (0.9)	0 (0.0)	9 (4.5)
- University	1 (0.5)	3 (0.9)	2 (0.7)	21 (10.6)

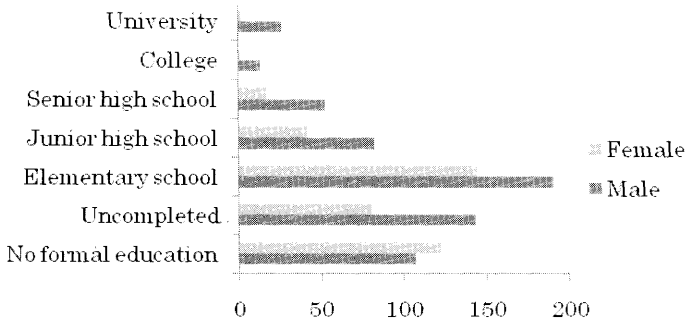


Figure 2　Respondents' formal education level

experiences and achievements. The number of men that attended schools is higher than women in all four villages (Figure 2).

The occupation is varied within different area characteristics. Most respondents living in coastal area work as fishermen while those in hilly lands work as farmers or farm laborers. Pemongkong village has a unique characteristic in which part of the area is coastal while the rest of the land is flatland. Therefore, fisherman and farmer are the most common occupation in the community. Furthermore, in coastal are, women aren't go fishing or sailing but tend to work in the farm land, commonly for self-consuming and opening a kiosk.

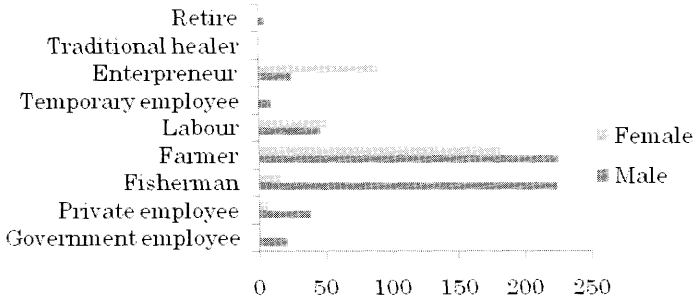


Figure 3　Respondents' occupation

4. 2. Economical status

Most respondents in the four villages have monthly wages of less than 500,000 Indonesian Rupiahs (IDR), excluding Sepit village in which most of them have wages between 500,000 to 1,000,000 IDR. Among respondents with wages less than 1,000,000 IDR, it is obvious that providing daily meal is put as the first priority. The distribution of respondent's wages and expenditures is summarized in table 2.

Table 2 Respondent's economic status

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN (%)	PERIGI (%)	SEPIT (%)
Average family wages per month (1,000 IDR)				
• < 500	137 (72.1)	139 (43.6)	270 (91.2)	68 (34.7)
• 500 to 1,000	48 (25.3)	135 (42.3)	22 (7.4)	98 (50.0)
• 1,000 to 2,000	4 (2.1)	33 (10.3)	4 (1.4)	26 (13.3)
• > 2,000	1 (0.5)	12 (3.8)	0 (0.0)	4 (2.0)
Average family expenditure per month (1,000 IDR)				
Daily needs				
• < 100	37 (18.8)	46 (14.5)	47 (15.8)	15 (7.7)
• 100 to 500	156 (79.2)	134 (42.3)	246 (82.6)	152 (77.9)
• 500 to 1,000	2 (1.0)	113 (35.6)	5 (1.7)	22 (11.3)
• > 1,000	2 (1.0)	24 (7.6)	0 (0.0)	6 (3.1)
Health care				
• < 100	118 (95.9)	209 (68.8)	243 (98.4)	157 (80.1)
• 100 to 500	5 (4.1)	89 (29.3)	4 (1.6)	38 (19.4)
• 500 to 1,000	0 (0.0)	6 (2.0)	0 (0.0)	1 (0.5)
• > 1,000	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Education				
• < 100	96 (61.9)	163 (67.9)	250 (91.2)	108 (55.1)
• 100 to 500	57 (36.8)	60 (25.0)	24 (8.8)	75 (38.3)
• 500 to 1,000	2 (1.3)	15 (6.3)	0 (0.0)	11 (5.6)
• > 1,000	0 (0.0)	2 (0.8)	0 (0.0)	2 (1.0)

5. MALARIA EXPERIENCES

In general, most respondents (59.8%) mentioned that they had suffered from malaria (See Table 3). However, it was not the case in Bungin and Perigi villages, in which fewer respondents experienced suffering from malaria (35.2% and 38.6%, respectively). Moreover, there are fewer respondents (12.0%) who were suffering from malaria during pregnancy. During their period of illness, most respondents visited medical doctor and community health center (PUSKESUMAS). Specifically in Bungin, medical doctors are the main provider for home-visit

Table 3 Malaria experiences

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN (%)	PERIGI (%)	SEPIT (%)
Experience of suffering from malaria	264 (81.5)	105 (35.2)	76 (38.6)	165 (83.3)
Provider visited when suffered from malaria				
• Medical doctor	2 (1.2)	164 (62.4)	1 (1.0)	11 (14.7)
• Community health centre (Puskesmas)	107 (65.6)	79 (30.0)	79 (76.7)	59 (78.7)
• Health cadre	5 (3.1)	2 (0.8)	4 (3.9)	0 (0.0)
• Hospital	6 (17.2)	5 (1.9)	0 (0.0)	2 (2.7)
• Traditional healer	28 (3.7)	3 (1.1)	18 (17.5)	0 (0.0)
• No provider visited	15 (9.2)	10 (3.8)	1 (1.0)	3 (4.0)

Provider visited when family member had fever								
• Medical doctor	3	(1.5)	152	(47.2)	2	(0.7)	9	(4.6)
• Community health centre(Puskesmas)	131	(67.5)	117	(36.3)	169	(56.9)	151	(77.8)
• Health cadre	2	(1.0)	0	(0.0)	3	(1.0)	0	(0.0)
• Hospital	2	(1.0)	6	(1.9)	1	(0.3)	4	(2.1)
• Traditional healer	33	(17.0)	18	(5.6)	60	(20.2)	2	(1.0)
• Midwife	0	(0.0)	0	(0.0)	1	(0.3)	0	(0.0)
• No provider visited	23	(11.9)	29	(9.0)	61	(20.5)	28	(14.4)
Have had malaria during pregnancy	25	(12.6)	86	(26.5)	11	(3.7)	0	(0.0)
Medication taken for malaria								
• Amoxicillin	0	(0.0)	0	(0.0)	0	(0.0)	2	(1.0)
• Chloroquine	0	(0.0)	0	(0.0)	0	(0.0)	4	(2.0)
• Fansidar	0	(0.0)	1	(0.3)	1	(0.3)	1	(0.5)
• Primaquine	1	(0.5)	2	(0.6)	1	(0.3)	0	(0.0)
• Quinine	0	(0.0)	4	(1.2)	0	(0.0)	0	(0.0)
• Resochine	7	(3.5)	7	(2.2)	1	(0.3)	5	(2.5)
• Pill(s), capsule(s), or injection(s)	102	(51.5)	197	(60.6)	77	(25.8)	41	(20.7)
• Traditional medicine	4	(0.0)	3	(0.9)	0	(0.0)	0	(0.0)
• Magical formula or spell	21	(10.6)	3	(0.9)	3	(1.0)	0	(0.0)
• Massage	2	(1.0)	0	(0.0)	0	(0.0)	0	(0.0)
• No medication	1	(0.5)	0	(0.0)	0	(0.0)	0	(0.0)

nursing care. Despite experiencing malaria, there are fewer respondents that can properly mention the proper medication for malaria. Table 3 summarized respondent's experience of malaria.

6. KNOWLEDGE, ATTITUDE AND PRACTICE OF MALARIA

The majority of respondents recognized malaria (48.9%) as the most dangerous disease, followed by diarrhea (13.7%), fever (4.4%), tuberculosis (4.0%) and skin disease (3.2%) (See Figure 4). Within the four villages, only respondents in Sepit village consider diarrhea as the most dangerous disease (23.4%).

Although most respondents considered malaria as the most dangerous disease and many of them experienced malaria, it is not consequently followed with better understanding of malaria. With regard to malaria symptoms, fifty one percent of respondents in this study know three or more symptoms of malaria, including fever, shivering, sweating, headache, abdominal symptoms, fatigue, respiratory symptoms and seizures. Fever and shivering are the most common known symptoms of malaria (Figure 5). Furthermore, the knowledge of malaria symptoms between coastal and hilly areas is different significantly ($p < 0.001$). Nevertheless, the correlation between the area characteristics and the knowledge of malaria symptoms is weak (Spearman correlation $= -1.36$). The Spearman rank analysis result suggests that respondents in the coastal area know less about malaria symptoms compared to those at the hilly area.

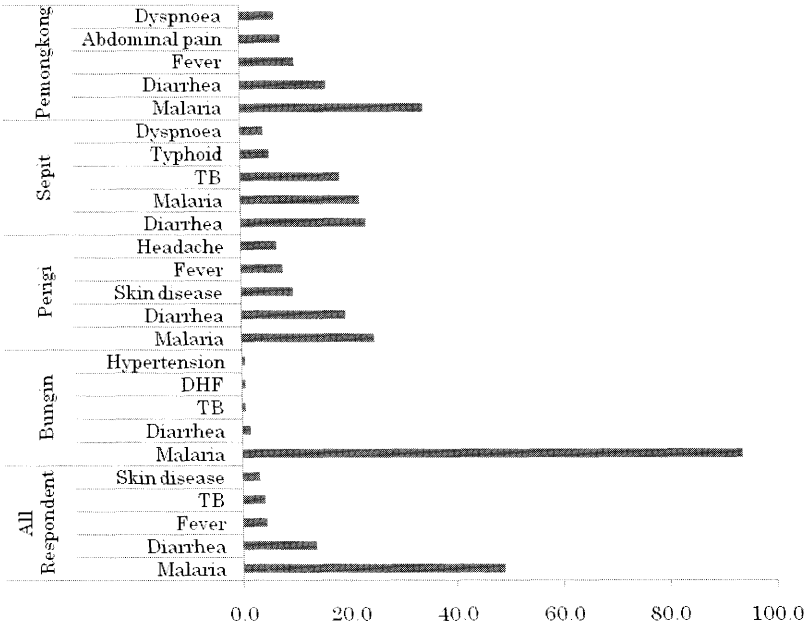


Figure 4 Community perception regarding the most dangerous

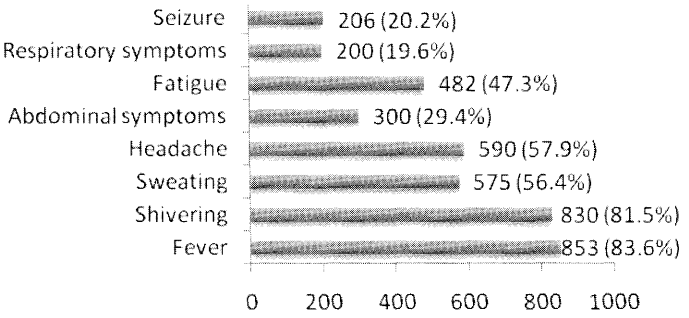


Figure 5 Knowledge of malaria symptoms

Concerning malaria transmission, most respondents (76.1%) perceive that malaria is a communicable disease; however, few know that malaria is transmitted through mosquito bite (29.7%). As a result, there were fewer respondents (0.9%) that familiar with malaria prevention methods.

The prevention for malaria in most cases is targeted toward modifying human behavior, managing the environment and controlling the vector (Anopheles mosquito). The only well recognized malaria prevention was the application of anti-mosquito, use of mosquito's chemical control, and sleeping under a bed net (figure 6). By comparison with the area characteristics, the knowledge of malaria prevention is not different significantly ($p = 0.799$).

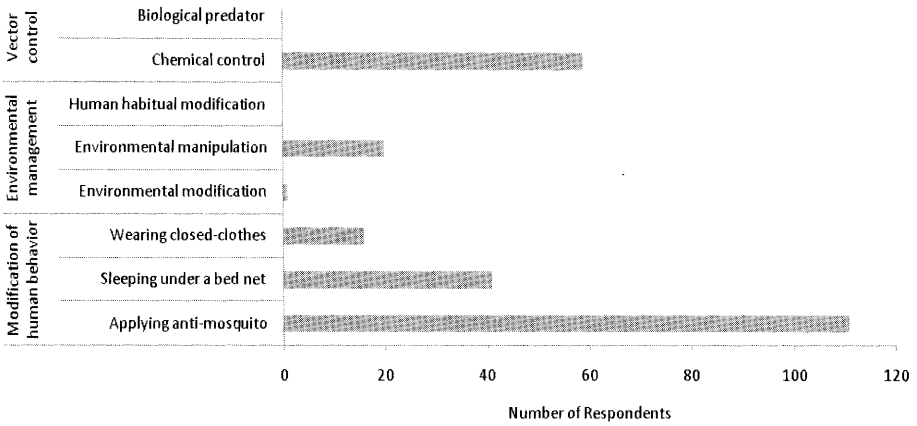


Figure 6　Recognition of malaria prevention method

The knowledge of malaria treatment is relatively poor. It is that only 4.7% respondents can identify the proper treatments for malaria. Among any available treatment, "Resochine" medicine is widely recognized as the cure of malaria (72.9%). Figure 6 summarized the commonly known medicines for malaria. There is a significant different statistically between the coastal and hilly areas concerning with the knowledge on malaria treatment. But the correlation is weak ($p < 0.001$; Spearman correlation $= 0.126$).

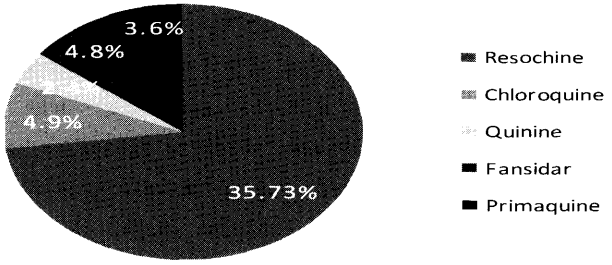


Figure 7　Commonly known medicine for malaria

Overall the malaria knowledge is poor. There is merely one person (0.1%) in Pemongkong village that had a good understanding of malaria (Table 4). Nevertheless, 4.2% of respondents recognized two of the three constructs, i.e. malaria symptoms and prevention, malaria symptoms and treatment or malaria prevention and treatment. When it is compared between the area characteristics, i.e. the coastal and hilly, the malaria knowledge is not different significantly ($p = 0.304$).

Table 4 Knowledge, Attitude and Practice of Malaria

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN (%)	PERIGI (%)	SEPIT (%)
Know≥ 3 malaria symptoms	88 (44.4)	199 (61.2)	142 (47.7)	88 (44.4)
Commonly known malaria symptoms				
• Fever	190 (96.0)	306 (94.2)	183 (61.4)	173 (87.4)
• Shivering	185 (93.4)	289 (88.9)	177 (59.4)	179 (90.4)
• Sweating	117 (59.1)	211 (64.9)	152 (51.0)	95 (48.0)
• Headache	120 (60.6)	296 (91.1)	131 (44.0)	43 (21.7)
• Abdominal symptoms	41 (20.7)	153 (47.1)	96 (32.2)	10 (5.1)
• Fatigue	98 (48.5)	243 (74.8)	101 (33.9)	42 (21.2)
• Respiratory symptoms	26 (13.1)	87 (26.8)	80 (26.8)	7 (3.5)
• Seizure	32 (16.2)	140 (43.1)	24 (8.1)	10 (5.1)
Know≥ 2 malaria prevention methods	0 (0.0)	5 (1.5)	1 (0.3)	3 (1.5)
Commonly known malaria prevention methods				
• Human behavior modification	38 (19.2)	45 (13.5)	11 (3.7)	44 (22.2)
• Environmental management	7 (3.5)	4 (1.2)	1 (0.3)	9 (4.5)
• Vector control	2 (1.0)	52 (16.0)	2 (0.7)	3 (1.5)
Know the treatment for malaria	4 (2.0)	7 (2.2)	5 (1.7)	32 (16.2)
Knowledge of malaria				
• Poor	198 (100.0)	325 (100.0)	298 (100.0)	197 (99.5)
• Good	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)

7. SOURCE OF INFORMATION ON MALARIA

The source of information on malaria is mostly coming from health professional and health cadre as shown in Figure 8. Information on malaria, furthermore, have also been introduced on Friday Sermont by religious leaders and any other religious gathering in both coastal (29.3%) and hilly area (1.4%). Besides information on malaria, Friday sermont and religious gathering has also been used to deliver health related information including personal and environmental hygiene (59.4%), mental illness (1.2%), disease prevention (4.6%) and treatment (0.2%). There is a statistically significant different between health professional as the informant and others regarding knowledge on malaria symptom (see. Figure 8). However, the correlation between this variable is weak ($p = 0.001$, Spearman correlation = 0.101).

Furthermore, it is assumed that experiences of having malaria before would provide a better knowledge on malaria, but it is not true in this study. There is no different knowledge between respondents that stated suffering from malaria before and who didn't ($p = 0.44$). With regard to malaria symptoms, there is a statistically significant difference between those who experienced having malaria before and who didn't but the correlation is weak ($p < 0.001$, Spearman correlation 0.110).

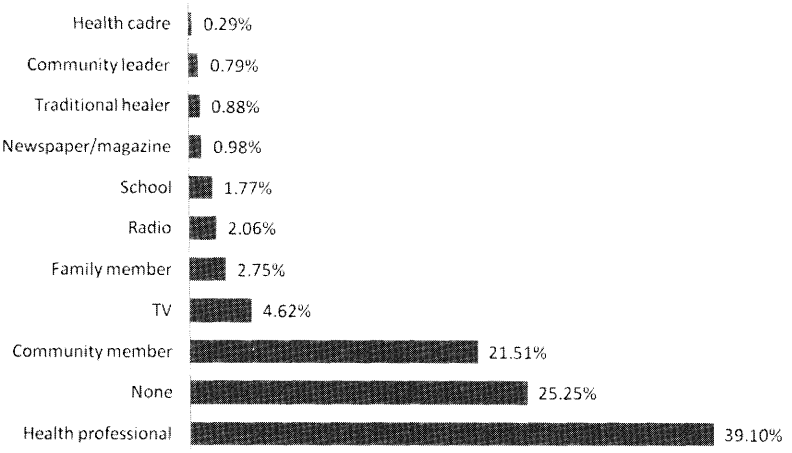


Figure 8　Source of information for malaria

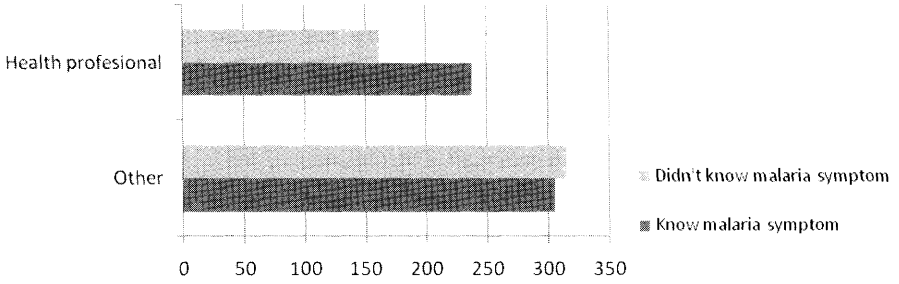


Figure 9　Knowledge of malaria symptom from different informants

8. VULNERABLE BEHAVIOR AND MALARIA PREVENTION PRACTICES

Certain high-risk malaria behaviors are focused on the transmission of malaria, e.g. travelling to endemic area, outdoor-night activities, sleeping in open spaces without bed-nets or other mosquito's protection, and wearing open-clothes. Table 5 summarized common respondent's vulnerable behaviors.

There are three common outdoor-night activities among local people, i.e., working and preparing at night, night patrol and gathering with friends or neighbors. These high-risk malaria activities are, however, difference between four villages. Respondents living in villages in coastal area are generally working as fisherman that urges them to work outdoor at night. The farmers living in hilly areas also work at night, in particular during the harvesting season. More men tend to do outdoor-night activities. Comparing with the sexuality, there is a

Table 5 Vulnerable behaviors

BEHAVIOURS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN (%)	PERIGI (%)	SEPIT (%)
Outdoor-night activities:				
Working	51 (25.8)	142 (43.7)	58 (19.5)	17 (8.6)
Night patrol	31 (15.7)	8 (2.5)	24 (8.1)	37 (18.7)
Praying	2 (1.0)	12 (3.7)	22 (7.4)	6 (3.0)
Other religious activities	1 (0.5)	3 (0.9)	9 (3.0)	7 (3.5)
Shower	0 (0.0)	5 (1.5)	2 (0.7)	0 (0.0)
Gathering with friends/neighbors	0 (0.0)	56 (17.2)	59 (19.8)	4 (2.0)
Watching TV	12 (6.1)	5 (1.5)	29 (9.7)	0 (0.0)
Taking clean water	0 (0.0)	1 (0.3)	2 (0.7)	0 (0.0)
Shopping	0 (0.0)	7 (2.2)	0 (0.7)	0 (0.0)
Visiting relatives/friends	0 (0.0)	19 (5.8)	21 (7.0)	1 (0.5)
Sleep in open spaces:				
Routine ($\geq$ 5 times per week)	14 (7.6)	53 (16.5)	13 (4.4)	2 (1.0)
Often (3 - 4 times per week)	26 (14.1)	79 (24.6)	33 (11.1)	8 (4.2)
Seldom ($\leq$ 2 times per week)	55 (29.9)	67 (20.9)	59 (19.9)	23 (12.0)
Never	89 (48.4)	122 (38.0)	192 (64.6)	159 (82.8)

statistically significant difference with regard to the outdoor and night activities ($p < 0.001$). But the correlation is weak (Spearman correlation= 0.273). Working individuals also tend to do more outdoor and night activities compared to those who aren't employed ($p < 0.001$, Spearman correlation= 0.164).

Almost half of respondents (43.5%) slept in open spaces and outside of their house at least two nights in a week. This sleeping behavior is particularly prominent in coastal area villages, i.e., Bungin and Pemongkong. More men (74.3%) and working individuals (94.9%) sleep in open spaces. This difference between sex and working status is significant statistically ($p < 0.001$ and $p = 0.005$, consecutively) though the correlation is weak (Spearman correlation= 0.262 and Spearman correlation= 0.103, consecutively).

The practices of preventing malaria are relatively limited to the use of anti-mosquito goods and impregnated bednets. As shown in Table 6, the most common anti-mosquito goods are different between four villages. In Pemongkong and Bungin, mosquito's coil is commonly used (49.5% and 66.8%, consecutively), while in Perigi and Sepit, chemical spray is better as they acknowledge (12.1% and 80.8%, consecutively).

Although most respondents acknowledge bednets utilization as a mean of preventing malaria, there are only a few of them (18.9%) used it daily. Table 6 summarized bednets utilization in the family. Approximately 64.3% of respondents didn't own bednets. Bednets are used only in 54.0% respondents that own them. Among respondents that stated using bednets, there are fewer respondents (26.2%) that specifically provide the nets for children (Figure 10.).

Table 6 Malaria Prevention Practices

BEHAVIOURS	VILLAGE NAME							
	COASTAL				HILL			
	PEMONGKONG	(%)	BUNGIN	(%)	PERIGI	(%)	SEPIT	(%)
Use of anti-mosquito :								
Mosquito's coil	98	(49.5)	217	(66.8)	1	(0.3)	14	(7.1)
Spray	1	(0.5)	18	(5.5)	36	(12.1)	160	(80.8)
Anti-mosquito's lotion	5	(2.5)	120	(36.9)	2	(0.7)	9	(4.5)
Bednets utilization :								
Husband and wife	6	(3.0)	0	(0.0)	3	(1.0)	8	(4.0)
Children	7	(3.5)	2	(0.6)	1	(0.3)	15	(7.6)
Children and mother/father/ grandparents	16	(8.1)	2	(0.6)	2	(0.7)	5	(2.5)
Grand parents	1	(0.5)	2	(0.6)	1	(0.3)	1	(0.5)
Other family members	3	(1.5)	0	(0.0)	4	(1.3)	3	(1.5)
All family members	35	(17.7)	8	(2.5)	20	(6.7)	22	(11.1)
Respondents	6	(3.0)	0	(0.0)	1	(0.3)	17	(8.6)
Never used bednets	122	(61.6)	308	(94.8)	265	(88.9)	124	(62.6)

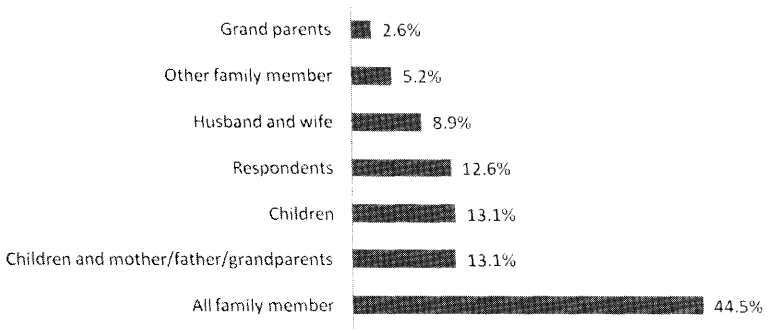


Figure 10 Bednets utilization among family

9. COMMUNITY, CULTURE AND RELIGIOUS ASPECTS

More than half respondents (60.3%) participate in community activities. The participation, however, differs between four villages. In general, most respondents participate in 'gotongroyong (community collaboration)' more than other social gathering available in the community (Figure 11).

There are fewer women participated in a common residential meeting such as RT, RW or Dusun. Statistical analysis suggests that men tend to participate in community activities more than women ($p < 0.001$; Spearman correlation $= 0.230$) as well as employed individuals ($p = 0.001$; Spearman correlation $= 0.109$). However, the correlation between sex and employment status and participation in

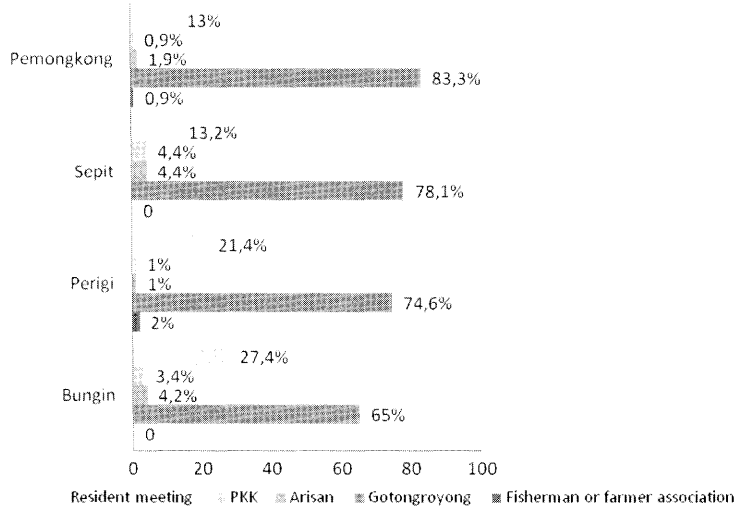


Figure 11 Community social gathering

community activities is weak. Based on respondent's age, there is no statistical difference between elderly and adult in terms of participation in community activities ($p = 0.402$).

Compared to community activity, there are more respondents that participate in religious activities (91.8%). Friday sermon, praying in the mosque, and 'pengajian (a religious meeting)' are the most common attended activities (Figure 12). Statistical analysis suggest that men, employed, and elderly are more frequent in participating in religious activities ($p < 0.001$; Spearman correlation $= 0.256$; $p < 0.001$; Spearman correlation $= 0.170$; $p = 0.004$; Spearman correlation $= -0.002$, consecutively). These correlations, however, are weak.

Furthermore, there are fewer respondents (18.1%) that become a member of community organizations. There are different types of social organizations between villages, in which the respondents participated. In Pemongkong and Sepit, PAMSWAKARSA (EXPLANATION IN ENGLISH!), a community-based organization that mostly work to provide safety and security for the local community, is a prominent local social organization (Table 7). Unlike in Pemongkong and Sepit, there are no prominent organization in Bungin and Perigi.

Religious and community activities are the most important social activity found in this study. As shown in Figure 13, participation in religious activities is far more prominent than other social activities.

In a typical East Lombok community like Sepit and Pemongkong, religious leaders are still considered more influential than local formal leaders like village heads and officers. But this does not apply to the cases in Perigi and Bungin,

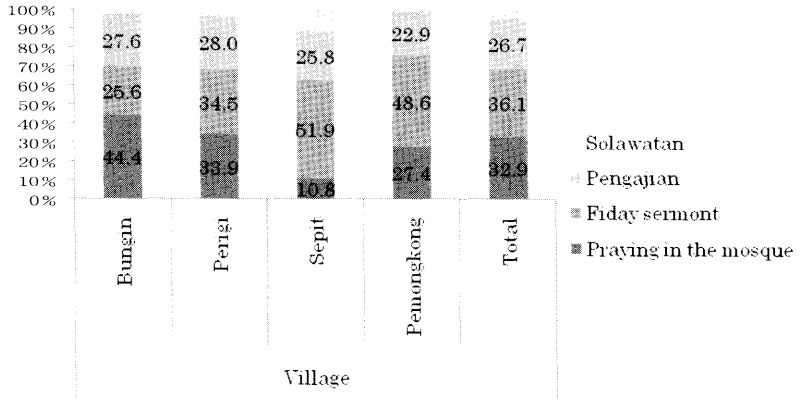


Figure 12　Common religious activities

Table 7　Respondent's participation in a local social organization

BEHAVIOURS	VILLAGE NAME							
	COASTAL				HILL			
	PEMONGKONG	(%)	BUNGIN	(%)	PERIGI	(%)	SEPIT	(%)
Pesantren	1	(0.5)	3	(0.9)	9	(3.0)	5	(2.5)
Koperasi	6	(3.0)	2	(0.6)	2	(0.7)	2	(1.0)
Karang taruna	1	(0.5)	9	(2.8)	2	(0.7)	3	(1.5)
Political party	0	(0.0)	11	(3.4)	1	(0.3)	2	(1.0)
PAMSWAKARSA	80	(40.4)	0	(0.0)	1	(0.3)	20	(10.1)
BPD	0	(0.0)	2	(0.6)	0	(0.0)	0	(0.0)
Local NGO	0	(0.0)	2	(0.6)	1	(0.3)	0	(0.0)
Religious based organization	1	(0.5)	4	(1.2)	2	(0.7)	1	(0.5)
PKK	0	(0.0)	2	(0.6)	1	(0.3)	0	(0.0)
Farmer association	1	(0.5)	0	(0.0)	2	(0.7)	0	(0.0)
Linmas	0	(0.0)	3	(0.9)	0	(0.0)	0	(0.0)
LKMD	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.5)

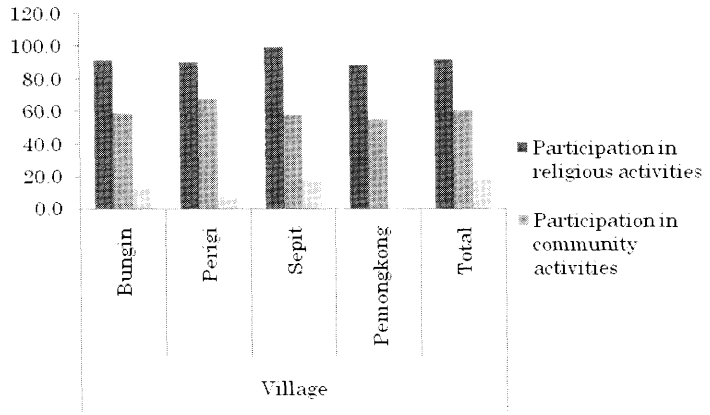


Figure 13　Community participation in social and religious activities

where formal leaders have a slightly higher position in terms of influential figures in the community.

10. CONCLUSION

The result of CBDESS, Part 2 shares similar findings compared to the CBDESS, Part 1 (Mitsuda, Mulyanto (eds.), 2007). The community members have predominantly a low level of malaria knowledge. They also have a very low level of formal education. One interesting finding is that the community members relied on health professionals as the primary source of malaria. This result urges us to pay more attention to how to make health professionals more effectively to educate the community. Special training may be required to upgrade health professionals' capability in advocating and educating the community.

More than 70% respondents did not continue their education beyond elementary school. Approximately 20% of them do not even attend formal education at all. Therefore we should consider how to educate this people as early as they enter elementary education and also those who are outside formal education system.

In the formal education system, malaria education needs to be integrated in the elementary school curriculum. This will enable young children to learn about malaria. Hopefully their knowledge of malaria will be sufficient to help them preventing malaria, even if they are not going to higher education level.

Outside the formal education system, malaria education can take place in community activities, especially religious activities as the most attended activities in the community. We can bring together health professional as the trusted source of malaria information and religious leader as the most influential persons to improve community knowledge and behavior. But we also have to consider different patterns in the area like Bungin and Perigi where formal leaders are more respected. We can joint health professionals and formal leaders in the malaria education.

NOTE: Miyagi, I, et. al. 1994, Mosquito species (Diptera: Culicidae) from Lombok Island, Indonesia, Mosquito Systematics, 26 (1): 19-24.

〔付記〕
本論文は，平成21年度佛教大学学外研修（海外研修）によるインドネシア国立マタラム大学医学部ムリヤント教授グループとの国際共同研究「マラリア・コントロール・プログラム」の研究成果の一部である。また，本研究に対して，平成22年度佛教大学特別研究費を受けた。

（みつだ　ひさよし　公共政策学科）
2010年4月12日受理

〔写真１〕　CBDESS 調査のために炎天下２時間かけてスエラ村を目指す

〔写真２〕　乳幼児検診とマラリア指導（スエラ村，東ロンボク島）

〔写真 3〕 マラリア血液検査（ブンギン村，スンバワ島）

〔写真 4〕 CBDESS 調査に協力したマタラム大学医学部学生諸君