EVALUATION BY VILLAGERS OF THE MALARIA CONTROL PROJECT ON LOMBOK AND SUMBAWA ISLANDS, WEST NUSA TENGGARA PROVINCE, INDONESIA

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Abstract. The cooperative malaria control project between Indonesian and Japanese institutions was conducted from 2001 to 2004 at small malaria endemic foci on Lombok and Sumbawa Islands. The aim of this research was to evaluate the effects of the project according to the opinions of the villagers. We conducted a KAP survey of a simple random sample of 300 householders on each island. The conclusion of the study was that the project reduced malaria incidence significantly on Lombok. However, the effects were not as clear on Sumbawa. Poor socio-economic status and lack of school education were important related factors. Therefore, health education, or behavioral change communication, was an essential component of malaria control.

INTRODUCTION

Malaria is still one of the major public health problems in Indonesia with six million clinical cases and 700 deaths each year (Laihad, 2000), except on economically developed islands such as Java and Bali (Baird *et al*, 1996). West Nusa Tenggara Province (NTB), which consists of two major islands, Lombok and Sumbawa, has scattered malaria endemic foci at various areas, mainly along the coasts (Gebrak Malaria Team, 2000). In 2001, 809 malaria patients were hospitalized in Mataram Hospital, Lombok Island (Dachlan *et al*, 2005). From November 2001 to October 2004, a malaria control project was undertaken by the Institute of Tropical Medicine, Nagasaki University, Japan, with financial support by Japan International Cooperation Agency (JICA), in cooperation with Indonesian institutions at two sub-districts in NTB: Meninting on Lombok Island and Utan Rhee on Sumbawa Island. The Indonesian institutions included the Tropical Diseases Center (TDC), Airlangga University; NTB Provincial Health Office; the West Lombok and Sumbawa District Health Offices; and the Meninting and Utan Rhee Health Centers.

An epidemiological survey of the project area indicated that there were two endemic types of malaria in Meninting (forest and coastal types), and in Utan Rhee, only the

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coastal type (Kanbara *et al*, 2004). Under this project, the following control activities were undertaken. First, the organization of visiting teams for case detection and treatment. To get a general understanding of the malaria situation in the area, a spleen examination was undertaken at all elementary schools. Based on the results of the spleen examination, four sub-villages were selected, and Case Detection and Treatment teams were established in the health center to monitor malaria epidemics in the whole project area. The teams used diagnostic kits for rapid diagnosis (ICT test), while also preparing thin and thick blood smears for microscopic examination at the health center. Patients who tested positive for the ICT test received a full therapeutic dose of the drug of first choice, chloroquine, and in addition, primaquine for two days against *falciparum* malaria and for seven days against *vivax* malaria.

The second project control activity was a systematic distribution of insecticide-treated nets (ITNs). ITNs are considered essential by the WHO for malaria control programs because they provide protection from mosquitoes. The results of the entomological survey supported the efficiency of ITNs; distribution of ITNs was carried out in all the sub-villages.

The third control activity was education for health workers and villagers. The most important component of malaria control is the understanding and cooperation of the local community. After discussing how best to undertake this component, we undertook sequentially the following steps: a) a KAP study, b) preparation of pamphlet on malaria control, c) the organization of educational volunteers, and d) the production of audiovisual materials for malaria education in the local language (Sasak).

These control activities brought about a decrease in malaria cases at the coastal areas, but they could only reduce malaria cases to one-half in mountainous areas (Kanbara H, personal communication, 2004). This was the result of difficult access to villages and by the characteristic behavior of the vector. Eighteen months following the termination of the project, JICA sent an official evaluation team to assess the effects of the project. This was undertaken primarily through interviews with key informants in the areas, but not with villagers who had received benefits from the project. Therefore, this study aimed to evaluate the effects of the control project as indicated by the opinions of the villagers who were involved.

MATERIALS AND METHODS

Study sites

West Nusa Tenggara Province consists of two main islands, Lombok Island and Sumbawa Island (Fig 1). It has seven districts, 91 sub-districts and 703 villages. The capital is Mataram on Lombok Island. Four sub-villages and two villages from Lombok and Sumbawa islands were selected as the study sites. The study sites included both mountainous and coast areas on Lombok Island, only coast area on Sumbawa Island because our project was only conducted in the coast area on Sumbawa Island. The population of West Nusa Tenggara Province was about 4,076,000 persons; females were 2,135,000 and males were 1,940,000, respectively. In 2004, the population of Lombok Island was 2,535,000 and for Sumbawa Island, 1,540,000.

The study area in Lombok was Meninting area. The names of sub-villages were Pelolat and Penanggak, in the mountainous area, and Kerandangan and Batu Layar in the coast area. The study area in Sumbawa was Utan Rhee. The names of the study villages are Stw Brang and Jorok. The data for the sub-village and village populations are presented in Table 1.

Questionnaire survey

A survey form that integrates both KAP (knowledge, attitude, and practice) and RAP

Fig 1–Study sites in West Nusa Tenggara Province.

Table 1
Population data about study sites.

Subvillage/village	Male	Female	Total
Lombok Island			
Pelolat	184	180	364
Penanggak	673	699	1,372
Kerandangan	597	601	1,198
Batulayar	892	916	1,808
Sumbawa Island			
Stw Brang Village			3,109
Jorok Village			6,135

Data on male and female populations not available for Sumbawa Island

(rapid assessment procedures) methods in a questionnaire was used to collect data from households selected by simple random sampling. The respondents in each household were either the household head or his spouse. Where there was no available adult household member, that particular household was excluded from the study and another household was randomly selected to replace it. Interviewers were recruited from provincial and district health center personnel, and Mataram University students. Interview teams were trained over a two-day period on questionnaire administration. To control for bias, in-

terviewers were required to wear street clothes as opposed to the Indonesian civil service uniform. The previous survey concerning malaria conducted in these areas provided the baseline information for the questionnaire (Moji, 2004).

Questions were both closed- and open-ended. The questionnaire consisted of four parts, containing 42 questions. The first part focused on diagnose and treatment. The second part focused on prevention. The third part focused on health education, and the fourth part focused on the project as a whole. We carried out a pre-test, and we modified the questionnaire accordingly. The questionnaire was written in Bahasa Indonesia (national language of Indonesia). Under the supervision of an Indonesian doctor, field assistants read out the questions to the respondents who then completed the forms individually.

Analysis

The results of the study were analyzed using the SPSS (version 11.5) software package.

Ethical guidelines

We initiated the program by explaining the outline of the study to the local authorities. Then, we explained verbally the purpose and methods of the study to respondents, and informed consent was obtained in a written form.

RESULTS

Demographic characteristics

A total sample of 600 household heads was interviewed from the two islands. Most of the baseline characteristics were similar for each area (Table 2). The mean age was 41.7 years old, and ages ranged from 17 to 90. The population was predominately Muslim (95.3%) and were of Sasak ethnicity. The majority of residents were farmers or fishermen. More than 60% of the population did not complete elementary school.

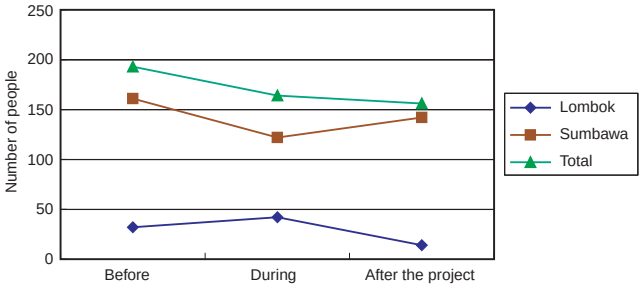

Fig 2–Number of respondents who were diagnosed with malaria before, during, and after the project.

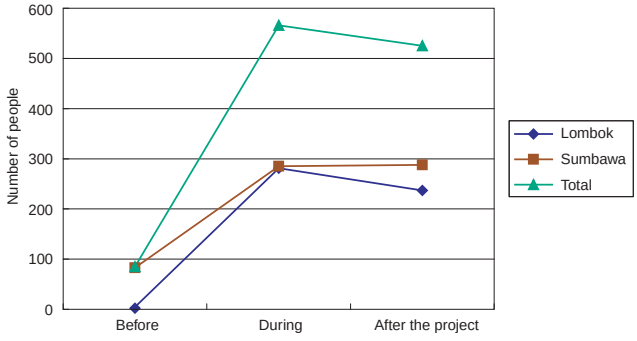

Fig 3–Number of respondents who have and used bednets before, during, and after the project.

Diagnosis and treatment

Before the project was initiated, 193 people (32.1%) suffered from malaria (Fig 2). During the project, 164 people (27.3%) were diagnosed with malaria more than once per year. After the project was finished, 156 people (26.0%) got malaria. Most of those who had malaria went to health center to be treated (Table 3).

Prevention

Only 85 households (14.2%) had bednets before the project began (Fig 3). Especially on Lombok Island, only two households had bednets. During the project, 578 households (96.3%) received bednets; and of those recipients, 566 respondents (97.9%) used bednets every night. After the project, 525 (87.8%) continued to use the bednets. Of those who received the bednets, 542 (90.6%)

Table 2
Baseline demographic characteristics of individuals.

Household characteristics	Lombok Island		Sumbawa Island		Total	Percent (n=600)
	Coast side	Hill side	Coast side	Hill side		
Total individuals	100	200	300	0	600	
Male	75	131	259	0	465	77.5
Female	25	69	41	0	135	22.5
Average no. of children per hosehold		1.44		1.46		
Ethnicity						
Sasak		294		185	479	79.8
Others		6		115	121	20.2
Religion						
Muslim		288		284	572	95.3
Hindu		0		13	13	2.2
Others		12		3	15	2.5
Educational background						
Did not finish elementary school		224		170	394	65.7
Finish elementary school		52		101	153	25.5
Finish junior high school		16		20	36	6.0
Finish senior high school		5		8	13	2.2
More tertiary education		3		0	3	0.5
Unknown		0		1	1	0.2
Occupation						
Farmer		152		212	364	60.7
Fisherman		3		56	59	9.8
Labor		37		9	46	7.7
Employee		54		12	66	11.0
Officer		2		1	3	0.5
Others		50		1	51	8.5
Unknown		2		9	11	1.8

did not treat their bednets with insecticide; of these, 511 respondents (94.3%) said that this was due to lack of distribution of the insecticide (Table 4).

Health education (Table 5)

Three hundred sixty-eight respondents (61.3%) thought that the explanation from our staff was the most effective to understand malaria. Concerning the cause of malaria, 477 respondents (79.5%) thought that a mosquito bite was the cause of malaria. Concerning the symptoms of malaria, 497 respondents (82.8%) thought that fever is the most common symptom of malaria, while 504 respondents (84.0%) thought that shivering is the most common symptom of malaria. Regarding the health education messages that had been conveyed during the project, the most impressive message was about using bednets while sleeping (33.8%) while the second most impressive message was to clean or to flush the stagnant water (31.8%).

DISCUSSION

According to the previous study of this region, the splenomegaly case rate varied from

Table 3
Responses to questions about treatment[a].

	Lombok	Sumbawa	Total	p
Before our project started, how did you treat malaria? (multiple-choice) (n=193)				
Do nothing	0	2	2	0.010
Go to health center	21	135	156	0.808
Go to traditional healer	10	24	34	0.176
Use modern medicine	4	30	34	0.176
Use traditional medicine	3	22	25	0.130
Others	1	3	4	0.021
After our project finished, how did you treat malaria? (multiple-choice) (n=156)				
Do nothing	1	1	2	0.013
Go to health center	12	112	124	0.795
Go to traditional healer	0	3	3	0.019
Use modern medicine	2	12	14	0.090
Use traditional medicine	1	19	20	0.128
Others	1	0	1	0.006

[a]Limited to those who were diagnosed with malaria.

Table 4
Questions about ITNs.

	Lombok	Sumbawa	Total
After our project finished, have you ever treated your bednets with insecticide? (yes-no)			
Yes	55	0	55
No	242	300	542
No answer	3	0	3
Total	300	300	600
Why did you neglect to treat bednet with insecticide? (multiple-choice question)			
No distribution of insecticide	223	288	511
Do not like insecticide	5	0	5
Feel no need to treat	0	3	3
Others	25	13	38

0% to 25.9%, and slide-positive malaria case rate varied from 0% to 33.9% (Dachlan *et al*, 2005). The slide positive rate for East Nusa Tenggara Province varied from 16.8% to 37.9% (Syafruddin *et al*, 2006). The survey results from this project were more similar to the latter than to the former rates. Over the course of the project, the number of malaria patients in the Meninting area of Lombok Island decreased significantly; although in the Utan Rhee area, Sumbawa Island, people were still anxious about malaria infection in spite of their readiness to go to a health center and the regular use of bednets. It can be suggested that the main reason for this difference is the behavior of different anopheles species and the differences in methods of capture of the vector (Kanbara H, personal communication, 2004).

The results indicated that many people

Table 5
Questions about knowledge of malaria causes and symptoms.

	Lombok	Sumbawa	Total	p (n=600)	95% CI
What was the most useful media to understand the disease of malaria? (multiple-choice)					
Leaflet	14	44	58	0.097	0.021 - 0.173
Wayang (Shadow picture)	96	12	108	0.180	0.108 - 0.252
Video	39	19	58	0.097	0.021 - 0.173
Nothing	11	8	19	0.032	(0.047) - 0.110
Direct to the health volunteer	158	210	368	0.613	0.564 - 0.663
Others	14	11	25	0.042	(0.037) - 0.120
What is the cause of malaria? (multiple-choice)					
Mosquito bite	240	237	477	0.795	0.759 - 0.831
Food and/or drink	38	91	129	0.215	0.144 - 0.286
Sit up late at night	41	87	128	0.213	0.142 - 0.284
Weather change	76	151	227	0.378	0.315 - 0.441
Ghost/spiritual reason	1	10	11	0.018	(0.061) - 0.098
Others	44	37	81	0.135	0.061 - 0.209
What is the most common symptom of malaria? (multiple-choice)					
Fever	233	264	497	0.828	0.795 - 0.861
Shivering	249	255	504	0.840	0.808 - 0.872
Headache	176	144	320	0.533	0.479 - 0.588
Fatigue	54	65	119	0.198	0.127 - 0.270
Back pain	51	30	81	0.135	0.061 - 0.209
Do not know	11	1	12	0.020	(0.059) - 0.099
Others	8	48	56	0.093	0.017 - 0.170
Do you still remember the message of health education for malaria? Please write the things? (open-ended)					
Use bednet while sleep	143	60	203	0.338	0.273 - 0.403
Clean up the water area	101	90	191	0.318	0.252 - 0.384
Use insecticide spraying	18	46	64	0.107	0.031 - 0.182
Go to health center when get malaria	33	4	37	0.062	-0.016 - 0.139
Malaria is infected by mosquito	10	0	10	0.017	-0.063 - 0.096
Do not sit up late at night	15	11	26	0.043	-0.035 - 0.122
Wear the long sleeved shirt	2	7	9	0.015	-0.064 - 0.094
Others	21	8	29	0.048	-0.030 - 0.126
Forget	24	7	31	0.052	-0.026 - 0.130

95% CI = 95% confidential interval

had not used bednets before the project began; for example, on Lombok Island, only two household had bednets. Possible explanations for non-use of bednets are, first, that they tended to sleep outside the house (Moji, 2004). Second, some adults had acquired immunity from malaria because they got malaria many times while they were children (Kanbara *et al*, 2004). A third reason could be economic. The cost constraints of preventive measures in malaria endemic areas have been well documented in different areas and countries (Barcus *et al*, 2002; Erhart *et al*, 2004; Tiensuwan *et al*, 2000). The fourth reason could be that they did not know how to prevent malaria.

It is very important to impregnate bednet with insecticide for malaria prevention (Ter Kuile *et al*, 2003). One of the most promising of malaria preventive tools is ITNs, which have been shown to reduce the number of infective mosquito bites by 70-90% in a variety of ecologic settings and to reduce all cause mortality among young children by 16-33% (Phillips-Howard *et al*, 2003; Zimmerman, 2003; Bhutta *et al*, 2005). Using ITNs is more cost-effective for preventing malaria than using DDT (Kamolratanakul *et al*, 2001). The apparent benefit of the project was that nearly all of the target population changed their behavior to sleep using a bednet, and many people maintain that habit. However many did not re-impregnate their bednets with insecticide. According to the respondents, if someone were to distribute the insecticide, they would be able to treat their bednets.

Experience has shown that health education interventions that aim to improve knowledge, or change attitudes and behaviors have an effect on the incidence and the severity of an illness. Studies of different diseases have also shown an association between health education and changes in attitudes or practices. In Bangladesh, mother's knowledge of vaccination had the strongest association with immunization of children (Rahman *et al*, 1995). It is well documented that health promotion is essential for the success of the control of filariasis (Ramaiah *et al*, 1996). Therefore, to help manage the malaria problem, good information is needed regarding the relationship between malaria and environmental factors (Dale *et al*, 2005).

The results of this study (Table 5) indicated that the knowledge that a mosquito transmits malaria (79.5%) was higher than other causes. According to previous research, about 50% of villagers had a similar response (Moji, 2004). The respondents remembered well how to prevent malaria.

Concerning educational effects, many respondents thought that the most effective means to improve their understanding about malaria was the explanation from the project staff. The researchers had thought that it would have been more impressive to use a combination of video and *wayang* (traditional shadow puppet play), and *sakeco* (traditional musical performances). However, many respondents reported that they preferred to listen to the health volunteers. Previous research of health education in Cambodian determined that it was more effective to use combined video and poster compared with only the poster (Denis, 1998). However, we can conclude that there is nothing better than one-to-one communication. Therefore, we can conclude that there should be an effort to improve the abilities to provide good malaria knowledge.

There were primarily two limitations of this study. One limitation was that, in a survey, the respondents are likely to give favorable responses or to respond in a way that they feel is expected when asked by project staff about their own project. The orientation of interviewers included this consideration. Nevertheless, some kinds of bias could not have been avoided. Another limitation was the lack of follow-up in-depth interviews or focus-group discussions that would further explore the issues under consideration. We considered that the most effective and accurate tool to do the evaluation was a KAP study. We did not have sufficient time to include the other methodologies. Future evaluations could usefully include these other methods.

In conclusion, the malaria control project in Lombok and Sumbawa Islands, which included active malaria case detection (with prompt treatment) and distribution of ITNs reduced malaria incidence and prevalence significantly on Lombok Island. However, the effects of the project were not as certain on Sumbawa Island. One possible reason was the different species of the major vectors. How-

ever, the perceptions, attitudes, miss-conceptions, ignorance, and risky behaviors of the local people in terms of malaria probably played key roles in the transmission of the disease. Poor socio-economic status and lack of school education were also important related factors. Therefore, health education, or behavioral change communication, is an essential component of malaria control. With health education, however, must come health services, such as treatment, active case detection, medical check-up (periodic monitoring survey), ITN provision, larva control, and other health services.

ACKNOWLEDGEMENTS

This work was conducted with the financial support of a grant-in-aid from the Ministry of Health Labor and Welfare (H17-Shinkou-3), Japan, and an International Cooperation Research Grant (16P1) from the International Medical Center of Japan. We would like to thank the Nusa Tenggara Barat health officers, Meninting Health Center members, Utan Rhee Health Center members, and all participants in this research project for their time and cooperation.

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