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MALARIA TRANSMISSION ALONG THAI-MYANMAR BORDER

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ABSTRACT

Malaria, the world's most prevalent vector-borne disease, is currently an endemic in 92 countries. Prompt diagnosis, appropriate treatment, and the use of bed-nets can reduce malaria cases. However, malaria control can be complicated in certain areas because of poverty, diversity of ethnicity, and language barriers, especially of the migrants.

The objectives of this study were to determine the risk factors of malaria in the migrants along the Thai-Myanmar border in Tak Province in terms of descriptive epidemiology and to identify the association between these risk factors and malaria occurrence, then synthesizing these risk factors into training program.

The study was conducted from April to November 2006 using qualitative and quantitative research methods.

The particular ethnic population of concern to Thailand is those Burmese who have recently migrated to Thailand. They have a life in a high risk area, poor socioeconomic status, and poor hygiene practices. Moreover, the illegal passage of the Burmese migrants into Thailand has made them afraid of being arrested. In 2006, of the 9,351 Burmese migrants' cases, only 0.9% made a recovery. The low percentage of Burmese migrants that made a full recovery from malaria is attributed to their inability to follow through with all of the requirements on the malaria treatment after the initial diagnosis. Failure by the migrants to follow through with the full malaria treatment leads to severe malaria and drug resistance. Knowledge of participants were statistically improved by training program ($t = 22.02$, $df = 99$, p-value < 0.001).

Keywords: Malaria, Thai-Myanmar border, migrant.

INTRODUCTION

Malaria, the world's most prevalent vector-borne disease, is currently an endemic in 92 countries. Approximately 41 % of the world's population is at risk, and each year an additional 300 million to 500 million clinical cases occur. Worldwide, approximately two million deaths per year can be attributed to malaria, half of these in children under the age of five (WHO, 2000).

The Mekong region, especially Thailand, is an area of substantial malaria transmission as a result of the migration of people from neighboring countries. Malaria remains a significant problem for the people

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living along Thailand's western and eastern borders, where the most severe cases of malaria often end with fatality. The two main species of malaria found in this area are Plasmodium falciparum and P. vivax. The most resistant malaria parasites in the world are now found on the Thai-Myanmar border (White et al., 1999)

Prompt diagnosis, appropriate treatment, and the use of bed-nets can significantly reduce the chances of other people becoming infected with malaria. However, malaria control can be complicated in certain areas because of poverty, diversity of ethnicity, and language barriers, especially of the migrants who continually find it difficult to get access to the health service system (Wernsdorfer, 1994). In addition, migrants usually have little or no immunity to malaria when they migrate to endemic or high risk areas where highly efficient infectious vectors can lead to the revival of the disease (Matens and Hall, 2000).

In Thailand, there are many programs currently employed to help control the spread of malaria. These include public information, health education, surveillance, anti-vector measures, anti-parasite measures and entomology activities, and epidemiological evaluation. The ultimate success of malaria control is dependent on the ability to change the personal protective behavior of those individuals most at risk. However, these programs are considered to be underutilized. Those migrants that come into Thailand illegally from neighboring countries are reluctant to use the health services that are available to them for fear of being arrested. As a result of delaying appropriate treatment, this group of people has become the most important factor attributing to increased malaria infection and transmission (Sirilak, 2001).

Cultural traditions and lifestyle are major factors that influence health risk, health promotion, and health behavior (Green and Kreuter, 1999). Understanding the epidemiology of malaria patterns as well as understanding the cultural traditions among the migrant population can be another step in finding the proper approach for controlling the transmission of malaria among this group of people.

The objectives of this study were to determine the risk factors of malaria in the migrant populations along the Thai-Myanmar border in Tak Province in terms of descriptive epidemiology and to identify the association between these risk factors and malaria occurrence, then synthesizing these risk factors into training program that could help reduce the risk of malaria transmission.

MATERIALS AND METHODS

Study design and population

A cross-sectional epidemiological descriptive study was designed to investigate the dynamic target population living in endemic areas of malaria outbreak. The participants were selected from the migrant foreign nationals living along the Thai-Myanmar border area in Tak Province. Training activities were developed to educate 100 migrants living in the Mae Sot District within the Tak Province. The selection of participants was based upon the inclusion criteria of being those migrants with a firm commitment to attend all of the training activities.

Data collection

The study was conducted from April to November 2006, to determine socio-demographic and behavioral factors associated with malaria infection among the migrant population. This study incorporated the use of the following qualitative and quantitative research methods: epidemiologies of malaria patterns were explored. Data were collected from the Disease Prevention and Control Office; the Vector-Borne Disease Control Center; the Vector-Borne Disease Control Unit; Health Center; Malaria Clinic; and Malaria Post. Questionnaires and check lists were used to conduct quantitative survey on malaria prevention and treatment behaviors. In-depth interviews and participatory observations were conducted on the cultural traditions, lifestyle, and health belief from various ethnic-populations who had migrated into Mae Sot District, Tak Province. In-depth interviews were conducted with the public health officers residing in Mae Sot District to discuss

which malaria control measures were currently employed. Risk factors were synthesized into training programs for the participants that can eventually be used by the whole population at risk along The Thailand-Myanmar border. Training program and evaluation were conducted.

Data analysis

Questionnaires were checked for the completeness of the data. Multiple choice questions were coded and recorded on a statistical program (SPSS version 11.5). Quantitative data were analyzed using descriptive statistics and paired t-test. Data collected from in-depth interview and participatory observation were coded as qualitative data by typology and taxonomy.

RESULTS

1. Epidemiology of malaria patterns

Data from the Vector-Borne Disease Control Center in Mae Sot, Tak Province showed that out of 5,988 patients studied from October 2005 to April 2006, 52.2 % were Burmese migrants; 26.9 % were Thai; and 21% were hill tribes. Five districts in Tak Province with the highest number of malaria cases include Tha Song Yang, Mae Sot, Phop Phra, Umphang, and Mae Ramat, respectively. In 2006, 17,918 malaria patients living in the Tak Province made a recovery. Out of 4,812 Thai malaria cases, 70.3 % made a recovery; out of 3,755 hill tribe malaria cases, 67.1% made a recovery; and out of 9,351 Burmese migrants' cases, only 0.9% made a recovery (Table 1). The rather low percentage of Burmese migrants that made a full recovery from malaria is attributed to their inability to follow through with all of the requirements on the malaria treatment after the initial diagnosis. Failure by the migrants to follow through with the full malaria treatment most often leads to a more severe case of malaria in the future which will be resistant to previously used drugs.

The data from the Disease Prevention and Control Office showed 50.3 % of the patients were farmers, 27.2% were students, and 15.4% were labors,

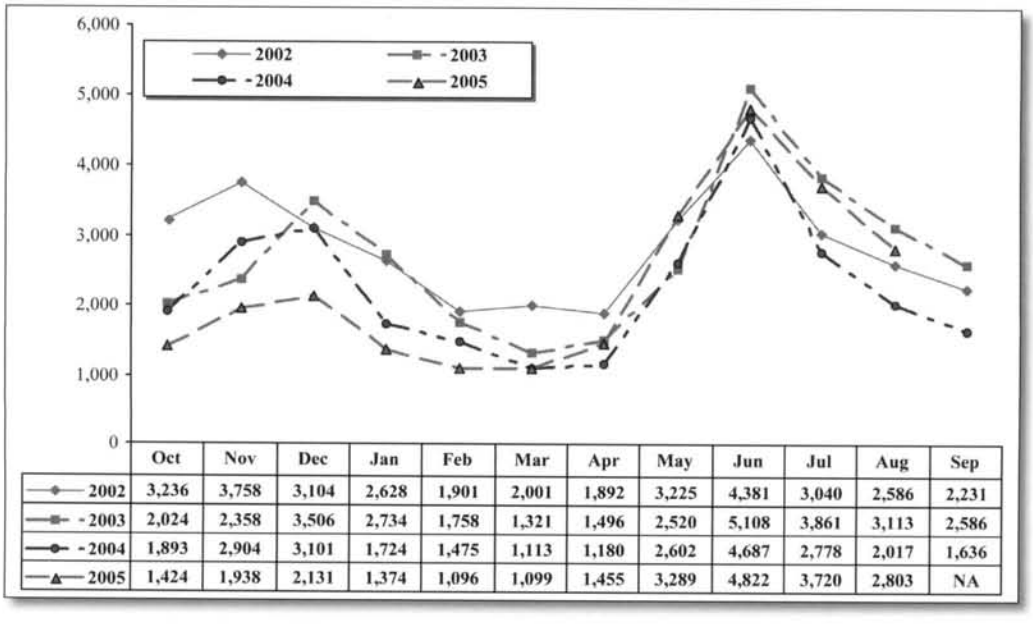
Table 1. Number of malaria patients and patient recoveries in Tak Province from October 2005 to April 2006.

No.	Area (District)	Thai patients		Hill tribe patients		Burmese migrant patients		Total	
		Cases	Recovered cases (%)	Cases	Recovered cases (%)	Cases	Recovered cases (%)	Cases	Recovered cases (%)
1	Mae Sot	895	648 (72.4)	597	516 (86.4)	2,809	0	4,301	1,164 (27.1)
2	Phop Phra	444	284 (64.0)	140	101 (72.1)	3,116	0	3,700	385 (10.4)
3	Umphang	602	347 (57.6)	635	393 (61.9)	1,414	55(3.9)	2,651	795 (30.0)
4	Mae Ramat	491	331 (67.4)	203	116 (57.1)	418	0	1,112	447 (40.2)
5	Tha Song Yang	2,284	1,713(75.0)	2,178	1,391(63.9)	1,588	26(0.3)	6,050	3,130 (51.7)
6	Mueang Tak	38	29 (76.3)	0	0	6	5(83.3)	44	34 (77.3)
7	Ban Tak	10	8 (80.0)	2	2 (100)	0	0	12	10 (83.3)
8	Wang Chao	48	23 (47.9)	0	0	0	0	48	23 (47.9)
9	Sam Ngao	0	0	0	0	0	0	0	0
	Total	**4,812**	**3,383 (70.3)**	**3,755**	**2,519 (67.1)**	**9,351**	**86 (0.9)**	**17,918**	**5,988 (33.4)**
	Percentage of cases	**26.9**		**21.0**		**52.2**		**100**	

as shown in Table 2. Figure 1 illustrates the temporal pattern of malaria epidemic among migrants in Thailand from 2002 to 2005 which were high in the rainy season and found to be the highest in June.

Table 2. Number of malaria cases in Tak Province from September 2005 to September 2006 classified by the occupation of the patients.

Occupation	Number of patients	Percentage of patients
Farmers	12,025	50.3
Students/Children	6,502	27.2
Laborers	3,682	15.4
Stay at home (house wives)	382	1.6
Monks	383	1.6
Soldiers	263	1.1
Sellers/venders	215	0.9
Government officers	215	0.9
Teachers	96	0.4
Others	143	0.6
Total	23,906	100



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2002	3,236	3,758	3,104	2,628	1,901	2,001	1,892	3,225	4,381	3,040	2,586	2,231
2003	2,024	2,358	3,506	2,734	1,758	1,321	1,496	2,520	5,108	3,861	3,113	2,586
2004	1,893	2,904	3,101	1,724	1,475	1,113	1,180	2,602	4,687	2,778	2,017	1,636
2005	1,424	1,938	2,131	1,374	1,096	1,099	1,455	3,289	4,822	3,720	2,803	NA

Figure 1. The temporal pattern of malaria epidemic among migrants in Thailand.

2. In-depth interview and participatory observation on migrants' lifestyle

The particular ethnic population of concern to Thailand is those Burmese's who have recently migrated to Thailand. They have experienced a life in a high risk area, poor socioeconomic status, and poor hygiene practices. In addition, the illegal passage of the Burmese migrants into Thailand has made them afraid of being arrested. As a result, many migrants delay receiving appropriate medical treatment, which can lead to a future case of severe malaria that will be resistant to previously used drugs. These persons did not use mosquito nets and other malaria protection measures because of the lack of knowledge and concern. Many had situated their home near stagnant or slow moving water, a favorite breeding ground for anopheline mosquitoes. Most of the Burmese migrants congregate around their homes in the evening for dinner and social activities without personal protection, at the same time the anopheline mosquitoes are seeking blood.

3. In-depth interview on malaria control measures

The in-depth interview data collected from public health officers regarding malaria control measures showed that they were continually lacking the proper medicine and malaria treatment supplies to keep up with increasing demand. The policy emphasized by the Vector-Borne Disease Control Center is insecticide residual spraying. However, this measure is not suitable for the most at risk population that continually moves from one place to the other. There are many agencies in Tak Province currently working on malaria control, however, without effective communication between agencies, the benefit of synergy amongst the agencies to solve the malaria plight does not exist (Figure 2).

4. Training program development

Training program conducted in this area was specific to lifestyle and occupations of the population. These programs incorporate a number of long- and short-term opportunities to provide multidisciplinary training for Burmese migrants and Hill tribe population. Both local and regional malaria experts contributed to the training program. The health volunteers from Malaria Clinic were invited to be the educators. The malaria training course was disseminated to all major health care institutions throughout the local area. The training program was focused on the following topics: knowledge about malaria disease; knowledge about the vectors of malaria; knowledge about how to prevent malaria; knowledge about the places to treat malaria after infection. Evaluation of the individual performance of the course participants was based on the assessment of pre- and post-tests. Statistical difference was assessed by paired t-test ($t = 22.02$, $df = 99$, p-value < 0.001), with the average of pre-test score of 3.66 and the average of post-test score of 6.73 (out of 10) (Table 3).

DISCUSSION

Population movement, particularly short-term migration to the forest area, contributed substantially to the prevalence of malaria in Tak Province. The work done by the migrant worker can be characterized by difficulty, dirty, and distance (Bloland and Williams, 2003). The nature of the work done by migrant farmers, which requires them to be in the fields until the harvest is complete, keeps them from using such malaria prevention measures as bed nets, and causes them to delay appropriate treatment once they are infected. Children who followed their parents to work in the farms or in the rice fields was another major population found suffering from malaria infliction.

Laborers moving back and forth across the Thai-Myanmar border many times were found to delay appropriate medical treatment. In addition, most Burmese migrant patients did not return for the follow-up blood test because a majority came into Thailand illegally and feared of being arrested. This was especially apparent in the Mae Sot and Phop Phra Districts. As a result, only 0.9% of Burmese migrants made a full recovery from malaria (Table 1). This resulted in increased patient suffering and increasing the risk of developing severe malaria that can be easily passed on to other.

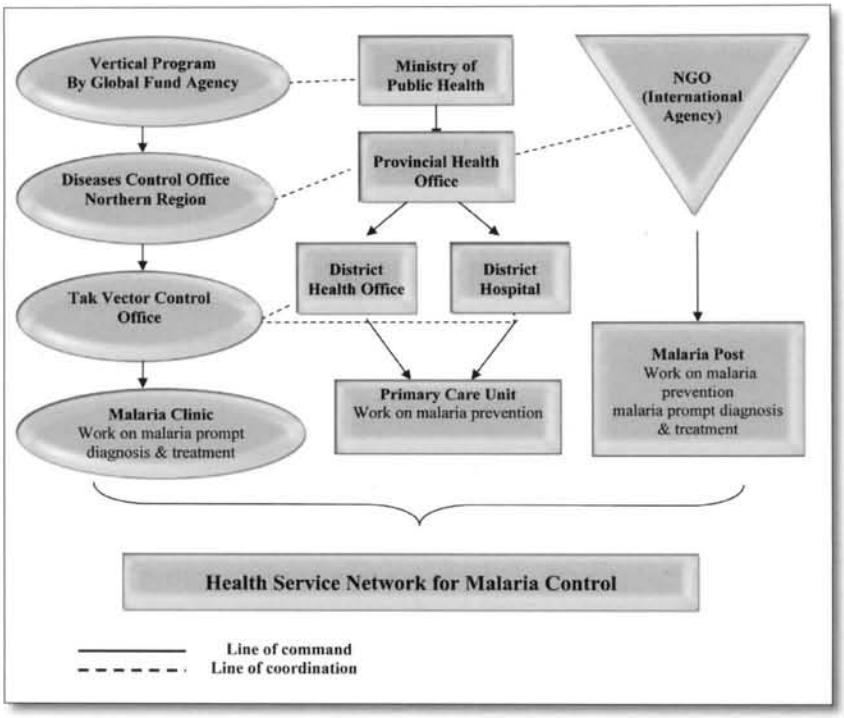


Figure 2. Organization chart of agencies working on malaria prevention in Tak Province, Thailand.

Table 3. Pre- and post-training levels of knowledge about malaria for all individuals in Tak Province, Thailand (n=100)

Questions	Pre-test (n) %	Post-test (n) %
1. If you or your child has fever, headache, and chills, what is the disease?	54 (54)	86 (86)
2. How is malaria transmitted?	47 (47)	77 (77)
3. How can you prevent malaria?	39 (39)	74 (74)
4. Where should you go for malaria treatment?	38 (38)	69 (69)
5. When is anopheline mosquito seeking blood?	28 (28)	54 (54)
6. People who live and work in the forest can get malaria	33 (33)	67 (67)
7. Malaria can lead to death	49 (49)	73 (73)
8. Malaria can be treated with the right drugs and right dose	33 (33)	67 (67)
9. Diagnosis of malaria is performed using a drop of blood	24 (24)	54 (54)
10. Stagnant water promotes the occurrence of malaria	21 (21)	52 (52)
**Means and standard deviations of knowledge score	3.66 ± 0.78	6.73 ± 1.27

* One point was given for any correct answer, 0 point was given for an incorrect answer
Correct answers to the questions are: 1. Malaria, 2. Mosquito bite; 3. Sleep in the bed-net and prevent from mosquito bite; 4. Malaria post and malaria clinic; 5. In the evening and at night; 6. True; 7. True; 8. True; 9. True; 10. True.
**Plus-minus values are means ± standard deviations (SD).
***All pre- and post-intervention differences were significant ($P < 0.001$).

Training programs that were developed for taking care of patients with severe malaria in the Mekong countries can be sustained if there is cooperation among local organizations, regional organizations, and national organizations. The ability to give prompt treatment to malaria patients in Thailand also depends on the Ministry of Public Health in cooperation with Government Pharmaceutical Organizations to produce more medicine at an affordable price. Insecticide spraying should be performed during the rainy season (from May to July) in order to reduce the number of anopheline mosquitoes. The temporal pattern of malaria epidemic is always the highest during the rainy season; June having the most recordable malaria cases. Future work will include the development of malaria prevention measures for Burmese migrants along the Thai-Myanmar border.

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REFERENCES

Bloland, P.B. and Williams, H.A. 2003. *Malaria Control during Mass Population Movements and Natural Disasters.* The National Academy Press, Washington, DC. pp 3-5.

Green L.W. and Kreuter, M.W. 1999. *Health Promotion Planning: An Educational and Ecological Approach 3rd edition.* Mountain View, California: pp 12-25

Matens, P. and Hall, L. 2000. Malaria on the move: Human population movement and malaria transmission. *Perspectives* 6(2): 103-109.

Sirilak, S. 2001. *Situation Analysis of the Existing Health Service Facilities for Malaria Diagnosis and Treatment in the Border Area of Tak Province, Thailand.* Master Thesis in Primary Health Care Management, the Faculty of Graduate Studies, Mahidol University, Bangkok, Thailand.

Wernsdorfer, H.W. 1994. Epidemiology of drug resistance in malaria. *Acta Tropica* 56: 143-56.

White, N.J., Looareesuwa, S., Nosten, F., and Marsh, K. 1999. Malaria: averting a disaster. *Lancet* 353: 1965-1967.

World Health Organization. 2000. *WHO Expert Committee on Malaria: Twentieth Report.* Geneva, Switzerland.