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Health Status: Malaria, Anemia and Intestinal Parasitic Infections on the Thai-Myanmar Border

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Abstract

We report a study of the health status of Sai Yok people living in Kanchanaburi Province, western Thailand, on the Thai-Myanmar border. Our report focused particularly on malaria, anemia, and intestinal parasitic infections. Falciparum malaria appeared not to be seasonal, with the prevalence in the dry month of February 2003 similar to the wet month of July 2003. In the first survey in February 2003, the prevalence of *P. falciparum* and *P. vivax* was 0.1 and 0.5%, respectively. A second survey was conducted in July 2003, when the prevalence of *P. falciparum* was 0.4% and *P. vivax* 0.6%. There was no difference in malaria prevalence between dry and rainy seasons. In February, anemia in malaria patient was only found in one asymptomatic falciparum malaria patient (0.1%), whereas in July, anemia was not found in any malaria patient.

Intestinal parasites were found in 398 (67.8%) of 587 people presenting for stool examination in February. The three most frequently found intestinal parasites were *Entamoeba coli* (19.4%), *Giardia lamblia* (13.1%), and *Endolimax nana* (10.0%). One month later, after the results of stool examinations had been obtained, antiparasitic drugs and health education were given to the infected population. In July, a second survey was conducted, and intestinal parasites were found in 323 (25.8%) of people coming for stool examination (n = 1,252). The three most frequently found intestinal parasites were *E. coli* (10.4%), *G. lamblia* (4.1%), and hookworm (2.2%). The prevalence of intestinal parasitic infections were reduced markedly from 67.8% in the first survey to 25.8% in the second survey ($p < 0.05$).

In summary, the prevalence of malaria and anemia was low (< 2%) among the Sai Yok people. There was a high, but falling, rate of intestinal parasitic infections.

Keywords: malaria, anemia, intestinal parasites, Thai-Myanmar

Introduction

Thailand's western border with Myanmar is made up of forest fringe foothills. This terrain presents numerous problems for the control of malaria transmission. Malaria among foreign laborers is a major obstacle to the control program, although the number of reported cases declined significantly in 2000 [1]. Malaria is localized in three main areas; the Thai-Myanmar border, the

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Thai-Cambodian border and the central part of the southern peninsula. There are two annual peaks of malaria transmission in Thailand; June to August and October to November. These peaks are related to the rainy season and the prevalence of major vectors. Approximately 50% of malaria cases were caused by *P. falciparum* in the year 2000, compared with 90% in 1994. Since 2002, more than 70% of the total cases of malaria in Thailand has been reported from the border provinces, with 20% from Kanchanaburi Province on the Thai-Myanmar border [2].

Intestinal parasitic infections also pose a threat to public health in Thailand, particularly in remote communities of low economic status, such as those in border areas.

Sai Yok District in Thailand is close to Myanmar. Most of the people there have come from other countries, particularly Myanmar, Bangladesh, and Pakistan. Many of the inhabitants are poor immigrants who work as laborers in the forest or on farms near the forest. The objective of this study was to evaluate the health status of Sai Yok people in western Thailand with an emphasis on malaria, anemia, and intestinal parasitic infections.

Materials and methods

Study sites

The study was conducted at four villages in Bongtee subdistrict, Sai Yok District, Kanchanaburi Province.

Study subjects and specimen collections

Cross-sectional studies were conducted in February and July, 2003 at the same study sites. Blood and stool samples were collected from people willing to participate in the study and each individual was questioned about signs and symptoms of malaria. Blood and stool specimens were also taken at health centers and schools. Children were taken by their parents or school teachers for health check-ups, blood examinations for malaria and anemia, and stool examinations.

Giemsa-stained thick and thin blood films were examined at x700 magnification by well-trained, experienced microscopists from the Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University. Blood samples were also evaluated for anemia, defined as hemoglobin <10 g/dl or hematocrit <30%. In February and July 2003, 834 and 868 people, respectively, were examined for malaria. Stools from 587 people in February and 1,252 in July were examined by Kato-Katz technique. Antiparasitic drugs according to national policy, and health education, were given to those people with positive parasite infections one month after the first survey. Some persons in the first and second surveys were the same individuals.

Statistical analysis

The Mann-Whitney *U* test was used to compare groups, and differences <0.05 were considered significant. Proportions were compared by Chi-square test with Yates correction, or Fisher's exact test, as appropriate. All statistical analyses were performed using the statistical computer package Epi-Info (version 6; Centers for Diseases Control and Prevention, Atlanta, GA).

Results

The studies were conducted in Bongtee subdistrict, about 26 km from Sai Yok District, Kanchanaburi Province, along the Bilauktaung Range (Tenasserim or Tanoasri), which is near the centers of Thailand and Myanmar. There are about 2,000 inhabitants in Bongtee subdistrict, of whom Thai, Mon, Karen, Bangladeshi, and Pakistani comprise the local population. Since the study sites were at the international border, many people migrated across the border and worked there. Most adults could not speak Thai, while many children and young adults could. Most of them were poor. Their main occupations were gardeners, farmers, woodcutters and laborers. Houses or huts in the study sites were grouped into four villages along the main road and surrounded by forest. There was no doctor, nurse, dentist, pharmacy, pipeline water supply or sewage system. Drinking water mainly came from ponds or canals in the villages, and many of them did not boil water before drinking. Some houses had latrines, some houses or huts did

not. Socio-demographic characteristics of the study subjects, such as age distribution, gender, occupations were not analyzed in this study.

Table 1 shows that the prevalence of malaria infection was similar in dry (February) and wet (July) months. The comparative prevalence of falciparum and vivax malaria in the two seasons was not significantly different. In February, no child had falciparum malaria and no adult had vivax malaria. The prevalence of falciparum and vivax malaria was low in the dry month (0.1 and 0.5%, respectively) and remained low in the wet month (0.4 and 0.6%, respectively).

Table 2 shows the prevalence of anemia. There was no significant difference of anemia in the two studies. In February, anemia in malaria patient was only found in one asymptomatic falciparum malaria patient (0.1%), whereas in July, anemia was not found in any malaria patient.

Table 3 shows the prevalence of intestinal parasites. In February, 398 of 587 people (67.8%) had parasitic infections, and many of them had multiple parasitic infections. Thirteen and 15 species of parasites were found in the first and second surveys, respectively. The three parasites most frequently found were *Entamoeba coli, Giardia lamblia*, and *Endolimax nana*. One month after the first survey in February, and after stool examination results has been obtained, antiparasitic drugs according to the national policy, and health education, were given. In the second survey in July, 323 of 1,252 people (25.8%) had parasitic infections; the three most frequently found parasites were *E. coli, G. lamblia*, and hookworm.

Table 1 Prevalence of malaria.

Survey	People*	No. examined	No. positive (%)		
			P. falciparum	*P. vivax*	*P. malariae*
February 2003	Children	585	0	4 (0.7)	0
	Adults	249	1 (0.4)	0	0
	Total	834	1 (0.1)	4 (0.5)	0
July 2003	Children	674	2 (0.3)	3 (0.4)	1 (0.2)
	Adults	194	1 (0.5)	2 (1.0)	1 (0.5)
	Total	868	3 (0.4)	5 (0.6)	2 (0.2)

* Children aged <15 years; adults aged ≥15 years.

Table 2 Prevalence of anemia*.

Survey	People**	No. examined	No. positive (%)		
			anemia	falciparum malaria with anemia	vivax malaria with anemia
February 2003	Children	486	3 (0.6)	0	0
	Adults	236	6 (2.5)	1 (0.4)	0
	Total	722	9 (1.2)	1 (0.1)	0
July 2003	Children	512	6 (1.2)	0	0
	Adults	179	5 (2.8)	0	0
	Total	691	11 (1.6)	0	0

* Anemia defined as hemoglobin <10 g/dl or hematocrit <30%.

** Children aged <15 years; adults aged ≥15 years.

Table 3 Prevalence of intestinal parasitic infection in the first (February 2003) and the second (July 2003) surveys.

Species	No. positive (%)	
	1st survey (n = 587)*	2nd survey (n = 1,252)*
Ascaris lumbricoides	14 (2.4)	13 (1.0)
Blastocystis hominis	30 (5.1)	15 (1.2)
Dientamoeba spp	0	1 (0.1)
Echinococcus spp	0	1 (0.1)
Endolimax nana	59 (10.0)	41 (3.3)
Entamoeba coli	114 (19.4)	130 (10.4)
Entamoeba histolytica	50 (8.5)	15 (1.2)
Entamoeba hartmanni	2 (0.3)	0
Enterobius vermicularis	1 (0.2)	1 (0.1)
Giardia lamblia	77 (13.1)	51 (4.1)
Hookworm	25 (4.3)	27 (2.2)
Iodamoeba butschlii	5 (0.8)	3 (0.2)
Minute intestinal fluke	0	1 (0.1)
Sarcocystis spp	1 (0.2)	1 (0.1)
Trichuris trichiura	14 (2.4)	19 (1.5)
Chilomastix mesnili	6 (1.0)	4 (0.3)

* Most people had multiple parasitic infections.

Discussion

Kanchanaburi is a malaria-endemic area in western Thailand. Many people live along the international border, which is forested and endemic for the disease. Malaria prevalence in the general population of Sai Yok District was stable and low in the rainy month of July and in the dry month of February. One possible reason was that the widespread use of effective antimalarials, particularly artemisinin derivatives, in the border areas had reduced malaria gametocyte transmission rates. The lower malaria prevalence recorded in Sai Yok than in other border areas, such as Mae Sot in Tak Province, may be attributable to the lower number of people migrating across the border in Sai Yok. In addition, field microscopy is an inefficient method for malaria surveillance in western Thailand because the prevalence is low [3].

Anemia rates were less than 2% in both surveys and only one falciparum malaria patient was anemic. Anemia showed no seasonal variation in this study. The intensity of intestinal infections, such as hookworm, was not assessed during the study. Other factors related to anemia should be further investigated. High prevalence rates of many kinds of intestinal parasites that are predominantly transmitted via the fecal-oral route are indicative of poor living conditions [4] and low standards of hygiene among border people [5-6]. The lower prevalence of intestinal parasites in the second survey (25.8%) compared to the first survey (67.8%) may partly have resulted from previous antiparasitic treatment given to some individuals who attended both studies, and sanitation education. However, judging by the high rates of parasitic infections in this study, more preventive and control measures in this community are required. Nearly all parasite species are transmitted by ingesting infective stages contaminating water, vegetables, or hands [5]. Chemotherapy must be used to minimize the intensity of infection, and eliminate parasites. Health promotion by means of health education should aim to promote good personal hygiene in at-risk populations [6]. Sanitation to prevent parasite transmission must be improved and may include the provision of safe drinking water and proper latrines.

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