

# MALARIA AND ENTEROBIASIS AMONG KAREN LONG-NECK TRIBE IN MAE HONG SON PROVINCE

Choosak Nithikathkul<sup>1</sup>, Panida Polseela<sup>5</sup>, Wilawan Poodendan<sup>5</sup>, Marc Brodsky<sup>7</sup>, Derek Rakprapant<sup>2</sup>,  
Suparp Chadchatreechan<sup>6</sup>, Aree Phetheart<sup>8</sup>, Yaowalark Sukthana<sup>3</sup> and Somjai Leemingsawat<sup>4</sup>

<sup>1</sup>Department of Biological Science, <sup>2</sup>Department of Mathematics and Statistics, Faculty of Science and Technology, Huachiew Chalermprakiet University, Samut Prakan; <sup>3</sup>Department of Protozoology, <sup>4</sup>Department of Medical Entomology, Faculty of Tropical Medicine, Mahidol University, Bangkok; <sup>5</sup>Department of Microbiology and Parasitology, Faculty of Basic Medical Science, Naresuan University, Phitsanulok; <sup>6</sup>Vector-borne Disease Control Unit No.8, Mae Hong Son, Thailand; <sup>7</sup>United States Naval Hospital, California, USA; <sup>8</sup>Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, UK

**Abstract.** In Thailand, Mae Hong Son Province is highly endemic for malaria. Knowing this, the local Health Department has introduced a program to educate local residents about the risk factors, in particular the dangers and symptoms of malaria. This study was conducted to evaluate these efforts, by determining the number of malaria infections in a segment of the population, and also by testing for enterobiasis among a group of its children. Two villages in Mae Hong Son Province were chosen for this purpose with a combined population of about 300. Of these, 195 were screened for malaria. Two subjects were diagnosed positive for malaria by microscopy. One of these two villages was chosen to screen for *Enterobius vermicularis* infection in children as well. Out of 69 stool samples, five (7%) showed infection with *E. vermicularis*: three with a low number of eggs (1-50), and two with a high number of eggs (>100). Compared with infection rates in similar studies, the results of this study indicate that the Health Department's efforts are meeting with relative success. The low prevalence of infection indicates that the villagers are using the information they have received to help combat infection.

## INTRODUCTION

Malaria is still one of the important infectious diseases in Thailand, despite decades of successful control programs and dramatic reductions in morbidity and mortality. While deforestation has pushed malaria out of many regions of Thailand, malaria remains most prevalent along the underdeveloped borders of Thailand and eastern Myanmar, western Cambodia and northern Malaysia. Based on the malaria surveillance activities in Thailand from 1985-1998, recorded malaria cases in Thailand totaled 275,443 in 1985, peaking at 349,291 cases in 1988, and declining thereafter 85,625 cases in 1995 (Chareonviriyaphap *et al*, 2000). The current study was undertaken to assess the prevalence of malaria in the Karen Long-neck population.

Helminth infections are a major health problem worldwide. The following estimates are based on those of the World Health Organization between 1975-1986. Clonorchiasis and opisthorchiasis: 19 million infected;

paragonimiasis: 3.2 million; fasciolopsiasis: 10 million; ascariasis: 1 billion; hookworm: 900 million; trichuriasis: 500-800 million; and strongyloidiasis: 35 million infected. *Enterobius vermicularis* is particularly widespread among school-aged children. Several studies were carried out in urban slum areas in Bangkok, showing a rate of infection varying from 53% to around 65% (Vajarasthira and Harinasuta, 1960; Tepmongkol *et al*, 1980). Studies of pre-school aged children in Khon Kaen Province, in the northeastern region of Thailand, indicated that the prevalence was 50.9% (Kaewkes *et al*, 1983). A study in Nakhon Pathom Province, an urban area adjacent to Bangkok, exhibited a prevalence rate of 38.2%. A cross-sectional survey in primary school students in Bang Phli District, Samut Prakan Province, Thailand showed that the prevalence of *E. vermicularis* was 38.8% (Nithikathkul *et al*, 2001b) and 21.9% (Nithikathkul *et al*, 2001a). However, no researcher has evaluated the epidemiology of helminth infections in the Karen Long-neck tribe that lives in Mae Hong Son Province. The present study was aimed to determine the prevalence of *E. vermicularis* in children in the Karen Long-neck tribe in Mae Hong Son Province.

## MATERIALS AND METHODS

### Study sites

The study was carried out among Karen Long-neck

---

Correspondence : Choosak Nithikathkul, Department of Biological Science, Faculty of Science and Technology, Huachiew Chalermprakiet University, Samut Prakan 10540, Thailand.

Tel: 66 (0) 312630; Fax: 66 (0) 3126237

E-mail: choosak@hcu.ac.th

tribe in two villages (Nai Soi and Huai Saw Taw) in Mae Hong Son Province, a northern province 750 km from Bangkok, Thailand. The total estimated population in Nai Soi Village and Huai Saw Taw Village was 300. The socioeconomic situation in both villages was poor *ie* houses were made of wood and bamboo. The main occupations of villages are making souvenirs for sale.

### Enterobiasis diagnostic methods

For enterobiasis, the children enrolled in the study were between one and ten years of age, and were drawn from Nai Soi Village. A total of 69 children were examined. The investigator interviewed the parents for information concerning the personal data of the children and the family's socioeconomic status, *ie* parents' occupations and number of children in the family. The data were collected from the children as they entered the testing site. The total population (212) comprised 93 males and 119 females. The parents were asked to assure that the children did not bathe before collecting specimens. Diagnosis was done by using a two by six centimeter rectangle of transparent tape. The adhesive side of the transparent tape swab was placed on the perianal skin, pulled off and placed, adhesive side down, onto a labeled slide. The slides were collected and taken to the laboratory for assessment. The slides were then examined under a light microscope for the presence of *E. vermicularis* eggs. Slides containing eggs with viable larvae resulted in a positive diagnosis. A slide with 50 eggs or lower was rated as a low level of infection, whilst 51-100 eggs and more than 100 eggs per slide were rated as medium and high levels, respectively.

### Malaria diagnosis

Blood samples were collected from 195 villagers after informed consent was obtained. The ages of the subjects ranged from 3 months in Nai Soi and eighty years in Huai Saw Taw. Overall, 195 blood samples were collected, 82 from male subjects and 113 from female subjects. Blood slides (thick film) were prepared by finger-prick, air dried, and read after Giemsa staining using a light microscope with a x100 oil immersion lens. The same procedures were used for slides from the Health Center and from the community survey.

## RESULTS

### Prevalence of enterobiasis

The demographic information of respondents showed that over a half (56.1%) of the 212 respondents were female and the number of children in each family

Table 1  
Demographic information of respondents.

Characteristics	No.	%
Total respondents	212	100.0
Male	93	43.9
Female	119	56.1
Number of children in each family		
1-5	33	47.8
6-10	29	42.0
Not known	7	10.2

was mostly 1-5 (47.8%) (Table 1). The majority parental occupation in the villages was laborer (43.5%) and unemployed (42.0%). More individual house ground floors were made of soil and wood than soil mixed with grass and wood (Table 2). Parental education in this area was at an illiterate level (data not shown). The enterobiasis rate of females was higher than males (Table 2). The age group 3-6 years had the highest observed prevalence in this study.

### Prevalence of malaria

Table 3 shows the infection rate of malaria by respondents' characteristics. Among 195 respondents, 58% were female. The majority of the people in the villages were 1-10 years of age (40%). Two malaria cases (1%) were found. The first case was a 6-year girl with asymptomatic malaria. The second case was a 23-year old man, who had fever a few days before blood examination. Both cases were positive for *P. vivax*.

## DISCUSSION

This study reveals an enterobiasis rate of 7.3% among children from Karen Long-neck villages in Mae Hong Son Province, Thailand. The overall prevalence was lower than a report from Khon Kaen Province (50.9%) in 1983 (Kaewkes *et al.*, 1983), and in the slum areas of Bangkok in 1980 (53.4%) (Tepmongkol *et al.*, 1980). Khon Kaen Province is in the northeastern region of Thailand, which is lagging economically behind Bangkok and other more developed areas of Thailand. We did, however, find similar results to a study done in the urban areas of Nakhon Pathom Province in 1992 (38.6%) (Wahah and Ratanaponglakh, 1992). We only focused on children because the earlier studies (Tepmongkol *et al.*, 1980; Nithikathkul *et al.*, 2001c) found the highest prevalence was in 6 to 8-year-olds. Either social or environmental

Table 2  
Infection rates of enterobiasis and levels of infection by respondents' characteristics.

Characteristics	Examined cases	Total infected cases (%)	Level of infection	
			Low (%)	High (%)
<b>Sex</b>				
Male	34	1 (2.9%)	0	1 (2.9%)
Female	35	4 (11.4%)	3 (8.6%)	1 (2.9%)
<b>Age (years)</b>				
1-2	21	1	1	0
3-6	21	4	2	2
6-8	19	0	0	0
8-10	8	0	0	0
<b>Occupation of parents</b>				
Laborer	30	0	0	0
Agriculture	3	0	0	0
Unemployed	29	5	3	2
<b>Ground floor characteristics</b>				
Soil and wood	45	3	1	2
Soil mixed with grass and wood	17	2	2	0

Table 3  
Infection rate of malaria by respondents' characteristics.

Characteristics	No. examined (%)	No. positive (%)
Total sample	195	2 (1.0)
<b>Sex</b>		
Male	82 (42)	1 (1.2)
Female	113 (58)	1 (0.8)
<b>Age (years)</b>		
1-10	78 (40.0)	1 (1.3)
11-20	49 (25.1)	0 (0.0)
21-30	32 (16.4)	1 (3.1)
31-60	32 (16.4)	0 (0.0)
> 60	4 (2.1)	0 (0.0)
<b>Number of malaria infections (time)</b>		
0-4	63	91.3
>5	6	8.7

factors could account for the discrepancy between the studies. Three- and six-year-olds are old enough to begin taking responsibility for their own personal hygiene, but they have less experience compared with older children. They also start social activities, such as visiting and playing with other children of the same age. The comparison in boys and girls in the study

indicated that the girls exhibited a very slightly higher rate of infection. Conversely, Kaewkes *et al* (1983) found dissimilar results in Khon Kaen Province, where boys showed a higher rate of infection.

Factors influencing the infection rate may include personal hygiene, levels of parental care, social interactions in the villages, and parental knowledge of, and attention to, hygiene *eg* hand-washing and taking a bath. Other factors not evaluated in this study include a detailed analysis of the children's physical environment, clinical signs, and the extent of the parents' knowledge of health and hygiene relating to parasite infestation and transmission. The season of the year may also affect variances in infection rates due to climatic and weather factors, such as humidity and temperature. These factors could potentially affect the infection rate of *E. vermicularis*. These concerns might be addressed in future research.

The findings from this study can be used as base-line information on pinworm infection in Mae Hong Son Province, which can be subsequently utilized to develop programs for the prevention and control of pinworm infection and thus decrease the prevalence of *E. vermicularis*. The relationship between the number of eggs and clinical signs is the focus of a further study.

The present malaria situation in Thailand in rural areas of the country is related to quality of life, control

programs and economic status. The findings of this study suggest the already reported influence of *P. vivax* infection among Karen Long-neck villagers. Since we did not directly investigate the movement of villagers in the area, we can not rule out the possibility that they acquired infections outside the village, such as from the forest area.

The low prevalence of malaria indicates that the villagers are using the information they have received from the local Health Department to help combat infection.

#### ACKNOWLEDGEMENTS

The authors greatly appreciate the support received from: the Public Health Institute in Mae Hong Son, the Director of the Malaria Center, Ministry of Public Health, Dean of Public Health and Environment, Huachiew Chalermprakiet University, and Associate Professor Dr Samarn Tesana. We also extend our thanks to Mr Worapan and Mr Taweeboon from the Provincial Health Office in Mae Hong Son, the staff of the Vector-borne Disease Control Unit No.8, Mae Hong Son Province, the Heads of the two vilages, and Dr Ole Wichmann for his editing assistance.

#### REFERENCES

Chareonviriyaphap T, Bangs MJ, Ratanatham S. Status of malaria in Thailand. *Southeast Asian J Trop Med Public Health* 2000;31:225-37.

Kaewkes S, Tesana S, Sithithaworn P, Srisawangwonk T, Raengsangounwong P. Enterobiasis in young

school children in Khon Kaen. *J Parasitol Trop Med Assoc Thai* 1983;6:19-24.

Nithikathkul C, Changchup B, Wannapinyoship S, Poister C, Boontan P. The prevalence of enterobiasis in children attending mobile health clinic of Huachiew Chalermprakiet University. *Southeast Asian J Trop Med Public Health* 2001a;32(suppl 2):138-42.

Nithikathkul C, Changchup B, Wannapinyoship S, Poister C, Boontan P. The prevalence of *Enterobius vermicularis* among primary school students in Bang Phli District, Samut Prakan Province, Thailand. *Southeast Asian J Trop Med Public Health* 2001b;32(suppl 2):133-7.

Nithikathkul C, Sukthana Y, Poister C, Akarachantachote N, Wannapinyosheep S. A survey on prevalence of oxyuriasis among primary school students in Samut Prakan Province. *J Trop Med Parasitol* 2001c;Dec:49-55.

Tepmongkol M, Suntadwoot C, Lamonand C, *et al.* Enterobius infection in young school children at Slum Klongtoei. *Siriraj Hosp Gaz* 1980;32:597-600.

Vajarasthira A, Harinasuta C. The incidence of enterobiasis among children of five school and two hospitals in Bangkok. *Ann Trop Med Parasitol* 1960;54:129-31.

Wahah T, Ratanaponglakh D. Prevalence of enterobiasis in pre-school children in municipality area of Nakhon Pathom Province. *J Trop Med Parasitol* 1992;15:96-101.