



## ***Enterobius vermicularis* Infection among Children in Lower Northern Thailand**

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### **Abstract**

The prevalence of the pinworm, *Enterobius vermicularis*, was determined in 4 provinces of lower northern Thailand (Phitsanulok, Uthai Thani, Kamphaeng Phet, and Nakhon Sawan) during January 2008-May 2010. Of the 1,131 children tested, 19.9% were positive for *E. vermicularis* eggs by Scotch-tape technique. The infection rate was highest among residents of Phitsanulok (25.0%), followed by Kamphaeng Phet (20.3%), Uthai Thani (17.9%), and Nakhon Sawan (13.8%). The age group 4-6 years had the highest positive rate. The results indicated relatively high overall infection rates. Mass treatment and educational programs should be undertaken, to reduce re-infection in these areas.

**Keywords:** *Enterobius vermicularis*, prevalence, children, Thailand

### **Introduction**

*Enterobius vermicularis* or pinworm, is one of the most frequently encountered intestinal nematodes. It infects millions of people all over the world, especially children [1,2]. Although most infections are asymptomatic, it induces bothersome symptoms in some cases. The medical condition associated with pinworm infection is known as enterobiasis or oxyuriasis, manifested by itching and irritation of the perianal region, and mental distraction. In addition, this infection adversely affects school success and physical

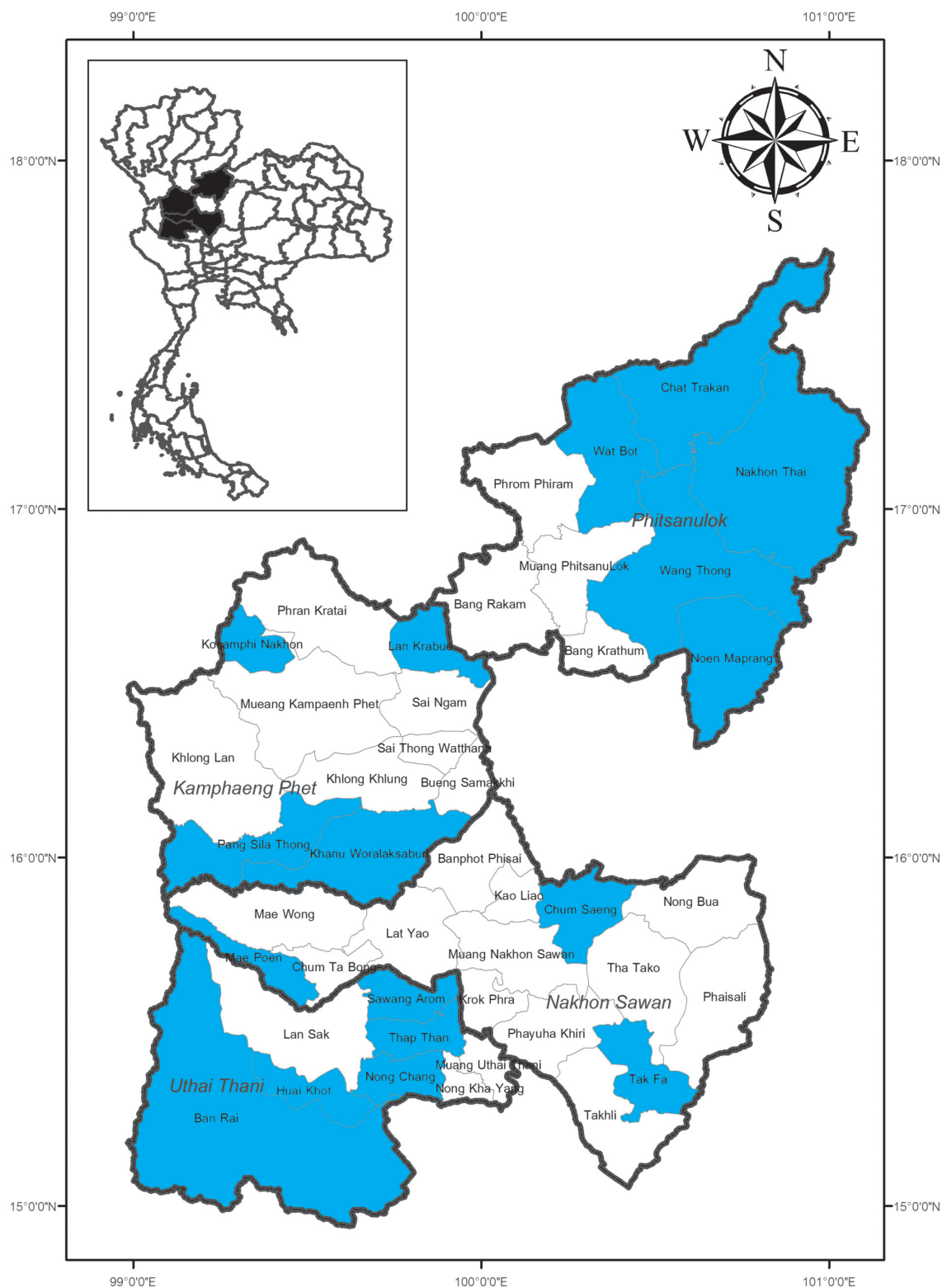
growth, especially among young children [3]. Preventing infection is difficult, because of the parasite's rapid spread and high reinfection rate [4]. Continuous monitoring of infection rates is key to successful disease control [5].

The prevalence of *E. vermicularis* infection among children has been reported in many parts of the world, with infection rates varying considerably, depending on the age groups and localities studied [1,5]. In Thailand, the prevalence of pinworm infection among children and schoolchildren has been reported from investigations in Ang Thong, Ayudhaya, Bangkok, Chiang Mai, Mae Hong Son, Phichit, Prathum Thani, Samut Prakan, and Suphanburi [1,2,6-11], but not in the lower north (*ie*, Phitsanulok, Uthai

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**Fig 1** Locations of the study areas in 4 provinces of Lower Northern Thailand (colored green).

Thani, Kamphaeng Phet, and Nakhon Sawan). Therefore, the objective of this study was to determine the current *E. vermicularis* infection rate among children living in these 4 provinces of lower northern Thailand.

## Materials and methods

This study was undertaken through the mobile services for people's health and occupational development, provided by Naresuan University, Phitsanulok Province, Thailand. The prevalence of *E. vermicularis* infection was determined by Scotch-tape technique, the gold standard for the diagnosis of this infection [4]. Briefly, a piece of clear adhesive tape was used to obtain a sample from the perianal surface. The sample was then mounted (adhesive side down) on a glass slide and examined under a light microscope by expert parasitologists at the Department of Microbiology and Parasitology, Faculty of Medical Science, Naresuan University. Participants were examined between 08:30-12:00 h on the service day.

A total of 1,131 children residing in Phitsanulok Province (Chat Trakan, Nakhon Thai, Noen Maprang, Wat Bot, and Wang Thong districts); Uthai Thani Province (Ban Rai, Huai Khot, Nong Chang, Thap Than, and Sawang Arom districts); Nakhon Sawan Province (Chum Saeng, Mae

Poen, and Tak Fa districts); and Kamphaeng Phet Province (Lan Krabue, Pang Sila Thong, Khanu Woraklaksaburi, and Kosamphi Nakhon districts) (Fig 1) were recruited for study between January 2008-May 2010. The sample of 1,131 children (529 males and 602 females) was categorized into 5 age groups; 1-3 years, 4-6 years, 7-9 years, 10-12 years, and > 12 years. After determination, all positive (infected) children were treated individually with the anti-helminthic drug, mebendazole. Statistical analysis used the Pearson Chi-square test (SPSS for Windows version 17.0).

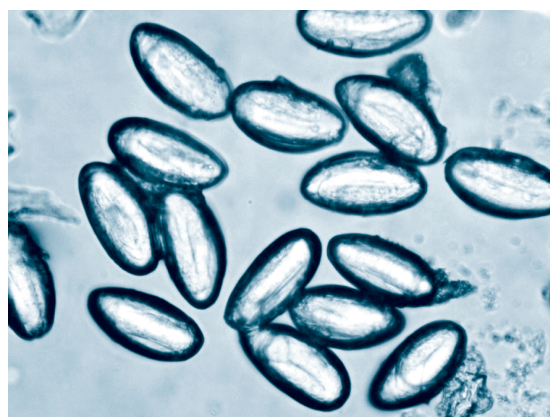
## Results

The positive (infected) rate for *E. vermicularis* eggs (Fig 2) was 19.9% (226/1,131) (Table 1). The infection rate was highest in children living in Phitsanulok (25.0%), followed by Kamphaeng Phet (20.3%), Uthai Thani (17.9%), and Nakhon Sawan (13.8%). More positive infections were found among boys than girls, but without statistically significant difference ( $p = 0.067$ ). However, a significant difference was found between percentage infection among boys and girls in Uthai Thani Province (Table 1).

An analysis of infective individuals found that the group aged 4-6 years had higher infection rates than the others (Table 2). The statistically significant differences between the age groups are shown in Table 2. The lowest prevalence rate was found in the group aged > 12 years. In this study, a 46-year-old woman was also found positive for *E. vermicularis* eggs, but this result was not included in the statistical analysis.

## Discussion

*E. vermicularis* is one of the most frequently encountered and ubiquitous nematodes known. Infection rates vary significantly in different areas. The prevalence rates (13.8-25.0%) found in the current study agreed with previous reports from other provinces in Thailand, which ranged between 5.5-45.38% [1,7,12,13]. *Enterobius* is normally the predominant parasite in areas where socio-economic and environmental conditions, and hygiene practice levels, are lower. Disease



**Fig 2 Light microscopy showing *Enterobius vermicularis* eggs determined by Scotch-tape technique (x100)**

is easily transmitted among family members through inhalation, contaminated hands, and fomites (inanimate objects or substances capable of carrying infectious organisms) [14,15]. Thus, rapid spread and high reinfection rates among children in the same class, or among family members, are common [5]. In the current study, the infection rate was highest in the age group 4-6 years, which agreed with other studies [5,7,16]. Generally, when an enterobiasis field survey is conducted, children are the main targets, since children's behaviors contribute more to the development of infection than adult behaviors. Surprisingly, one 46-year-old female was also found positive, indicating infection also occurs among adults.

In conclusion, the prevalence rate of *E. vermicularis* was relatively high in Phitsanulok Province. Appropriate medication and educational programs should be administered among this population, to prevent the spread of infection, and reinfection.

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**Table 1 Prevalence of *Enterobius vermicularis* among children in 4 provinces of Lower Northern Thailand.**

Province	Percentage infection (No. positive/No. examined)		
	Boys	Girls	Total
Phitsanulok	24.6 <sup>a</sup> (40/162)	25.3 <sup>a</sup> (36/142)	25.0 (76/304)
Uthai Thani	22.8 <sup>a</sup> (29/127)	14.7 <sup>b</sup> (24/163)	17.9 (53/290)
Kamphaeng Phet	22.9 <sup>a</sup> (37/161)	18.1 <sup>a</sup> (34/188)	20.3 (71/349)
Nakhon Sawan	15.1 <sup>a</sup> (12/79)	12.8 <sup>a</sup> (14/109)	13.8 (26/188)
Total	22.3 <sup>a</sup> (118/529)	17.7 <sup>a</sup> (108/602)	19.9 (226/1,131)

The same letter in each row indicates no significant difference (Pearson Chi-Square,  $p > 0.05$ )

**Table 2 Prevalence of *Enterobius vermicularis* infection among age-groups of children in Phitsanulok, Uthai Thani, Kamphaeng Phet, and Nakhon Sawan provinces.**

Age (years)	Percentage <i>Enterobius vermicularis</i> infection (No. positive/No. examined)				
	Phitsanulok	Uthai Thani	Kamphaeng Phet	Nakhon Sawan	Total*
1-3	12.3 (9/73)	6.4 (5/78)	16.1 (10/62)	0.0 (0/28)	9.9 (24/241) <sup>c</sup>
4-6	22.7 (35/110)	32.9 (26/79)	23.9 (21/88)	10.8 (4/37)	24.2 (86/314) <sup>a</sup>
7-9	26.5 (21/79)	18.7 (14/75)	22.9 (19/83)	20.0 (9/45)	22.3 (63/282) <sup>a,b</sup>
10-12	25.0 (10/40)	13.8 (8/58)	19.1 (21/110)	25.0 (12/48)	19.9 (51/256) <sup>b</sup>
>12	50.0 (1/2)	0.0 (0)	0.0 (0/6)	3.3 (1/30)	5.2 (2/38) <sup>c</sup>
Total	25.0 (76/304)	18.3 (53/290)	20.3 (71/349)	13.8 (26/188)	19.9 (226/1,131)

\* The same letter in each row indicates no significant difference (Pearson Chi-Square,  $p > 0.05$ )

## References

1. Nateeworanart S, Vitta A, Lee UP. Egg positive rate of *Enterobius vermicularis* in children in a rural area of Pichit province, Thailand. *Southeast Asian J Trop Med Public Health*. 2007;38 Suppl 1:40-2.
2. Piangjai S, Muangyimpong Y, Tipavangkosol P, Arthansri P, Choochote W. A survey on the prevalence of *Enterobius vermicularis* in primary school children in Chiang Mai province. *J Trop Med Parasitol*. 1992;15:106-7.
3. Celiksoz A, Acioz M, Degerli S, Oztop AY, Alim A. Effects of enterobiasis on primary school children. *Afr J Microbiol Res*. 2010;4:634-9.
4. Shoup B. Diagnosis and management of pinworm infection. *Primary Care Update for OB/GYNS*. 2001;8:240-3.
5. Kang S, Jeon HK, Eom KS, Park J. Egg positive rate of *Enterobius vermicularis* among preschool children in Cheongju, Chungcheongbuk-do, Korea. *Korean J Parasitol*. 2006;44:247-9.
6. Changsap B, Nithikathkul C, Boontan P, Wannapinyosheep S, Vongvanich N, Poister C. Enterobiasis in primary schools in Bang Khun Thian District, Bangkok, Thailand. *Southeast Asian J Trop Med Public Health*. 2002;33 Suppl 3:72-5.
7. Kitvatananchai S, Marujiwat K, Petabut N, Thawornpol K. *Enterobius vermicularis* infection among children living in orphanages in Bangkok and Pathum Thani province, Thailand. *J Trop Med Parasitol*. 2000;23:28-31.
8. Nithikathkul C, Changsap B, Wannapinyosheep S, Poister C, Boontan P. The prevalence of *Enterobius vermicularis* among primary school students in Samut Prakan Province, Thailand. *Southeast Asian J Trop Med Public Health*. 2001;32 Suppl 2:133-7.
9. Nithikathkul C, Changsap B, Wannapinyosheep 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*. 2001;32 Suppl 2:138-42.
10. Saksirisampant W, Prownebon J, Kanmarnee P, Thaisom S, Yenthakam S, Nuchprayoon S. Prevalence of parasitism among students of the Karen hill-tribe in Mae Chame district, Chiang Mai province, Thailand. *J Med Assoc Thai*. 2004;87 Suppl 2:278-83.
11. Saksirisampant W, Prownebon J, Kulkumthorn M, Yenthakam S, Janpla S, Nuchprayoon S. Prevalence of intestinal parasitic infections among school children in the central region of Thailand. *J Med Assoc Thai*. 2006;89:1928-33.
12. Polseela P, Poodendan W, Tangchaisuriya U, Nithikathkul C, Arnat N, Pannarunothai S, *et al*. Parasitic infection among primary school students in Mueang district, Phitsanulok province, Thailand. *Southeast Asian J Trop Med Public Health*. 2004;35 Suppl 1:120-2.
13. Tukaew A, Chaisalee T, Nithiuthai S, Thiamtip S, Suyaphun A, Wiwanitkit V, *et al*. *Enterobius vermicularis* infection among pre-school children in Karen hilltribe villages in Chiang Mai, Thailand. *Southeast Asian J Trop Med Public Health*. 2002;33 Suppl 3:70-1.
14. Haswell-Elkins M, Elkins DB, Manjula K, Michael E, Marsdon R. The distribution and abundance of *Enterobius vermicularis* in south Indian fishing community. *Parasitol*. 1987;95:339-54.
15. Noor Hayati MI, Rajeswari B. The epidemiology and symptomatology of enterobiasis among young children attending a community clinic in Kuala Lumpur, Peninsular Malaysia. *Trop Biomed*. 1991;8:151-6.
16. Remm M. Distribution of enterobiasis among nursery school children in SE Estonia and of other helminthiasis in Estonia. *Parasitol Res*. 2006;99:729-36.