ความชุกของการติดเชื้อพยาธิเข็มหมุด (*Enterobius vermicularis*) ในนักเรียนระดับประถมศึกษา จังหวัดชัยภูมิ ประเทศไทย

Prevalence of *Enterobius vermicularis* infection among Students from Elementary Schools, Chaiyaphum Province, Thailand

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บทคัดย่อ

โรคพยาธิเข็มหมุด (enterobiasis) มีสาเหตุมาจากการติดเชื้อพยาธิเข็มหมุด (*Enterobius vermicularis*) ซึ่งพบมากในเด็กวัยเรียน พยาธิเข็มหมุดก่อให้เกิดอาการคันบริเวณทวารหนักในเวลากลางคืน การศึกษาวิจัยครั้งนี้เป็นการศึกษาเชิงพรรณนาแบบภาคตัดขวาง เพื่อศึกษาความชุกของการติดเชื้อพยาธิเข็มหมุดในเด็กนักเรียน โรงเรียนประถมศึกษา จังหวัดชัยภูมิ ระหว่างเดือนกรกฎาคม ถึงเดือน กันยายน 2557 กลุ่มตัวอย่างคือ นักเรียนในโรงเรียนประถมศึกษา 7 โรงเรียน ที่ตั้งอยู่ในตำบลนาฝาย อำเภอเมือง จังหวัดชัยภูมิ จำนวน 441 ราย ซึ่งทำการตรวจพยาธิโดยวิธีสก๊อตเทปเทคนิค การศึกษาครั้งนี้พบว่า ความชุกการติดเชื้อพยาธิเข็มหมุดในนักเรียนทั้งหมดร้อยละ 11.3 พบความชุกติดเชื้อพยาธิในเพศชายร้อยละ 12.6 สูงกว่าเพศหญิงร้อยละ 9.7 ซึ่งแตกต่างแต่ไม่มีมีนัยสำคัญทางสถิติ (*P*-value = 0.330) เมื่อจำแนกตามอายุ พบว่ามีการติดเชื้อพยาธิเข็มหมุดตั้งแต่อายุ 4-12 ปี โดยพบมากที่สุดในช่วงอายุ 7-9 ปี ร้อยละ 17.8 และพบความแตกต่างของกลุ่มอายุและความชุกการติดเชื้ออย่างมีนัยสำคัญทางสถิติ (*P-value* < 0.001) จากการศึกษาครั้งนี้ แสดงให้เห็นว่า โรคพยาธิเข็มหมุดยังเป็นปัญหาสุขภาพที่สำคัญสำหรับเด็กในวัยเรียน ดังนั้นเด็กนักเรียนควรจะต้องได้รับการตรวจพยาธิเข็มหมุดอย่างน้อย ปีละ 1-2 ครั้ง นอกจากนี้ควรให้สุขศึกษาเกี่ยวกับเรื่องสุขวิทยาส่วนบุคคลแก่ คุณครู ผู้ปกครอง และเด็กนักเรียนในโรงเรียนประถมศึกษา ควบคู่กันไป เพื่อเป็นการลดความชุกการติดเชื้อพยาธิเข็มหมุด

คำสำคัญ: ความชุก พยาธิเข็มหมุด เด็กนักเรียน ชัยภูมิ

Abstracts

Enterobius vermicularis is a nematode parasite which is the cause of enterobiasis in humans, especially children. *E. vermicularis* causes of anal-itching at night. This study was a cross-sectional study, aimed to study the prevalence of *E. vermicularis* infection among students from elementary schools during July to September 2014. A total of 441

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students from 7 elementary schools in Nafhai sub-district, Mueang district, Chaiyaphum province were examined by scotch tape technique. The overall prevalence of *E. vermicularis* infection was 11.3%. The prevalence of *E. vermicularis* infection in boys was 12.6% which was higher than for girls 9.7% although the difference was not statistically significant (*P*-value = 0.330). The 7–9 years age group had the highest prevalence of *E. vermicularis* infection (17.8 %) compared to other age groups and was statistically significant (*P*-value < 0.001). This study found that the younger children had the highest prevalence of *E. vermicularis* infection and had higher risk of infection with *E. vermicularis* than older children. Therefore, children should be checked for *E. vermicularis* infection at least 1–2 times a year. Moreover, children, parents, and teachers should be educated about personal hygiene to reduce *E. vermicularis* infection.

Keywords: prevalence, *Enterobius vermicularis,* students, Chaiyaphum

Introduction

Enterobius vermicularis (Pinworm, Threadworm or Seatworm) is the cause of enterobiasis or oxyuriasis. It is estimated that over 400 million people are infected, especially children.[1] Although most infections are asymptomatic, some infections are symptomatic. Common enterobiasis symptoms manifest as itching and irritation of perianal region.[2] Moreover, *E. vermicularis* can ocurr as severe manifestations in other organs including the appendix, liver and female genitals.[3] *E. vermicularis* can be transmitted through oral means, the respiratory tract, and reinfection.[4, 5] Oral infection included the anus-hand-mouth route and/or ingestion of contaminated food. *E. vermicularis* eggs are light so respiratory tract infection would be from inhaling dust contaminated with the parasite eggs.[5] After ingestion or inhalation of infective eggs, the larvae hatch in the small intestine and the adults develop in the colon.[6] Reinfection can occur when the newly hatched larvae migrate from the anal skin back into the rectum.[6] Therefore, the prevalence of *E. vermicularis* infection is high in schoolchildren, low hygiene communities, and slum communities.[1-3, 7]

The prevalence of *E. vermicularis* infection has been reported in many parts of the world, with the prevalence of infections varying considerably, ranging from 0.6 to 38.8%.[1, 7-10] In Thailand, various studies reported the prevalence of *E. vermicularis* infection in many parts including Northern; Chiang Mai 45.4%, Phitsanulok 25.0%, Kamphaeng Phet 20.3%, Uthai Thani 17.9% and Nakhon Swan 13.8%, [2, 11] Central; Bangkok 21.6% and Samut Prakan 38.8%,[7, 12] Southern; Trang 7.1%,[13] and Northeast; Khon Kaen 50.9%,[14] Chaiyaphum 23.7%,[15] Nakhon Ratchasima 0.5%,[16] and Maha Sarakham 0.2%.[17]

This study surveyed the prevalence of *E. vermicularis* infection among students from elementary schools in Chaiyaphum province, Thailand.

Materials and Methods

Study design

This study was a cross-sectional (descriptive-analysis) study. This study examined on students from 7 elementary schools (Ban Nong Ya Plong, Ban Choraka, Ban Nafhai, Ban Tat Ton, Ban Khro Huai Chan, Ban Nong Waeng and Ban Kud Kha Min schools) in Nafhai sub-district, Mueang district, Chaiyaphum province, Thailand during July to September 2014. Nafhai sub-district is located at the 15.9260° latitude and 102.0147° longitude (Figure 1).

Data collection and Laboratory processing

Researchers visited randomly selected areas of the sub-districts in Mueang district, Chaiyaphum province, accompanied by local public health officials and sub-district health promoting hospital in sub-districts. Parents of students or their legally authorized representative signed consent documents. A total of 441 parents of students were interviewed demographic data. A total 441 students from 7 elementary schools were examined for *E. vermicularis* by the scotch tape technique which is the gold standard for the diagnosis *E. vermicularis* infection. Briefly, we used a piece of clear adhesive tape to obtain a sample from a perianal surface. After that, the sample was mounted on the glass slide and examined under a light microscope by parasitologists.[6]

The 441 students comprised 245 boys and 196 girls. All samples were divided into 3 age groups; 4–6 years, 7–9 years, 10–12 years and were also classified by learning different age groups. Finally, all infected students were treated with mebendazole and were educated for reducing *E. vermicularis* infection effectively.

Statistical analysis

Demographic characteristics of the participants were described by using frequency, percentage, and 95% confidence intervals (CIs) for categorical data, mean and standard deviation (SD) for continuous data. To investigate factors that affect *E. vermicularis* infection, odds ratios (ORs) and their 95%CIs were estimated using simple and multiple logistic regressions for survey sampling.

All analyses were performed using Stata version 10.0 (StataCorp, College Station, TX). All test statistics were performed under a two-sided hypothesis and a *P-value* of less than 0.05 was considered statistically significant. This study was undertaken through the Academic Service by Department of Public Health, Faculty of Arts and Science, Chaiyaphum Rajabhat University, Chaiyaphum province, Thailand.

This study was approved by the Maharat Nakhon Ratchasima Hospital Ethics Committee for Human Research (075/2013).

Results

Demographic Characteristics

Of the 441 students, 55.6% were boys, with a mean age (±SD) of 8.4 (± 2.5) years old (range: 4–12) (Table 1). The most frequent education level of children's parents (32.0%) was a secondary school (M.1-M.3). The majority occupation of children's parents (48.3%) was a laborer. The most frequent income of children's parents (48.8%) was 5,001–10,000 Baht (Table 1).

Prevalence of *E. vermicularis* infection

The prevalence of *E. vermicularis* infection was 11.3% (95%CI: 8–14). Infection with *E. vermicularis* was 17.8% (95%CI: 12-23) in age group 7–9 years. The prevalence of *E. vermicularis* infection was 12.6% (95%CI: 8–16) in boys, which was higher than in girls 9.7% (95%CI: 6 – 14) (Table 2).

The most frequent education level of parents with infected children was secondary school (M.1–M.3) 14.1% (95%CI: 9–21). The most frequent occupation of infected children's parents was as Government officer 19.2% (95%CI: 6–39). Additionally, the children's family income was most frequently 5,001–10,000 Baht and 10,001–15,000 Baht were 13.0% (95%CI: 8–18; 95%CI: 5–26, respectively). The Ban Kud Kha Min school had the highest prevalence of infection 20.0% (95%CI: 6–44) (Table 2).

Factors associated with prevalence of *E. vermicularis* infection

The strongest factor that associated with the prevalence of *E. vermicularis* infection was age groups. That is, children aged between 4-6 years and 7-9 years were 6.1 and 7.4 times, respectively, more likely to be infected with *E. vermicularis* than children of10–12 years (OR = 6.1; 95%CI: 2.1–17.5; *P-value* < 0.001; OR = 7.4; 95%CI: 2.8–19.4; *P-value* < 0.001) (Table 3).

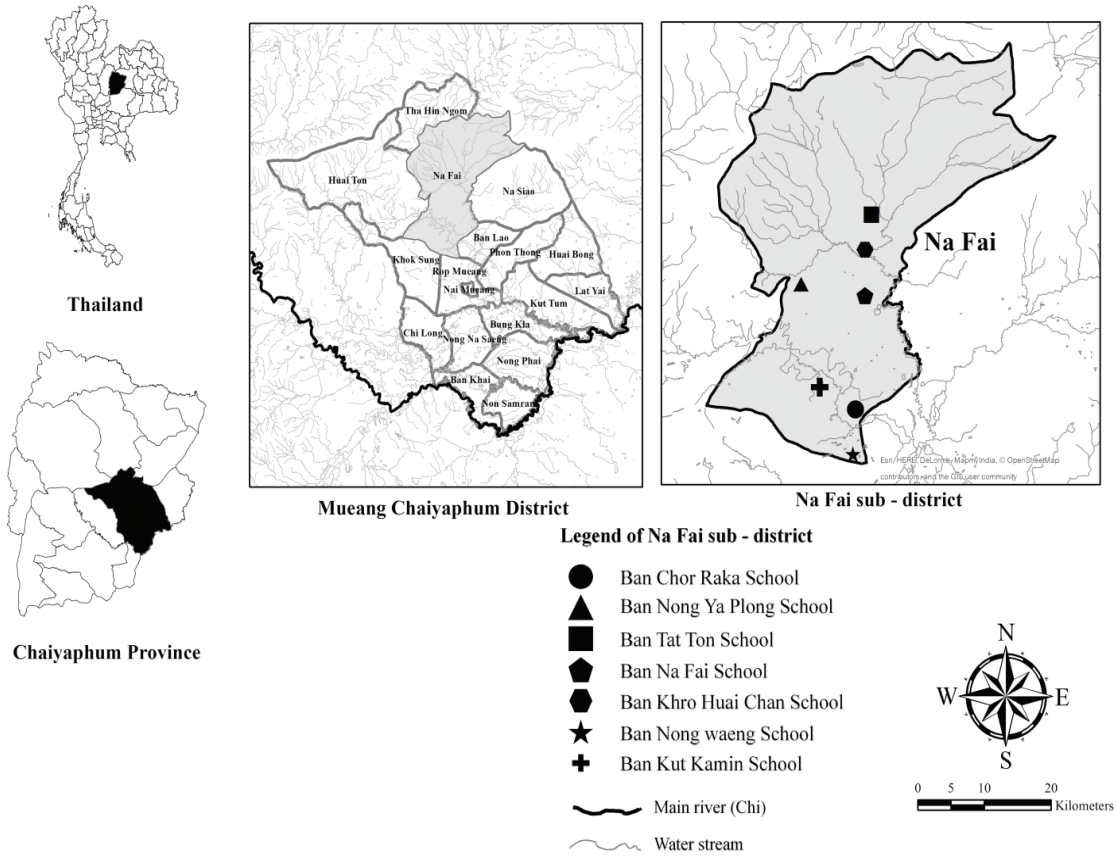

Figure 1 Map of Nafhai sub-district, Mueang Chaiyaphum district, Chaiyaphum province. (Map was created by ArcGIS online: http://www.arcgis.com/home/index.html)

Table 1 Demographic characteristic of students from 7 elementary schools

Characteristic	Number	Percentage
Age (years)		
4-6	92	20.9
7-9	174	39.5
10-12	175	39.6
Mean±SD (Min:Max)	8.4 ± 2.5 (4:12)	
Genders		
Girls	196	44.4
Boys	245	55.6
Parents' education levels		
Primary school	58	13.1
Secondary school (M.1-M.3)	141	32.0
Secondary school (M.4-M.6)	97	22.0
Collage	81	18.4
Bachelor	34	7.7
Higher Bachelor	30	6.8
Parents' occupations		
Agriculture	88	20.0
Labors	213	48.3
Own business	79	17.9
Government	26	5.9
Private sector	35	7.9
Family income (Bath)		
≤ 5,000	123	27.9
5,001-10,000	215	48.8
10,001-15,000	46	10.4
15,001-20,000	20	4.5
≥20,000	37	8.4
Mean±SD	9,835.8 ± 7,717.4	
Schools		
Ban Nong Ya Plong	140	31.7
Ban Choraka	102	23.1
Ban Nafhai	77	17.5
Ban Tad Ton	48	10.9
Ban Khro Huai Chan	31	7.0
Ban Nong Waeng	23	5.2
Ban Kud Kha Min	20	4.5
Total	441	100.0

Table 2 The prevalence of *E. vermicularis* infection in 7 elementary schools

Factors	Number	Prevalence of *E. vermicularis* infection	95%CIs
Age (years)			
4-6	92	15.2	(8 to 22)
7-9	174	17.8	(12 to 23)
10-12	175	2.8	(0.3 to 5)
Gender			
Girls	196	9.7	(6 to 14)
Boys	245	12.6	(8 to 16)
Parents' education levels			
Higher Bachelor	30	6.7	(0.8 to 22)
Bachelor	34	8.8	(2 to 24)
Collage	81	7.4	(3 to 15)
Secondary school (M.4-M.6)	97	13.4	(7 to 21)
Secondary school (M.1-M.3)	141	14.1	(9 to 21)
Primary school	58	10.3	(4 to 21)
Parents' occupations			
Private sector	35	14.3	(0.4 to 30)
Government	26	19.2	(6 to 39)
Own business	79	7.6	(3 to 15)
Labors	213	11.7	(8 to 15)
Agriculture	88	10.2	(5 to 18)
Family income (Bath)			
≥20,000	37	2.7	(0.1 to 14)
15,001-20,000	20	10.0	(1 to 31)
10,001-15,000	46	13.0	(5 to 26)
5,001-10,000	215	13.0	(8 to 18)
≤ 5,000	123	10.6	(6 to 17)
Schools			
Ban Nong Ya Plong	140	10.7	(6 to 17)
Ban Choraka	102	8.8	(4 to 16)
Ban Nafhai	77	10.4	(5 to 19)
Ban Tad Ton	48	16.7	(7 to 30)
Ban Khro Huai Chan	31	6.5	(1 to 21)
Ban Nong Waeng	23	17.4	(5 to 38)
Ban Kud Kha Min	20	20.0	(6 to 44)
Total	441	11.3	(8 to 14)

Table 3 Simple logistic regression for each category of factors on *E. vermicularis* infection

Factors	Number	Prevalence of *E. vermicularis* infection	ORs	95%CIs	*P-value*
Age (years)					<0.001
10-12	175	2.8	1		
7-9	174	17.8	7.37	(2.8 to 19.4)	
4-6	92	15.2	6.10	(2.1 to 17.5)	
Genders					0.330
Girls	196	9.7	1		
Boys	245	12.6	1.35	(0.7 to 2.6)	
Parents' education					0.565
Higher Bachelor	30	6.7	1		
Bachelor	34	8.8	1.35	(0.2 to 8.7)	
Collage	81	7.4	1.12	(0.2 to 5.9)	
Secondary school (M.4-M.6)	97	13.4	2.16	(0.5 to 10.2)	
Secondary school (M.1-M.3)	141	14.1	2.31	(0.5 to 10.5)	
Primary school	58	10.3	1.61	(0.3 to 8.5)	
Parents' occupation					0.554
Private sector	35	14.3	1		
Government	26	19.2	1.42	(0.4 to 5.6)	
Own business	79	7.6	0.49	(0.1 to 1.7)	
Labors	213	11.7	0.79	(0.3 to 2.2)	
Agriculture	88	10.2	0.68	(0.2 to 2.2)	
Family income (Bath)					0.326
≥20,000	37	2.7	1		
15,001-20,000	20	10.0	4.00	(0.3 to 47.1)	
10,001-15,000	46	13.0	5.40	(0.6 to 47.0)	
5,001-10,000	215	13.0	5.40	(0.7 to 40.9)	
≤ 5,000	123	10.6	4.25	(0.5 to 33.7)	

Discussion

This study showed that the overall prevalence of *E. vermicularis* infection among students from seven schools in Nafhai sub-district, Mueang Chaiyaphum district, Chaiyaphum province was 11.3% which was lower than that cited in previous research. [2, 3, 7, 9, 11, 12, 14, 15] These variations in prevalence may be due to differences in environmental condition, socio-economic, education level of parents, and lower personal hygiene.[18, 19] The public health service system has continually sought to influence people to obtain information for treatment, prevention, and control enterobiasis. However, this study has the prevalence of *E. vermicularis* infection higher than some previous reports.[13, 16, 17] Because this study used the scotch tape technique for diagnosis of *E. vermicularis* which is the gold standard method whereas other studies used simple direct smear, Kato's thick smear, modified Harada-Mori filter paper strip culture technique and formalin ethyl-acetate concentration technique.[13, 16, 17] Although infection in boys (12.6%) was higher than girls

(9.7%) the difference was not statistically significant and gender was not significantly associated with *E. vermicularis* infection as noted in some previous reports.[18, 20, 21] However, other work reported that gender was significantly associated with *E. vermicularis* infection, with boys suffering considerably higher infection rates than girls.[9, 22] In the present study, the most of the parents' were educated to secondary school level (M.1-M.3), although education was not significantly associated with *E. vermicularis* infection. Nevertheless, some researchers reported parents' education levels were associated with *E. vermicularis* infection.[18, 23] The present study indicated parents' income and occupations were not related with *E. vermicularis* infection, which was similar to the previous study.[7] The result of this study showed that the age groups of 7–9 years had the highest prevalence of *E. vermicularis* infection (17.8%) and the age groups of children influenced the prevalence of *E. vermicularis* infection (*P*-value <0.001) similarly to the previous studies.[7, 12, 18] Younger children tended to have higher *E. vermicularis* infection than older children. This might be because younger children do not have enough knowledge about preventing *E. vermicularis* infection.[19]

Conclusions

This study showed that enterobiasis is an important problem for school children, especially younger children. Therefore, children should be checked for *E. vermicularis* infection at least 1–2 times a year. Furthermore, children, parents, and teachers should be educated about personal hygiene to reduce *E. vermicularis* infection. The schools should provide the right environment for learning and prevent *E. vermicularis* infection such as good ventilation and the right number students in the classroom. Additionally, local government should emphasize and support continued efforts at solving of this problem. All organization and the government should produce educational media that are suitable for each child's age groups to prevent and control *E. vermicularis* infection. In the future, we should study the pattern of problem-solving of *E. vermicularis* infection in primary school children in accordance with community context.

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