

# THE PREVALENCE OF *ENTEROBIUS VERMICULARIS* AMONG PRIMARY SCHOOL STUDENTS IN SAMUT PRAKAN PROVINCE, THAILAND

C Nithikathkul<sup>1</sup>, B Changsap<sup>2</sup>, S Wannapinyosheep<sup>2</sup>, C Poister<sup>3</sup> and P Boontan<sup>2</sup>

Departments of <sup>1</sup>Biology, Faculty of Science and Technology;

<sup>2</sup>Basic Medical Science, Faculty of Science and Technology;

<sup>3</sup>Department of English, Faculty of Liberal Arts,

Huachiew Chalermprakiet University, Samut Prakan Province 10540, Thailand

**Abstract.** A prevalence survey of *Enterobius vermicularis* in primary school students aged 6 - 10 years in Bang Plee district, Samut Prakan Province, Thailand was undertaken from January to March 2000. There were 783 subjects, 395 males and 388 females. Diagnosis was done by transparent tape swab technique. It revealed that 1) worms were found in 38.82% of the students, 2) there was a correlation between prevalence of parasite infection and student sex and age and 3) family socio-economic background (income and occupation) had no relationship with the prevalence of the enterobiasis ( $p < 0.05$ ).

## INTRODUCTION

Currently there is a strong trend toward development in Thailand. There have been impressive advances in both science and technology. Educational levels are rising throughout society. Literacy rates are increasing rapidly and many more individuals are obtaining higher education. Prevention and control programs dealing with parasitic diseases have been developed and implemented. However, even with these advances, parasitic diseases remain a serious concern of the public health system in Thailand.

There have been a number of studies of parasite infection in humans in Thailand. Preuksaraj *et al* (1982) conducted research into the prevalence of parasitic infections in Thailand in 1980-1981. Their study found a 62.9% intestinal helminthic infection rate. Liver flukes affected 54.6% of the individuals studied. They found variations in the rates of infection dependent upon regional and seasonal differences. Some species of parasites have a local distribution in specific regions, and other species are distributed worldwide. The study also found that variation in the infection rate was affected by many factors including the eating habits of the individuals studied, personal hygiene, and environmental factors (Teopiporn *et al*, 1981; Vajarashira and Harinasuta, 1960; Wahah and Ratanaponglakh, 1992). All of these factors affected both the parasite's survival rate and transmission rate. This was particularly apparent in the rate of infection of the liver fluke in Northeast Thailand where people frequently enjoy eating raw fish, mollusks and arthropods such as shrimp and crab. Hookworms and roundworms were more frequently found in Southern

Thailand because of climatic differences such as more moderate temperatures and higher moisture due to heavier rainfall in that region. These two climatic factors encourage the survival and development of these types of parasites.

Preuksaraj and his colleagues (1982) included pinworms in their study. This parasite has worldwide distribution and is considered more of a problem in cooler temperate climates than in warmer tropical regions (Jongsuksantigul *et al*, 1992; Preuksaraj *et al*, 1982). The Pinworm (*Enterobius vermicularis*) may for all practical purposes be considered commensal in all persons save those whose hypersensitivity leads to rectal pruritus. The invasion of the appendix appears to be a relatively common occurrence (Cerva *et al*, 1991). Pinworms or their eggs have occasionally been reported from other ectopic sites, such as liver, lung (Beaver *et al*, 1973; Daly and Baker 1984, Little *et al*, 1984) and female genital organs (Beckman and Holland, 1981; Kogan *et al* 1981). Excessively high pinworm infection rates have been found in communities of high population density such as slums (Teopiporn *et al*, 1981; Tepmongkol *et al*, 1980) and institutional settings such as orphanages and schools (Maneechai *et al*, 1992; Wahah and Ratanaponglakh, 1992). The pinworm parasite is primarily found in young children due to their inadequate hygienic practices and their behavior patterns which encourage infection.

There were three objectives in this study. First, we attempted to determine the prevalence of *E. vermicularis* in primary school students in Bang Plee district of Samut Prakan Province. The second objective was to determine the extent of any

relationship between sex and age, and the rate of infection in these school children. The third objective was to determine any relationships between family socioeconomic status (occupation and income) with the rate of infection.

## MATERIALS AND METHODS

The students in the study were between six and ten years of age and were from five primary schools in the Bang Plee district of Samut Prakan Province, Thailand. The selection of subjects was by group sampling. Entire classrooms were tested. At least 100 students were examined from each of the five schools. A total of 783 students were examined, 395 males and 388 females. The sampling comprised approximately 20 % of the students in the following schools: Wat Bang Plee Yai Nai School, Tanasit Anusorn School, Klong Bang Krabue School, Triam Prarinyanusorn School and Klong Bang Kaew School.

## Sample collection and diagnostic methods

Parents of the students were provided with questionnaires and asked to fill in information concerning personal data of the student and the family's socioeconomic status, *ie* parents' occupations and family income. The questionnaires were collected from the students as they entered the testing site. The students were examined from 7:00 to 10:00 am. The parents were asked to assure that the students did not bath after waking in the morning of the testing.

The diagnosis was made by the transparent tape technique using a 2 x 6 cm rectangle of transparent tape. The adhesive side of the transparent tape swab is placed on the perianal skin, pulled off and placed, adhesive side down, on the labeled slide. The slides are collected and taken to the laboratory for examination. The slides are then observed under the light microscope for the presence of *E. vermicularis* eggs.

Statistical data was analyzed by using the  $\chi^2$ -test.

Table 1  
Parasitic infection rates of male and female students in the five primary schools.

School	Infected / Examined subjects (%)		
	Male (%)	Female (%)	Total (%)
Klong Bang Keaw	43/101 (42.6)	47/102 (46.1)	90/203 (44.3)
Tanasit Anusorn	21/57 (36.8)	34/70 (48.6)	5/127 (43.3)
Klong Bang Krabue	10/35 (28.6)	17/33 (51.5)	27/68 (39.7)
Wat Bang Plee Yai Nai	42/108 (38.9)	43/113 (38.1)	85/221 (38.5)
Triam Parinyanusorn	19/94 (20.2)	26/70 (38.6)	46/164 (28.0)
Total	135/395 (34.2)	168/388 (43.3)	303/783 (38.7)

Table 2  
Infection rates of *Enterobius vermicularis* classified according to sex and age of students.

Age (years)	Infected / Examined subjects (%)		
	Male (%)	Female (%)	Total (%)
6	10/13 (76.9)	8/14 (57.1)	18/27 (66.7)
7	42/116 (36.2)	52/104 (50.0)	94/220 (42.7)
8	28/102 (27.5)	40/97 (41.2)	68/199 (34.2)
9	32/113 (28.3)	53/137 (38.7)	85/250 (34.0)
10	23/51 (45.1)	15/36 (41.7)	38/87 (43.7)
Total	135/395 (34.2)	168/388 (43.3)	303/783 (38.7)

Table 3  
The relationship between the infection rate and family economic status.

Occupation		Income	
Parental occupation	Infection rate (%)	Parental income (Baht/Month)	Infection rate (%)
Laborer	41.5	≤ 3,000	43.4
Employee	33.3	3,001 – 5,000	43.5
Private business	32.6	5,001 – 7,000	42.6
Government employee	60.0	7,001 – 9,000	36.5
Agricultural	33.3	9,001 – 11,000	27.3
Housewife	50.0	< 11,001	38.8

## RESULTS

The prevalence of *E. vermicularis* among students from the five schools in this study was 38.7% (Table 1). The prevalence rates of infection between male (34.2%) and female (43.3%) students showed no significant difference ( $p > 0.05$ ,  $\chi^2$ -test).

An analysis of the relationship between infection rates and the ages of the students exhibited the highest infection rate (66.7%) among 6-year-old students. The rates for 7, 8 and 10 years old were 42.7, 34.2 and 43.7% respectively. The lowest rate (34.0%) was found in 9-year-old students. The prevalence of infection and its correlation to age of the students showed a significant difference ( $p > 0.05$ ,  $\chi^2$ -test).

An analysis of the relationship between the rate of infection and family socioeconomic status (occupation and income) (Table 3) indicated that the highest infection rate was found among the children whose parents were governmental employees (60%), and the lowest was among the children whose parents were owners of private businesses (32.6%). Prevalence of *E. vermicularis* infection and family socioeconomic status showed no significant differences among various groups ( $p > 0.05$ ,  $\chi^2$ -test).

## DISCUSSION

This study revealed an average infection rate of 38.7% of the *E. vermicularis* among elementary students between the ages of six and ten years old at five primary schools in Bang Plee district, Samut Prakan Province, Thailand. Female students had a slightly higher rate of infection than male students and younger students showed a higher prevalence than older students. Differences in family socioeconomic status (occupation and income) showed no statistically significant difference in the prevalence of infection

among the students.

Factors, not evaluated in the study included a detailed analysis of the students' physical environment, population density within the grounds of the individual schools and the extent of teachers' knowledge of public health and hygiene relating to parasite infection and transmission. The season of the year might also affect the variation 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 by future research. It is hoped that the findings from this study will provide information concerning pinworm infection in Samut Prakan Province. These data can be utilized to develop programs for the prevention and control of pinworm infection and thus decrease the prevalence of infection.

It is of interest to compare our results with prior studies. We found a lower overall prevalence than that found in earlier studies done in Khon Kaen Province in 1992 (50.9%) (Kaewkes *et al*, 1983) and in the slum areas of Bangkok in 1990 (53.4%) (Teopipiporn *et al*, 1981). Khon Kaen Province is in the northeastern region of Thailand which is somewhat 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 (38.63%). Both Samut Prakan and Nakhon Pathom are in the greater Bangkok urban area but on geographically opposite sides of Bangkok.

This study was focused on six to ten-year old children as earlier studies found the highest prevalence in eight to nine-year olds (Preuksaraj *et al*, 1982; Tepmongkol *et al*, 1980). Our study found the highest infection rates in six to seven year old children which did not correspond with the results of the earlier studies. Either social or environmental factors could account for the difference between the studies. Six and seven-

year-olds are old enough to begin taking responsibility for their own personal hygiene but inexperienced enough to be more inept than older children. They also begin to be more mobile at this age visiting other children and playing farther from home and interacting with their environment more than their younger siblings.

An analysis of the difference between males and females in the study indicated that females exhibited a slightly higher rate of infection. However, these results were not significantly different statistically. Teopipiporn *et al* (1981) obtained similar results during a study conducted in five locations in different environments in the Bangkok slums. A study conducted in the Din Dang slums of Bangkok also found no significant differences between males and females (Tepmongkol *et al*, 1980). Conversely, Kaewkae *et al* (1983) found dissimilar results in Khon Kaen Province where boys showed a higher rate of infection. Though on the whole, these differences are not significant, possible factors influencing these results might be that rural boys tend to be outside more and boys in urban areas are attracted to computers, video games and other sedentary activities.

The socio-economic data collected from this study dealt with the parents' incomes and occupations. We had originally predicted an inverse relationship between parental income and the children's rate of infection. However, the study indicated no relationship between family socio-economic status and the prevalence of *E. vermicularis* infection ( $p > 0.05$ ).

An examination of the data concerning parental occupation gave some interesting results. The highest rate of infection was found in the children whose parents were government workers (60%) followed by housewife/house husband (50%), laborer (41.5%), business employee (33.3%) and private business owners exhibited the lowest rate of infection (32.6%). Possible explanations of these results could rest in the fact that governmental employees have low income and often work long hours, thus providing fewer resources for the care of the children, both financially and as time available for quality parental care. Conversely, the owners of private business would have more adequate financial resources and much more free time to attend to their children's care. This, however, is a speculation as we have no hard data supporting these observations.

Factors influencing the infection rate may include personal hygiene, levels of parental care, social interactions at school and teacher knowledge of attention to hygiene practices, *ie* hand washing.

## ACKNOWLEDGEMENTS

The authors greatly appreciate the financial support received through a research grant from Huachiew Chalermprakiet University. Our thanks are also extended to Dr Pramote Thongkajai, Miss Lusda Kurpon of Bang Plee Hospital, Presidents of the five schools studied, Wat Bangplee Yai Nai, Triam Parinyanusorn, Klong Bang Kaew, Klong Bang Krabuo, and Tanasit Anusorn. Dr Sumaree Sungthong, Dr Sumkich Promjue of Srinakharintarawiroj University. Ajarn Noppamas Akarachantachote of Huachiew University and student volunteers for their kind cooperation.

## REFERENCES

- Bever PC, Kriz JJ, Lau TJ. Pulmonary nodule caused by *Enterobius vermicularis*. *Am J Trop Med Hyg* 1973;22:711-3.
- Beckman EN, Holland JB. Ovarian enterobiasis - a propose pathogenesis. *Am J Trop Med Hyg* 1981;30:74-6.
- Cerva L, *et al*. Intestinal parasites : A study of human appendices. *Folia Parasitol* 1991;38:5-9.
- Daly JJ, Baker GF. Pinworm granuloma of the liver. *Am J Trop Med Hyg* 1984;3:62-4.
- Jongsuksantigul P, *et al*. Study on prevalence and intensity of intestinal helminthiasis and opisthorchiasis in Thailand. *J Trop Med Parasitol* 1992;15:80-95.
- 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.
- Kogan J, Alter M, Price H. Bilateral *Enterobius vermicularis* salpingo-oophoritis. *Postgrad Med J* 1981;73:305-10.
- Little MD, Cuello CJ, D' Alessandro A. Granuloma of the liver due to *Enterobius vermicularis*. *Am J Trop Med Hyg* 1973;22:567-9.
- Mameechai P, Tasanaswang C, Panyaruggij P. Survey of enterobiasis in school children in Bangkok and Nonthburi Provinces. *J Trop Med Parasitol* 1992;15:39-49.
- Preuksaraj S, Jeradit C, Sathitayathai A, Kijvannee S, Sudonrusmi T. Studies on prevalence and intensity of intestinal helminthic infection in the rural population of Thailand. *Commun Dis J* 1982; 8:244-68.

- Teopiporn P, Sornsamai S, Bunnag T, Masnagmmueng R. Studies on the prevalence of enterobiasis in slum areas of Bangkok. *J Parasitol Trop Med Assoc Thai* 1981;4:11-3.
- Teptomongkol M, Suntadwoot C, Lamonand C, *et al.* Enterobius infection in young school children at Slum Klontey. *Siriraj Hosp Gaz* 1980;32:597-600.
- Vajarasthira S, 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.