INTESTINAL PARASITIC INFECTIONS IN HILL-TRIBE SCHOOLCHILDREN IN CHIANG MAI, NORTHERN THAILAND

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Abstract. We surveyed intestinal parasitic infections in hill-tribe schoolchildren residing permanently in Chiang Mai Province. The positive rate, of 403 stool specimens examined using the formalin-ether sedimentation technique, was 48.9%. No significant difference between male (50.8%) and female (47.1%) students was found for the infection. The most common protozoa was *Entamoeba coli* (40.9%), followed by *Giardia lamblia* (14.9%). The most common helminth was hookworm (13.4%), followed by *Ascaris lumbricoides* (8.0%), and *Trichuris trichiura* (6.9%). *Opisthorchis viverrini*, the most important liver fluke infection in northern Thailand, was found in only 1.5%. Children harbored 1-5 species of parasites, with the most being single infections (67.5%), followed by double infections (26.9%). This finding promoted an urgent need for the treatment of infected schoolchildren, and the prevention of re-infection must be underlined.

INTRODUCTION

Intestinal parasitic infections have long been recognized as one of the major public health problems in Thailand. The important parasites affecting human health are mostly soil-transmitted helminths (STH), *ie* hookworm, *Ascaris lumbricoides* and *Trichuris trichiura*. Aside from being a source of several diseases, STH also cause adverse effects on growth, particularly in schoolchildren. Studies in Africa indicated that intestinal worm infections depressed growth, physical fitness, physical activity, appetite and cognitive performance in school-age children (Stephenson *et al*, 1993). Hookworm infection, anemia, abdominal pain, diarrhea, nausea, vomiting, belching, flatulence and loss of appetite have all been associated with the presence of adult worms (Migasena and Gilles, 1991). Vitamin B1, B2 and B6 deficiencies were found in schoolchildren with hookworm infection (Nontasut *et al*, 1996). The intensity of infection with *Ascaris lumbricoides* has been correlated with the level of verbal ability (Levav *et al*, 1995). Moderate to heavy *T. trichiura* infection affected cognitive abilities in children 9-12 years of age (Nokes *et al*, 1992), whilst severe infection was associated with growth retardation and iron deficiency anemia (Cooper *et al*, 1992). Therefore, children who are healthy can be more physically and/or mentally active than those who are not.

In Chiang Mai Province, northern Thailand, intestinal parasitic infections still exist, with prevalence rates ranging from 50.3%-76.7% in 1969-1990 (Thitasut *et al*, 1973; Yamaguchi *et al*, 1982; Yasmuth and Sukhawat, 1990). Concerning infection in hill-tribe students in Chiang Mai, the prevalence rate in those cases was different from that in low-land students. A study in 1984 indicated that the percentage of Karen students (one type of hill-tribe people) infected with hookworm, *A. lumbricoides* and *T. trichiura* were 19.4%, 26.3% and 13.1%, respectively (Yasmuth and Sukhawat, 1990). A recent study also revealed that significantly more intestinal parasite infection occurred in male hill-tribe students at a junior high school in Chiang Mai (53.7%) than in low-land students (4.6%) (Piangjai *et al*, 1998). However, no report is available regarding the prevalence of intestinal parasitic infection in elementary hill-tribe schoolchildren residing permanently in Chiang Mai Province. These children have less knowledge of parasitic infection and personal hygiene than junior high school students. Hence, this study was undertaken to compare parasitic infections between elementary students and hill-tribe students at a junior high school.

MATERIALS AND METHODS

The study was conducted during 1997-1998, with hill-tribe schoolchildren boarding at Suksa Songklao School, which is located on the outskirts of Mueang district, Chiang Mai Province, northern Thailand. A total of 403 students (282 in elementary classes and 121 in junior high school classes: 197 males and 206 females) were recruited after receiving complete informed consent for participation from the director of the school. Participating students were provided with a plastic box, labeled with their name and class, for the purpose of collecting their stools. Stool collection

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was made for the following 4 days. Stool examination was performed using the formalin-ether concentration method for the detection of intestinal parasites (Ritchie, 1984).

RESULTS

Of the total 403 stool specimens examined, 197 (48.9%) were positive for intestinal parasites. Intestinal parasites were found at the same intensity in both males (50.8%; 100/197) and females (49.2%; 97/206) (χ^2 = 0.54; p = 0.46). Among the protozoa, *Entamoeba coli* was by far the most common species, detected in 40.9%. The others were *Giardia lamblia*, *Endolimax nana, Chilomastix mesnili* and *Entamoeba histolytica.* Three nematodes (hookworm taken as one species), one trematode and 5 protozoan species were observed, but no cestode infection was detected (Table 1). Among the helminths, STH infections were predominant, with a 13.4% prevalence of hookworm being the most common infection, followed by *A. lumbricoides* (8.0%) and *T. trichiura* (6.9%). *Opisthorchis viverrini* were found only in 1.5% of the children. Most were single infections (65.7%), while double, triple, tetrad and pentad infections were observed in 25.4%, 4.5%, 2.0% and 2.5% of the study population, respectively. The prevalence of intestinal parasites was slightly higher in students of elementary classes (51.4%; 145/208) than in that of junior high school classes (43.0%; 52/121), but the difference was not significant (χ^2 = 2.42; p = 0.12) (Table 2).

Within 197 parasite harboring students, 89 (41 males and 48 females) had only non-pathogenic protozoa. Pathogenic protozoa and helminths were found in only 108 (26.8%) of the students in this school. Among the pathogenic parasites, *G. lamblia* was predominant, and observed in 41 students (38.0%). However, these non-pathogenic protozoa could indicate poor hygiene among the hill-tribe people, since infection can spread via fecally contaminated food or water.

Table 1
Intestinal parasites found in stool specimens of hill-tribe schoolchildren residing as boarders.

Parasite	No. positive (%)
Protozoa	
Blastocystis hominis	15 (5.4)
Chilomastix mesnili	3 (1.1)
Endolimax nana	17 (6.2)
Entamoeba coli	113 (40.9)
Entamoeba histolytica	2 (0.7)
Giardia lamblia	41 (14.9)
Sarcocystis spp	1 (0.4)
Helminth	
Ascaris lumbricoides	22 (8.0)
Enterobius vermicularis	2 (0.7)
Hookworm	37 (13.4)
Opisthorchis viverrini	4 (1.5)
Trichuris trichiura	19 (6.9)

Table 2
Intestinal parasites found in stool specimens of hill-tribe schoolchildren residing as boarders in elementary and junior high school classes.

Parsite		Total no. positive (male, female)	
		Elementary classes	Junior high school classes
Protozoa	*Blastocystis hominis*	9 (4,5)	6 (3, 3)
	Chilomastix mesnili	2 (1,1)	1 (0, 1)
	Endolimax nana	12 (3,9)	5 (1, 4)
	Entamoeba coli	80 (41, 39)	33 (12, 21)
	Entamoeba histolytica	1 (0, 1)	1 (0, 1)
	Giardia lamblia	37 (18, 9)	4 (1, 3)
	Sarcocystis spp	-	1 (1, 0)
Helminth	*Ascaris lumbricoides*	20 (14, 6)	2 (0, 2)
	Enterobius vermicularis	2 (2, 0)	-
	Hookworm	26 (19,7)	11 (6, 5)
	Opisthorchis viverrini	2 (0, 2)	2 (0, 2)
	Trichuris trichiura	16 (11, 5)	3 (0, 3)

DISCUSSION

Most of the students, who enrolled as boarders at Suksa Songklao School, were from the hill-tribe areas of Chiang Mai Province and its vicinity. Intestinal parasitic infections in these schoolchildren were relatively high (48.9%); however, they were slightly lower than previously reported in Karen hill-tribe schoolchildren residing in Chiang Mai (66.9%) (Yasmuth and Sukhawat, 1990), and hill-tribe students in Somdet Prabhudhachinnawong School (53.7%) (Piangjai *et al*, 1998). The lower rate might be due to the fact that these children were boarders, and the school provides better sanitation in food preparation and latrine care and/or hygiene education. Regarding the most common parasite in this study (hookworm infections), a majority of students wore slippers or shoes outside. This indicates that previous hookworm infections were contracted prior to school enrollment, and they remained extant thereafter unless treated. Re-infection of hookworm might not occur while boarders are at school because of the good environmental conditions and improvement in personal hygiene there.

Most parasites detected were pathogenic, *ie* STH, *G. lamblia* and *E. histolytica*. Therefore, those schoolchildren who are moderately or heavily infected with STH may have the adverse effects mentioned previously. Treatment of hookworm infection in children would definitely cause a decline in parasite load, and albendazole (400 mg single dose) has been recommended as a regimen for eradicating this parasite (Sukontason *et al*, 2000). Those heavily infected with *G. lamblia* and *E. histolytica* might develop chronic diarrhea and dysentery, respectively. These could lead to illness or disease unless treated properly.

Enterobius vermicularis was found in only two cases. Stool examination is not an appropriate method for the detection of this parasitic infection. The cellophane tape technique is the recommended method (Beaver *et al*, 1984). The true prevalence of this parasite in students may be far more than presented in this study. Further survey using the appropriate technique must be performed.

The prevalence of intestinal parasites in hill-tribe schoolchildren is still high in both elementary and junior high school classes. The present result, along with previous studies (Thitasut *et al*, 1973; Yamaguchi *et al*, 1982; Yasmuth and Sukhawat, 1990; Piangjai *et al*, 1998), indicates that the prevalence of parasitic infection is still high and stable in this group of people. Since they live at the source of the main rivers of Thailand, and up to now have grown a lot of vegetables for low-land people, parasites can spread to the low-land people through water or the contamination of fresh vegetables. Urgent parasite control and health promotion in hill-tribe people has to be performed.

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