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PREVALENCE OF INTESTINAL PARASITE AND RELATED FACTORS AMONG SCHOOL CHILDREN IN SUAN PHUENG SUBDISTRICT, RATCHABURI, THAILAND

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ABSTRACT

Background: *Intestinal parasitic infections are still regarded as the major public health problems in Thailand, especially in rural areas. The presence of intestinal parasites in school children is a well-accepted indicator of poor personal hygiene and low economic standards. This study aimed to determine the prevalence of intestinal parasitic infections and its associated risk factors among primary school children (Grade 4 to 6) in Suan Phueng sub-district, Ratchaburi, Thailand, where is located at Thai-Myanmar border areas.*
Methods: *A cross-sectional study was conducted at three selected governmental primary schools. A total of 252 school children (130 boys, 51.6% and 122 girls, 48.4%) were recruited in this study. Intestinal parasites were detected from their stool samples by using formalin ethyl-acetate concentration technique. Socio-demographic status and personal hygiene were assessed by a validated structured questionnaire.*
Results: *An overall prevalence of intestinal parasitic infection was 19%. Poly-parasitism was found in 4% of school children. The most common parasite was Entamoeba coli (6.4%) followed by Ascaris lumbricoides (4.5%), Endolimax nana cyst (4.0%), and Giadia lumbria (1.8%). Additionally, family income, drinking water sources from school and home, hand-washing habit after using toilet, anal cleansing after defecation, and parents' education level were significantly associated with intestinal parasitic infections.*
Conclusions: *High prevalence of intestinal parasitic infections was found in primary school children at Suan Phueng sub-district, Ratchaburi, Thailand. Therefore, health promotion, modern health education, water sanitation, and hygiene (WASH) programs are crucial for prevention of intestinal parasitic infections in primary schools, particularly in Thai-Myanmar border areas. Reducing the prevalence of parasitic infections in school children may be of immense benefits on child growth, development, and educational outcomes.*

Keywords: *School children, Intestinal parasites, Prevalence, Risk factors, Health education*

INTRODUCTION

Intestinal parasitic infection stands the main public health problem in the world, particularly in developing countries. However, the impacts of the infection on health care system have been mostly neglected[1]. Nowadays, many studies reported the prevalence of intestinal parasitic infections in some specific areas, but not as a national data, even in a country like Thailand that stands as leading country in ASEAN region. In 2009, the national survey of helminthiasis in Thailand showed high prevalence of parasitic infection (18.1%) in Thai people[2]. Parasitic infections in children are still common, even in developed countries. Globally, over 1 billion people are approximately infected with at least one type of intestinal helminthes, with the highest prevalence in school-aged children. Parasitic infection can lead to mal-absorption and chronic blood loss in children, together with long-term effects on their physical (height and weight) and cognitive development[3]. Parasitic infection is also a risk factor for malnutrition which is common in developing countries, poor psychomotor development, growth retardation, and stunting in children.

Intestinal parasites, which have direct life cycle and are transmitted by fecal-oral route, are significant to children because of poor personal hygiene, environmental conditions such as water, social and geographical factors[4]. An intestinal parasitic infection is believed to be imposing an unnecessary burden on many school children and on the over-all cost of health care. Other epidemiological data mention that sanitation is at least as effective in preventing disease. Although several studies have been conducted on the distribution and prevalence of intestinal parasites in school children at Thailand, but there are still several localities for which epidemiological information is not available. Therefore, the objective of the present study was to determine the prevalence of intestinal parasitic infections and associated risk factors among primary school children in Suan Phueng sub-district, Ratchaburi, Thailand.

METHODS

Study area

The cross-sectional study was carried out in three primary schools in Suan Phueng sub-district, Ratchaburi, Thailand. These schools included Tako Pit Thong Border Patrol Police School, Ban Tham Hin Border Patrol Police School, and Ban Huai Phak School which are all governmental primary schools.

Sample size and study population

The study was carried out during January and March 2018. Three primary schools in Suan Phueng sub-district, Ratchaburi, Thailand, were purposively selected in this study. Total 252 school children, who were studying in grade 4 to 6, participated the study. All children who were willing to participate in this study were asked for permissions from their parents or guardians on informed consent form to join the study. The children, who were not permitted by their parents or guardians, were excluded.

Data collection and stool examination

Health promotion volunteers at community hospitals were well-trained for general personal hygiene examination such as cleanliness of hair and fingernails. They were also practiced to collect the data and explain the pre-structured questionnaires regarding on socio-demographic, environmental and behavioral factors, and other associated risk factors. In order to get the reliable information, all school children were interviewed using the Thai language.

School children who were selected for the study were clearly instructed to collect the stool samples properly and provided the clean and labeled plastic containers, toilet tissue paper, and pieces of applicator sticks.

Laboratory procedures

The collected stool samples were immediately prepared by using a 10% formalin solution and transported to Biomedical Laboratory of Faculty of Medical Technology, Siriraj Hospital, Mahidol University, where formal-ether concentration techniques were performed to increase the chance of detection of parasites. After concentration step, a drop of sediment was placed onto a microscope slide and covered with a cover slip. The entire cover slip was examined with a ×10 objective for large parasite and ×40 object for smaller parasites. All results were recorded on a corresponding record form and quantified as positive or negative according to the parasite detection.

Quality control

Well-trained interviewers were used to get the proper responses from the school children. Regarding stool samples, all were checked two times such as serial number, quality and procedures of collection. Experienced laboratory professionals checked all laboratory materials such as quality of reagents, sampling equipment, transporting system and microscope in the Faculty of Medical Technology, Siriraj Hospital, Mahidol University.

Data analysis

Data entry and analysis were done using SPSS version 18 computer software. The baseline characteristics of the study population were summarized using means. Ranges for continuous variables proportions and frequencies were used for categorical variables. Chi-square test was used for finding the association between intestinal parasitic infection and selected variables. Logistic regression was used to find out the factors influencing the prevalence of intestinal parasitic infection among school children. *p*-value was set at less than 0.05 for statistical significance. This study was approved by the Ethics Review Committee of Faculty of Tropical Medicine, Mahidol University and received the permission form Ratchaburi Health Department and school administrative authorities at Suan Phueng District.

RESULTS

Socio-demographic characteristics

A total of 252 school children, aged between 9-17 years old were considered in the analysis of this study with the non-response rate of 9.1%. The mean age of 252 schoolchildren (90.9%) were 11.86±1.52 years. A male and female ratio was 1.06:1 (Table 1).

Parents' educational status was classified under the level of illiterate and primary school or higher, that was, 147 were illiterate and 345 were primary school and higher levels. Regarding father's occupation, mine employees were 8 (3.3%), followed by forest product sellers were 13 (5.3%), unemployed and resort or hotel employees were 19 (7.7%) for each, then agriculture employees were 58 (23.6%), construction labors were 65 (26.4%) and others were 64 (26.0%). For mother, mine employees and construction labors were 11 (4.4%) for each, followed by forest product sellers were 15 (6.1%), resort or hotel employees were 40 (16.3%), agriculture employees were 43 (17.5%), unemployed were 65 (26.4%), and others were 61 (24.2%) (Table 1). Family income group ($p<0.047$) and parents' educational status ($p<0.001$) were found to be significantly associated with the intestinal parasitic infections among the socio-demographic characteristics of the school children.

Table 1. Socio-demographic of school children (n=252)

Characteristics	Number (%)
Sex	
Male	130(51.6)
Female	122(48.4)
Age category (years)	
≤ 12 years	181(71.8)
≥ 13 years	71(28.2)
Mean±SD	11.86±1.52
Schools	
Tako Pit Thong Border Patrol Police School	56(22.2)
Ban Tham Hin Border Patrol Police School	86(34.1)
Ban Huai Phak School	110(43.7)

Prevalence of intestinal parasitic infections

Based on microscopic stool sample examinations, 7 species of intestinal parasites were identified. Overall prevalence of intestinal parasitic infection was 19%. Poly parasitism was found among 4% of school children. Additionally, the parasites which were found among the school children included *Entamoeba coli* (6.4%), *Ascaris lumbricoides* (4.5%), *Endolimax nana* cyst (4.0%), *Giadia lumbria* (1.8%), *Entamoeba histolytica* (1.2%), *Blastocystis hominis* (0.7%), and hook worm (0.4%) (Figure 1). But there was no significant difference between male and female school children (p>0.05).

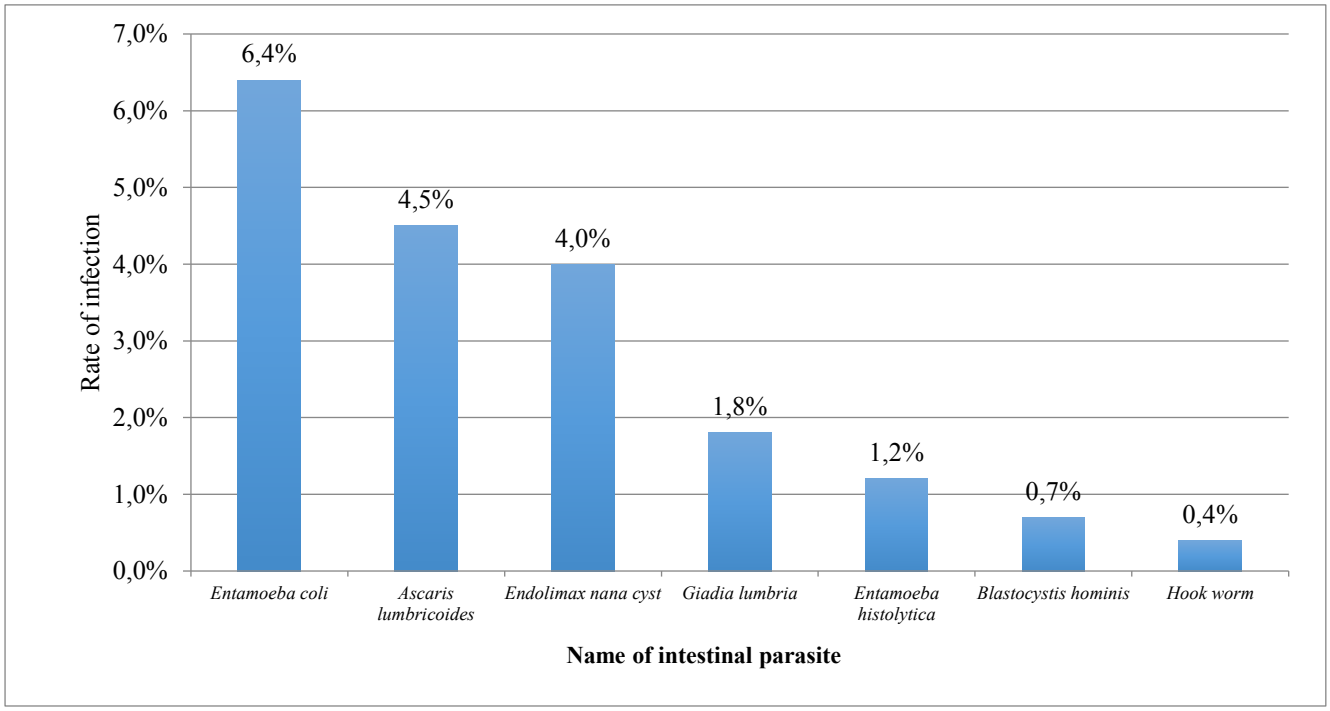

Figure 1. Rate of intestinal parasitic infection

Personal hygiene profiles

Regarding toilet, school children were knowledgeable in personal hygiene and health education. Among them, 84 (33.4%) did not always wash their hands after using toilet and 168 (66.6%) always washed their hands after using toilet. A statistically significant difference between not washing hands after using toilet and intestinal parasitic infections was found (p<0.001). In that, 194 (77%) school children used water for their anal cleansing after using toilet. Twenty-four (9.5%) school children used toilet tissue paper and 34 (13.5%) cleaned with other methods such as newspaper, writing paper, leaves, sticks, and some did not clean (Table 2). There was a statistically significant association between no-water anal cleansing and intestinal parasitic infection (p <0.001) (Table 3).

For drinking water, 52 (20.6%) school children reported that they drank bottled water and 200 (79.4%) drank treated tapped water and other types of water in their schools. At home, 70 (27.8%) drank bottled water sold in the public and 182 (72.2%) drank from other water sources such as stream water, rainwater and community treated water (Table 2). In addition, significant association between intestinal parasitic infections and both water sources of school (p=0.006) and home (p<0.001) were found (Table 3).

Table 2. Personal hygiene profiles

Characteristics	Number (%)
Water sources at school	
Unpurified water and others	200 (79.4)
Bottles water sold	52 (20.6)
Water source at home	
Bottled water sold	70 (27.8)
Others (Stream water/Rain/Community water	182 (72.2)
Hand wash after toilet	
Not Always	84 (33.3)
Always	168 (66.7)
Hand wash before eat	
Never	171 (67.9)
Sometimes	144 (57.1)
Always	93 (36.9)
Anal washing	
Using water	194 (77)
Using toilet tissue	24 (9.5)
Others (newspaper/writing paper/leaves and sticks, never clean)	34 (13.5)

Table 3. Association between intestinal parasitic infection and selected variable

Factors	Intestinal parasite		*p* value*
	Found (%) (n=48)	Not found (%) (n=204)	
Family Income group			0.047
Lower than minimum salary	30 (11.9)	95 (37.7)	
Higher than minimum salary	18 (7.1)	109 (43.3)	
Water source from school			0.006
Unpurified water and others	45 (17.9)	155 (61.5)	
Bottled water sold	3 (1.2)	49 (19.4)	
Water source from home			< 0.001
Bottled water sold	1 (0.4)	69 (27.4)	
Others (stream water/Rain/Community water)	47 (18.7)	135 (53.6)	
Hand wash after toilet			< 0.001
Not Always	42 (16.7)	42 (16.7)	
Always	6 (2.4)	162 (64.3)	
Anal washing			< 0.001
Using with water	3 (1.2)	191 (75.8)	
Using toilet paper	16 (6.3)	8 (3.2)	
Others (Newspaper or writing paper, leaves and sticks, never clean)	29 (11.5)	5 (2.0)	
Father's education			<0.001
Illiterate	42 (16.7)	42 (16.7)	
Primary school level and higher	6 (2.4)	162 (64.3)	
Mother's education			<0.001
Illiterate	35 (14.2)	17 (6.9)	
Primary school level and higher	11 (4.5)	183 (74.4)	

Factors associated with intestinal parasitic infections

In this study significant relationships were observed between intestinal parasitic infections and some of social-demographic variables, personal hygiene, and behavioral factors. It was revealed that family income group (p=0.047), parents' education levels (p<0.001), drinking water sources at school (p=0.006) and drinking water sources at home (p<0.001) were found to be significantly associated with intestinal parasitic infections.

In binary logistic regression analysis, family income group (p=0.009), drinking water sources at school (p=0.018), hand washing after using toilet (p<0.001), and mother's education level (p<0.001) were significantly associated with intestinal parasitic infections (Table 4). The risks of intestinal parasitic infections among school children with low family income were 0.07 times (AOR=0.074, 95% CI=0.01-0.52) higher than other school children with high family income. Similarly, school children who did not drink bottled drinking water at school were also found to be 0.1 times (AOR = 0.123, 95% CI=0.022–0.697) more likely to be infected with intestinal parasitic infections compared to those who drank the bottled drinking water at school. Moreover, school children who didn't wash their hands after using toilet were found to be 0.005 times (AOR=0.005, 95% CI=0.001–0.039) higher odds of getting intestinal parasitic infections compared with those who washed their hands after using toilet. In addition, the chance of being infected with intestinal parasitic infections was 0.066 times (AOR=0.066, 95% CI=0.019–0.237) greater in children whose mothers were illiterate (Table 4).

Table 4. Factors associated with intestinal parasitic infections

Factors	Intestinal parasite		Adjusted odds ratio (95%CI)	*p*-value
	Found (%) (n=48)	Not found (%) (n=204)		
Family income group				
Lower than minimum salary	30 (62.5)	95 (46.6)	1(reference)	
Higher than minimum salary	18 (37.5)	109 (53.4)	0.074(0.010-0.521)	0.009
Water source at school				
Bottled water sold	3 (6.2)	49 (24.0)	1(reference)	
Unpurified water and others	45 (93.8)	155 (76.0)	0.123(0.022-0.697)	0.018
Hand wash after Toilet				
Not always	42 (87.5)	42 (20.6)	1(reference)	
Always	6 (12.5)	162 (79.4)	0.005(0.001-0.039)	<0.001
Father's education				
Illiterate	35 (76.1)	60 (30.0)	1(reference)	
Primary school level and higher	11(23.9)	140 (70.0)	0.410(0.109-1.538)	0.186
Mother's education				
Illiterate	35 (76.1)	17 (8.5)	1(reference)	
Primary school level and higher	11 (23.9)	183 (91.5)	0.066(0.019-0.237)	<0.001
Age(continuous)	-	-	1.296(0.820-2.050	0.267
Sex				
Male	99(48.5)	31(64.6)	1(reference)	
Female	105(51.5)	17(35.4)	0.348(0.095-1.276)	0.11

DISCUSSION

This study assessed the associations of potential risk factors with the prevalence of intestinal parasitic infection among school children. Socio-demographic, environmental, behavioral factors, and different sanitation facilities had a significant contribution for the presence of intestinal parasitic infections [5, 6]. Among results, one of the strong statistically significant associations was the presence of intestinal parasitic infections and hand washing after using toilet (p<0.001, AOR = 0.005, 95% CI 0.001–0.039). This finding was consistent with other study in which the knowledge of washing hands after using toilet affected to the presence of intestinal parasitic infections in school children[7].

Our study attempted to show the potential risk factors for the prevalence of intestinal parasitic infections in primary school children. The overall prevalence of intestinal parasite was 19.0% and it was consistent with a previous study which was conducted in primary schools at Phitsanulok, Thailand [8]. However, the prevalence of intestinal parasitic infections is still high compared with other similar studies among school children of Thailand[9]. Our data agreed with several studies [8, 9, 10], which showed that intestinal parasitic infections are common (4.2-48.9%) among children in Thailand. The prevalence of intestinal parasitic infections among children was much higher than those of adults[11].

On the other hand, drinking water source was one of the important risk factor and significantly associated with the prevalence of intestinal parasitic infections (p=0.018, AOR=0.123, 95%CI=0.022–0.697). In this study, a relatively high prevalence of parasitic infection was observed in school children who drank untreated water at school and home. In contrast, other study showed that the prevalence of intestinal parasitic infections was found to be significantly high in school children who drank untreated

drinking water. This might be due to the intestinal parasites especially protozoa that can be transmitted from water[12].

Differences due to sex were not observed in this current study. These results were similar to study conducted in Thailand's school children[13]. In this study, the prevalence of intestinal parasitic infection was high in rural areas which was similar to a previous investigation [14].

Consistently, in this study, significantly higher prevalence of intestinal parasitic infection was detected among mothers of school children who were illiterate (p<0.001, AOR = 0.066, 95% CI=0.019 -0.237). Similarly, these findings were consistent with other study that mother's education levels related to intestinal parasitic infections [15]. Mothers with higher educational qualification was better in looking after their children's health. Intestinal parasitic infection was also associated with family income group (p=0.009, AOR=0.074, 95%CI=0.010–0.521). It might be due to that low income families had poor sanitation and living conditions which lead to high risk of the intestinal parasitic infections in school children. This finding agreed with a former study, which found that low income family was difficult to look after their health, and had high chance to transmit intestinal parasites[16].

The limitations of this study included (1) eating behaviors in school children was not evaluated and (2) other standard investigation techniques should be done in parallel to confirm results. This is Nevertheless, it was a good reference study on important risk factors of intestinal parasitic infections among school children in Thai-Myanmar border area.

CONCLUSION

The prevalence of intestinal parasitic infections, especially soil-transmitted helminthes (STHs) was still high in school children at Suan Phueng, Ratchaburi, Thailand. This indicated that protozoa and helminthes infections are very common in this area and associated to several factors including socio-demographic issues, personal hygiene, and environmental aspects. Health education on personal hygiene to school children and their parents especially mothers is required. Health promotion, modern health education, water sanitation, and hygiene (WASH) programs are crucial for prevention of intestinal parasitic infections in primary schools, particularly in Thai-Myanmar border areas. Reducing the prevalence of parasitic infections in school children may be of immense benefits on child growth, development, and educational outcomes.

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CONFLICT OF INTEREST

No conflict of interest related with this article was reported.

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