

INTESTINAL HELMINTHIC INFECTIONS IN SCHOOLCHILDREN IN CAMBODIA

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Abstract. During the period January to December 1998, the National Malaria Center (CNM) carried out a parasitological survey of schoolchildren in rural and semi-urban areas, to assess intestinal helminthic infections in schoolchildren in the central parts of Cambodia. In the rural areas, there were four schools in Stung Treng Province (all situated along the Mekong River), five schools in Kratie Province (around rubber plantations), six schools in Kampong Chhnang Province (along Tonle Sap Lake); and in the semi-urban areas, three schools in Beng Tumpon Commune and five schools in Chbar Ampeou Commune (Mean Chey District) were selected for study. By Kato-Katz technique, the prevalence of soil-transmitted helminthic infections in schoolchildren in both the rural and urban areas was high. The infection rate was between 10-40% for *Ascaris*, 2-17% for *Trichuris* and 5-65% for hookworm. Schistosomiasis and opisthorchiasis were found in the schoolchildren living along the Mekong River (Stung Treng Province); the infection rate of *S. mekongi* ranged from 12 to 43%. These infections in children were with hepatomegalies. An intervention in an urban area (Chraing Chamres) showed that after repeated treatment with mebendazole 500 mg single dose every 6 months, the prevalence of all parasites had dropped to about one third of the initial level.

INTRODUCTION

Intestinal helminthic infections are the most common human parasitic infections. The WHO estimates that more than one billion of the world's population is infected with intestinal parasites. Children and pregnant women are particularly vulnerable to infection, which cause many nutritional problems and, consequently, produce growth retardation.

In the schistosomiasis control program in the Province of Kratie, Northern Cambodia, infection with intestinal helminths was frequently found. Moreover, in a series of surveys in several provinces of Cambodia, a high prevalence of helminthic infections was detected. Both rural and urban communities were similarly concerned. Observation reveals that the majority of the population lives in areas that lack hygiene and have inadequate water supply and sanitation facilities.

The public health problem of helminthic infections has been neglected in Cambodia. Only schistosomiasis and filariasis were considered to be parasitic diseases that lead to high mortality and morbidity. However, recent research has shown that intestinal helminthic infections can produce various types of morbidity and mortality.

Safe and low-cost anthelmintic drugs are now available: the most commonly used are mebendazole and albendazole. They can be administered as a single dose, which makes them an ideal tool for mass treatment in the target community.

The objective of this study is to assess intestinal helminthic infection and morbidity in rural and urban settings in Cambodia, and also to monitor the impact of mass-treatment with mebendazole 500 mg single dose.

MATERIALS AND METHODS

Study areas

Schoolchildren in rural and urban areas were examined for intestinal helminthic infections.

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Rural areas: the study sites were 3 provinces, Stung Treng (District of Thalaborivatt and Siem Bok); Kratie (Snoul District); and Kampong Chhnang.

School in the rural areas 1) Stung Treng: schools of three villages in Thalaborivatt District and one village in Siem Bok District; these are situated along the Mekong River; 2) Kratie: schools of five villages in Snoul District; these are situated around rubber plantations; 3) Kampong Chhnang, schools of six villages; all are situated along Tonle Sap Lake; children of these schools were investigated.

Urban areas: Beng Tumpon and Chbar Ampeou communes (Mean Chey District, Phnom Penh). Children from eight villages of two communes were examined.

Parasitological survey

The age and sex of each child were recorded. Questionnaires reporting morbidity, including frequent abdominal pain, chronic diarrhea and other symptoms, were administered. Stool samples were collected and examined by Kato-Katz technique. Only children in the Province of Stung Treng were examined for liver and spleen enlargement. After complete investigation, all schoolchildren were treated with mebendazole.

Pilot control program

A pilot control program for intestinal helminthic infection by repeated mass treatment was performed at a site in Phnom Penh. The efficacy of the mass treatment with a 500 mg single dose of mebendazole for the control of soil-transmitted helminthiasis was assessed. Six thousand chil-

dren from four schools (n=6,000) in Chraing Chamres, Phnom Penh received mebendazole every six months. The stool samples of the children (n=300 to 350) were examined by Kato-Katz technique for the presence of intestinal parasites. Follow-up started in December 1996 and ended in January 1999; in all, five repeated treatments were given. Some stool specimens were processed with SAF (sodium acetyl formalin concentration) and Bearmann technique.

RESULTS

Rural areas

Area along the Mekong River in Stung Treng Province. The results from the questionnaire showed severe morbidity from intestinal parasitic infection in the community. The reported symptoms included the presence of blood in the stool, abdominal pain and diarrhea (Table 1). About 20% of the cases expelled worms in their feces. From clinical examination, the observed organomegaly was mainly hepatomegaly (Table 2).

Parasitological investigation showed that the children were infected with *Ascaris*, hookworms and *Trichuris* (Table 3). In the villages in Thalaborivatt District (Kralapeas and Kandal schools), close to the Laotian border, *Schistosoma mekongi* and *Opisthorchis viverrini* were also found. These infected children were found similarly to have hepatomegaly, especially in Kralapeas School, which had a high prevalence of *S. mekongi* (Table 3).

Area around rubber plantations (Kratie Province). This area lacked hygienic facilities and

Table 1
Results of questionnaire from 4 schools in rural areas along the Mekong River in Stung Treng Province.

Schools	Number examined (%)			Reported symptoms (%)			
	Male	Female	Total	Bloody stool	Abdominal pain	Chronic diarrhea	Worms in stool
O. Mras	39 (48.7)	41 (51.3)	80	3 (3.8)	25 (31.3)	12 (15.0)	22 (27.5)
O. Svay	59 (51.8)	55 (48.2)	114	24 (21.1)	63 (55.3)	27 (23.7)	24 (21.1)
Kralapeas	47 (55.3)	38 (44.7)	85	47 (55.3)	47 (55.3)	41 (48.2)	20 (23.5)
Kandal	39 (62.9)	23 (37.1)	62	22 (35.5)	14 (22.6)	12 (19.4)	3 (4.8)
Total	184 (54.0)	157 (46.0)	341	96 (28.2)	149 (43.7)	92 (27.0)	69 (20.2)

Table 2
Results of the clinical examination in four schools along the Mekong River
in Stung Treng Province.

Schools	Number examined	Liver (left lobe) (%)			Spleen (%)			
		Level 0	Level 1	Level 2	Level 0	Level 1	Level 2	Level 3
O. Mras	80	77 (96.3)	1 (1.3)	2 (2.5)	78 (97.5)	1 (1.3)	1 (1.3)	0
O. Svay	114	97 (85.1)	12 (10.5)	5 (4.4)	113 (99.1)	0	1 (0.9)	0
Kralapeas	85	45 (53.0)	28 (32.9)	12 (14.1)	78 (91.8)	3 (3.5)	3 (3.5)	1 (1.2)
Kandal	62	59 (95.2)	3 (4.8)	0	62 (100.0)	0	0	0
Total	341	278 (81.5)	44 (12.9)	19 (5.6)	331 (97.0)	4 (1.2)	5 (1.5)	1 (0.3)

Table 3
Prevalence of helminthic infections in schoolchildren along the Mekong River, in four schools
in Stung Treng Province, examined by Kato-Katz technique.

Schools	Number examined	Number positive (%)	Number infected (%)				
			<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>S. mekongi</i>	<i>Opisthorchis</i>
O. Mras	80	22 (27.5)	14 (17.5)	4 (5.0)	5 (6.3)	0	0
O. Svay	114	36 (31.6)	7 (6.2)	3 (2.6)	16 (14.0)	14 (12.3)	0
Kralapeas	85	49 (57.6)	5 (5.9)	2 (2.4)	3 (3.5)	37 (43.5)	4 (4.7)
Kandal	62	34 (54.8)	4 (6.5)	4 (6.5)	16 (25.8)	9 (14.5)	4 (6.5)
Total	341	141 (41.3)	30 (8.8)	13 (3.8)	40 (11.7)	60 (17.6)	8 (2.3)

Table 4
Results of stool examination of schoolchildren in five schools in Snoul District,
Province of Kratie, by Kato-Katz technique.

Schools	Number examined	Number positive (%)	Number infected (%)			
			<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>H. nana</i>
Snoul Watt	83	61 (73.5)	39 (47.0)	0	26 (31.3)	1 (1.2)
Rubber Plantation 2 December	101	77 (76.2)	56 (55.4)	6 (6.0)	26 (25.7)	1 (1.0)
2 Tnou Srok Snoul	42	36 (85.7)	21 (50.0)	2 (4.8)	16 (38.1)	0
Sre Char	30	21 (70.0)	14 (46.7)	0	8 (26.7)	1 (3.3)
Svay Chras	52	32 (61.5)	21 (40.4)	2 (3.8)	13 (25.0)	0
Total	308	227 (73.7)	151 (49.0)	10 (3.2)	89 (28.9)	3 (1.0)

knowledge of the population about hygiene was very poor. Anemia was reported from health workers in the field. A total of 308 fecal samples from schoolchildren in five schools in the communes of Snoul and Svay Chras was examined. The prevalence of helminthic infection is shown in Table 4. *Ascaris* infection was the most prevalent (49.0%), while hookworm infection was also high (28.9%).

Area along Tonle Sap Lake (Kampong Chhnang Province). A parasitological survey for intestinal parasitic infection was done in six schools along Tonle Sap Lake in Kampong Chhnang. A total of 576 schoolchildren were investigated. The infection rate is shown in Table 5. *Ascaris* and hookworm infections were highly prevalent, 32.5% and 24.3%, respectively.

Table 5
Results of stool examination of schoolchildren in six schools in Kampong Chhnang Province by Kato-Katz technique.

Schools	Number examined	Number positive (%)	Number infected (%)			
			<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>H. nana</i>
Chnok Trou	114	64 (56.1)	22 (19.3)	16 (14.0)	13 (11.4)	17 (14.9)
Koh Ressey	90	73 (81.1)	12 (13.3)	9 (10.0)	44 (48.9)	11 (12.2)
Koh Thom	93	82 (88.2)	61 (65.6)	11 (11.8)	24 (25.8)	2 (2.1)
Koh Tkeou	93	66 (71.0)	55 (59.1)	10 (10.8)	14 (15.1)	0
Ta koh	79	48 (60.8)	22 (27.8)	5 (6.3)	22 (27.8)	4 (5.1)
Stung Chreou	107	48 (44.9)	15 (14.0)	5 (4.7)	23 (21.5)	11 (10.3)
Total	576	381 (66.1)	187 (32.5)	56 (9.7)	140 (24.3)	45 (7.8)

Table 6
Results of stool examination in three schools in Beng Tumpon Commune (Mean Chey District) by Kato-Katz technique.

Schools	Number examined	Number infected (%)			
		<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>H. nana</i>
Dambokpos	95	57 (60.0)	14 (14.7)	27 (28.4)	5 (5.3)
Chamroeun Phal	76	34 (44.7)	1 (1.3)	50 (65.8)	3 (3.9)
Sansamkosal	143	57 (39.9)	5 (3.5)	10 (7.0)	2 (1.4)
Total	314	148 (47.1)	20 (6.4)	87 (27.7)	10 (3.2)

Table 7
Results of stool examination in five schools in Chbar Ampeou Commune (Mean Chey District) by Kato-Katz technique.

Schools	Number examined	Number infected (%)			
		<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>H. nana</i>
Chbar Ampeou I	123	37 (30.1)	20 (16.3)	8 (6.5)	1 (0.8)
Chbar Ampeou II	105	44 (41.9)	14 (13.3)	1 (1.0)	3 (2.9)
Chak Ang Re Leu	118	45 (38.1)	17 (14.4)	1 (0.8)	0
Preah Ponlea	112	53 (47.3)	7 (6.3)	5 (4.5)	0
Ressey Sras	93	51 (54.8)	16 (17.2)	5 (5.4)	2 (2.1)
Total	551	230 (41.7)	74 (13.4)	20 (3.6)	6 (1.1)

Urban areas

Beng Tumpon and Chbar Ampeou Commune (Mean Chey District). The stool samples obtained from 314 children in three schools of Beng Tumpon Commune and 551 children in five schools of Chbar Ampeou Commune in Mean Chey were examined. The results showed that even in urban areas of Cambodia, there was a high prevalence

of *Ascaris lumbricoides*, hookworm and *Trichuris trichiura* infections. The *Hymenolepis nana* infection rate was low (Tables 6, 7).

A pilot control program in one area of Phnom Penh

The baseline data for helminthic infections in a study site of an urban area of Phnom Penh are shown in Table 8. The highest prevalence was

Table 8
Results of intestinal parasitic infection in Chraing Chamres, with follow-up treatment every 6 months with mebendazole 500 mg.

Periods	Dec 96 ^a	Jul 97	Oct 97	Jan 98	Jun 98			Jan 99
Treatment	MBZ	MBZ	ND	MBZ	MBZ			MBZ
Method of exam	KK, SAF	ND	KK	KK	KK	SAF	Bearmann	KK
No. examined	314	ND	310	219	339	120	92	473
Parasites found (Prevalence %)								
<i>Ascaris</i>	62.2	ND	21.0	27.8	31.0	49.2	-	26.2
<i>Trichuris</i>	29.7	ND	5.2	5.5	7.4	16.7	-	7.8
Hookworm	15.8	ND	5.8	7.6	4.1	5.8	-	5.3
<i>Opisthorchis</i>	0	ND	0.3	-	0.3	0	-	-
<i>Enterobius</i>	7.2	ND	-	-	0.3	0.8	-	-
<i>H. nana</i>	19.8	ND	-	-	5.2	7.5	-	3.6
<i>Strongyloides</i>	3.2	ND	-	-	-	-	14.1	-
Total	73.4	ND	32.3	41.1	46.9	64.1	14.1	42.9

* Before treatment SAF = sodium acetyl formalin concentration
MBZ = mebendazole KK = Kato-Katz ND = Not done

Ascaris infection, 62.2%. Other infections were hookworm (15.8%), *Trichuris* (29.7%), *Hymenolepis nana* (19.8%), *Strongyloides* (3.2%), and *Enterobius* (7.2%).

After a second treatment with mebendazole 500 mg, the prevalence of all parasitic infections dropped to about one third of the initial level. However, by the end of the fifth treatment, the prevalence of these helminthic infections remained unchanged from the second treatment. This means reinfection frequently occurred. However, repeated treatment every 6 months was able to keep the prevalence of infection at a low level (Table 8).

DISCUSSION

Helminthic infections were highly prevalent in both urban and rural settings of Cambodia. The soil-transmitted helminths, *Ascaris*, hookworm and *Trichuris*, were the most frequent parasites found. Schistosomiasis and opisthorchiasis were found only in the rural area along the Mekong River (Odrematt, 1998), while *Hymenolepis nana* was dominantly found in the urban setting. These helminthic infections are substantial causes of intestinal and liver morbidity in urban and rural communities. Therefore, the control of infection

should be undertaken.

The repetitive treatment intervention in the urban area showed that the helminthic infection rate could be reduced to a low level (Urbani, 1997; 1998). A long-term parasite control program is planned for Phnom Penh and some selected provinces in Cambodia. The strategic program emphasizes treatment and health education.

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