Tropical Medicine and Health Vol. 38 No. 2, 2010, pp. 75-79

Short Communication

Parasite egg contamination of hands in a suburban area of Hanoi, Vietnam

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Received 5 February, 2010 Accepted 1 March, 2010 Published online 22 May, 2010

Abstract: Contamination of hands by soil-transmitted helminth eggs was investigated in a small village located in the suburbs of Hanoi, Vietnam. Thirty-three households, consisting of one to eight members, were selected in the village. In addition, 130 school children, including 80 pupils from primary school grade 1 and 50 students from secondary school grade 8, were selected for the survey. A total of 285 villagers were subjected to the collection of hand-wash samples either once or twice during the study. Parasite eggs were found in 37 (13.0%) samples from 21 males and 16 females aged between 2 and 72 years old. One person was positive in both the rainy and dry season. Eggs of seven parasite species were detected; *Enterovius. vermicularis* (8.4%), *Ascaris* sp. (2.1%), *Trichuris* sp. (1.1%), *Ascaridia galli* (0.7%), *Taenia* sp. (0.7%), *Capillaria* sp. (0.4%) and *Toxocara* sp. (0.4%). A total of 249 villagers were subjected to collection of nail samples either once or twice during the study. Parasite eggs were found in 10 (4.0%) samples from 5 males and 5 females aged between 6 and 46 years old. Six people were also positive on examination of hand-wash samples. Eggs of four parasite species were detected; *E.vermicularis* (2.0%), *Ascaris* sp. (0.8%), *Trichuris* sp.(0.8%) and *Toxocara* sp. (0.4%). The present study indicates that the infection route by hands plays an important role in the transmission of the soil-transmitted helminth.
Key words: Intestinal parasite; Hand; Nail; Contamination; Vietnam

INTRODUCTION

We carried out an epidemiological study on soil-transmitted helminth (STH) infections in a village located in the suburbs of Hanoi, Vietnam. The main object of this study was to identify factors influencing the transmission of STH eggs. Vietnam is a highly endemic area for STH infection [1]. In our study area, 76% of school children were infected with the parasite. Among the helminth parasites, the most frequently detected was *Trichuris trichiura* (67%) followed by *Ascaris lumbricoides* (34%), and hookworm (3%) [2].

We have already shown that vegetables sold in the village market were contaminated with parasite eggs [3], and that water samples collected from ponds and ditches contained many parasite eggs [4]. Parasite eggs were also found from soil and dust samples collected in the village [unpublished data]. These findings clearly indicated that, in our study area, vegetables, water, soil and dust are important sources of STH infection. Villagers were subject to infection from STH both directly and indirectly. The mode of infection should be considered for the prevention of STH infections. The most common route of transmission might be oral infection through food. However, indirect infection with parasite eggs attached to hands also seems to be important, especially among children who suck their fingers and play in the garden and field. Therefore, we attempted to detect helminth eggs from the hands of villagers in the present study.

MATERIALS AND METHODS

Study area and period

The survey was conducted from June 2003 to February 2004. The study area, Ha Hamlet, is located 10 km southwest of Hanoi, Vietnam. The population of the hamlet is 4,100 (1,010 households), with about three-quarters of the people engaged in agriculture. The villagers use well water

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for washing, cooking and drinking. Some people also use rain water for cooking and drinking. Waste water runs directly into ditches around houses and ends up in ponds near the village. Vegetables such as pumpkin, Chinese spinach and centella are grown in fields and gardens irrigated by the ditch water. Some villagers use nightsoil as a fertilizer for vegetables. There is a small open market in the village. The vegetables produced within the village and those brought from other places are sold in the market.

Thirty-three households were selected for study in the village. The households consisted of one to eight members. We also selected four classes from primary school (grade 1, 80 pupils) and two classes form secondary school (grade 8, 50 students).

Sampling and laboratory analyses

A total of 279 and 227 hand-wash samples were collected from villagers in the rainy and dry seasons, respectively. Parasite eggs on hands were collected at home or in school by soaking hands in a container containing 700 ml of 0.5% Tween 20 solution for 2 minutes and rubbing the hands together for 3 minutes. Then, hands were washed with 200 ml of new solution. All samples were taken to the laboratory. Each hand-wash sample was transferred to a one liter beaker, and 100 ml of solution used to wash the container was also transferred to the same beaker. Samples were left until the next day. After removing 900 ml of the supernatant, the remaining fluid was transferred to two 50 ml centrifuge tubes and centrifuged at 2,000 rpm for 5 minutes. After removing the supernatant, 5ml of saturated $NaNO_3$ solution was added to the tube, and mixed by shaking. Then, the saturated $NaNO_3$ solution was added to a level of three-quarters of the tube, and the tube was centrifuged at 2,000 rpm for 10 minutes. Saturated $NaNO_3$ solution was added to the top of the centrifuge tube, and a grease-free slide glass was placed carefully on the top to contact the surface of the fluid. After 20 minutes, the slide glass was removed, and a cover glass was placed on the slide glass for observation under a microscope. Several drops of saturated $NaNO_3$ solution were added again to the centrifuge tube, and a new slide glass was placed on the top. After 5 minutes, the slide glass was removed, and a cover glass was placed for observation. Two cover glasses were observed under a microscope.

A total of 210 and 116 nail samples were also collected in the rainy and dry seasons, respectively. Nail samples were collected by cutting 10 nails with a nail clipper or scissors on a clean paper before the collection of hand-wash samples, and these were transferred to a 15 ml tube to be carried to the laboratory. Five ml of 0.5% Tween 20 solution was added to the tube, intensely shaken, and left for 30 minutes. Samples were filtrated with a sheet of gauze to remove nail clippings. The sheet of gauze was washed with 5 ml of 0.5% Tween 20 solution. The tube was centrifuged at 2,000 rpm for 5 minutes, and sediments were observed under a microscope.

RESULTS

Parasite eggs recovered from hand-wash samples

Out of 279 hand-wash samples, 17 (6.1%) were positive for parasite eggs in the rainy season. Parasite eggs of six species were detected. The most common parasite was *Enterobius vermicularis,* followed by *Ascaris* sp., *Trichuris* sp., *Ascaridia galli*, *Taenia* sp., *Capillaria* sp. and *Txocara* sp. (Table 1). Out of 227 hand-wash samples, 21 (9.3%) were positive for parasite eggs in the dry season. Parasite eggs of four species were recovered. The highest detection rate was *E. vermicularis,* followed by *Ascaris* sp., *Trichuris* sp. and *Toxocara* sp. (Table 1).

A total of 285 villagers were subjected to the collection of hand-wash samples one or two times during this study. Parasite eggs were found in 37 (13.0%) samples of 21 males and 16 females aged between 2 and 72 years old

Table 1. Species and number of helminth eggs collected from hand-wash samples

Season		Rainy season	Dry season
No. of samples examined		279	227
No. of samples with eggs (%)	*Ascaris* sp.	2 (0.7)	4 (1.8)
	Trichuris sp.	1 (0.4)	1 (0.4)
	Enterovius vermicularis	9 (3.2)	15 (6.6)
	Ascaridia galli	2 (0.7)	
	Taenia sp.	2 (0.7)	
	Capillaria sp.	1 (0.4)	
	Toxocara sp.		1 (0.4)
	Any parasite	17 (6.1)	21 (9.3)

Table 2. List of positive cases among hand-wash samples

No.	Sex	Age	*Ascaris* sp.	*Trichuris* sp.	*Enterovius vermicularis*	*Ascaridia galli*	*Taenia* sp.	*Capillaria* sp.	*Toxocara* sp.
1	F	2				1			
2	M	3					1		
3	M	6			6				
4	M	6			1				
5	M	6			2				
6	M	6			1				
7	M	6	1		2				
8	M	6		1					
9	M	6			2				
10	M	6					1		
11	M	6			1				
12	M	7			1				
13	F	7			1				
14	F	7		1					
15	M	7			1				
16	F	7			1				
17	M	7			2				
18	F	7			1				
19	M	7			2				
20	M	7			1				
21	F	7			15				
22	M	7			4				
23	F	11			1				
24	M	14			1				
25	F	14			2				
26	F	14			1				
27	F	14			1				
28	M	17	1						
29	M	28	1						
30	F	28			2				
31	F	29	1						
32	F	35	1						
33	M	46		1					
34	F	54			1				
35	F	54							1
36	M	57						1	
37*	F	72	1			1			
No. of positive			6	3	24	2	2	1	1
Positive rate (%)			2.1	1.1	8.4	0.7	0.7	0.4	0.4

* positive in both rainy and dry seasons

(Table 2). One villager (No.37) was positive in both the rainy and dry season. Eggs of seven parasite species were detected; *E.vermicularis* (8.4%), *Ascaris* sp. (2.1%), *Trichuris* sp.(1.1%), *Ascaridia galli* (0.7%), *Taenia* sp. (0.7%), *Capillaria* sp. (0.4%) and *Toxocara* sp. (0.4%).

Parasite eggs recovered from nails

Out of 210 nail samples, 6 (2.9%) were positive for parasite eggs in the rainy season. Detected parasite species were *Ascaris* sp., *E. vermicularis, Trichuris* sp. and *Toxocara* sp. Out of 116 nail samples, 4 (3.4%) were positive for parasite eggs. Parasite eggs of two species, *E. vermicularis* and *Trichuris* sp., were detected in the dry season (Table 3).

A total of 249 villagers were subjected to the collection of nail samples once or twice during the study. Parasite eggs were found in 10 (4.0%) samples from 5 males and 5 females aged between 6 and 46 years old (Table 4). Six persons (No. 6, 13, 23, 24, 27 and 28) also recorded positive to the examination of hand-wash samples. Eggs of four parasite species were detected; *E.vermicularis* (2.0%), *Ascaris* sp. (0.8%), *Trichuris* sp. (0.8%) and *Toxocara* sp. (0.4%).

Table 3. Species and number of helminth eggs collected from nail samples

Season		Rainy season	Dry season
No. of samples examined		210	116
No. of samples with eggs (%)	*Ascaris* sp.	2 (1.0)	
	Trichuris sp.	1 (0.5)	1 (0.9)
	Enterovius vermicularis	2 (1.0)	3 (2.6)
	Toxocara sp.	1 (0.5)	
	Any parasite	6 (2.9)	4 (3.4)

Table 4. List of positive cases among nail samples

No.	Sex	Age	*Ascaris* sp.	*Trichuris* sp.	*Enterovius vermicularis*	*Toxocara* sp.
6	M	6			1	
13*	M	6	1			
38	M	7		1		
23*	F	11			1	
39	F	13				1
24*	M	14			1	
28*	F	14			1	
27*	F	14			1	
40	F	41		1		
41	M	46	1			
Number of positive			2	2	5	1
Positive rate (%)			0.8	0.8	2.0	0.4

* positive for the examination of hand-wash sample

DISCUSSION

In this study, 17 (6.1%) out of 279 hand-wash samples were positive for parasite eggs in the rainy season, and 21 (9.3%) out of 227 hand-wash samples were positive for parasite eggs in the dry season. Only one villager (male, 72 years old) was positive in both the rainy and dry season. A total of 285 villagers were examined once or twice, and parasite eggs were found in 37 (13.0%) samples. If the examination is repeated, the positive rate in hand-wash samples will increase. The source of infection is the environment infested with feces. The children's fingers might be contaminated with parasite eggs by touching soil or dust. These findings will be useful for the hygiene education of children to prevent re-infection after drug treatment.

Several research studies have detected parasite eggs from fingers and nails, and reported differences in the level of contamination similar to those observed in this survey. A high contamination of parasite eggs on fingers was shown in a study carried out in an agricultural community in Malaysia [5]. Among 29 children, parasite eggs were found in the finger-wash samples of 8 children (27.5%) and the nail dirt collected from three children (15%). By contrast, there are reports showing low contamination levels. In Malaysia, 100 nail clippings were examined, and only one sample from a child heavily infected with *T. trichiura* had one egg of *Trichuris* [6]. The survey was carried out in three orphanages in Jakarta, and the nails of three out of 213 orphans were positive for parasite eggs, *A. lumbricoides* and *E. vermicularis* [7]. These low positive findings on the fingernails of children in orphanages may be due to the fact that they cut their nails twice a week and that hygiene conditions are adequate.

The effect of hygiene education was observed in a study carried out in central India [8]. The prevalence of intestinal parasitic infection was significantly high among children with dirty untrimmed nails followed by those with poor hand-washing practices. One month after the hygiene education, the proportion of children washing their hands with soap after defecation significantly improved from 63.6% to 78.0%. The proportion of clean and trimmed nails also improved from 67.8% to 80.0%.

The state of soil is important for STH infection, and it is necessary to improve environmental conditions. Children touching soil frequently are prone to infection by the parasite egg, and therefore the route of transmission for STH is

mainly oral. As a result, an approach that integrates drug treatment with hygiene education to reduce dirty and untrimmed nails and increase hand-washing practices is required to control STH infections in children.

ACKNOWLEDGEMENTS

We thank the staff members of the Helminth Unit of the National Institute of Malariology, Parasitology, and Entomology, Hanoi Vietnam, for their assistance during the survey. This study was conducted as part of a joint university program between Vietnam and Japan sponsored by the Japan Society for Promotion of Sciences (JSPS).

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