Incidence of Soil-Transmitted Helminths in Soil Samples from Various Sub-Urban Areas of Yangon Environs

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Abstract

This study was conducted to find out the incidence of soil-transmitted helminths (STHs) in soil samples randomly collected from the three primary schools in Yangon during July 2007 to February 2008. Study sites included were primary schools from Insein, Mayangone and North-Dagon townships. Approximately one gram of soil samples were collected from three study sites on a monthly basis. Three replicate samples were taken from each study. The incidence of STHs were examined according to the methods described by WHO (1991). All helminth ova and larvae were classified according to Brown (1964). In the present study, the ova and larvae of five helminth species were observed, namely (1) *Ascaris* spp., ova, (2) *Enterobius vermicularis,* ova (3) *Trichuris trichiura,* ova (4) *Strongyloides stercoralis*, larvae and (5) *Taenia* spp., ova. The soil samples from North-Dagon primary school showed highest incidence of STHs. The second highest incidence of STH was observed for Insein primary school and Mayangone primary school showed the lowest incidence of STH. In addition, the higher incidence rates of helminth ova and larvae in soil were observed in monsoon months (July – September). Study also revealed that *Ascaris* species was the most dominant helminth in all soil samples. The second most dominant helminths were *Enterobius* and *Trichiuris* species. The lowest STHs were *Strogyloides* and *Taenia* species.

Introduction

Helminth, a worm classified as a parasite that lives on or in a human or another animal and derives its nourishment from its host. Lice are examples of parasites that live on humans; bacteria and viruses are examples of parasites that live either on humans or in humans. Helminths are a broad range of organisms that include intestinal parasitic worms, (roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*), or hookworms (*Necator americanus* and *Ancylostoma duodenale*). Infected people excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation. Other people can then be infected by ingesting eggs or larvae in contaminated food, or through penetration of the skin by infective larvae in the soil (hookworms). Infestation can cause morbidity, and sometimes death, by compromising nutritional status, affecting cognitive processes, inducing tissue reactions. Helminths can be divided into groups, plant helminths parasites and soil transmitted helminths parasite (STH). Soil Transmitted Helminths parasites infection is remained an important cause of morbidity and sometimes mortality in developing tropical country, particularly among pediatric age group (WHO, 1987 & 1991). It is estimated that more than one billion people in the world are infected by soil-transmitted helminths, mainly *Ascaris lumbricoides*, hookworms and *Trichuris trichiura* (Crompton, 1998 & 2001) Intensity of infection with *A. Lumbricoides* and *T. trichiura* generally reaches its peak in school-age children. This problem is predominant among the world estimated 400 million school children. It is often associated with poor growth, reduced physical activity, impaired cognitive function and learning ability (Stephenson, et al, 1998). Effective control of soil-transmitted helminths infections depends on improvement in sanitation and living conditions. Children with high-intensity *A. Lumbricoides* infection are at high risk of intestinal obstruction (deSilva, Guyatt and Bundy, 1997). There may be as many as 135,000 deaths a year that are directly due to soil-transmitted helminthes infections (Albonico, Crompton and Savioli, 1998) but the principal public health significance of these infections lies in their chronic effects on health and nutrition.

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Objectives

- To find the incidence rates of eggs and larvae of soil-transmitted helminths
- To investigate the comparative accounts of helminths observed in the schools of different townships

Materials and Methods

Study Area

Three primary schools at Insein, Mayangone and North Dagon Township in Yangon Region were selected as study sites (Plate I).

Collection of Soil Samples

For each primary schools, three different collection sites such as at entrance, on playground, and at canteen were chosen. One gram of soil samples were collected in transparent plastic bags. All samples were examined within one to two hours after being collected.

Methods

Soil samples were examined at the laboratory of Zoology Department, Dagon University. Following methods for applied for determination of helminths.

1. Direct smear method
2. Normal saline concentration method
   (a) Sediment
   (b) Floating
3. Counting of parasites

Direct Smear Method

Soil sample was directly examined by adding with normal saline solution. A coverslip preparation with two percent Lugo'l iodine solution was also made (WHO, 1991).

Normal Saline Concentration Method

The fresh soil weighing one gram was taken and smeared with normal saline and Lugo’l iodine solution. Then smears were covered with a coverslip. The samples were then counted for helminthics eggs and larvae under magnification (40x40 mm) objective of an Olympus microscope.

Counting of Parasites

The fresh soil weighing one gram was taken and smeared with normal saline and Lugo’l iodine solution. Then smears were covered with a coverslip and counted for helminths eggs and larvae under magnification (40x40 mm) objective of an Olympus microscope. The number of parasites per gram of soil samples was calculated from the parasites counted (Brown, 1964; WHO, 1991).

Results and Discussion

This study revealed the distribution patterns of STHs infections at three primary schools located in different sub-urban area of Yangon during an academic year (July 2007 to February 2008). The name of primary schools were No. (38) Insein, No. (11) Mayangone and No. (13) North-Dagon. Soil samples were collected on every Monday, Tuesday and Wednesday during the study period. Thirty soil samples were infected with different kinds of STHs eggs and larvae– *Ascaris* spp, *E. vermicularis*, *T. trichiura*, *S. stercoralis* and *Taenia* spp. (see Plate II).

A. Map of study areas showing Townships

B. Playground of a primary school

C. Entrance of a primary school

D. Canteen of a primary school

Plate I. Map of study area and collection sites of soil samples

North-Dagon primary school was the most STH infection prevalent school compared to other schools (Table 4). STHs eggs and larvae found in all soil samples throughout the academic year indicated that STHs transmission could probably due to ingestion of infective eggs via contaminated finger or contaminated food that had been eaten. In addition, higher percentage count of eggs and larvae were observed in monsoon months starting from July and ends in late October (Table 1, 2 and 3). It was well established that wet or damp soil favours the eggs of helminthes. Consequently, rainy season makes them to thrive more readily than that of dry season. Supporting to this fact is Yangon Hospital admissions due to STHs infections were highest in raining season and low from November to April (Than Saw et al, 1985). Nock (2003) and Dakul (2004) also reported that rainy season favour the proliferation of STHs infection. The report from Vietnam also indicated that helminthic environmental and human behavioural factors influence the transmission process.

In this work, the presence of five species of STHs eggs and larvae, namely *Ascaris*, *T. trichiura*, *E. vermicularis*, *S. stercoralis*, and *Taenia* spp, in soil samples were identified. *Ascaris* spp infection occurred with the highest frequency in all primary schools (Table 1, 2 and 3). The distribution of *Ascaris* spp eggs in the source and mode of transmission and seasonal variation of infection and morbidity of ascariasis were well documented in literature. In addition, the infective stages of *Ascaris*, the embryonated eggs have enormous capacity for withstanding the environmental extremes of sub-urban environment (Hotez, 2003). Furthermore, *Ascaris* are coated with a mucopolysaccharide that renders them adhesive to a wide variety of environmental surface.

Study also revealed that soil samples from all primary schools were infected with *T. trichiura*, *E. vermicularis*, *S. stercoralis* and *Taenia* spp. However, North-Dagon Primary School was infected the highest than other two schools. This seems to be their lack of knowledge of health such as defecation, cleaning, eating habits and personal hygiene; all these facts were correlated with the findings.

Table 1. Monthly distribution patterns of five species eggs and larvae, in soil samples collected from Insein No. (38) Primary School

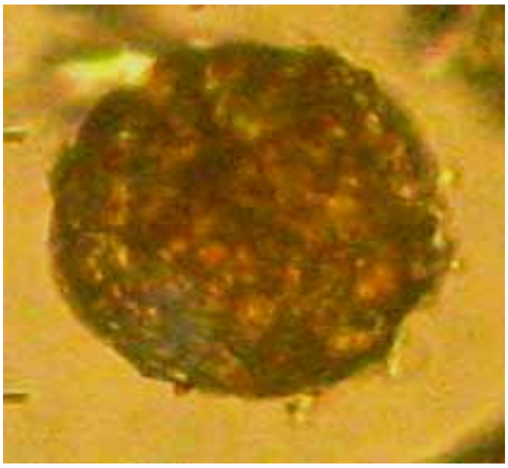
Species	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Ascaris spp.	245	291	237	81	64	47	39	32	1040
Trichuris trichiura	219	273	205	31	16	7	6	4	761
Enterobius vermicularis	191	233	195	53	32	15	9	6	734
Strongyloides stercoralis larvae	47	44	30	3	-	-	-	-	124
Taenia spp.	11	28	46	-	-	-	-	-	85
Total species	766	869	703	168	112	69	54	42	

Table 2. Monthly distribution patterns of five species eggs and larvae, in soil samples collected from the Mayangone No (11) Primary School

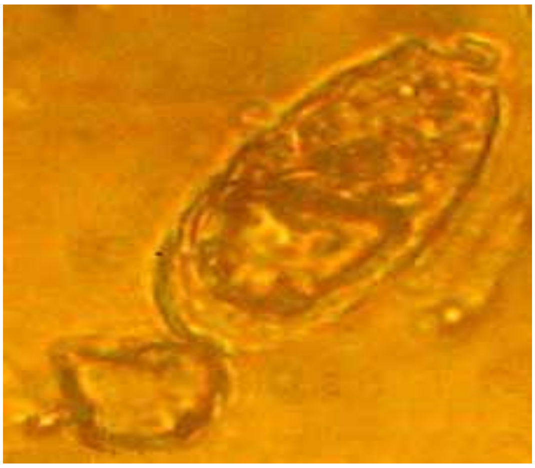
Species	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Ascaris spp.	304	400	266	72	58	47	33	22	1202
Trichuris trichiura	77	341	199	21	10	7	6	3	664
Enterobius vermicularis	64	244	196	38	35	23	14	5	619
Strongyloides stercoralis larvae	32	22	28	2	1	-	-	-	85
Taenia spp.	9	29	35	-	-	-	-	-	73
Total species	559	1007	724	133	104	77	53	30	

Table 3. Monthly distribution patterns of five species eggs and larvae, in soil samples collected from the North-Dagon No (13) Primary School

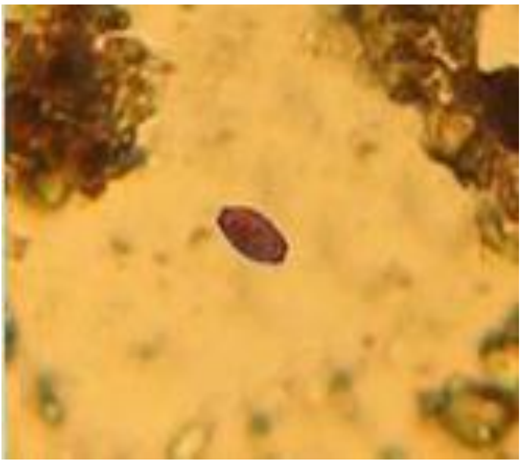
Species	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
Ascaris spp.	338	426	295	105	68	48	33	22	1335
Trichuris trichiura	224	337	232	27	8	7	2	-	837
Enterobius vermicularis	133	288	210	48	31	17	6	4	737
Strongyloides stercoralis larvae	14	71	10	-	-	-	-	-	95
Taenia spp.	19	42	35	-	-	-	-	-	96
Total species	728	1164	1102	160	107	72	41	26	



Ascaris sp. (roundworm)

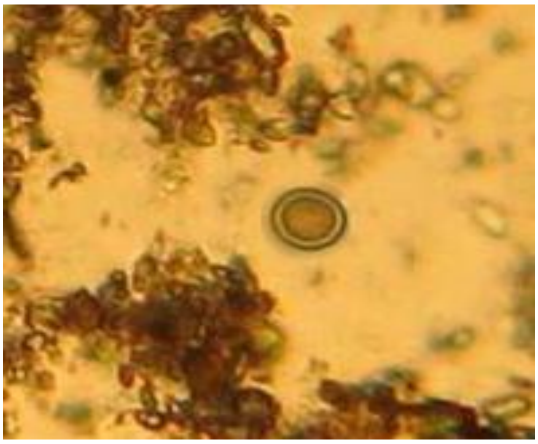


Enterobius vermicularis (pinworm)



Trichuris trichiura (whipworm)

Strongyloides stercoralis (threadworm)



Taenia sp. (tapeworm)

Plate II. Different kinds of soil transmitted helminths parasites' eggs and larvae that infected soil samples of three primary schools located in different sub-urban area

Table 4. Comparison of five species from three schools in sub-urban areas of Yangon

Species	North-Dagon primary school	Insein primary school	Mayangone primary school
Ascaris spp.	1335	1040	1202
Trichuris trichiura	837	761	664
Enterobius vermicularis	737	734	619
Strongyloides stercoralis larvae	95	124	85
Taenia spp.	96	85	83
Total species	3100	2774	2653

Conclusion

The soil-containing helminths count is useful clinically in schools for the prediction of disease course and prognosis. It is quick and technically easy to perform, requiring no special stain, using ordinary light microscopy and typically taking less time than a parasite count. Health and hygiene education reduces transmission and reinfection by encouraging healthy behaviours; provision of adequate sanitation is also important but not always possible in resource-poor settings. Control is based on: periodical deworming to eliminate infecting worms health education to prevent reinfection improved sanitation to reduce soil contamination with infective eggs.

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