Incidence of Soil-transmitted Helminths on Some Vegetable of Markets from Meiktila Township

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Abstract

The incidence of helminths on the roots of five kinds of vegetables from Meiktila Market, Pyitharyar Market and Paukchaung Market of Meiktila Township was conducted during July 2009 to June 2010. The results indicated the occurrence of five species of helminth eggs and larvae, namely *Ascaris lumbricoides, Strongyloides starcoralis, Taenia* sp., *Trichuris trichiura* and *Enterobius vermicularis.* The incidence rate of *A. lumbricoides* was highest (33.7%), followed by *S. starcoralis* (28.7%), *Taenia* sp., (20.1%), *T. trichiura* (11%) and *E. vermicularis* (6.5%). Total counts on helminth eggs/larvae on the vegetable from Meiktila Market topped with (37.9%), followed by Pyitharyar Market (33.1%) and Paukchaung Market (29%).

Keywords: Soil-transmitted helminths, vegetables, markets, Meiktila Township.

Introduction

The World Health Organization defines neglected tropical diseases (NTDs) as those that persist exclusively in the poorest and most marginalized communities, and have been largely eliminated elsewhere and thus are often forgotten (WHO, 2011).

Soil-transmitted helminths are relatively common parasites in the slum and rural areas of many countries, the high prevalence of which is closely related to poverty, poor environmental hygiene, and impoverished health services (Maipanich *et al*., 2008).

In many regions of the world infection with soil-transmitted helminths has been considered relatively harmless and phase in the process of growing up. During the past two decades childhood infection with STHs has received increasing attention constant with accumulating evidence that STH infections may interfere with normal growth and maturation in children (Albright and Keys, 2006).

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Soil-transmitted helminth infections represent a major public health problem in poor and developing countries and have contributed a universal burden which does not only depend on regional ecological condition but also on local standard of social and economic development of the people (Ukpal and Ugwu, 2003).

Fresh vegetables are an important part of a healthy diet. In recent years there has been an increase in the number of reported cases of food-borne illness linked to fresh vegetables. The consumption of raw vegetables is a major way in the transmission of parasitic contamination. Various epidemiological studies have indicated that the prevalence of intestinal parasites is high especially in developing countries. Intestinal parasites eggs/larvae may be found to adhere to vegetables, fruits, fingers, utensils, door handlers and money (Koyabashi, 1999) (cited by Ulukanligil *et al*., 2001).

Agriculturists enhance household income by processing leafy vegetables for in local markets, providing a supply of vitamin rich vegetables. Meiktila is situated in the central part of Myanmar. It has the climate, vegetation and topography which are suitable for the cultivation of several kinds of vegetables. These vegetables are grown throughout the year in Meiktila environs, using rain during wet season and irrigation during dry season. Irrigation water is derived from two sources, Meiktila Lake and hand dug wells. These cultivated vegetables were sold in different markets of Meiktila environs.

This paper described the incidence of soil-transmitted helminths on the vegetable samples from three markets of Meiktila.

Materials and Methods

Study area

Meiktila was selected as a study area. Meiktila is situated in the central part of Myanmar and located between 20° 51′ and 20°55′ N and between 95° 49′ and 95° 54′ E (Fig 1).

Study period

The duration of study period was from July 2009 to June 2010.

Samples collection sites

To investigate the incidence of helminth eggs/larvae, three markets (Meiktila Market, Pyitharyar Market and Paukchaung Market) were chosen as the study sites of vegetable samples.

The leafy vegetables and other crops sold in markets were derived from nearby villages and some from other townships. There are many well-irrigated farms around Meiktila's environs and varieties of vegetables were grown throughout the year. The water supply for cultivation is obtained from canals in Meiktila Lake.

Collection of vegetable samples

The vegetable samples were collected from each study market per month. Vegetable samples of *Ipomoea aquatica* (Water Convolvulus, Ka-zun), *Hibiscus sabdariffa* (Roselle, Chin-baung), *Coriandrum sativum* (Coriander, Nan-nan), *Mentha arvensis* (Mint, Pu-di-nan) and *Allium cepa* (Onion tops, Kyet-thon-meik) were obtained from each market and packed in plastic bags separately. A total of 180 vegetable samples were used from three study markets.

Preparation of samples for examination of helminth eggs/larvae

Vegetable samples were examined for helminth eggs/larvae using standard methodology (Dowens and Ito, 2001). The roots from each type of collected vegetable samples were cut approximately above 2cm from the base of the stem. One hundred gram weight of roots from each vegetable sample was taken and washed with 50 ml normal saline solution (0.85% NaCl) in separate beaker. The washing water was left two hours for sedimentation to take place and then top layer was discarded and the remaining washing water was centrifuged at 1000 rpm for 15 minutes (modified from method of Fallah *et al*., 2012). The supernatant was discarded, and then 5 ml of residue was carefully taken and examined in 2% Lugol stained slides through light Olympus Compound microscope using x100 and x400 magnification. Normal Saline solution and Lugol's Iodine solution were prepared according to the method of WHO (1991).

Identification of vegetable samples

The identification of vegetable samples was made based on Kress *et al.* (2003).

Identification and counting of helminth eggs/larvae

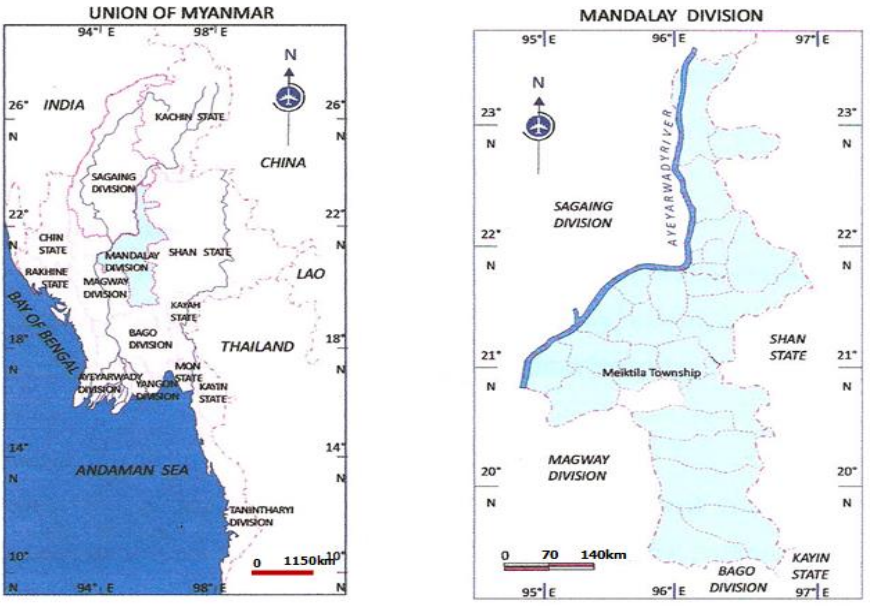
Identification of helminths was done based on morphological characteristics described by Yamaguti (1961), Brown (1969) and Thomas (1971). The helminth eggs were identified on the basis of their shape and size and consulted with identification guide of intestinal helminth parasites of WHO (1991).

Analysis of data

The incidence rates of helminth eggs/larvae were calculated using the following formula.

$$\text{Incidence Rate} = \frac{\text{Number of specific parasites}}{\text{Total number of parasites}} \times 100$$

(Thrusfield, 1995)



MEIKTILA TOWNSHIP

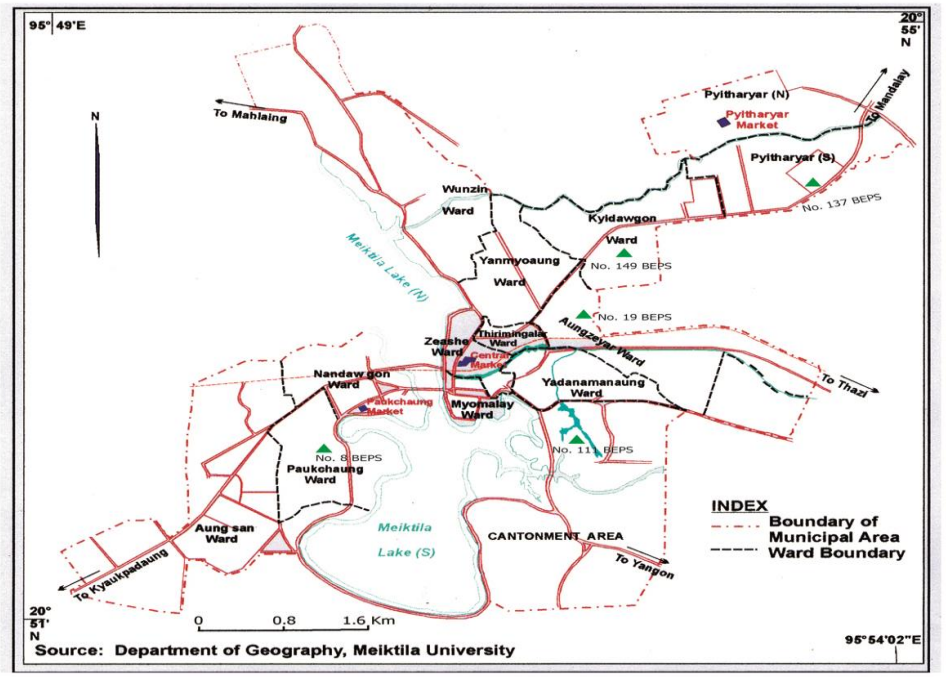


Fig. 1 Map of the study area and sites at Meiktila

Results

In this study, five helminth species of *Ascaris lumbricoides*, *Strongyloides starcoralis*, *Taenia* sp., *Trichuris trichiura* and *Enterobius vermicularis* were observed in *Ipomoea aquatica* (Water Convolvulus, Ka-zun), *Hibiscus sabdariffa* (Roselle, Chin-baung), *Coriandrum sativum* (Coriander, Nan-nan), *Mentha arvensis* (Mint, Pu-di-nan) and *Allium cepa* (Onion tops, Kyet-thon-meik) from three markets.

Comparison on incidence rates of helminthic infection on vegetable samples from three markets

In this study, the incidence rates of *A. lumbricoides*, *S. starcoralis*, *Taenia* sp., *T. trichiura* and *E. vermicularis* were described in vegetable samples from three markets.

Among the *I. aquatica* samples, the highest incidence rate of infection of *A. lumbricoides* was found to be in 12.19% in Meiktila, 9.90% in Pyitharyar and 9.81% in Paukchaung Markets. The highest incidence rate of *S. starcoralis*, was found 11.21% in Meiktila, 8.83% in Pyitharyar and

7.52% in Paukchaung Markets. The percentage of *Taenia* sp., infection was 8.59 in Meiktila, 6.38 in Pyitharyar and 5.56 in Paukchaung Markets. The small percentage of *T. trichiura* infection was 4.41, 4.58 and 3.10 in Meiktila, Pyitharyar and Paukchaung Markets respectively. A small percentage of *E. vermicularis* infection was found 3.27 in Pyitharyar, 2.45 in Meiktila and also 2.12 in Paukchaung Markets (Table 1).

Among the *H. sabdariffa* samples, the highest incidence rate of infection of *A. lumbricoides* was found to be 12.19% in Meiktila Market, 11.55% in Pyitharyar and 10.58% in Paukchaung Markets. The incidence rate of *S. starcoralis* 10.26% in Meiktila Markets, 10.05% in Pyitharyar and 7.59% in Paukchaung markets were observed. In the case of *Taenia* sp., infection was 7.27% in Meiktila, 6.52% in Pyitharyar and 6.31% in Paukchaung Markets. The infection rate of *T. trichiura* infection was found 4.06% in Meiktila, 3.85% in Pyitharyar and 3.74% in Paukchaung Markets. A small percentage of *E. vermicularis* was found 1.71 in Meiktila, 2.24 in Pyitharyar and 2.03 in Paukchaung Markets (Table 2).

Among the *C. sativum* samples, the highest incidence rate of infection of *A. lumbricoides* was found to be 13.29% in Meiktila, 10.93% in Pyitharyar and 9.82% in Paukchaung Markets. Regarding with *S. starcoralis* 11.44% in Meiktila Market, 8.93% in Pyitharyar and 8.34% in Paukchaung Markets were observed. The percentage of *Taenia* sp., infection was 7.97 in Meiktila, 5.98 in Paukchaung and 5.68 in Pyitharyar Markets. Infection with *T. trichiura* was noted 4.20% in Meiktila, 3.39% in Pyitharyar and 3.02% in Paukchaung Markets. A small percentage of *E. vermicularis* was found 2.58 in Pyitharyar, 2.43 in Meiktila and 1.92 in Paukchaung Markets (Table 3).

Among the *M. arvensis* samples, the highest incidence rate of infection of *A. lumbricoides* was found to be 11.97% in Meiktila, 10.90% in Pyitharyar and 10.81% in Paukchaung Markets. Concerned with *S. starcoralis* 11.47% in Meiktila Market, 9.57% in Pyitharyar and 8.17% in Paukchaung Markets were observed. The percentage of *Taenia* sp., infection was 8.42 in Meiktila, 6.52 in Pyitharyar and 5.78 in Paukchaung Markets. Incidence with *T. trichiura* was observed 4.04% in Pyitharyar, 3.71% in Meiktila and 2.55% in Paukchaung Markets. A small percentage of *E. vermicularis* was found 2.39, 1.73 and 1.89 in Pyitharyar, Meiktila and Paukchaung Markets respectively (Table 4).

Among the *A. cepa* samples, the highest incidence rate of infection of *A.lumbricoides* was found to be in 10.35% in Paukchaung, 12.06% in Pyitharyar and 12.24% in Meiktila Markets. The incidence rate of *S. starcoralis* was 8.10% in Paukchaung, 9.99% in Pyitharyar and 11.88% in Meiktila Markets were observed. The infection of *Taenia* sp., was 8.28% in Meiktila, 6.03% in Pyitharyar and 5.49% in Paukchaung Markets. The incidence of *T. trichiura* was found 3.87% in Meiktila, 3.06% in Pyitharyar and 3.15% in Paukchaung Markets. A small percentage of *E. vermicularis* was found 2.61 in Pyitharyar, 1.44 in Meiktila and Paukchaung Markets (Table 5).

Comparison on the abundance of helminth eggs/larvae in the vegetables from three markets

The total counts of helminth eggs/larvae on the vegetables obtained from Meiktila Market (37.9%) were higher than those of Pyitharyar Market (33.1%) and Paukchaung Market (29%). During the studied period, the incidence rate of *A. lumbricoides* eggs was the highest (33.7%), followed by larvae of *S. starcoralis* (28.7%), *Taenia* sp., (20.1%), *T. trichiura* (11%) and *E. vermicularis* (6.5%). From the results, it appeared that *A. lumbricoides* was the most dominant helminth species in all the three study sites (Table 6, Fig. 2 and 3).

Among the collected vegetables from the three study sites, the highest number of helminth incidence was found in *Coriandrum sativum* and the lowest counts in *Hibiscus sabdariffa* (Table 7).

No significant differences ($p>0.05$) were observed among incidence rates of helminth parasites and types of vegetables.

Table 1. Comparison on the Incidence rates of helminthic infection in *Ipomoea aquatica* samples from three markets

Helminth eggs/larvae	Study sites			Total
	Pyitharyar	Paukchaung	Meiktila	
A. lumbricoides	120 (9.81%)	121 (9.90%)	149 (12.19%)	390
S. starcoralis	108 (8.83%)	92 (7.52%)	137 (11.21%)	337
Taenia sp.,	78 (6.38%)	68 (5.56%)	105 (8.95%)	251
T. trichiura	56 (4.58%)	38 (3.10%)	54 (4.41%)	148
E. vermicularis	40 (3.27%)	26 (2.12%)	30 (2.45%)	96
Total	402	345	475	1222

Table 2. Comparison on the Incidence rates of helminthic infection in *Hibiscus sabdariffa* samples from three markets

Helminth eggs/larvae	Study sites			Total
	Pyitharyar	Paukchaung	Meiktila	
A. lumbricoides	108 (11.55%)	99 (10.58%)	114(12.19%)	321
S. starcoralis	94 (10.05%)	71 (7.59%)	96 (10.26%)	261
Taenia sp.,	61 (6.52%)	59 (6.31%)	68 (7.27%)	188
T. trichiura	36 (3.85%)	35 (3.74%)	38 (4.06%)	109
E. vermicularis	21 (2.24%)	19 (2.03%)	16 (1.71%)	56
Total	320	283	332	935

Table 3. Comparison on the Incidence rates of helminthic infection in *Coriandrum sativum* samples from three markets

Helminth eggs/larvae	Study sites			Total
	Pyitharyar	Paukchaung	Meiktila	
A. lumbricoides	148 (10.93%)	133 (9.82%)	180 (13.29%)	461
S. starcoralis	121 (8.93%)	113 (8.34%)	155 (11.44%)	389
Taenia sp.,	77 (5.68%)	81 (5.98%)	108 (7.97%)	266
T. trichiura	46 (3.39%)	41 (3.02%)	57 (4.20%)	144
E. vermicularis	35 (2.58%)	26 (1.92%)	33 (2.43%)	94
Total	427	394	533	1354

Table 4. Comparison on the Incidence rates of helminthic infection in *Mentha arvensis* samples from three markets

Helminth eggs/larvae	Study sites			Total
	Pyitharyar	Paukchaung	Meiktila	
A. lumbricoides	132 (10.90%)	131 (10.81%)	145 (11.97%)	408
S. starcoralis	116 (9.57%)	99 (8.17%)	139 (11.47%)	354
Taenia sp.,	79 (6.52%)	70 (5.78%)	102 (8.42%)	251
T. trichiura	49 (4.04%)	31 (2.55%)	45 (3.71%)	125
E. vermicularis	29 (2.39%)	23 (1.89%)	21 (1.73%)	73
Total	405	354	452	1211

Table 5. Comparison on the Incidence rates of helminthic infection in *Allium cepa* samples from three markets

Helminth eggs/larvae	Study sites			Total
	Pyitharyar	Paukchaung	Meiktila	
A. lumbricoides	134 (12.06%)	115 (10.35%)	136 (12.24%)	385
S. starcoralis	111 (9.99%)	90 (8.10%)	132 (11.88%)	333
Taenia sp.,	67 (6.03%)	61 (5.49%)	92 (8.28%)	220
T. trichiura	34 (3.06%)	35 (3.15%)	43 (3.87%)	112
E. vermicularis	29 (2.61%)	16 (1.44%)	16 (1.44%)	61
Total	375	317	419	1111

Table 6. Comparison on the abundance of helminth eggs/larvae collected from three markets (July 2009 to June 2010)

Study Sites	Counts on helminth eggs/larvae					Total counts
	A. lumbricoides	*S. starcoralis*	*Taenia* sp.,	*T. trichiura*	*E. vermicularis*	
Pyitharyar Market	642	550	362	221	154	1929 (33.1%)
Paukchaung Market	599	465	339	180	110	1693 (29%)
Meiktila Market	724	659	475	237	116	2211 (37.9%)
Total count	1965 (33.7%)	1674 (28.7%)	1176 (20.1%)	638 (11%)	380 (6.5%)	5833

Table 7. Comparison on the abundance of helminths eggs/larvae on vegetable roots collected from three markets (March to June 2010)

Vegetable samples	Counts on helminth eggs/larvae			Total count
	Pyitharyar Market	Paukchaung Market	Meiktila Market	
Ipomoea aquatica	402	345	475	1222
Hibiscus sabdariffa	320	283	332	935
Coriandrum sativum	427	394	533	1354
Mentha arvensis	405	354	452	1211
Allium cepa	375	317	419	1111
Total count	1929	1693	2211	5833

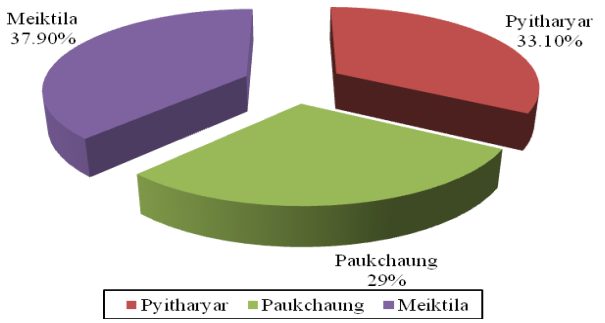


Fig. 2 Comparison of three markets based on relative abundance of helminth parasites in Meiktila (July 2009 to June 2010)

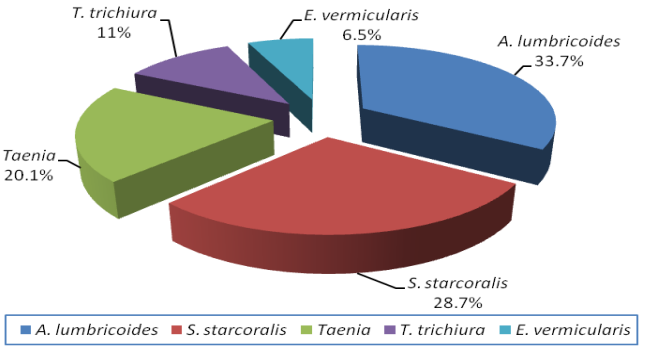


Fig. 3 Comparison on relative abundance of helminth eggs/larvae on vegetable samples collected from three study markets in Meiktila (July 2009 to June 2010)

Discussion

Among the recorded parasites, the incidence rate of *A. lumbricoides* eggs was found to be highest (33.71%), followed by *S. starcoralis* (28.7%), *Taenia* sp., (20.1%), *T. trichiura* (11%) and *E. vermicularis* (6.5%). *A. lumbricoides* are dominant among the helminth eggs/larvae detected in three markets. Similarly, predominance of *A. lumbricoides* has been reported on farms, markets and street food vender by Andoh *et al.*, (2009). So, the results in the present study are compatible with finding of Andoh *et al.*, (2009). The highest incidence rate of *A. lumbricoides* could be alluded to the fact that, this parasitic infection is readily transmitted easily from one person to another through contaminated food and water and without the involvement of the intermediate host.

During study period Meiktila Market revealed as a higher infested rate for helminths (37.9%) compared with the vegetables from Pyitharyar Market (33.1%) and Paukchaung Market (29%). With respect to the higher incidence rate in the vegetables of these markets, it could be related to the personal hygiene of both the sellers of the vegetables and cultivators and also to the poor environmental sanitation in plantation areas. Moreover, it might be through contamination by the sellers during handling, packing and selling the products for consumption.

All the three markets involved in the study indicated the higher prevalence rate for helminth parasites. The vegetables sold in markets are usually grown in urban agriculture sites in Meiktila throughout the year. Most of urban agricultural farms obtained their water supply for plantation from irrigation canals running adjacent to these farms. Water flowing in these canals were also used in various ways such as bathing, washing, drinking for live-stocked animals, and cleaning for domestic animals. So, the water from canals could be contaminated with helminths eggs/larvae from man as well as other mammals.

In developing countries, intestinal parasites are very common. Unclean fresh vegetables are an important route of STHs transmission. Endogrul and Senser (2005) found some protozoa like *Giardia* cysts in 5.5% of different fresh vegetables. Daryani *et al.* (2008) reported that the prevalence of 25% and 29% for pathogenic parasites in vegetables of markets and gardens, respectively with *Ascaris lumbricoides* eggs being detected in 2% of sample examined.

The incidence rates and occurrence of parasites from vegetables reported in the present work were found to be different from those reported by others. The differences may depend on several factors such as methods of examinations and geographical variations. Abougrain *et al.* (2009) reported that seasonal variation, type and number of samples examined, methods used for detection of the intestinal parasites, type of water used for irrigation, and post-harvesting handling methods of such vegetables are involved in differences of parasites observed among studies.

Thus, there is a need to improve the sanitary conditions of both at the plantation fields and the general environment and not only the personal hygiene of all the people who handle the products but also of the consumers as well.

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