

**Status of Infection with Soil-transmitted Helminths among  
Primary School Children in Three Selected Townships of Yangon Region**

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Infection with soil-transmitted helminths (STH) is still prevailing in developing countries including Myanmar especially in primary school children. Worm infestation is one of the priority diseases of National Health Plan in Myanmar. An intervention study was carried out among primary school children in three selected townships (Hlinethaya, South Dagon and North Dagon) of Yangon Region in 2013. The objective of this study was to assess the effectiveness of deworming and health education on STH prevalence among selected primary school children. A total of 1443 stool samples were examined using Kato-Katz thick smear technique before and after giving Albendazole (400 mg) drug according to school regular deworming programme. At the same time, health education regarding prevention of STH was given to the students and their parents or guardians. During baseline survey, helminths were detected in 32.3%, 18% and 10.6% of the students in Hlinethaya, South Dagon and North Dagon townships, respectively while in the second time survey (which was carried out 6 months after baseline survey), they were detected in 32.5%, 10.6% and 9.6%, respectively. *Trichuris trichiura* was found to be the most prevalent helminth in both surveys. These findings indicated that preventive chemotherapy together with health education play an important role in reduction of the prevalence of STH in two out of three townships. The prevalence of STH in Hlinethaya Township was not reduced which might be due to several factors including reinfection of the helminths, migrant population, low socio-economic status and poor personal hygiene.

*Key words:* Soil-transmitted, Helminthes, School children

## INTRODUCTION

Soil-transmitted helminth infections are widely distributed throughout the tropics and subtropics.<sup>1</sup> The soil-transmitted helminths (STH) are a group of parasitic nematode worms including roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*).<sup>2</sup> It is estimated that almost 2 billion people are infected with one or more of these soil-transmitted helminths, accounting for up to 40% of the global morbidity from infectious diseases, exclusive of malaria.<sup>3</sup> Soil-transmitted helminths pose significant public health challenges in many countries of Southeast

Asia (SEA). Overall, approximately one-third of the world's cases of ascariasis, trichuriasis, and hookworm disease occur in the 11 major SEA countries.<sup>4</sup>

Soil-transmitted helminths are transmitted through poor sanitation and hygiene. Therefore, children are typically at increased risk resulting in high prevalence and intensity of infection due to high level of exposure.<sup>5</sup> The public health importance of STH infections ranked highest in morbidity rate among school-aged children who often present much heavy worms infections

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because of their vulnerability to nutritional deficiency.<sup>2</sup> In 2001, the World Health Assembly passed a resolution urging member states to control the morbidity of soil-transmitted helminth infections through large-scale use of anthelmintic drugs for school-aged children in less developed countries.<sup>6</sup> Preventive chemotherapy (PCT) programmes in which single-dose Albendazole 400 mg or single-dose Mebendazole 500 mg, the drugs of choice for STH administered at the population level, is the main strategy for STH control.<sup>7</sup> A study in the Peruvian Amazon described that school-based health hygiene education intervention was effective in increasing STH knowledge and in reducing *A. lumbricoides* infection by 58%.

The benefits of school-based periodic deworming programs are likely to be enhanced when a sustained health hygiene education intervention is integrated into school curricula.<sup>8</sup> In Thailand, the 2001 national survey revealed that the overall helminth prevalence was 22.3% while in Laos the overall prevalence of infection with any STH was 70.6%.<sup>9,10</sup>

Several previous studies have been done to detect the prevalence of common intestinal helminthes and STH among school children in Myanmar.<sup>11-14</sup> Studies in Myanmar showed that *Ascaris lumbricoides* was the most prevalent intestinal helminth followed by *Trichuris trichiura* and hookworm.<sup>11-14</sup> Infection with multiple STHs is common in poor tropical countries where these helminths are endemic.<sup>10</sup> An overall parasitological prevalence of soil-transmitted helminths in school children in Myanmar was 69.7% in baseline survey in 2003. After seven years of implementation of national deworming programme, it had resulted in a significant reduction of STH prevalence to 21% in 2012.<sup>15</sup>

The objective of this study was to assess the effectiveness of deworming and health education on STH prevalence among primary school children in three selected townships of Yangon Region.

## MATERIALS AND METHODS

All schools from three selected townships were listed and used as the sampling frame. Among these schools, 10 schools were selected by random proportional. Of each school, 150 Grade 1 to Grade 3 students were selected randomly.

An intervention study was carried out from June to December 2013. During baseline survey in June, parents/guardians of the primary school students were explained about the nature of the research and given the plastic bag container containing wooden applicator. Informed consent was obtained from the parents/guardians of the students. They were also informed that they could withdraw their children from the survey without any disadvantage for either their children or themselves. Stool samples of the students were collected on the next day and kept at 4°C. Each stool sample was detected for soil-transmitted helminths by Kato-Katz thick smear technique at Parasitology Section, National Health Laboratory.

Albendazole 400 mg was given to students according to school regular deworming programme in August 2015. Health education regarding control of soil-transmitted helminths and proper hand washing technique was given to students and their parents/guardians by medical officers of National Health Laboratory, Township Medical Officers and school health staffs of respective townships. Second time survey was conducted on the same students who participated in baseline survey 4 months after giving Albendazole drug and health education.

### Data analysis

The data were compiled, coded and entered into Excel spread sheet and then, analyzed.

### Ethical consideration

Approval was obtained from the Ethical Committee on Medical Research involving Human Subjects, Department of Health, Myanmar.

## RESULTS

During baseline survey in June 2013, helminths were detected in 32.3% (162/502), 18% (101/562) and 10.6% (40/379) of the students in Hlinethaya, South Dagon and North Dagon townships, respectively. During the second time survey in December 2013, helminth infections were found in 32.5% (132/406), 10.6% (42/396) and 9.6% (27/282) of the students, respectively. The overall prevalence of helminth infection was 21% (303/1443) and 18.5% (201/1084) in baseline and the second time survey respectively (Fig. 1).

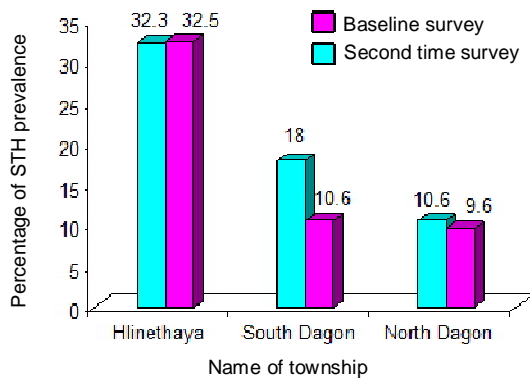


Fig. 1. Comparison of STH prevalence before and after intervention

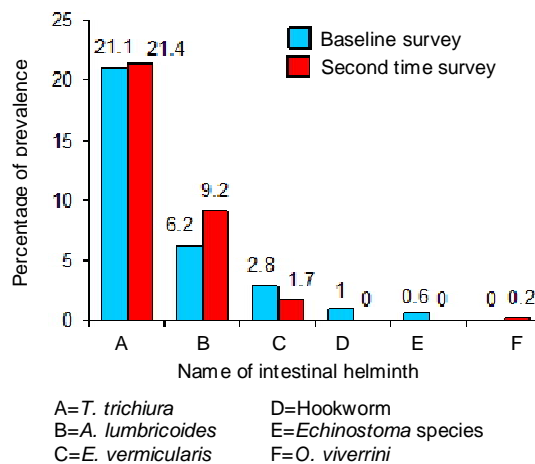


Fig. 2. Most prevalent intestinal helminths in Hlinethaya Township

In Hlinethaya Township, the most prevalent intestinal helminths during baseline survey were *Trichuris trichiura* (21.1%) followed by *Ascaris lumbricoides* (6.2%), *Enterobius*

*vermicularis* (2.8%), hookworm (1%) and *Echinostoma* species (0.6%). The same pattern of prevalence of helminths was detected during the second time survey in which the prevalence of *T. trichiura*, *A. lumbricoides*, *Enterobius vermicularis* and *Opisthorchis viverrini* were 21.4%, 9.2%, 1.7% and 0.2%, respectively (Fig. 2).

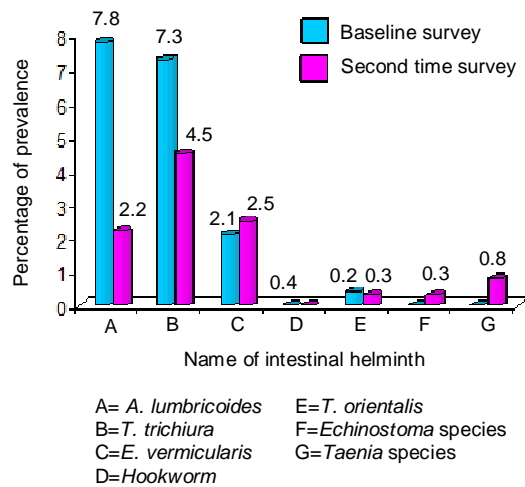


Fig. 3. Most prevalent intestinal helminths in South Dagon Township

In South Dagon Township, the most prevalent intestinal helminths during baseline survey were *Ascaris lumbricoides* (7.8%) followed by *Trichuris trichiura* (7.3%) *Enterobius vermicularis* (2.1%), hookworm (0.4%) and *Trichostrongylus orientalis* (0.2%). During the second time survey the prevalence of *T. trichiura*, *Enterobius vermicularis*, *A. lumbricoides*, *Taenia* species, *Echinostoma* species and *Trichostrongylus orientalis* were 4.5%, 2.5%, 2.2%, 0.8%, 0.3% and 0.3%, respectively (Fig. 3).

In North Dagon Township, the most prevalent intestinal helminths during baseline survey were *Trichuris trichiura* (6.6%) followed by *Ascaris lumbricoides* (2.1%), *Enterobius vermicularis* (1.1%), hookworm (0.5%) and others species (0.3%). During the second time survey the prevalence of *T. trichiura*, *A. lumbricoides*, *Enterobius vermicularis* and others species were 5.7%, 1.5%, 1.4% and 1%, respectively (Fig. 4).

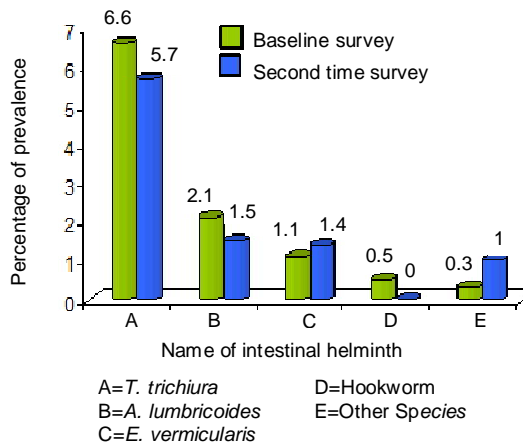


Fig. 4. Most prevalent intestinal helminthes in North Dagon Township

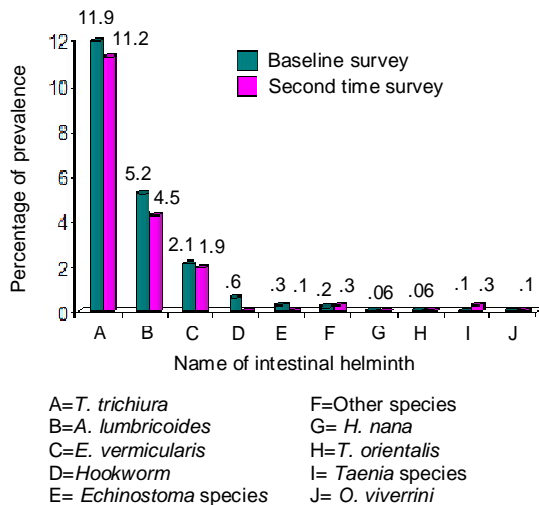


Fig. 5. Most prevalent intestinal helminths in three selected Townships

During baseline survey the most prevalent intestinal helminths in three selected townships were *Trichuris trichiura* (11.9%) followed by *Ascaris lumbricoides* (5.2%), *Enterobius vermicularis* (2.1%), hookworm (0.6%) and *Echinostoma* species (0.3%), others species (0.2%), *Hymenolepis nana* (0.06%) and *Trichostrongylus orientalis* (0.06%).

During the second time survey the prevalence of *T. trichiura*, *A. lumbricoides*, *Enterobius vermicularis*, others species, *Taenia* species, *Opisthorchis viverrini*, *Trichostrongylus orientalis* and *Echinostoma* species were 11.2%, 4.5%, 1.9%, 0.3%, 0.3%, 0.1%, 0.1 and 0.1% respectively (Fig. 5).

## DISCUSSION

In this study, the overall prevalence of 21% and 18.5% of STH infection were obtained among primary school children during the baseline and the second time surveys. These results were comparable to the overall helminth prevalence of 22.3% obtained among schoolchildren in Thailand<sup>9</sup> and that of 21% reported in Myanmar in 2012.<sup>15</sup>

The prevalence rates of the present study were considerably lower than that of Laos, which was 70.6%<sup>10</sup> and that of 66.6% obtained among primary school children in Yangon Division in 2010.<sup>16</sup> However, these results were higher when compared to the prevalence rate of helminth infestation in Magway Division in 2010 which was 3.2%.<sup>17</sup> The above variable results in prevalence of STH infection mainly depended on the personal hygiene, environmental sanitation, and seasonal variations.

In the present study, the most prevalent intestinal helminth was *Trichuris trichiura* in both surveys which was consistent with the finding of a study conducted among school children in Myanmar in 2003.<sup>18</sup> However, in other studies done in Myanmar, *Ascaris lumbricoides* was the most prevalent intestinal helminth<sup>17, 19</sup> while in Thailand and Laos, hookworm was the most prevalent one.<sup>9, 10</sup>

The prevalence rate of *Trichuris trichiura* (11.9% and 11.2%) in both surveys were considerably lower than that of Laos, which was 41.5%<sup>10</sup> But, these results were higher when compared to that of Thailand which was only 1.6%.<sup>9</sup> Treatment of STH infections in school-age children may improve growth but health education can be an effective and safe substitute for repeated deworming and reducing the opportunity for the emergence of drug-resistant helminthes.

The study carried out in Western Thailand on the Thai-Myanmar Border in 2003 revealed that the prevalence of intestinal parasitic infections was reduced markedly from 67.8% in the first survey to 25.8% in

the second survey after giving anti-parasitic drugs and health education.<sup>20</sup> Compared to Thailand study, the prevalence of intestinal parasitic infections in the present study was reduced from 21% to 18.5%.

These findings indicated that preventive chemotherapy together with health education play an important role in reduction of the prevalence of STH in two out of three townships. The prevalence of STH in Hlinethaya Township was not reduced which might be due to several factors including reinfection of the helminths, migrant population, low socio-economic status and poor personal hygiene.

#### Conclusion

In conclusion, we found that the reduction of the prevalence of STH can be achieved to a certain limit by preventive chemotherapy and health education to the students as well as to the parents or guardians. However, safe water supply and good personal hygiene (including practice of proper hand washing) of the family members are also important factors to reduce incidence of STH. Awareness of knowledge regarding the transmission and prevention of STH should be done by various means (health education, media including newspapers and journals) to the entire community of these townships.

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#### REFERENCES

1. Broker S, Clements A & Bundy DAP. Global epidemiology, ecology and control of soil transmitted helminth infections. *Advanced Parasitology* 2006; 62: 221-261.
2. Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A & Diemert D. Soil-transmitted helminth infections: *Ascariasis, trichuriasis* and hookworm. *Lancet* 2006; 367: 1521-1532.
3. Bundy DAP. In: *Epidemiology and transmission of intestinal helminthes*. Farthing MJG, Keusch GT & Wakelin D (Eds.), Enteric Infection 2, Intestinal Helminths, Chapman & Hall Medical, 1995; 5-24.
4. Jex AR, Lim YA, Bethony JM, Hotez PJ, Young ND & Gasser RB. Soil-transmitted helminths of humans in Southeast Asia: Towards integrated control. *Advances in Parasitology* 2011; 74: 231-65.
5. Montresor A, Crompton-DWT & Savioli L. Helminth control in school-age children. A guide for managers of control programme, WHO, Geneva 2002; 25: 1-10.
6. World Health Organization. Deworming for health and development. Report of the third global meeting of the partners for parasite control, Geneva, 2005.
7. World Health Organization. Accelerating work to overcome the global impact of neglected tropical diseases: A road map for implementation, Geneva 2012; 12-14.
8. Gyorkos TW, Maheu Giroux M, Blouin B & Casapia M. Impact of health education on soil-transmitted helminth infections in school children of the Peruvian Amazon: A cluster-randomized controlled trial. *PLOS Neglected Tropical Diseases* 2013; 7(9): e2397.
9. Waikagul J, Krudsood S, Radomyos P, Radomyos B, Chalemrut K & Jonsuksuntigul P, *et al.* A cross-sectional study of intestinal parasitic infections among school children in Nan Province, Northern Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health* 2002; 33(2): 218-23.
10. Conlan JV, Khamlome B, Vongxay K, Elliot A, Pallant L & Sripa V, *et al.* Soil-transmitted helminthiasis in Laos: A community-wide, cross-sectional study of humans and dogs in a mass drug administration environment. *American Journal of Tropical Medicine and Hygiene* 2012; 86(4): 624-634.
11. Thein Hlaing, Win Win Khine, Tin Tin Than, Than Saw, Myo Khin, Myint Myint Soe, *et al.* Nutritional status and parasitoses in school-enrolled and non-enrolled children in Yangon.

- Myanmar Health Sciences Research Journal* 1995; 7(2): 86-91.
12. Marlar Maung, Aye Aye Mon & Nang Nyo Nyo Win. The prevalence of soil-transmitted helminthiasis among primary school children in a downtown area of Yangon. 45<sup>th</sup> Myanmar Medical Conference, 1999; 30.
  13. May Kyi Aung, Myint Naing Tun, Than Than Su, Nilar San & Soe Naing. Intestinal parasitoses in selected group of primary school children of North Okkalapa Township. *Myanmar Health Research Congress Program & Abstract* 2002; 34-35.
  14. Wint Wint Nyunt. Common intestinal helminths in apparently healthy children attending the pre-primary school in North Okkalapa Township. *Thesis, M.Med.Sc (Microbiology), University of Medicine 2, Yangon, 2004.*
  15. Aung Tun, Su Mon Myat, Gabrielli AF & Montresor A. Control of soil-transmitted helminthiasis in Myanmar: Result of 7 years of de-worming. *Tropical Medicine and International Health*, 2013.
  16. Aye Than, Tin Oo, Khin Myo Aye, Khin Thet Wai, Maung Maung Mya, Myat Phone Kyaw, *et al.* Effect of health education and deworming on STH control in primary school children in rural area. *Myanmar Health Research Congress Program & Abstract* 2010; 70.
  17. Khin Thuzar Htwe, Thae Thae Min, Thin Thin Mar, Mya Mya Lwin, Win Win Maw & Mg Mg Win. Detection of intestinal parasitic infestation among primary school children, Magway. *Myanmar Health Sciences Research Journal* 2010; 22(2): 89-94.
  18. Thet Thet Zin, Aung Tun, Khin Maung Thwin, Hla Hla Aye, Htay Aung & Yee Yee Htay. A study on soil-transmitted helminthiasis (STH) among school children in Myanmar. *Myanmar Health Research Congress Program & Abstract* 2003; 35-36.
  19. Nyi Nyi Lwin. Intestinal parasitic infestation and socio-demographic characteristics of household food handlers, North Dagon Township. *Thesis, M.Med.Sc (Public Health), University of Public Health, Yangon, 2010.*
  20. Pothipak N, Srivilairit S, Pengruksa C, Faithong S, Haohan O & Chalermrut K, *et al.* Health status: Malaria, anaemia and intestinal parasitic infections on the Thai-Myanmar Border. *Journal of Tropical Medicine and Parasitology* 2005; 28: 26-30.