Original Research Article

SOIL TRANSMITTED HELMINTH INFECTIONS AMONG SLUM DWELLING WOMEN IN DHAKA, BANGLADESH.

ABSTRACT

Aims: The objective is to determine prevalence and risk factors for soil-transmitted helminth (STH) infections among slum dwelling women.

Study design: Cross sectional study.

Place and Duration of the study: A total of 100 stool samples were collected from Ganaktuli (Hazaribagh) slum of Dhaka city during March to September 2019. The respondent women were aged between 21 to 40 years old having at least one primary school-going child.

Methodology: The respondents were asked to provide their stool samples in supplied container and to fill up a questionnaire regarding their socio-demographic and behavioral practices. Formal Ether Concentration technique was applied to process the stool samples. Detection of helminth ova was done by microscopy.

Results: Of the hundred women, 87 were infected with at least one STH. *Ascaris lumbricoides* (41.38%) showed the highest prevalence followed by *Trichuris trichiura* (36.78%). Occupation, irregular nail clipping, irregular use of soap after defecation, walking barefoot, using open and common toilet, irregular consumption of antihelminthic drugs were noticed as significant risk factors.

Conclusion: STH infection is still a problem in Bangladesh. Proper drug administration and increase of hygiene practices among the slum dwellers are essential to bring a positive change.

Keywords: Dhaka, slum, women, stool, STH

1. INTRODUCTION

Soil-transmitted helminth (STH) infections are considered as most prevalent neglected tropical diseases (NTD) with an estimated 1.45 billion people infected with at least one species [1, 2]. Worldwide, an estimated 438.9 million people were infected with hookworm in 2010, 819.0 million with *A. lumbricoides* and 464.6 million with *T. trichiura.* Of the 4.98 million years lived with disability (YLDs) referable to STH, 65% were attributable to hookworm, 22% to *A. lumbricoides* and the remaining 13% to *T. trichiura* [2] (The NTDs including STH infection result in prolonged phases of ill health and in fact support to uphold poverty over their continuing effects on child development and worker productivity [3] The high STH burden in Asia is probably due to the moist and tropical climatic

conditions, scarcity of safe drinking water, inadequate sanitation, and poor hygiene practices, all of which facilitates worm survival and transmission [4, 5]. Government of Bangladesh has implemented school-based mass drug administration (MDA) bi-annually since 2008 aimed to control soil-transmitted helminth (STH) infection. Regardless of several rounds of MDA, the government is still facing challenges to accomplish the target coverage and utilization of the intervention [6] (In addition, the Bangladesh Expanded Program on Immunization offers mebendazole to pre-school children in Bangladesh [7] Due to urbanization, people tend to come to Dhaka, the capital city of Bangladesh, for better employment and income opportunities. A number of immigrants initially focus in slums, due to poverty and inadequate substitutes. Within the slums, poor environmental conditions and depressed infrastructures are observed. Due to lack of knowledge or proper institutional education, the people living in the slums are reluctant about sanitation which result in high prevalence of enteric parasites and risks of various diseases. Moreover, women suffer in the developing countries because of poverty coupled with social and traditional practices, philosophies, gender based ferocity, lack of educations and insufficient healthcare services Women continue to experience inferior health outcomes across a number of conditions, despite human rights advances and improvements in certain areas of health and development [8] The present study was perceived to determine the prevalence of common STH among slum dwelling young women of Dhaka and to assess socio-demographic and behavioral risk factors associated with STH infection.

2. MATERIAL AND METHODS

Stool samples were collected from Ganaktuli slum which is located in Hazaribagh thana of Dhaka city, Bangladesh.

2.1. Consent and ethical approval

Prior to the commencement of the research work, ethical clearance was given by the Ethical Committee of Faculty of Biological Sciences, University of Dhaka. The volunteers who collected stool samples from the respondents, were clearly informed on the aims and objectives of the study. Bengali language (as native) was used during data collection for better communication.

2.2. Study population and design

The present study was conducted among the women aged between 21 to 40 years old and having at least one primary school-going child. A total of 100 stool samples from the 100 women were collected during March 2019 to September 2019. House to house visits were done by the volunteers. A written questionnaire regarding demographic information and behavioral practices were provided to the women. The volunteers helped the women who did not know how to read or write. For collecting stool samples, each woman was provided with properly capped container. They were instructed by the research assistants and the volunteers to put an amount of stool in the container. The stool samples were transported to the Parasitology laboratory, Department of Zoology, University of Dhaka within one

to two hours of collection into a chiller box. The samples were kept in refrigerator at 4^{o} C and examined within two days of collection. Prevalence of STH was assumed 50% at 95% confidence level.

2.3. Data analysis

SPSS version 20.00 was used to input data and to analyze. Chi-square test was applied; the level of significance of each test was set at $P < 0.05$.

2.4. Laboratory screening

Formal Ether Sedimentation Technique was applied to examine the collected samples [9]. The stool samples were emulsified using 4 ml of 10% formal water suspension which was strained to remove large fecal particles. Then 4 ml of ether was added and the tube mixed for 1 min and immediately centrifuged at 750–1000 g (3000 revolutions per minute for 1 min). After centrifuging, the parasites sedimented to the bottom of the tube and the fecal debris collected in a layer between the ether and formal water. After discarding the supernatant, the sediment was transferred to a slide and covered with a cover glass. The sediment was examined microscopically for cysts, oocysts, eggs and larvae of intestinal parasites. The portion of stool samples processed and examined microscopically using the 10x objective first. Ova of helminth parasites were identified with the help of [10].

3. RESULTS AND DISCUSSION

Among the hundred stool samples, 87 samples were screened positive for at least one STH (Table 1). *A. lumbricoides* (36%) showed the highest prevalence followed by *T. trichiura* (32%). Concurrent infection with *A. lumbricoides* and *T. trichiura* was a little higher (10%) than the hookworm infection (9%) (Table 1). *Ascaris* sp. and *Trichuris* sp. have most often been found in urban and peri-urban communities whereas hookworm is found more often in rural communities [11]. *T. trichhiura* is specifically prevalent in the warm humid tropics where fecal contamination of the soil and water sources is a major factor in the contamination in a community. In 2006, Nguyen *et al.* conducted a study on reproductive-age Vietnamese women and found that 76% were infected with one or more helminth species; 36% with hookworm, 59% with *A. lumbricoides* and 28% with *T. trichiura* [12]. The egg of *A. lumbricoides* is recognized to stick to dust, fruits and vegetables. Infections usually occur through ingestion of infective ova from contaminated hands, food or drinks. As women usually do the dusting and kitchen chores, especially in underprivileged societies, they possess high risk of STH infections. The high prevalence of ascariasis in our study may be attributed to poor personal hygiene and low economic status of slum dwellers.

Table 1. Distribution of GI parasites among positive children (*n*=87)

Infection	*n* (%)
A. lumbricoides (AL)	36 (41.38)
T. trichiura (TT)	32 (36.78)
Hokworm	9 (10.34)
AL + TT	10 (11.49)
Total	87 (100)

Table 2. Demographic profile of the study participants in relation to soil-transmitted helminth infection.

Demographic profile	GI Positive (*n*=87), *n*%	GI negative (*n*=13), *n*%	Total (*n*=100), *n*%	χ^2 value, df, P-value
Education				
No institutional education	28 (32.18)	2 (15.38)	30 (30.00)	1.551, 2, 0.460
Primary	36 (41.38)	7 (53.85)	43 (43.00)	
Secondary	23 (26.44)	4 (30.77)	27 (27.00)	
Occupation				
Housewife	32 (36.78)	10 (76.92)	42 (42.00)	7.481, 1, 0.006*
Day laborer	55 (63.22)	3 (23.08)	58 (58.00)	
Toilet				
Open	24 (27.59)	0	24 (24.00)	21.488, 2, 0.000*
Common or shared	44 (50.57)	2 (15.38)	46 (46.00)	
Personal	19 (21.84)	11 (84.61)	30 (30.00)	
Antihelminthic drugs				
Never	19 (21.84)	0	19 (19.00)	9.623, 2, 0.008*
Irregular	39 (44.83)	3 (23.08)	42 (42.00)	
Regular	29 (33.33)	10 (76.92)	39 (39.00)	
Nail trimming				
Irregular	33 (37.93)	1 (7.69)	34 (34.00)	4.609, 1, 0.032*
Regular	54 (62.07)	12 (92.31)	66 (66.00)	
Footware				
Irregular	42 (48.27)	2 (15.38)	44 (44.00)	4.966, 1, 0.026*
Regular	45 (51.72)	11 (84.61)	56 (56.00)	
Handwash after defecation				
Irregular	36 (41.38)	0	36 (36.00)	8.406, 1, 0.004*
Regular	51 (58.62)	13 (100)	64 (64.00)	
Keeping animal				
No animal	51 (58.62)	9 (69.23)	60 (60.00)	0.531, 1, 0.466
Keep animal	36 (41.38)	4 (30.77)	40 (40.00)	
Knows about STH				
Never heard	38 (43.68)	6 (46.75)	44 (44.00)	0.028, 1, 0.867
Heard about IP	49 (56.32)	7 (53.85)	56 (56.00)	
Instruct child to wash hand after defecating				
Yes	48 (55.17)	8 (61.54)	56 (56.00)	0.186, 1, 0.666
No	39 (44.83)	5 (38.46)	44 (44.00)	

[χ^2= Chi-squared value, df=degree of freedom, P value*=significant]

Unexpectedly, women having primary education (41.38%) were more vulnerable to STH infection than the women with no institutional education (32.18%) which is similar to the study by Suntaravitun and Dokmaikaw [13]. The better educated the parents are, the lower the prevalence of intestinal parasites in children was reported by Nematian *et al.* [14]. But in our study, the women who are mothers' of at least one school-going child, showed reluctance to maintain own hygiene. That is why prevalence of STH was high in the educated groups also (P = 0.460) (Table 2). Among the day laborers, prevalence was higher (63.22%) than that of the housewives (36.78%) (P = 0.006). Maternal unemployment was considered as risk for infection in children by Quihui *et al.* [15]. Day laborers have to work outside and they are more exposed to the open environment where hygiene could be less maintained. In our study, all the women using open toilet were STH positive. Women who used

common or shared toiled showed higher prevalence (50.57%) than the personal toilet users (21.84%) (*P* = 0.000) (Table 2). Though males are more frequently reported open defecating than females [16] but we found a high interest among women to not to use toilet facilities. Belyhun *et al.* and Gunawardena *et al.* found that open defecation increases the risk of hookworm infection [17, 18]. Open defecation is likely to be highly contaminated environments with high probability of transmission, predominantly as hookworm larvae can directly enter the skin.

All the women who never used antihelminthic drugs, were STH positive. They used both albendazole and mebendazole unsteadily. Irregular antihelnminthic drug consumption resulted in higher STH prevalence (44.83%) than following regular time interval (33.33%) (*P* = 0.008). Northrop-Clewes *et al.* found that treatment with mebendazole reduces the prevalence of *A. lumbricoides* from 78% to 8%, of *T. trichiura* from 65% to 9% and of hookworm from 4% to 0% [19]. According to Hall and Nahar, albendazole was found to act mildly against *A. lumbricoides* but within 10 d all dosages had cured about 92% of infection. For the reduction of *T. trichiura* ova, they found 400 mg of albendazole for 3 d to achieve a cure rate of 80% [20].

We observed, 34 women used to clip their nail irregularly and among them 33 ((37.93%) were STH positive (*P* = 0.032) (Table 2). Mahmud *et al.* conducted a study among the children of northern Ethiopia. They revealed that whose nails were cut on a weekly basis were 49% less likely to be re-infected by intestinal parasites than children not receiving the nail clipping intervention [21]. We observed that the women who did not use hand wash after defecation, were all STH positive (*P* = 0.004). This finding was similar with the study conducted in Butajira that seldom washing of hands using soap users were more likely to maternal soil transmitted helminthes infections [17]. In 2019, Gebrehiwet *et al.* found that the women who had no habit of using soap after any procedure were five times more likely to have the soil transmitted helminthes infection compared to those who had practice of washing hands using water and soap [22]. Appropriate handwashing with soap and weekly trimming of fingernails can reduce the output of infective stages in feces that results in the contamination of the environment and therefore can lessen the transmission in the community [23, 24]. A review found inconclusive confirmation that hand-washing can lessen *A. lumbricoides* infection [25].

In our study, irregular foot ware use resulted in higher prevalence (48.27%) than the regular use (51.72%) (*P* = 0.026) (Table 2). Gebrehiwet *et al.* observed that the women who used to wear shoes were 95% less likely to be infected by soil transmitted helminths than who did not wear shoes [22]. But Kaliappan *et al*. reported that poor practice of footwear does not significantly enhance the risk of STH infection [26]. Animal keeping did not show significant influence in STH prevalence in our study (*P* = 0.466) (Table 2). 44 women never heard of STH and among them 38 (43.68%) were STH positive. 56 women were cognizant of STH and among them 49 (56.32%) were positive (Table 2). 48 (55.17%) STH infected women instructed their children to wash hands with soap after defecating and 39 women (44.83%) did not use to instruct (Table 2). Kassaw *et al.* observed that 45.20% of the women knew about and 54.8% of women did not know about intestinal parasitic infestations,

prevention and control methods in their study in Sekota town [27]. According to the findings of Kamunvi and Ferguson, intestinal worms rank poorly in people's minds as a vital health problem [28].

Conclusion

The study illustrated lack of cognizance among the slum dwelling women. Lack of health education and mostly lack of willingness is a barrier to attain good health. Lack of knowledge regarding mode of transmission, bad practice of defecation in open air and not washing hands after defecation are vital issues of concern. These should be addressed properly. Consequently, public awareness about STH prevention and control should be generated through campaigns and well-organized trainings.

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