Original Research Article

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

ABSTRACT

Aims: The objectiveof this trialwas to establish the prevalence and risk factors relating to soil-transmitted helminth (STH) infections among slum dwelling women in Dhaka city, Bangladesh.

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 from March to September 2019. Women aged between 21 to 40 years old were part of this study, and only those who had at least one primary school going child were included.

Methodology: The interviewedwomenwere asked to provide their stool samples in the containers supplied by the volunteers, and to fill up a questionnaire regarding their socio-demographic and behavioral practices. Formal Ether Concentration technique was applied to process the stool samples,and detection of helminth eggs was done by microscopy.

Results: Of the hundred women, 87(87%)were infected with at least one STH. *Ascaris lumbricoides* (41.38%) showed the highest prevalence followed by *Trichuristrichiura* (36.78%). Working as day laboreres,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: Soil transmitted helminthinfection is still a problem in Bangladesh. Proper drug administration and increase of hygiene practicesamong the slum dwellers areessential to lessen the high prevalence of soil transmitted helminth infections.

*Keywords:*Dhaka, slum, women, stool, soiltransmitted helminths

1. INTRODUCTION

Soil-transmitted helminth (STH) infections are considered the most prevalent neglected tropical diseases (NTD) with an estimated number of 1.45 billion people infected with at least one parasite[1, 2]. In 2010, 438.9 million people were infected with hookworm, 819.0 million with *Ascaris lumbricoides*, and 464.6 million with *Trichuristrichiura*, globally. 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 factsupport 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 STH infection, administrating mebendazole to pre-school children through the Bangladesh Expanded Program on Immunization [6, 7]. Regardless of several rounds of MDA, the government is still facing challenges to accomplish the target coverage and utilization of the intervention[6].

Due to urbanization, people tend to come to Dhaka, the capital city of Bangladesh, looking forbetteremployment and income opportunities. A number of immigrants initially concentrate in slums[8].Within the slums, poor environmental conditions and depressed infrastructures are observed.Due to lack of environmental hygiene, overcrowding, insufficiency of pure water and sanitation, slum dwellers may become affected by various health problems[9].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 [10].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 infectionamong them.

2. MATERIAL AND METHODS

Stool samples were collected from the women residing inGanaktulislumwhich 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 givenby the Ethical Review Committee of Faculty of Biological Sciences, University of Dhaka. The volunteers who obtained stool samples from the interviewed, 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 obtainedfrom 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 assisted the women who did not know how to read or write. For collecting stool samples, each woman received a properly capped container. They were instructed by the research assistants and the volunteerson how to put an amount of stool into the container. The stool

samples were transported to the Parasitology laboratory, Department of Zoology, University of Dhakawithin one to two hours of collection into a chiller box. The samples were kept in refrigerator at 4^{o} Cand examined within two days of collection.

2.3. Laboratory Screening

Formal Ether Sedimentation Technique was applied to examine the collected samples[11].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 1000 g. 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 were processed and examined microscopically usingthe 10x objective first. Eggs of helminth parasites were identified according to Chatterjee[12].

2.4. 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 $P < 0.05$.

3. RESULTS AND DISCUSSION

Amongthe hundred stool samples examined, 87 samples were 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 [13].*T. trichhiura* is specifically highly prevalent in the tropical and sub-tropical regions and peoplewithout proper sanitation are at risk of infection [14]. 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*[15].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 STH among STH-positive women in Ganaktuli slum of Dhaka city, Bangladesh (*n*=87).

Infection	*n* (%)
A. lumbricoides	36 (41.38)
T. trichiura	32 (36.78)

Hookworm	9 (10.34)
A. lumbricoides and *T. trichiura*	10 (11.49)
Total	**87 (100)**

Table 2. Demographic profile of the women residing in Ganaktuli slum of Dhaka city, Bangladesh in relation to STH infection.

Demographic profile	STH Positive (*n*=87), *n*%	STH 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)	
Use of shoes				
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				
Without soap	36 (41.38)	0	36 (36.00)	8.406, 1, 0.004*
With soap	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%)(*P* = 0.460)which is similar to results found bySuntaravitun and Dokmaikaw[16].The better educated the parents are, the lower the prevalence of intestinal parasites in children was reported byNematian*et al.*[17].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.*[18].Day laborers have to work outside and they are moreexposed 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 toilethad higher prevalence (50.57%) than the personal toilet users (21.84%) (P = 0.000)(Table 2).Though malesare more frequently reported open defecating than females[19], we found a high interest among womento not use toilet facilities.Belyhun*et al.* andGunawardena*et al.* found that open defecation increasesthe risk of hookworm infection[20, 21]. 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 drugsin lifetime, were STH positive.The women who used to take antihelminthic drugs once in year or two years were categorized as irregular users and the women who used to take least twice in year were categorized as regular users. Both the irregular and regular users, used to take both albendazole and mebendazole.Irregular antihelnminthic drug consumption resulted in higher STH prevalence (44.83%) thanusing at 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%[22].According to Hall and Nahar, albendazole was found to act mildly against*A. lumbricoides* but within 10 days, all dosages had cured about 92% of infection. For the reduction of *T. trichiura* egg, they found 400 mg of albendazole for 3 days to achieve a cure rate of 80% [23].

We observed, 34women used to clip their nail irregularly (only once in three to five months) 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, and theyrevealed that whose nails were cut on a weekly basis were 49% less likely to be re-infected by intestinal parasites than children not receivingthe nail clipping intervention[24]. We observed that the women who did not wash their hands with soap after defecation, were all STH positive (P = 0.004).Infrequent use of soap was more likely to maternal soil transmitted helminth infections in Butajira, Ethiopia[20].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[25].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 lessenthe transmission in the community [26, 27].A review found inconclusive confirmation that hand-washing can lessen *A. lumbricoides* infection [28].

In our study, less frequent use of shoesresulted in higher prevalence (48.27%) than the regular use (51.72%) (P = 0.026) (Table 2). Gebrehiwet*et al.*observed that thewomen who used to wear shoes were 95% less likely to be infected by soil transmitted helminths than who did not wear shoes[25].Kaliappan *et al*. reported that poorpractice of footwear does not significantly enhance the risk of STH infection[29].Animal keeping did not show significant influence in STH prevalence in our study (P = 0.466) (Table 2).Among the 100 interviewed women, 44 women never heard of STH and among them 38 (43.68%) were STH positive, and 56 women were cognizant of STH; among them 49 (56.32%) were STH positive (Table 2).We observed that 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[30].According to the findings of Kamunviand Ferguson, intestinal worms rank poorly in people's minds as avital health problem[31].

CONCLUSION

The study illustrated high prevalence of soil transmitted helminths among the slum dwelling women.Improper use of antihelminthic drugs, bad practice of defecation in open areas and not washing hands properlyafter defecation are vital issues of concern which should be addressed properly.Consequently, public awareness about STH prevention and control should be generated through campaigns andwell-organized trainings.

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