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Perceptions and practices of urban slum-dwelling women concerning soil-transmitted helminths infections in Bangladesh: A cross-sectional study.

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ABSTRACT

Introduction: Soil-transmitted helminths (STH) infections are still attributed to a significant part of mortality and disabilities in developing nations. This study aimed at exploring the perceptions and practices concerning STH and to assess the associated risk of infections among slum-dwelling women of Dhaka South City Corporations (DSCC), Bangladesh.

Materials and methods: A cross-sectional study was conducted in two selected slums (Malibagh and Lalbagh) of DSCC, Bangladesh, from September 2020 to February 2021. A total of 206 women participants were requested to provide stool samples, followed by a semi-structured questionnaire survey. Parasitological assessment was done by the formol-ether concentration (FEC) technique. Data were analyzed using descriptive statistics, and p -value < 0.05 was considered as statistically significant. An adjusted odds ratio (AOR) with a 95% confidence interval (95% CI) was estimated using logistic regression analysis to examine the association between explanatory and outcome factors.

Results: In total, 36 (17.5%) STH infections were observed out of 206 examined participants. Among the STH, *Trichuris trichiura* showed the highest prevalence (10.7%), followed by *Ascaris lumbricoides* (5.3%). Lack of formal education, overcrowded living, large family sizes, and using shared toilets were significantly associated with STH infections. Irregular nail cutting (AOR = 3.12), irregular soap usage after toilet (AOR = 2.98), wearing no shoes (AOR = 4.64), and failing to teach kids to wash their hands (AOR = 3.87) were revealed as practice concerns linked to high STH prevalence. Women, who had never heard about STH (AOR = 2.42) and had no misconceptions regarding STH (AOR = 1.94) were positively related to STH infection in this study.

Conclusion: Slum-dwelling women in Bangladesh still had a substantial infection of STH. Most of the communities under study were unaware of parasite infection and its negative effects on health. Revision of the policy of ongoing anthelmintic distribution programs and widespread health education programs are recommended aimed at controlling STH.

Abbreviations: DSCC, Dhaka South City Corporations; OSC, Out of School Children; PSAC, Pre School-Aged Children; SAC, School Aged Children; SDGs, Sustainable Development Goals; SPSS, Statistical Package for Social Sciences; STH, Soil-Transmitted Helminths; WHO, World Health Organization; WRA, Woman of Reproductive Aged..

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1. Introduction

Soil-transmitted helminths (STH) refer to a group of intestinal worms that are transmitted through contaminated soil. *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Necator americanus* and *Ancylostoma* spp.) are the three main STH species of concern that infect humans (Gordon et al., 2017). STH infection has progressively become a major global public health issue and has a negative socioeconomic impact by affecting income, education, and employment. The major at-risk groups are children of preschool age (PSAC) or school age (SAC), and women of childbearing age (Veessenmeyer, 2022). Women of reproductive age (WRA) are at high risk for STH-related morbidity, but actions to increase preventive chemotherapy coverage in WRA have been limited. Importantly, significant hormonal, nutritional, and immunological changes occur throughout pregnancy. Immune modulation brought on by hormonal changes (such as a reduction in circulating cortisol) or dietary changes (such as a protein deficiency) may increase susceptibility to helminth infection (Gordon et al., 2017). According to WHO (World Health Organization, n.d.-a), >500 million adolescent girls and women of reproductive age (including over 100 million pregnant and lactating women) are at risk of STH and schistosome infections and require treatment. However, reports or records of WRA-focused deworming are not routinely monitored (Davlin et al., 2020). The burden of disease imposed on helminth-infected girls and women of childbearing age, especially when pregnant, may very well define the single most important contribution of intestinal parasitic infections to calculating their global disease burden (Rodríguez-Morales et al., 2006). The ministry of health and family welfare (MOHFW) of Bangladesh has not focused PC on WRA because of the relatively low prevalence of STH infection. Besides, an insignificant efficacy of anthelmintic drugs was found against *T. trichiura* and hookworm (Gordon et al., 2017; Nath et al., 2022).

More than 1.5 billion people are infected with STH infections globally, predominantly in tropical and subtropical areas (World Health Organization, n.d.-a). One of the most prevalent soil-transmitted intestinal helminths, *Ascaris lumbricoides* can affect people of any age and is widespread in underdeveloped areas with poor sanitation (Schüle et al., 2014). Growth retardation, respiratory and digestive issues, as well as decreased physical fitness, can all be brought on by *A. lumbricoides*. On the other hand, whipworm and hookworm infections cause iron deficiency anemia as the parasites feed on the blood of the host tissue, leading to the loss of iron and protein, resulting in anemia (Smith and Brooker, 2010). During adolescence, repeated menstrual blood loss in girls leads to iron



Fig. 1. Malibagh rail line and Lalbagh slum areas of DSCC, Bangladesh (map created using ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute).

deficiency anemia (Galvani, 2005). Anemia is a public health concern, especially for children and women in developing countries (Kassebaum et al., 2014). There is an increased risk of preterm delivery and low birth weight among anemic childbearing women (Allen, 2000). It is quite difficult to cure a disease of poverty only with medicine, as these diseases are particularly connected with individual hygiene practices. Disease like STH is significantly correlated to individual hygiene practices and public sanitation, making it challenging to treat with medicine alone (Gordon et al., 2017).

Despite progress, there are still many problems for women in Asia, including underage marriage, inadequate nutrition, low social support, and educational disparities. It is very unfortunate that women continue to experience inferior health outcomes across a number of conditions, and their access to healthcare and health-seeking behaviors are still low (Scambler, 2011). Disease prevalence has been linked to socioeconomic factors (education, income, practices, access to resources, family power structure) rather than age-related biological difficulties or genetic factors (Andersen and Newman, 1973). Promoting well-being for all at all ages and empowering all women and girls are two of the prime focuses of the sustainable development goals (SDGs). In developing countries, women contribute significantly to the economy, and one of the basic pillars of women's empowerment in the area of health is self-awareness. It is crucial to determine whether livelihood and misconceptions influenced the risk of STH morbidity or not among women. Therefore, the current study intends to determine the prevalence of STH and assess the perceptions and practices of slum-dwelling women toward STH infection.

2. Methods and material

2.1. Ethical approval

This study was approved by the Ethical Review Committee, Faculty of Biological Sciences, University of Dhaka, Bangladesh. All the respondents were clearly informed regarding voluntary involvement. Verbal consent was obtained from the respondents for sharing their data in the study.

2.2. Study settings and study population

This cross-sectional study was conducted in two slum settings (Malibagh rail line slum and Lalbagh slum) of Dhaka south city corporations (Fig. 1) from September 2020 to February 2021. Dhaka is the capital city of Bangladesh, globally ranked as the sixth most populous city with >22 million population (World Health Organization, n.d.-b). More than five thousand slums are in Dhaka city with an estimated four million people, and every year a large number of migrants from villages end up in urban slums. In the present study, sample size was determined using Cochran's formula (Cochran, 1963). Assuming the maximum variability of 50% ($p = 0.5$) and taking 95% confidence level with $\pm 5\%$ precision, the calculated sample size was 385 individuals. Considering only 450 women living in shacks/jhupri (tin-shed, mud-floored settlements) of the selected areas, sample size was adjusted and resulted in minimum 207 individuals [$385 / (1 + (384 / 450)) = 207$]. A total of 207 women who agreed to provide their stool samples were selected using a convenient sampling technique. Participants who only agreed to fill out a questionnaire and had no interest in providing stool sample was not included in the study. Women who had lived in the targeted locations for at least two years were eligible for inclusion in the study. Additionally, pregnant women with anatomical deformities or who were seriously ill with any health issues were excluded from the study.

2.3. Questionnaire design and data collection

The data was collected using a pre-tested questionnaire consisting of demographic and socioeconomic information, perceptions, and practices concerning STH infections. The questionnaire was prepared in English first and translated into Bengali (native). Interviews were conducted by door-to-door visits by the trained field assistants familiar with the study area. The participants completed the survey themselves under the direct monitoring of researchers. The research team helped the women to understand the questionnaire who did not have literacy skills.

2.4. Stool sample collection and laboratory analysis

Stool samples of each interviewed participant were collected once. For collecting stool, each woman received a pre-labeled, properly capped plastic container. Before collection, the research assistants instructed the participants on how to put an amount of stool into the container. After collecting samples from participants' homes, samples were kept in a cooler box and transported to the Parasitology Laboratory, Department of Zoology, University of Dhaka. The samples were kept in the refrigerator at 4 °C and examined within two days of collection. Formol ether concentration technique was used to examine the collected samples (Nath et al., 2021). Each stool sample (1–2 g) was mixed with 5 ml distilled water and left for 5 min to settle. The mixed solution was strained to remove large fecal debris. The mixture was then put into a test tube and centrifuged for 5 min at 1500 rpm. The supernatant was then mixed with 10% formalin and absolute ether (formalin: ether = 7:3) and centrifuged at 1500 rpm for an additional 5 min. After discarding the supernatant, the sediment was checked for parasites. Ova of helminth parasites were identified following standardized procedures as presented in the World Health Organization's 'training manual on diagnosis of intestinal parasites (Nath et al., 2022; World Health Organization, 2004).

2.5. Data quality assurance

Proper training on data collection and investigation along with particulars about the study were provided to the research assistants, volunteers, and laboratory attendants prior to sample collection to confirm reliable data collection strategy. Completed questionnaires were routinely verified during the data collection process for any inconsistencies, logical errors, or missing values. Principal investigator and laboratory technologist both examined all the stool samples to decrease the risk of observation bias, and slides were cross-checked by senior professionals.

2.6. Data analysis

Data were analyzed using a statistical package for the social science (SPSS) version 20.0. Descriptive statistics were used to summarize the frequency and proportions of independent and dependent variables. Associations between dependent and independent variables were analyzed by Chi-square test. Prevalence ratios were computed to relate the probability of infections with intestinal helminth. The association between individual risk factors and STH infection was assessed using both univariable and multivariate logistic regression models. A p -value of <0.05 was considered statistically significant and was subjected to multivariate analysis.

3. Results

3.1. STH prevalence

A total of 206 women from two selected urban slums were included in the study (1 participant was lost during the study period). Among the study subjects, 36 (17.5%) were screened as positive for STH infection (Table 1). The highest prevalence was of *T. trichiura* (10.7%), followed by *A. lumbricoides* (5.3%). Coinfection of *A. lumbricoides* and *T. trichiura* was observed in 1.5% of participants.

3.2. Sociodemographic context and occurrence of STH infections

Demographic characteristics and socioeconomic context associated risk of STH infections were presented in Table 2. In this study, 42 participants did not have any institutional education. Among them, 18 (50.0%) women were helminth positive, followed by the women who had primary level of education (41.7%). Women who studied up to 9th grade were the least infected group (8.3%) ($P = 0.000$). Among the 107 female day laborers, 23 (63.9%) were infected. Among the 99 housewives, 13 (36.1%) were STH-positive ($p = 0.081$). Women, who lived in large families (>6 members), showed the highest prevalence (72.2%), followed by the family size of four to six members (25%) and three members (2.8%) ($p = 0.000$). Women who had to adjust to living in one room with other family members were more infected (69.4%) than women who lived in a two-room house (30.6%) ($p = 0.046$). Common toilet use was found to be a significant risk factor for STH infection. One hundred forty-eight women used shared toilets, and among them, 33 (91.7%) women were infected with STH; 58 women used personal toilet, and among them, only three women were STH positive (8.3%) ($p = 0.002$).

3.3. Practices of slum-dwelling women concerning control of STH infections

Table 3 shows the behaviors of the women concerning STH infections and its control. We used two categories for clipping nails: irregular and regular. Women who did not clip their nails within a month were considered irregular, and the women who used to clip their nails weekly or biweekly were considered regular clippers. In this study, 73 women used to clip their nails irregularly; among them, 21 (58.3%) were STH-positive. Among the 133 regular nail clippers, only 15 (41.7%) were STH-positive. Also, 108 women affirmed that they wear shoes irregularly; among them, 30 (83.3%) women were found to be STH-positive. Among regular shoe users, only 6 (16.7%) women were STH-positive. Additionally, 91 women were found to use soap as a hand wash most of the time, and among them, 24 (66.7%) were STH-positive. Regarding washing hands with soap, 12 (33.3%) were found STH-positive. Women who wash their hands with soap after defecation were shown to have lower STH infection rates. Women who used to take anthelmintic drugs once in every six months were considered regular users. Most of the women used Albendazole (400 mg) in two doses, and few reported taking benzimidazole (500 mg) as anthelmintic drug. Among the STH-positive women, the majority of the women never consume anthelmintic drugs or irregular users.

Table 1
Prevalence of STHs among slum-dwelling women of DSCC, Bangladesh ($N = 206$).

Parasite	n (%)	95% CI
<i>A. lumbricoides</i>	11 (5.3)	0.028–0.096
<i>T. trichiura</i>	22 (10.7)	0.170–0.159
<i>A. lumbricoides</i> and <i>T. trichiura</i>	3 (1.5)	0.004–0.045
No infection	170 (82.5)	0.765–0.873

Table 2
Socio-demographic factors associated with intestinal parasitic infections.

Variable	Parasite Infection			AOR [95% CI]	P-value
	Positive	Negative	Total		
Education					
No institutional education	18 (50.0)	24 (14.1)	42 (20.4)	1	0.000
Up to class V	15 (41.7)	115 (67.6)	130 (63.1)	2.98 [1.72, 3.85]	
Up to class IX	3 (8.3)	31 (18.2)	34 (16.5)	4.52 [3.13, 7.62]	
Occupation					
Housewife	13 (36.1)	86 (50.6)	99 (48.1)	1	0.081
Day laborer	23 (63.9)	84 (49.4)	107 (51.9)	2.05 [0.96, 2.39]	
Family size					
Three members	1 (2.8)	112 (65.9)	113 (54.9)	1	0.000
Four to six members	9 (25.0)	48 (28.2)	57 (27.7)	2.71 [1.45, 4.92]	
More than six members	26 (72.2)	10 (5.9)	36 (17.5)	5.86 [4.07, 9.02]	
Accommodation					
Two room	11 (30.6)	83 (48.8)	94 (45.6)	1	0.046
One room	25 (69.4)	87 (51.2)	112 (54.4)	1.33 [1.05, 2.91]	
Toilet					
Personal	3 (8.3)	55 (32.4)	58 (28.2)	1	0.020
Common	33 (91.7)	115 (67.6)	148 (71.8)	2.90 [1.61, 4.74]	

AOR: adjusted odd ratio; CI: confidence interval. $p < 0.05$ indicates statistically significant difference.

Table 3
Behavior associated with intestinal parasitic infections.

Variable	Parasite Infection			AOR [95% CI]	P-value
	Positive	Negative	Total		
Nail clipping					
Irregular	21 (58.3)	52 (30.6)	73 (35.4)	1	0.002
Regular	15 (41.7)	118 (69.4)	133 (64.6)	3.12 [2.23, 5.31]	
Use of shoes					
Regular	6 (16.7)	92 (54.1)	98 (47.6)	1	0.000
Irregular	30 (83.3)	78 (45.9)	108 (52.4)	4.64 [2.08, 8.61]	
Hand wash after defecation					
Without soap	24 (66.7)	67 (39.4)	91 (44.2)	1	0.003
With soap	12 (33.3)	103 (60.6)	115 (55.8)	2.98 [1.01, 3.46]	
Instruct child to wash hand after defecating					
Yes	14 (38.9)	130 (76.5)	144 (69.9)	1	0.000
No	22 (61.1)	40 (23.5)	62 (30.1)	3.87 [3.12, 5.34]	
Anthelmintic drugs					
Regular	4 (11.1)	37 (21.8)	41 (19.9)	1	0.314
Irregular	15 (41.7)	68 (40.0)	83 (40.3)	1.14 [0.58, 2.24]	
Never	17 (47.2)	65 (38.2)	82 (39.8)	1.65 [0.98, 2.62]	

AOR: adjusted odd ratio; CI: confidence interval. $p < 0.05$ indicates statistically significant difference.

3.4. Perceptions of slum-dwelling women concerning control of STH infections

Table 4 represents the perceptions of women concerning STH infections and their control. Among the 206 women, 30 believed that worms help digest food, and only 2 were helminth positive (AOR 0.67). Although 128 mothers had no misconception regarding STH, 31 were STH-positive (AOR 1.94). In this study, the majority of the study population did not have any misconceptions regarding STH infections, but surprisingly, they showed high STH infections. Among the 206 women, 83 had never heard of STH, and 26 were screened STH-positive (AOR 2.42). Women, who used to think STH as a major problem, were all helminth negative. One hundred fifteen women thought STH as a minor problem, and midst them, 105 were free of infection (AOR 1.33).

Table 4
Perception associated with intestinal parasitic infections.

Variable	Parasite Infection			AOR [95% CI]	P-value
	Positive	Negative	Total		
Misconception					
Sugar creates worms	3 (8.3)	45 (26.5)	48 (23.3)	1	0.005
Worms helps to digest	2 (5.6)	28 (16.5)	30 (14.6)	0.67 [0.28,1.15]	
No misconception	31 (86.1)	97 (57.1)	128 (62.1)	1.94 [0.67,2.35]	
Thoughts about STH					
Thinks a major problem	0 (0.0)	8 (4.7)	8 (3.9)	1	0.000
Thinks a minor problem	10 (27.8)	105 (61.8)	115 (55.8)	1.04 [0.49,2.22]	
Never heard	26 (72.2)	57 (33.5)	83 (40.3)	2.42 [1.33,4.4]	

AOR: adjusted odd ratio; CI: confidence interval. $p < 0.05$ indicates statistically significant difference.

4. Discussion

Our study shows that STH infection still poses a health challenge among women living in urban slum areas of Dhaka, Bangladesh. Prevalence of intestinal parasite infection was 17.5% in this study. Socioeconomic conditions like education level, family size, living places, and latrine were positively associated with parasitic infection. This finding is consistent with our previous study conducted in the urban slums of Dhaka and Sylhet, Bangladesh (Nath et al., 2022). In this study, women who worked as day laborers were likely to be infected twice than other women who were fully housewives, that could be due to higher exposure to the contaminated environment. The socio-ecological, environmental, and environmental factors that influence helminth infection are outlined in Fig. 2, along with their interactions. Several helminth infections have been decreased or eradicated in the majority of developed countries utilizing existing control interventions like school-based mass drug administration; however, these interventions must be modified in developing countries based on priorities, and capabilities (Scambler, 2011; Gazzinelli et al., 2012). Designing control measures and promoting helminth prevention requires a deeper knowledge of social and environmental variables. Interdisciplinary, intersectoral, and community-based strategies engaging both the health and non-health sectors are necessary for successful control approaches. Scambler (Scambler, 2011) provided evidence for the relationship between social gradient and health when he mentioned that each person's social position like degree of education, employment status, or living situation affects their health and lifespan. Educational background or literacy is one of the key factors in governing social equality. and plays a crucial role not only in individual health but also socioeconomic index of the family. Mother's education may act as the prime predictor of health and sustenance disparities among children. In Egypt, mothers' knowledge, perceptions, and behavior were found to be vital in developing and implementing an effective community-based intestinal helminth control program (Curtale et al., 1998). MDA is considered a cost-effective intervention to control STH infection in most countries despite the development of anthelmintic drug resistance (Smits, 2009). Bangladesh government has been implementing biannual school-based deworming drug distribution programs since 2008 to combat soil-transmitted helminthiasis (Nath et al., 2019). Up to January 2020, the program has managed to arrange 23 rounds of deworming sessions (Dhakal et al., 2020). But Nath et al. (Nath et al., 2019), Hafiz et al. (Hafiz et al., 2015), and Rahman (Rahman, 2016) reported several gaps in the coverage of school-based deworming program among school-going children (SGCs) and out-of-school children (OSCs), which is also supported by Saha et al. (Saha et al., 2022). Along with schoolteachers, involving educated mothers in ongoing school-based MDA programs may

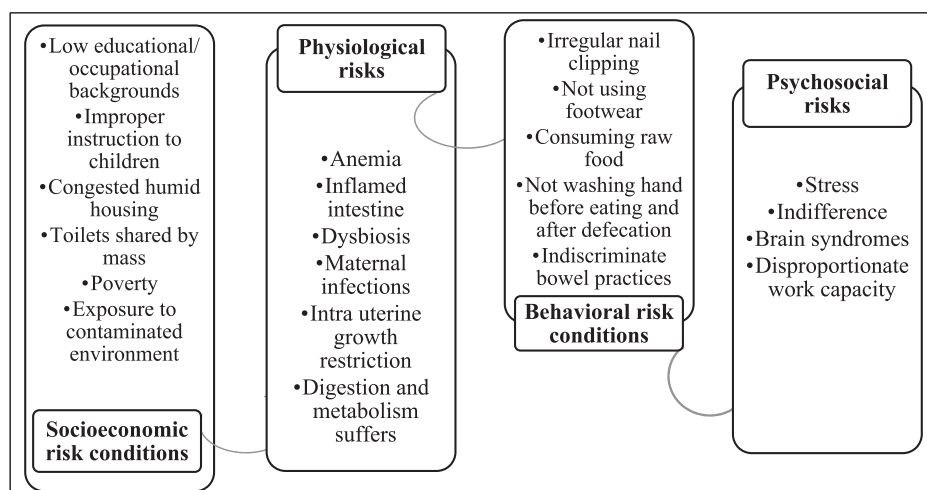


Fig. 2. Socio-environmental approach to assess helminth infection related health status (scheming by existing literatures).

encourage more children to participate the MDA program. Specific categories of house components and congested living are also reported to be related to parasitic infection (Prakash et al., 1980). Although overcrowding and larger household sizes have been linked to a higher frequency of infectious diseases, little study has been done on how these factors affect helminth infections. In this study, overcrowded living was found as a significant risk factor for STH infection (Table 1). A number of people migrate to the capital city (Dhaka) of Bangladesh every year in the hope of a better life and employment. Nevertheless, this unplanned urbanization without proper advancement of community accelerates the spread of STH infections even in climates that are not suitable for STH survival (Salam and Azam, 2017). In this study, the STH infection rate was higher among shared toilet users (91.7%) than among personal toilet users (8.3%) (Table 1). When Ramlal et al. (Ramlal et al., 2019) examined the relationship between toilet access and potential STH infection, they discovered that slums with regular shared latrines had an average of 1.6 episodes of diarrhea per year, as opposed to 1.4 in areas with private latrines.

Among the helminth parasites detected, the prevalence of *T. trichiurus* was predominant, followed by *A. lumbricoides*. *Ancylostoma lumbricoides* can lead to reduced physical fitness, growth retardation, respiratory and gastrointestinal problems, and has a negative impact on cognitive function (Schüle et al., 2014). Whipworms (*Trichuris trichiura*), contribute to iron deficiency anemia and loss of appetite, particularly in pregnant women, due to the mechanical damage that the adult worms cause when they burrow into the intestinal epithelium, and their subsequent feeding behaviors (Gordon et al., 2017). In the present study, no hookworm infection was observed among the women, which could be diagnostic method used in this study, as the formol ether concentration technique probably has a limited capacity to detect hookworms and *Strongyloides* infection. In addition, the time between collecting samples from households and transporting them to the laboratory may have had an effect on the hatching of hookworm ova. Nath et al. (Nath et al., 2022) reported around 15.0% hookworm infections from urban slums of Bangladesh, where a significant proportion of adults were diagnosed with hookworm infections. Hailu et al. (Hailu et al., 2020) also found hookworm infection as the major intestinal parasitic infection among pregnant women in Ethiopia. Variation among results could be attributed to the time and period of the study, characteristics of the study population, diet, customs, professions, research methodologies, and geographic dissimilarities. Women who do not instruct their children to wash hands after defecation are more likely (AOR 3.87) to become infected with STH. Therefore, if women are more aware of proper hygiene habits, they can benefit their own health as well as the health of their children, and the community. Additionally, by promoting a healthy lifestyle, parents and other important guardians can have a big impact on the lifestyle decisions their children make (National Academies of Sciences, Engineering, and Medicine, 2016). Children are significantly more likely to obtain MDA coverage if their guardians are aware of the program (Saha et al., 2022).

In this study, an association was observed between any STH infection, frequency of nail trimming, and usage of foot wears. The presence of helminth eggs under the nails is an indication of inadequate hygiene. It is yet unclear if frequent nail trimming indeed prevents STH infection or if it is merely a stand-in for good hygiene. Mahmud et al. (Mahmud et al., 2015) reported that the interferences between soap-based hand washing and weekly systematic nail clipping resulted in a significant decrease in the reinfection rate with enteric parasites. Although some studies reported that improved handwashing practices reduced STH infections (Mahmud et al., 2015; Bieri et al., 2013; Gyorkos et al., 2013), Acumen et al. (Ercumen et al., 2019) observed that handwashing did not reduce STH infection aside from a modest reduction in *T. trichiura* intensity. According to Paige et al. (Paige et al., 2017), the use of shoes along with environmental sanitation can serve as an operational strategy for reducing STH infection. By maintaining proper hygiene practices, environmental contamination can be decreased (Smits, 2009).

Health promotion activities are also crucial in protecting communities from helminth infections. In this study, the majority of the respondents considered worms as a minor problem. The least infection was observed among respondents who considered worms as a major issue. Bath et al. (Bath et al., 2010) reported that although a substantial percentage of respondents (23%) recognized how worms spread, they thought eating junk food and sweets caused intestinal worms. In 1994, Rousham (Rousham, 1994) explored the widespread myth in Bangladesh that “sweet consumption causes worms.” This false belief is still prevalent in the research areas. Among the 206 women, 48 (23.3%) believed that worms could be created in the body by consuming sugar. It is important to assess societal thoughts to eliminate or lessen a disease of poverty like STH. Although in this study, the majority of the study population did not have any misconceptions regarding STH infections, surprisingly, they displayed the maximum prevalence of STH (86.1%).

Our study has several limitations. First, the sample size was limited due to Covid-19 situation and budgetary constraints. Hence, further study with large sample size is a prerequisite to assess the connotation of perceptions or practice with helminth infections. Secondly, we collected single stool samples per woman rather than two/three samples per woman. Repeated samples may have allowed for even greater sensitivity in detecting the true prevalence of infection. Thirdly, in some cases, it took several hours before delivering their samples to the nearest refrigeration/cooling facilities, which may have contributed to the degradation of hookworm eggs.

5. Conclusion

This study provides a comprehensive assessment of STH infection among urban slum-dwelling women in Bangladesh. The findings showed a moderate level of STH prevalence with a substantial whipworm infection rate. Participants had a good perception of the disease but demonstrated a poor attitude to its prevention and control. Community awareness about parasite infections and prevention strategies should be created through proper health education campaigns and organized training. Overall, the finding of this study could offer crucial hints about the transmission of STH in the community and assist in developing a more targeted preventive strategy.

Author contributions

Conceptualization: Mukutmoni M; Questionnaire development and data collection: Mukutmoni M, Liza FT; Formal analysis: Mukutmoni M, Liza FT, Parvin RA, Nath TC; Methodology: Mukutmoni M, Parvin RA; Validation: Mukutmoni M; Writing-original draft: Mukutmoni M; Review and editing: Nath TC.

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Declaration of Competing Interest

The authors declare no conflict of interest exist.

Data availability statement

The datasets are available from the first author upon reasonable request.

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