

## **OCCURRENCE OF *STRONGYLOIDES STERCORALIS* IN RURAL AREAS ADJACENT TO DHAKA CITY**

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**Abstract:** The present study was designed to investigate *Strongyloides stercoralis* infection in rural communities of Savar and Gazipur. A total of 160 stool samples were collected from the inhabitants of the study areas during December 2016 to November 2017. The samples were processed by direct smear, formol-ether concentration technique and Harada-Mori culture. The overall prevalence of *S. stercoralis* was 10.63%; 11% in Savar and 10% in Gazipur. The elderly people were more prone to *S. stercoralis* infection. No respondent belonging to age group of 11-20 years was found positive for infection. Poor educational status, inferior financial condition and inadequate hygiene practice were found as potential risk factors ( $P < 0.05$ ). Noticeable prevalence was observed among the respondents living in mud floored house (13.46%), irregular nail clippers (22.73%), bare footers (14.89%) and laborers (27.27%) in Savar. Prevalence was high among the respondents deprived of institutional education (17.86%) in Gazipur.

**Key words:** *Strongyloides stercoralis*, Harada-Mori culture, prevalence, socio-economic background

### **INTRODUCTION**

Threadworm, *Strongyloides stercoralis* is an intestinal parasitic nematode, infects more than 100 million people worldwide (Puthiakunnon *et al.* 2014). Strongyloidiasis is endemic in Southeast Asia, Latin America, sub-Saharan Africa, and parts of the Southeast United States (Genta 1989). Sultana *et al.* (2012a) conducted a study in a slum community of Dhaka city and found 23.10% prevalence of *S. stercoralis*. The evidence demonstrate that strongyloidiasis is mostly determined by the socio-economic status of the communities rather than geographic or climatic conditions. It determines that strongyloidiasis should no longer be referred to as a “tropical” disease but rather a disease of socio-economic disadvantage (Beknazarova *et al.* 2016).

*S. stercoralis* is exclusive among intestinal nematodes as it is able to complete its life cycle within the host through an asexual auto infective cycle, permitting the infection to persist in the host for an indefinite period. Under some conditions associated with impaired immune system, the auto infective

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cycle can become amplified into a potentially fatal hyper infection syndrome. The syndrome is characterized by increased numbers of infective filariform larvae in stool and sputum which results in an increased parasite burden and migration, gastrointestinal bleeding and respiratory distress (Keiser and Nutman 2004). Severe complication with *S. stercoralis* infection may lead to substantial mortality as high as 87% (Ericsson *et al.* 2001).

The present study was conducted to detect *S. stercoralis* and to relate the socio-economic conditions with the prevalence. Authors believe that the study will contribute to knowledge of epidemiology of strongyloidiasis which could form the basis of further extensive surveys in Bangladesh.

### **MATERIAL AND METHODS**

The study was conducted among the inhabitants of rural community in Savar (Genda, Pandhoa) and Gazipur (Barotopa, Gazipur), adjacent to Dhaka city during December 2016 to November 2017. Both children and adults (male and female) were involved in study population. A total of 160 stool samples were collected. Participants were asked to fill up the questionnaire regarding their socio-demographic and behavioral aspects. The fresh stool samples were carried to the Parasitology Laboratory, Department of Zoology, University of Dhaka within one hour of collection.

Direct smear, formol-ether concentration technique (Cheesbrough 1987) and Harada-Mori culture (Harada and Mori 1955) were used to detect *S. stercoralis* larvae in the stool sample. Single stool samples were collected from study participants and about two grams were used in each of triplicate Harada-Mori cultures, with a total amount of approximately six grams cultured per stool sample. Cultures were incubated at 25–28°C for one week and examined daily. Samples were regarded as positive if at least one larva was identified in any of the triplicate culture vials. *S. stercoralis* larva were identified following Garcia (2001). Obtained data were analyzed applying Chi-square statistics and  $P < 0.05$  was considered as significant.

### **RESULTS AND DISCUSSION**

Out of 160 collected samples, seventeen samples (eleven in Savar and six in Gazipur) were positive for *S. stercoralis* infection. Among the other helminths, prevalence of *Ascaris lumbricoides* was the maximum in Gazipur (38.33%) and Savar (37%) followed by *Trichuris trichiura* in Gazipur (16.66%). *Enterobius vermicularis* showed the similar prevalence in both the study areas (15%) (Fig.1).

Both male and female showed similar prevalence in the present study (Fig. 2) which agrees with Yori *et al.* (2006) and Sultana *et al.* (2012b). Possibly both males and females living in the study areas have the same chance of infection around their residence.

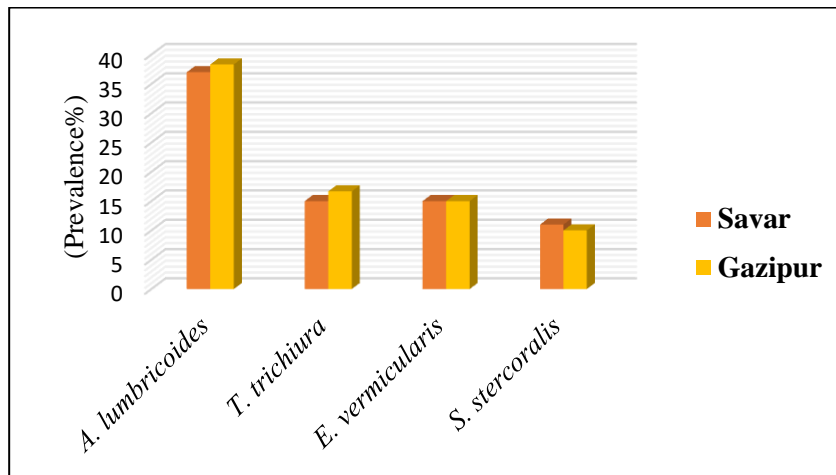


Fig. 1. Prevalence of helminth infection among the inhabitants of the study areas.

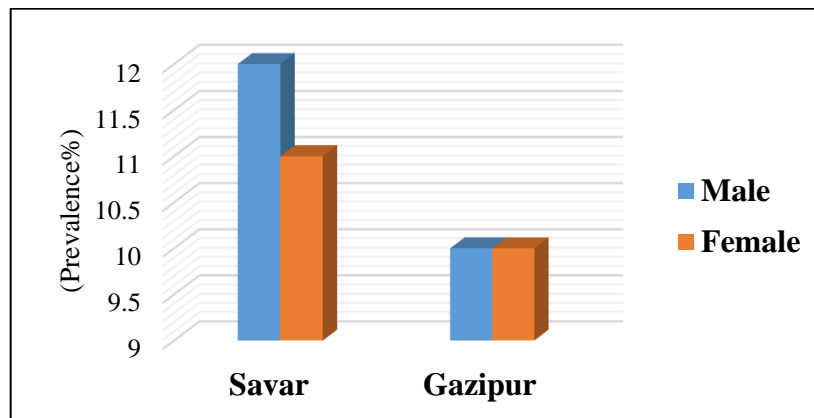


Fig. 2. Prevalence of *S. stercoralis* infection based on gender.

In the present study, in both study areas, elderly people were more prone to *S. stercoralis* infection. The highest prevalence (30%) was found among the respondents of 51 to 60 years old in Savar and 28.75% in Gazipur (Table 1) which is similar to the results as exhibited by Boonjaraspinyo *et al.* (2013) and Sultana *et al.* (2015b). According to Widjana and Sutisna (2000), the prevalence of *S. stercoralis* infection increases gradually with age to reach its maximum in

adulthood. No infection was observed among the respondents aged between 11 to 20 years old (Table 1). It may so happen that the age group was less exposed to sources of infective-stage larvae living in soil. Increase in public awareness about the importance of proper sanitation, particularly in school may also be attributed to this result.

High prevalence of *S. stercoralis* was observed among the laborers both in Savar (27.27%) and Gazipur (25.00%) (Table 1). Laborers are usually more exposed to soil than the others. In Savar, housewives displayed high prevalence of *S. stercoralis* (Table 1). This is probably due to unhygienic practice in daily life. In both Savar and Gazipur, prevalence of *S. stercoralis* was higher among the respondents who did not wear shoes (14.89% and 10.71% respectively) than in shoe wearing respondents (7.55% and 9.37% respectively) (Table 1). Similar result was recorded by Reichert *et al.* (2016). As *S. stercoralis* is a soil-transmitted helminth and penetrate via hosts skin, so risk of infection is associated with the habit of walking barefoot on sandy ground or soil. Senephansiri *et al.* (2017) found that the most important risk factor for *S. stercoralis* infection in their study was the failure to wear shoes when going outside of the house (P = 0.003).

In both the area studied, the maximum prevalence of *S. stercoralis* was observed among respondents who had no institutional education. No infection was screened among the respondents having educational level upto secondary or above (Table 1). Laoraksawong *et al.* (2018) found that the respondents with a primary school level or no formal education were 4.5 times more likely than those with a diploma, bachelor's degree, or higher to be infected with *S. stercoralis* (P=0.037). Pitisuttithum *et al.* (1990) observed the highest prevalence among the illiterate respondents (35%) in their study. In Savar, the lowest prevalence (10.69%) was recorded among the respondents whose monthly family income was 5001 to 10000 BDT. No infection was found in the respondents having higher monthly incomes. The uppermost prevalence (16.66%) was observed among the respondents of economically inferior class (1000 to 5000 BDT monthly income) (Table 1). Pitisuttithum *et al.* (1990) found the highest rate of strongyloidiasis (30.5%) among the middle class family. Reichert *et al.* (2016) showed that low income and poverty-related living conditions are critical risk factors for hookworm related cutaneous larva migrans. In Savar, prevalence of *S. stercoralis* was higher (12.07%) among insanitary toilet users than among sanitary toilet users (9.53%) (Table 1). Moshabela *et al.* (2012) found no difference between diarrhoeal disease for those reporting shared sanitation facilities with other households. Both in Savar and Gazipur, mud floor was

favourable for *S. stercoralis* infection (13.27% and Gazipur 12.50% respectively) followed by cement floor (8.33% and 10.34% respectively) (Table 1).

**Table 1. Prevalence of *S. stercoralis* infection based on household factors**

Household factors	Total no. of samples examined		No. of positive samples and prevalence (%)	
	Savar	Gazipur	Savar	Gazipur
<b>Age of the respondents (year)</b>				
0-10	23	13	2 (8.69)	1 (7.69)
11-20	13	7	0 (0.00)	0 (0.00)
21-30	19	12	3 (15.79)	1 (8.33)
31-40	16	10	2 (12.50)	1 (10.00)
41-50	19	11	1 (5.26)	1 (9.09)
51-60	10	7	3 (30.00)	2 (28.57)
<b>Occupation</b>				
Service	41	25	2 (4.88)	1 (4.00)
Laborer	11	8	3 (27.27)	2 (25.00)
Housewife	21	12	3 (14.28)	1 (8.33)
Student	7	4	1 (14.28)	0 (0.00)
Others	20	11	2 (10.00)	2 (18.18)
<b>Housing</b>				
Mud floor	52	31	7 (13.46)	4 (12.90)
Cement floor	48	29	4 (8.33)	2 (6.89)
<b>Shoes</b>				
Wear shoes	53	32	4 (7.55)	3 (9.37)
Bare footed	47	28	7 (14.89)	3 (10.71)
<b>Drinking water</b>				
Supply water	68	40	9 (13.23)	5 (12.50)
Tube well water	32	20	2 (6.25)	1 (5.00)
<b>Types of toilet</b>				
Insanitary	58	35	7 (12.07)	4 (11.43)
Sanitary	42	25	4 (9.53)	2 (8.00)
<b>Hand wash</b>				
Soap	42	25	4 (9.53)	2 (8.00)
With water only	58	35	7 (12.07)	4 (11.43)
<b>Nail clipping</b>				
Irregularly	44	26	10 (22.73)	5 (19.23)
Regularly	56	34	1 (1.78)	1 (2.94)
<b>Educational level</b>				
No institutional education	46	28	8 (17.39)	5 (17.86)
Primary	38	23	3 (7.89)	1 (4.35)
Secondary	13	8	0 (0.00)	0 (0.00)
Secondary and above	3	1	0 (0.00)	0 (0.00)
<b>Monthly family income (BDT)</b>				
1000-5000	12	6	3 (25.00)	1 (16.67)
5001-10000	59	35	6 (10.17)	3 (8.57)
10001-15000	28	17	2 (7.14)	2 (11.76)
15001-20000	1	2	0 (0.00)	0 (0.00)

Previous survey based on a household cluster in Bangladesh exhibited that using community latrines, living in a house with either earthen floor, earning monthly incomes of less than BDT 1040 (US \$13) and poor literacy of the respondents were linked with *S. stercoralis* infection (Hall *et al.* 1994).

In the present study, the maximum prevalence was found among the respondents who did not use soap after defecation in Savar (12.07%) and Gazipur (11.42%) (Table 1). In conditions of inadequate sanitary and hygiene environment there is a high risk of rhabditiform larvae excreted in stools passing to other human hosts (Beknazarova *et al.* 2016). Tube well water users were less vulnerable to *S. stercoralis* infection (Table 1). Studies have reported significant associations between source of drinking water (Apidechkul 2015) and parasitic infection. Irregular nail clippers showed the highest prevalence of *S. stercoralis* both in Savar (20.45%) and Gazipur (23.07%) ( $P < 0.05$ ) (Table 1). According to the research conducted by Mahmud *et al.* (2015), hand washing with soap at key times and weekly nail clipping significantly decreased intestinal parasite reinfection rates.

### CONCLUSION

Strongyloidiasis is a major global health challenge which is taken too lightly in many developing countries. Health education campaigns, use of protective footwear, appropriate sanitation through proper disposal of fecal material and systematic deworming are practicable objectives to minimize the prevalence of strongyloidiasis. The present research had shed light on the prevalence of *S. stercoralis* infection in Savar and Gazipur for a better understanding of the problem in Bangladesh. For more reliable data to consolidate the results, further survey is necessary, which should involve most of the slums, rural areas, hospitals and clinics in the country.

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