J. Asiat. Soc. Bangladesh, Sci. 41(1): 45-50, June 2015

OCCURRENCE OF *STRONGYLOIDES STERCORALIS* IN SLUM AREAS OF DHAKA, BANGLADESH

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Abstract

The present study was conducted to find out the prevalence of *Strongyloides stercoralis* in three slum areas of Dhaka, Bangladesh. Overall prevalence of *S. stercoralis* in collected samples was found to be 14.68%. Other enteric parasites detected in the stool were *Ascaris lumbricoides* (16.08%), *Trichuris trichura* (8.39%) and *Enterobius vermicularis* (5.59%). Male respondents showed higher prevalence (16.66%) of *S. stercoralis* infection compared to female (11.32%). Age group of 41-50 years showed the highest prevalence (44.44%) compared to other age groups. Highest infestation rate was observed in labors (22.22%). Mud floor house dweller showed higher prevalence of infestation (18.66%) compared to those in cement floor. Prevalence of *S. stercoralis* was highest (20.77%) in community latrine users. Supplied drinking water users also showed the higher infection rate (15.84%). Bare footed respondents showed infection rate of about 16.66%, whereas 11.86% was noted in those who use shoes.

Key words: *Strongyloides stercoralis,* Direct smear, FEC, Harada-Mori culture, Prevalence, House hold factors.

Introduction

Strongyloidiasis is a disease of nematode parasite, *Strongyloides stercoralis* that infects human. It is a soil-transmitted helminth. About 30–100 million people worldwide is infected (Bethony *et al.* 2006). The parasite has high prevalence in societies where fecal contamination of soil or water is found, thus are more likely infected by this parasitic disease because of their poor sanitation system and unhygienic condition in developed and under developed countries (Segarra-Newnham 2007). Strongyloidiasis is now listed as one of the neglected tropical diseases (WHO 2002).

This is a persistant disease that occurs by the autoinfection phenomenon. Clinical signs of Strongyloidiasis infected immunocompetent people can be inconspicuous or even absent, although hyperinfection syndrome (HS) can be detected under some conditions like immunocompromise, characterized by increased numbers of infective filariform larvae in stool and sputum (Igra-Siegman 1981 and Keiser and Nutman 2004). In case of disseminated infections, mortality rate is reported to be as high as 87% (Siddiqui and Berk 2001). *Strongyloides* infection is only confirmed by larval presence in stool; however, this could often be underestimated due to irregular shading of this parasites, particularly in chronic cases (Segarra-Newnham 2007 and Repetto *et al.* 2010).

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A number of studies on the epidemiology of this disease has been carried out in Bangladesh. Studies confirmed the prevalence of *S. stercoralis* in different areas of Dhaka city. Strongyloidiasis has been found by Muttalib (1975) (32%), Huq and Yasmin (1981) (0.03%), Sultana *et al.* (2012) (23.1%), Hall *et al.* (1995) (11.6%). Other intestinal parasites namely *Ascaris lumbricoides, Trichuris trichuira* and the hookworm were also detected in those studies. The aim of the present study was to find out the prevalence of *S. stercoralis* in three slum communities of Dhaka city and other parasitic infection within the same areas. This survey also aimed to find out household factors related to *S. stercoralis* infection.

Materials and Methods

The selected areas were Adabor slum, Kamrangir Char and Azimpur of Dhaka City. Sampling was done from July 2012 to June 2013 by simple random technique. Selected houses were visited and dwellers were to fill up a survey questions for demographic information. These questionnaires were applied to analyze the house hold-factors within the communities.

Total 143 stool samples were collected in clean and leak proof container from the respondents aged 1 - 50 years. Then those were divided into five groups viz. 01-10 years, 11-20 years, 21-30 years, 31-40 years, and 41-50 years. Every specimen was properly labeled with the age, sex and date of collection. The prevalence rate of infestation in relation to age, occupation, poor sanitation, way of living and quality of drinking water was also detected.

Direct smear, Formal Ether Concentration (FEC), and Harada-Mori culture methods were used to detect *S. stercoralis* larvae in the stool sample and these techniques were used within 6 hours of the sample collection. In direct smear, saline water was used to prepare sample. In FEC technique by Monica Cheesbrough (1987) was followed. In Harada-Mori culture method (triplicate) 2 g of stool were used for culture replicate; thus a total of 6 g of stool was used in this study. Cultures were incubated at 25-28°C for a week and examined daily up to 7-10 days. Positive samples were confirmed by microscopic examination of *Strongyloides* eggs and larvae for morphological structure (Garcia 2001).

Results and Discusion

Out of 143 collected samples, *S. stercoralis* infection was found in 21 (14.68%) cases, whereas other helminthic infection was found in 43 (30.06%). *Ascaris lumbricoides*, *Trichuris trichuira* and *Enterobius vermicularis* were found in 16.08%, 8.39% and 5.59%, respectively (Table 1). Out of 143 respondents 90 were males and 53 were females. Occurrence of *S. stercoralis* infection was higher in male (16.66%) compared to female (11.32%). However, this difference was not statistically significant ($p>0.05$) (Table 2). Some studies in other countries also showed significantly higher prevalence in

males than in females (Faust and Giraldo 1960, Cabrera 1981, Arakaki *et al.* 1992 and Yelifari *et al.* 2005). Another study by Hall *et al.* (1994) showed similar results. In his study infestation rate of *S. stercoralis* infection was 10.6% in female and 12.8% in male. This might be because of males are more susceptible to *S. stercoralis* infection than female due to their more involvement in different outdoor activities like farming and agriculture.

Table 1. Overall prevalence of *S. stercoralis* infection and other helminthic infection found in stool samples.

Total no. of samples examined	Name of the parasites	Positive cases	Prevalence (%)
143	*Strongyloides stercoralis*	21	14.68
	Ascaris lumbricoides	23	16.08
	Trichuris trichuira	12	8.39
	Enterobius vermicularis	8	5.59

Table 2. Distribution of *S. stercoralis* infection based on gender.

Sex	Total no. of samples examined	Total no. of samples infected	Prevalence (%)
Male	90	15	16.66
Female	53	6	11.32
Total	143	21	14.68

Occurrence of *S. stercoralis* infection based on age of the respondents showed that the highest prevalence (44.44%) was in the age group of 41-50 years and the lowest prevalence (5%) was in the age group of 21-30. However, no larvae were detected in the first two groups (0-10 and 11-20). The present study demonstrated that the prevalence of *S. stercoralis* infection in respondents aged 41-50 years old was higher than that in respondents below 40 years (Table 3). The relation between age and infection rate was statistically significant ($p<0.05$). Prevalence of *S. stercoralis* infection gradually increased with age (Lindo *et al.* 1995 and Hirata *et al.* 2007). This might be due to recent increase in public awareness about the importance of hygienic condition and awareness about child health among parents. Another reason could be the people who work in Dhaka but came from rustic area being infected in search of livelihood. Their ages are mostly above 20 years.

Study of prevalence of *S. stercoralis* infection based on occupation of respondents was also carried out. This was done by categorizing them into five groups which were Service, Labor, Housewife, Students and Others (Table 3). Laborer had the highest prevalence rate (22.22%) whereas the lowest prevalence was observed in housewives (8.00%). However, there was no relationship between occupation and infection ($P>0.05$). This correlates with previous study by Sultana *et al.* (2012) in Bangladesh.

The selected areas had mainly two types of houses. Of the two types, maximum slum dweller lived in the tin shed with mud floor house and their prevalence rate for *S. stercoralis* infection was higher (18.66%) than the dwellers lived in tin shed with cement floor house (10.29%). But the relationship between the two types of housing and *S. stercoralis* infection was not significant ($p>0.05$) (Table 3). However, copro analysis in an earlier study in Bangladesh showed highest risk of *S. stercoralis* infection among people who lived in a house with a mud floor. This might be due to transmission of infection of *S. stercoralis* through mud. Infective *S. stercoralis* is a soil transmitted parasite which can infect human through soil. Infective *S. stercoralis* larva has been detected on earth floors of houses in a slum community in Colombia (Faust and Giraldo 1960).

Table 3. Prevalence of *S. stercoralis* infection based on various household factors.

Household factors	Total no. of examined samples	Total no. of infected samples	Prevalence %
Age groups of respondents (years) **			
0-10	15	0	0
11-20	18	0	0
21-30	59	3	5.08
31-40	42	14	33.33
41-50	9	4	44.44
Occupation of respondents			
Service	21	3	14.28
Labor	54	12	22.22
House wives	25	2	8.00
Students	19	2	10.52
Others	24	2	8.33
Housing			
Mud floor	75	14	18.66
Cement floor	68	7	10.29
Shoes			
With shoes	59	7	11.86
Bare footed	84	14	16.66
Drinking water			
Supply water	101	16	15.84
Tube well	42	5	11.90
Types of latrine			
Own latrine	19	1	5.26
Shared latrine	33	2	6.06
Community latrine	77	16	20.77
Indiscriminate	14	2	14.28

** P<0·05=Significant association with age groups.

In the present study the prevalence of *S. stercoralis* infection has been recorded according to respondent's practice of defecation. There were four types of latrine but all

were sanitary. Among them community latrine users showed highest prevalence (20.77%) than others. Private latrine users had the lowest infection rate (5.26%) (Table 3). This factor did not correlate with *S. stercoralis* infection. This is consistent with previous study of Sultana *et al*. (2012) and Hall *et al.* (1994) in Bangladesh. The high risk of infection was found to be associated with frequent use of poorly maintained latrine. Infection rate of *S. stercoralis* was high in bare footed respondents (16.66%) and low in shoe wearing respondents (11.86%) (Table 3). Similar reports were also recorded by Sultana *et al*. (2012). This might be due to *S. stercoralis* is a soil transmitted and skin penetrating parasite. People who do not wear shoes are more likely to get this skin penetrating parasitic infection.

S. stercoralis infection in respondents based on the source of drinking water showed that infection rate among supply water user and tube well water user were 15.84% and 11.90%, respectively. Here supply water user had maximum infection rate ($P>0.05$) (Table 3). Hall *et al.* (1994) also showed source of drinking water as a factor related to *S. stercoralis* infection. This might be due to transmission of *S. stercoralis* through water. Usually eggs are carried by water and therefore, water plays a vital role in the transmission. In case of tube well water, prevalence was lower than in supply water. This is probably contamination rate in supply water is higher than in tube well water.

High prevalence of infection in slum dwellers indicates that there is lack of general knowledge and public awareness about the transmission and causes of *S. stercoralis* infection. They are unaware about the hygienic necessities to prevent strongyloidiasis. Most of the respondents in the slums are poor and illiterate and do not have a clear perception about the *S. stercoralis* infection. Illiteracy, traditional belief and superstitions are thus make a vicious combination to cause *S. stercoralis* infection among them.

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(Received revised manuscript on 9.3.2015)