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Article

Socio-demographic factors facilitating intestinal helminth infestation and impact of single dose of mebendazole administration among the street children of Karwan Bazar, Tejgaon, Dhaka

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Abstract: A total of eighty stool samples from forty street children living in Karwan Bazar, Tejgaon area were collected to study the prevalence of intestinal helminths during February 2017 to May 2017. The highest prevalence of *Ascaris lumbricoides* and *Trichuiris trichiura* was observed among the children aged 13-15 (70%) years old followed by the age group 7-9. Male children were more *A. lumbricoides* prevalent (53.57%) followed by *T. trichiura* (46.43%) than the female children (41.67%; for both the *A. lumbricoides* and *T. trichiura*). Except *Enterobius vermicularis* and hookworm, heavy infestation with other worms was reduced; esspecially *A. lumbricoides* (50% to 12.5%) and *T. trichiura* (45% to 15%), after administering Mebendazole (Vermox 500mg, single dose). Children who collected waste material from dustbin were highly helminth prevalent group (91.67%) followed by vegetable shop worker (66.67%). In February 2017, double infection showed the highest occurrence (32.5%). After administering single dose of mebendazole, in May 2017, single infection was at the peak (55%). With the initiation of broad-spectrum anthelminthic drugs that are low-priced, non-hazardous and simple to deliver, further control programs should include health education, public and good personal hygiene practices among the street children.

Keywords: street children; stool samples; helminth; mebendazole

1. Introduction

Parasites are a remarkably diverse assortment of life forms that confront generalization, basically their actions define them. It is estimated that infections with the chief soil-transmitted helminths - the roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*) and the hookworms (*Ancylostoma duodenale* and *Necator americanus*) – contribute 5.18 million disability adjusted life-years worldwide in 2010. Globally, an estimated 820 million people are infected with roundworms, 460 million with whipworms and 440 million with hookworms (WHO, 2017). The greatest number of helminth infections occur in Sub-Saharan Africa, East Asia, China, India and South America (de Silva *et al.*, 2003). Helminths; not only have far reaching and important impacts on the earth's ecology, but they have much broader effects on our daily lives than we realize. These parasites pretense a severe risk that is deteriorated by restricted resources (Guyatt *et al.*, 2000). In Peru, it is estimated that three million children between one and fifteen years of age are in need of mass chemotherapy (WHO, 2012) to combat helminth infection. Adverse effects of helminth infections contribute in establishing and keeping the vicious cycle of helminth infection, poverty, reduced productivity and weak socioeconomic development (Hotez *et al.*, 2008).

Pre-school and school-aged children are prone to have high worm burdens. Usually street children belong to this age group too. Population estimates of street children are unreliable, however a commonly used figure is the UNICEF estimation of 100 million worldwide (UNICEF, 2006). It is estimated that there are more than 600,000 street children living in Bangladesh, 75% of them live in Dhaka ("Street children in Bangladesh", n.d.). The

health problems of the homeless people are broad and they are at high risk for acute and chronic medical illnesses (Morrison, 2009). Some study suggests that homeless persons are marginalized group of people who cannot access conventional health care services due to the economic and time restraints linked to their occupations. Hence, they persist as reservoir for infectious diseases transmission even in countries where there is an active disease control (Uddin, 2010).

The aim of this study is to estimate the prevalence of intestinal helminth infestation among the street children in Karwan Bazar, Tejgaon and effect of administering antihelminthic drug. Another insight is to identify socio-demographic factors associated with the prevalence. Such data could update whether approaches of unnoticed or targeted accurate action are necessary.

2. Materials and Methods

2.1. Study design

Forty street children; seven to eighteen years of age from Karwan Bazar, Tejgaon area were enlisted for the study. A total of eighty (pre-treatment and post-treatment) stool samples from 40 street children twice in a year were collected; February 2017 and May 2017. Among the forty children, 28(70%) were male, 12 (30%) were female. A total of eighty samples were collected and processed by Formol-ether concentration technique to study the prevalence of intestinal helminths.

2.2. Data collection and analysis

A questionnaire was developed to collect socio-demographic data. The street children, selected for bringing their stool samples, were interviewed face to face. To collect their stool, they were supplied with a plastic container with 5 ml of 10% formalin in it for quick preservation. Socio-demographic queries and laboratory test records were entered into an Excel spreadsheet and subsequent analysis was carried out by using SPSS version 16. Associations between proportions were explored in X^2 tests. A p value < 0.05 was considered indicative of a statistically significant result.

2.2.1. Targeted treatment

After first time collection of stool samples in February 2017, the respondents along with the family members were provided with Mebendazole (Vermox 500 mg). They were also instructed by the team to maintain hygiene like cleaning their hands after defecation, before taking meal, trimming nails and using footware. In May 2017, the stool collection was conducted again.

2.2. Laboratory screening

Formalin-preserved stool samples were transported to Parasitology Laboratory, Department of Zoology, University of Dhaka. Samples were stored in 4^0C. The samples were analyzed by using the standard Formol-ether-concentration technique (Cheesbrough, 1987). Stool samples were examined via Olympus light microscope using 10x objective. Ova were identified by the following descriptions and pictures published by WHO (1980) and Garcia (2009).

3. Results and Discussion

3.1. Socio-demographic factors and prevalence of helminth parasites

In the present study, six species of intestinal helminths were detected; of those, *Ascaris lumbricoides*, *Trichuris trichiura*, *Enterobius vermicularis* and hookworm were nematodes and *Hymenolepis nana*, and *Taenia* sp. were cestodes. *A. lumbricoides* showed the highest prevalence (50%) followed by *T. trichiura* (47.5%) (Figure 1). Mekonnen *et al.* (2014) found *A. lumbricoides* (34.9%) and *T. trichiura* (22.8%) as the most prevalent parasites. Conlan *et al.* (2012) found the overall prevalence of infection with any soil transmitted helminths tested by the formalin-ether concentration technique was 70.6%; the prevalence of *A. lumbricoides*, *T. trichiura* and hookworm were 26.1%, 41.5% and 46.3%, respectively. In the present study, prevalence of hookworm (5%) and pinworm (*E. vermicularis*) was low (7.5%) (Figure 1).

Prevalence of *A. lumbricoides* was the highest midst the children aged 13-15 years old (70%) and the lowest amongst those aged 10-12 (30%) in the present study. *T. trichiura* was also prevalent among the age group 13-15 (70%) (Table 1). Children between the ages of five and fifteen years appear to suffer from the extreme infections of *A. lumbricoides* and *T. trichiura* (Bethony *et al.*, 2006) with infection intensities diminishing as individuals enter adulthood. Cabada *et al.* (2014) found in his study, children aged 19 years old and younger, 46% were infected with at least one helminth. Those under 5 years were less likely than children of 5–19 years old to have *T. trichura* (OR 50.4; 95% CI: 0.17–0.94).

Table 1. Age wise prevalence of helminths among the street children.

Age group	No. of children	*A. lumbricoides*		*T. trichiura*		*E. vermicularis*		Hookworm		*H. nana*		*Taenia* sp.	
		n	%	n	%	n	%	n	%	n	%	n	%
7-9	10	6	60	5	50	2	20	1	10	4	40	4	40
10-12	10	3	30	3	30	0	0	1	10	4	40	4	40
13-15	10	7	70	7	70	1	10	0	0	4	40	4	40
16-18	10	4	40	4	40	0	0	0	0	3	30	2	20

Table 2. Sex wise prevalence of helminths among the street children.

Sex	No. of children	*A. lumbricoides*		*T. trichiura*		*E. vermicularis*		Hookworm		*H. nana*		*Taenia* sp.	
		n	%	n	%	n	%	n	%	n	%	n	%
Male	28	15	53.57	13	46.43	2	7.14	1	3.57	12	42.86	11	39.28
Female	12	5	41.67	5	41.67	1	8.33	1	8.33	2	16.67	3	25

Table 3. Occurrence of intestinal helminths according to occupation.

Variable	No. of children examined	Helminth	
Type of work		**n**	**%**
Collect waste material from dustbin	12	11	91.67
Household worker	7	4	57.14
Vegetable shop worker	9	6	66.67
Tea stall worker	5	3	60
Flower seller	7	4	57.14

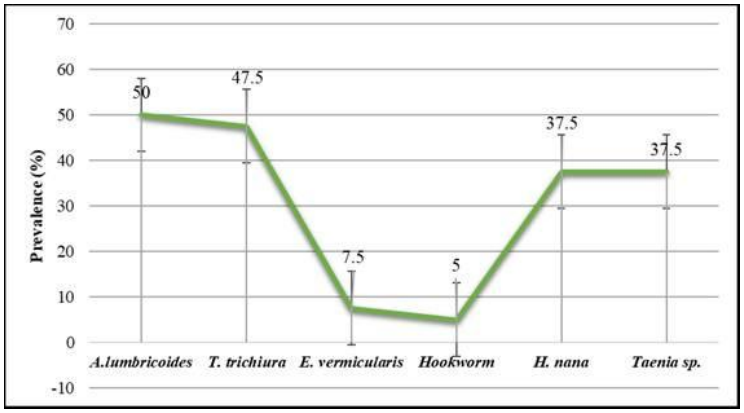

Figure 1. Prevalence of helminths among the street children.

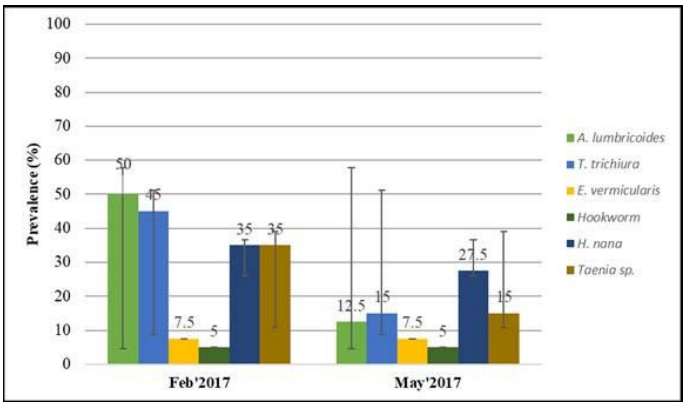

Figure 2. Anthelminthic treatment and outcome.

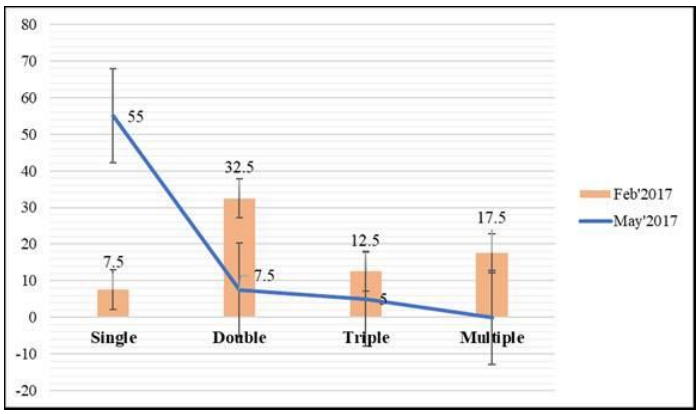

Figure 3. Trends of polyparasitism among the street children.

There are a number of conceivable hypotheses existing to clarify this supposed "convex" age-intensity profile (Bundy *et al.,* 1988). This age dependency could be the result of acquired immunity to infection or lifestyle alterations that modify the individuals' exposure to probable contaminations (Galvani, 2005). Hence, this high prevalence of *A. lumbricoides* and *T. trichiura* is an indicator of improper faecal disposal too. Bailey *et al.* (2013) found the prevalence of parasitosis was the highest amongst children aged 7–10 years (77.5%) and the lowest amongst those aged >14 years (10.0%) ($p = 0.003$). In the present study, prevalence of hookworm was low; nil among the children >12 years old (Table 1) which is contradictory with some studies. Evidence exists in China and Southeast Asia that peak hookworm prevalence and intensity occurs during adulthood (Bethony *et al.,* 2002) indicating that targeting school age children alone may have partial influence in decreasing environmental contamination with hookworm eggs.

Table 2 shows that the prevalence of the *H. nana* (42.86%) was much higher in males than in females (16.67%) ($p > 0.05$). *H. nana* is one of a few parasites that can cause autoinfection which can persist for years. Low level immunity specially in highly immunosuppressed hosts (Cho *et al.*, 2009), autoinfection can lead to hyperinfection. However, the children under the study were not interrogated or screened for immunological problem. In the present study, prevalence of *A. lumbricoides* (53.57%) and *T. trichiura* (46.43%) was insignificantly higher in males than in females (41.67%) ($p > 0.05$) (Table 2). The children under the study, irrespective of gender, shared the same environmental condition which may be a cause behind the insignificant difference. Conlan *et al.* (2012) also found insignificant difference ($p > 0.05$) in prevalence between male and females for all parasite species in his study while others observed an increase in the prevalence of intestinal parasitic infection among the males (Kettani *et al*., 2008) and others found an equivalence between both genders (Babiker and Ahmed, 2009). In the present study, the highest percentage of helminth prevalence was observed among the children who were involved in collecting waste material from the dustbins (91.67%) followed by the vegetable shop worker (66.67%) (Table 3). Similar result was found by Sultana *et al.* (2015).

3.2. Anthelminthic treatment and outcome

The analysis for antiparasitic treatment is shown in Figure 2. There was a significant decrease in prevalence after antihelminthic drug administration; prevalence of *A. lumbricoides* (50% to 12.5%) and *T. trichiura* (45% to 15%) ($p < 0.05$) decreased to a greater degree (Figure 2). Activity of mebendazole against *A. lumbricoides* remains high and significant cure rates are steadily more than 90% (Keiser and Utzinger, 2008). But there was no difference observed when adjusting for *E. vermicularis* and hookworm ($p = 0.725$) in the present study. However, latest studies have upturned doubts about the effectiveness of mebendazole in lessening the intensity of hookworm infection and to a minor degree *T. trichiura* (Knopp *et al*., 2010). A study conducted by Bailey *et al.* (2013) revealed no statistically significant difference in parasitosis of any species between the children who had been given treatment and those who had not. Turner *et al.* (2016) found that in lower transmission settings, annual albendazole monotherapy at a high coverage (75%) was projected to be sufficient in controlling heavy infections in children. Still, these limitations show that in high transmission backgrounds, once yearly albendazole monotherapy may be inadequate to regulator the prevalence of extensive infections.

3.3. Trends of polyparasitism among the street children

Multiparasite infections is common in such communities and there is evidence that individuals harbouring such infections may suffer exacerbated morbidity, making children even more vulnerable (Petney and Andrews, 1998). In the present study, in February 2017, occurrence of double infection was at the peak (32.5%) followed by multiple (more than three parasites) infection (17.5%). But after administering anthelminthic drug, single infection showed the maximum occurrence (55%) followed by double (7.5%), triple the next (5%) and no multiple infection case ($p < 0.05$) (Figure 3). A careful screening of the identified literature yielded 39 studies through which Salam and Azam (2017) reported the prevalence of soil-transmitted helminth infections from 19 different states of India. Nearly 90% studies reported the prevalence of more than one parasite species in the same sample population. It can be said that concomitant helminth infections are the norm rather than the exception.

4. Conclusions

Homelessness, poor accommodation and the allied health troubles remain a vital community health problem and a barrier for the development as a potential country. The present study publicized high prevalence of intestinal helminth infections among the street children and associated risk issues which in turn could be a probable root of the infection in the whole community. In order to tackle this problem, the World Health Organization recommends periodic administration of anthelminthic drugs (WHO, 2012). Furthermore, community-based sanitation program should be conducted by the government as well as the researchers to lessen the intestinal parasites.

Conflict of interest

None to declare.

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