

Frequency of Intestinal Parasitic Infections Among Schoolchildren in Ibb City- Yemen

Abstract

Intestinal parasitic infections are widely distributed and remain one of the most health problems in Yemen. This is a cross-sectional study aimed to determine the prevalence of intestinal parasitic infection and associated factors among schoolchildren in Ibb City, Yemen. A total of 300 stool samples were collected from schoolchildren between January to April 2018 and examined by direct smear and formalin ether concentration techniques. The result showed that 62.7% were positive for intestinal parasites, with a higher frequency of single than multiple infections (85.1 vs. 14.36%, respectively). Also, 85.64% were infected by protozoa whereas 14.36% infected by helminths. The prevalence of infection was 61.70% for *Entamebahistolytica*, 23.94% for *Giardia lamblia*, 7.45% for *Ascarislumbricoides*, 4.3% for *Hymenolepis nana*, and 2.61% for *Enterobiusvermicularis*. Moreover, the highest prevalence of *E. histolytica*, *G. lamblia*, and *A. lumbricoides* was within group aged 9-12 years. *H. nana* was between age groups of 9-12 and 13-16 years while *E. vermicularis* was found among 5-8 and 9-12 years. In addition, females were 69% infected significantly higher than males 54.55%. Besides, the various signs and symptoms associated with intestinal infections have been documented. High prevalence of intestinal infection was documented among schoolchildren drinking from cistern water, poor hygiene practices, poor food sanitation, non-swimming, and non-previously treated for *Schistosoma* parasite. High frequency of intestinal parasitic infection between schoolchildren in the study area requires more effort to implement the appropriate programmers that warrant to control and prevention the prevalence of intestinal parasitosis.

Keyword: IbbCity, Intestinal Parasitic, Prevalence, Schoolchildren, Yemen.

Introduction

Intestinal parasitic infections, caused by both protozoa and helminthes parasites, are one of the biggest health problems globally and responsible to infect up to 3.5 billion people and about 450 million person is ill resulting from intestinal parasites¹.

The highest prevalence of intestinal parasites is concentrated in developing countries with up to 50%². Many factors play an important role in developing countries for transmission of the intestinal parasites the representing the unavailability of potable water, reduced hygienic environments, fast population growth, and, low economic status^{3,4}.

Intestinal parasitic infections are the most threats that challenge the healthy living in developing countries primarily affecting school children⁵.

The children's susceptibility to heavy infection due to their increased nutritional requirements and less developed immune systems. As a result of morbidity, they are at increased risk for detrimental effects like poor growth, reduced physical activity, impaired cognitive function and learning ability⁶. It was estimated that about 12% of the global disease burdens caused by intestinal parasites are reported among children aged between 5 to 14 years in developing countries⁷. Also, up to 270 million pre-school and 600 million schoolchildren are living in an area where the parasites are extensively transmitted⁸.

In developing countries, the intestinal parasites such as *Entamebahistolytica*, *Giardia lamblia*, *Enterobiusvermicularis*, and *Hymenolepis nana* are spread more easily and more commonly among children⁹.

Yemen belong to the developing countries that lack the strategies and programs for eradicating or preventing transmission the parasitic infection among the population. There are several reports have been conducted to determinethe intestinal parasitic infections betweenchildren in Yemeni communities. A study by, in Hadramowat, Al-Haddad and Baswaid¹⁰ found thatthe most infective parasites prevailed in children were *G.lamblia*, *E.histolytica*, *Ascarislumbricoides*, *Trichuristrichiura*, *H. nana*, *Taeniasaginata*, and *Schistosomamansoni*.

However, in Sana'a, Alyousefiet al.¹¹ reported that the intestinal parasites between children were *G.duodenalis*, *E. histolytica/dispar*, *Cryptosporidium*, *A.lumbricoides*, *S.mansoni*, *H. nana* and *E.vermiculari* recorded in the urban and rural area. Also, it was reported that 75.4% of examined children under 12 years in Taiz districts were infected with *E.histolytica/dispar*, *G.duodenalis*, *A.lumbricoides*, *H. nana*, *S. mansoni*¹². Moreover, Alwabr and Al-Moayed¹³ recorded that the *E. histolytica*, *S. mansoni*, *T.trichiura*, and *E. vermicularis* were reported between schoolchildren in Al-Mahweet governorate.

One study only was conducted in Ibbcity, in 2010, to determine the prevalence of intestinal parasitic infection among children and showed *E.histolytica*, *G.lamblia*, *A.lumbricoides*, *T.trichiura*, *H.nana*, *S.mansoni*, *Ancylostomaduodenale*, *E.vermicularis*, and *Strongyloidesstercoralis*¹⁴. This study is small and not enough to show the prevalence of intestinal infection among the schoolchildren and related factors. Therefore, the present work was aimed to determine the prevalence of intestinal parasitic infection and related risk factors among schoolchildren in Ibb City, Yemen.

Materials and Methods

Study Design and Area

A cross-sectional study was carried out at the medical laboratory at Ibb University in Ibb city, Yemen, during the period from January to April 2018. Seven districts were selected for this study namely Al-Dehar, Al-Maeen, Al-Mashanh, Al-Sabal, Harathah, Mafrg-Jebelah, and Shabanthat located in Ibb city. From each district, one school was selected randomly.

Ethical statement

The study protocol was approved by the Ibb University, Yemen and permission to start data collection were also given by the Education Office belonging to the Ibb city. Before the beginning of data collection, the study objectives and methods were explained to the manger of school and children to consent for inclusion in this study.

Data Collection

A designed questionnaire was subjected to each participant such as age, gender, the clinical information like diarrhea, blood in the stool, and abdominal pain as well as environmental factors like; source of drinking water, parents occupation, and swimming.

Sample Collection and Examination

A total of 300 stoolsamples were collected from schoolchildren attending governmentalschools. The age of the participants was between 5 and 16 years old. A dry, clean, leak proof container (labeled faecal) was given to each child and was instructed on how to introduce specimens (stool) into the bottles and transmitted to a laboratory, as soon as possible, for parasitological examination¹⁵. The

stool samples were prepared and examined by using three techniques of routine examination of stool: direct examination, saline sedimentation, and formol-ether concentration¹⁵.

Results

A total of 300 samples were collected from schoolchildren attending seven governmental schools in Ibb city. Of these samples, 168(56%) were females and 132 (44%) were males. The distribution of collected samples according to age was listed in Table 1.

Table 1: The distribution of collected specimens according to gender and age

Gender	Age groups (years) N(%)			Total
	5-8	9-12	13-16	
Female	52 (17.3%)	68 (22.7%)	48(16%)	168 (56%)
Male	47 (15.7%)	45 (15%)	40 (13.3%)	132 (44%)
Total	99 (33%)	113 (37.7%)	88(29.3)	300 (100%)

The distribution of collected samples according to districts was figured in Figure 1. It was collected 48 (16%) samples from Al-Dehar, 43 (14.3%) samples from Al-Maeen, 39 (13%) samples from Al-Mashanh, 37(12.3%) samples from Al-Sabal, 44(14.67%) samples from Harathah, 47 (15.67%), and samples from Mafrg-Jebelah, and 42 (14%) samples from Shaban.

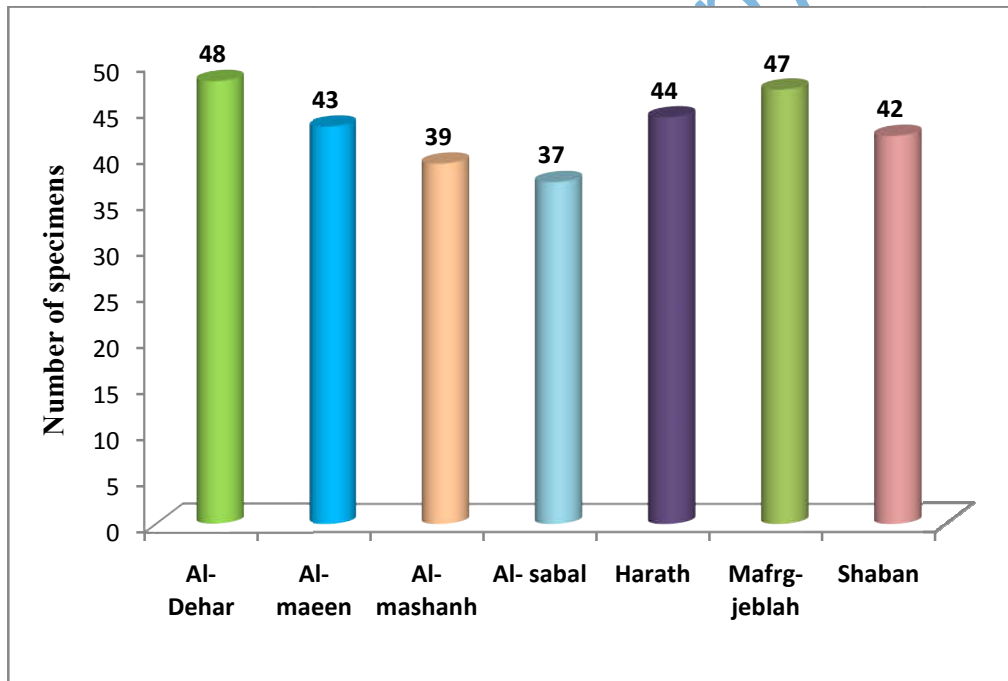


Figure 1: The collected samples according to districts

Out of 300 schoolchildren samples, 188 (62.7%) were recorded positive for parasites infection while 112 (37.3%) samples were reported negative for parasitic infection as shown in Figure 2.

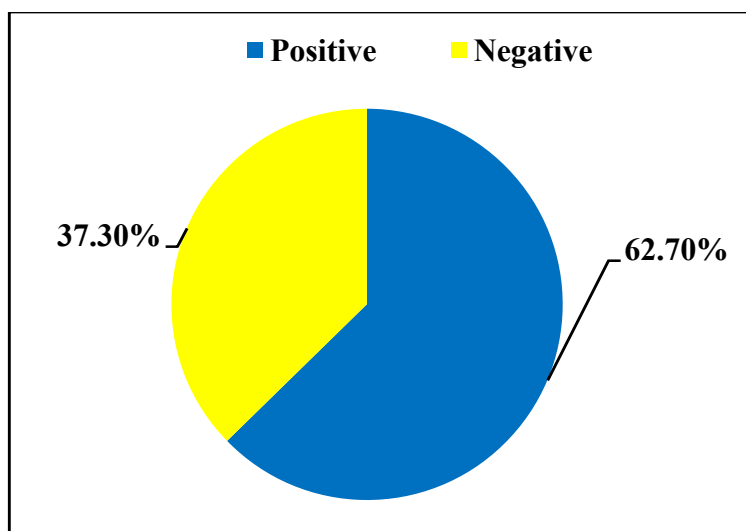


Figure 2: Positive and negative for parasitic infection

Furthermore, multiple infections were obviously identified. The results were documented that 160(85.1%) of the positive samples were infected with one type of parasite, whereas 28 (14.9%) were infected with two types of parasites (Table 2).

Table 2: Multiplicity of parasitic infections among schoolchildren

Infections multiplicity	Number of samples	Rate %
One parasite	160	85.1%
Two parasite	28	14.9%
Total	188	100%

Figure 3 shows that the 161 (85.64%) of the positive samples were infected by intestinal protozoa (cyst) while 27 (14.36%) of the positive samples were infected by intestinal helminthes (eggs).

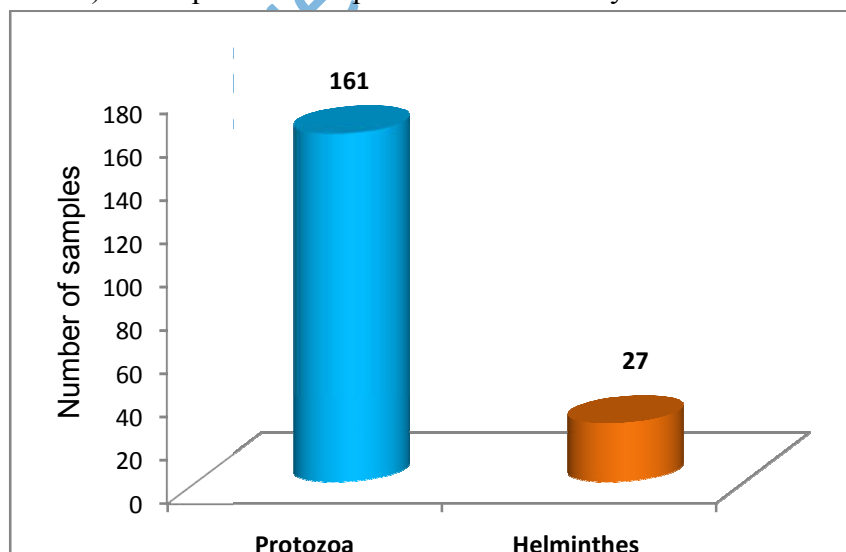


Figure 3: Type of intestinal infection among schoolchildren

The present results revealed that the most predominate of intestinal parasitic infection was *E.histolytica* with 116 (61.70%) followed by *G.lamblia* 45(23.94%), *A.lumbricoides* 14(7.45%), *H. nana* 8(4.3%), and *E.vermicularis* 5(2.61%) as listed in Table (3).

Table 3: Prevalence of intestinal parasites among schoolchildren

Parasite types	Frequency	Percent %
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<i>E. histolytica</i>	116	61.70%
<i>G.lamblia</i>	45	23.94%
<i>A.lumbricoides</i>	14	7.45%
<i>H. nana</i>	8	4.3%
<i>E.vermicularis</i>	5	2.61%
Total	188	100%

The prevalence of intestinal parasitic infection in relation to age highest prevalence of *E. histolytica* was reported among the age group of 9-12 years (41.4%) followed by the age of 13-16 years (37.9%). The high rate infections were 51.1% and 57.1% recorded between 9-12 years by *G. lamblia* and *A. lumbricoides*, respectively. Also, the similar results of *H. nana* infection were (50%) reported between groups aged 9-12 and 13-16 years while infection *E. vermicularis* infection was found among 5-8 years and 9-12 years as listed in Table 4. Moreover, the overall rates of intestinal parasitic infection were recorded 69.1% and 54.55%, respectively, in females and males as summarized in Table 4.

Table 4: Distribution of intestinal parasitic infections in relation to age and gender

Variables		Identified parasites N(%)					Total (%)
		<i>E. histolytica</i>	<i>G. lamblia</i>	<i>A. lumbricoides</i>	<i>H. nana</i>	<i>E. vermicularis</i>	
Age (years)	5-8	24 (20.7%)	12(26.7%)	2(14.3%)	0	2(40%)	40 (40.40)
	9-12	48 (41.4)	23(51.1%)	8(57.1%)	4(50%)	2(40%)	85(75.22)
	13-16	44 (37.9%)	10(22.2%)	4(28.6%)	4(50%)	1(20%)	63(71.6)
Gender	Male	42 (36.2%)	16 (35.6%)	6(42.9%)	4(50%)	4(80%)	72(54.55)
	Female	74 (63.8%)	29(64.4%)	8(57.1%)	4(50%)	1(20%)	116(69.1)

Table 5 summarizes the common signs and symptoms among infected schoolchildren. It was revealed that the high rate was 49.3% recorded with an abdominal pain followed by 46.7% for diarrhea. While the low rate was with 8% with bloody in the stool.

Table 5: Clinical signs and symptoms among infected schoolchildren

Signs and symptoms	Responding to question	
	Yes (%)	No (%)
Bloody in stool	24 (8%)	164 (54.7%)
Fever	72 (24%)	116 (38.7%)
Cough	80 (26.7%)	108 (36%)
Muscles pain	44 (14.7%)	144 (48%)
Diarrhea	140 (46.7%)	48 (16%)
Itch skin	68 (22.7%)	120 (40%)
Abdominal pain	148 (49.3%)	40 (13.3%)
Weight loss	88 (29.3%)	100 (33.3%)

The results in relation to factors were showed that the prevalence of intestinal parasitic infection among schoolchildren drinking from the cistern with 76.6%, poor hygiene with 76.1%, poor food sanitation with 57.4%, no swimming practice 68.1%, not previously treated for *Schistosoma* 68.1% as listed in Table 6.

Table 6: Factors associated with intestinal parasitic infection among schoolchildren

Variables		Frequency (%)
Source of water	Piped	44 (23.4)
	Cistern	144 (76.6)
Personal hygiene	Good	45 (23.9)
	Poor	143 (76.1)
Food sanitation	Good	80 (42.6)
	Poor	108 (57.4)
Parents occupation	Agriculture	44 (23.4)
	Others	144 (76.6)
Swimming	Yes	60 (31.9)
	No	128 (68.1)
Previous Schistosomatreatment	Yes	60 (31.9)
	No	128 (68.1)

Discussion

The high prevalence of intestinal parasites among children in Yemen is well-known. The major factors associated with the prevalence of intestinal parasitic infections are the low hygienic practices, environment contamination with fecal, lack of safe water, and health education resulting from the high level of poverty¹³.

The present study was revealed that 300 samples (168 females and 132 males) were collected from schoolchildren from Ibb city. It was observed that 62.7% of samples were reported positive for intestinal parasitic infection while 37.3% were reported negative. Similar studies reported from different regions of Yemen including Hadramowat governorate (58.7%)¹⁰, Ibb (57.4%)¹⁴, and Sana'a (54.8%)¹⁶.

However, the low prevalence was reported in Yemen; in Taiz 38.2%¹², in Sana'a city 40.3%¹¹, while the higher prevalence was in Al-Mahweet governorate with 90%¹³. The current work showed that the multiple infections at 14.9% with two types of parasites. Similarly, the previous studies were reported the multiple infections in Yemen; in Sahar district 3%¹⁷, in Sana'a city 11.7%¹¹, and in Sana'a governorate 8.5%¹⁶, in Al-Mahweet 75.5%¹³.

In the present study, it was found that the intestinal protozoa were (85.64%) the most predominant infections among schoolchildren, while the intestinal helminthes infections were (14.36%). A similar result was reported by Al-Mekhlafiet *al.*¹⁶ found that protozoa and helminthic infections were 37.6% and 17.2%, respectively, recorded among rural schoolchildren in Sana'a.

In this result showed that the *E. histolytica* was the most prevailed of intestinal parasitic infection with 116 (61.70%) followed by *G. lamblia* 45 (23.94%), *A. lumbricoides* 14 (7.45%), *H. nana* 8 (4.3%), and *E. vermicularis* 5 (2.61%). This finding is similar to previous studies conducted in Yemen. A study by Alsubaieet *al.*¹⁴ documented that the high prevalence of intestinal parasitic was *E. histolytica* (33.7%), *G. lamblia* (23.6%), *A. lumbricoides* (14.3%), *T. trichiura* (9.3%), *H. nana* (6.2%), *S. mansoni* (3.1%), *A. duodenale* (1.2%), *E. vermicularis* (0.8%), and *S. stercoralis* (0.8%).

However, a study by Alwabr and Al-Moayed¹³ recorded that the most common intestinal parasites prevalence were *E. histolytica* (64%) followed by *S. mansoni* (36.5%), *Trichuris trichiura* (18%), and *E. vermicularis* (13%). Another study by AL-Harazi¹² reported that the 75.4% of examined children were infected with *E. histolytica/dispar* (20.6%), *G. duodenalis* (12.4%), *A. lumbricoides* (3%), *H. nana* (0.9%), and *S. mansoni* (0.9%) in an urban and rural area.

In contrast, Alyousefiet *al.*¹¹ observed that the *G. duodenalis* had the highest infection rate (17.7%) followed by *E. histolytica/dispar* (17.1%), *A. lumbricoides* (2.4%), *H. nana* (1.4%), *E. vermicularis* (0.4%) and *S. mansoni* (0.3%). Also, Al-Haddad and Baswaid¹⁰ found that the most parasites prevailed in children were *G. lamblia* (19.17%), *E. histolytica* (16.83%), *A. lumbricoides* (15.83%), *T. trichiura* (2.33%), *H. nana* (2.33%), *T. saginata* (1.50%), and *S. mansoni* (0.67%).

Among the protozoan parasite, *E. histolytica* and *G. lamblia* are the most prevailing cause of intestinal morbidity in children. *E. histolytica* infects annually about 500 million cases and causes around 50 million of amoebic dysentery and invasive amebiasis diseases and kills about 100 thousand persons^{18,19}. *G. lamblia* responsible for about 200 million cases every year²⁰. Also, *A. lumbricoides* and *T. trichiura* are responsible for about 1.2 billion and 795 million, respectively, infections globally²¹.

The occurrence of chronic and heavy intestinal parasitic infection lead to intestinal bleeding, mal-absorption of nutrients, nutritional deficiency, cells and tissues damage. In eventually these results generally effect in retardation of growth, slow height-weight development, reduced mental development, school absenteeism, low academic performance, predisposed to malnutrition and infection²².

In current work, the higher prevalence of *E. histolytica*, *G. lamblia*, and *A. lumbricoides* infection was recorded among the age group of 9-12 years. While the age groups of 9-12 and 13-16 years were 50% infected by *H. nana*. The *E. vermicularis* infection was found among 5-8 years and 9-12 years. These results are in agreement with Alwabr and Al-Moayed¹³ who observed that the high prevalence of intestinal parasitic infection was (43%) recorded in the age group 10-12 years

This could be explained by the extreme movement of children at this age and they may become more susceptibility to infected water while swimming/playing or fetching water for domestic purposes or helping in agriculture activities²³.

In the current study, the prevalence of intestinal parasitic infection in females with 69% was significantly higher than males (54.55%). Conversely, the previous study by Alwabr and Al-Moayed¹³ reported that the infection rates between males (46.5%) were higher than females (43.5%). The present result showed that the majority of clinical signs and symptoms sufferings are associated with the main parasites in Yemen such as *E. histolytica* and *Giardia*. Also, the bloody in stool, cough, muscle pain, itch skin, and weight loss are shared with all parasitic infections and another disease. This result was supported by Al-Haddad and Baswaid¹⁰ who found that different symptoms as diarrhea, abdominal pain, abdominal distention, constipation, nausea and vomiting, and fever were presented between participated.

The effect of intestinal parasites on children weight was investigated in Yemen. Alwabr and Al-Moayed¹³ showed that more than 67% of the infected schoolchildren were found to be underweight and 22% stunting. High prevalence of intestinal infection in this work was recorded among schoolchildren drinking from cistern water, poor hygiene practices, poor food sanitation, non-swimming, and non-previously treated for *Schistosoma* parasite. The environmental and behavioral factors could be attributable to the high prevalence of intestinal parasitic infections in the study area.

Conclusions

It can be concluded that the high prevalence of protozoa and helminthes infections reported in the present investigation indicated poor hygiene and environmental contamination as a problem of public health among schoolchildren in the area. Therefore, there are more efforts to implement the

appropriate programmers that warrant to control and prevention the prevalence of intestinal parasitosis among schoolchildren.

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