



Frequency of Intestinal Parasitic Infection Among Working Children in Tehran, Iran

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Abstract

Background: Parasites infection is one of the public health issues among children all over the world. The limited available data indicates that working children often suffer from poor health.

Objectives: In this study, the frequency of intestinal parasitic infection in working children related to Sobh-e Rooyesh School was evaluated for the first time in Tehran, Iran.

Methods: Fresh stool samples were collected from 175 working children associated with Sobh-e Rooyesh School in Tehran and transferred to Research Center of Pediatric Infectious Diseases, Institute of Immunology and Infectious Diseases, Iran University of Medical Sciences, which then examined by the wet mount examination with Phosphate-buffered saline and formalin ether concentration and agar plate culture. The trichrome staining was performed using stool samples conserved in Phosphate-buffered saline.

Results: The results showed that in general the frequency of parasitic infection was 77/175 (44%). The frequency of *Blastocystis hominis* as the most common parasites was (32.6%) followed by (9.1%) related to *Giardia lamblia* and (8%) samples were positive for *Entamoeba coli*. Frequency of helminthic infection was 3/175 (1.7%) including 2/175 (1.1%) *Hymenolepis nana* and 1/175 (0.57%) *Ascaris lumbricoides*.

Conclusions: The frequency of intestinal parasitic infections was relatively high among working children in Tehran. Frequency of protozoan infection was more than that of helminth infection. It is suggested that additionally necessary treatment, health education and personal hygiene should be provided to prevent transmission.

Keywords: Intestinal, Infection, Parasites, Tehran, Children, Iran

1. Background

Parasitic infection is widely considered especially in children in developing countries due to poor health and low level of sanitation (1). The most common intestinal parasites such as *Giardia lamblia* (*G. lamblia*) and *Blastocystis hominis* (*B. hominis*) have been reported from several studies (2). The protozoan parasite, *G. lamblia*, causes gastroenteritis which is transmitted by water and the parasite is highly infective by ingestion of as few as 10 cysts in human (3, 4).

Soil-transmitted helminthes infections are distributed throughout the tropics and subtropics. *Necator americanus* (*N. americanus*), *Ancylostoma duodenale* (*A. duodenale*), *Ascaris lumbricoides* (*A. lumbricoides*) and *Trichuris trichiura* (*T. trichiura*) were reported from all over the world (5). The most prevalent helminth infection was *Hymenolepis nana* (*H. nana*), followed by *A. lumbricoides* and *Enterobius vermicularis* (*E. vermicularis*) from some previous studies (2).

High risk behavior and public health problems were found more greatly in persistent street children who live in street than those living in orphanage and resident institutes. They have poor health and limited access to health services, and they are considered as reservoir for parasitic diseases because of poor personal and environmental hygiene (6, 7), so global standards are necessary for legalization of working children rather than its condemnation (8). It is estimated that there are 100 million street children living over the world, however, real population is uncertain. It is thought that there are 40 million in Latin America alone (9).

There is some information about situation of parasitic infection in street children and working children in other countries (10, 11), but there was no data on the frequency of parasitic infection among working children in Iran.

2. Objectives

The aim of this study is to evaluate the frequency of intestinal parasitic infection in working children related to Sobh-e Rooyesh School in Tehran, Iran.

3. Methods

3.1. Sampling

This cross-sectional study was carried out between February and December, 2018. Fresh stool samples were collected from 175 working children associated with Sobh-e Rooyesh School in Tehran. The children's ages were between 7 - 15 years, with the mean age of 9.5 years.

The Sobh-e Rooyesh is a school for working children in Tehran, Iran. It is the first school for working children in Iran. It was established in 2014 for children who have to work to earn money for their families. The school-aged children are educating at different grades at school. The school population was 341 including 187 boys and 154 girls in age group of 7 - 15 years in 2018 and the school located in at Harandi neighborhood, downtown Tehran. The students are educating in different grades and teaching different social skills and proper profession according to their talents and situation in order to choose jobs with good and healthy income instead of false and risky jobs in the future. All of children participated in this study back to residency or their relatives at night. The most of children live in their residency and some of them live with their father and mother.

Sampling was carried out by accidental method according to the formula which is calculated as $n = Z^2 \times P(1 - P)/d^2$, where P is the prevalence of intestinal parasite in Tehran, d is 0.045 marginal error, and standard score (Z) is 95% confidence interval. The prevalence of intestinal parasites has been reported among a certain population in Tehran in previous study (12). The sample size was calculated at 172 and finally the sample size used in the study was 175.

The inclusion criteria was children associated with Sobh-e Rooyesh school and work as working children and were in age group of 7 - 15 years.

A questionnaire was filled up with the pieces of information about gender, age, education, nationality, life style, washing hands before eating meal or after taking toilet, contact with soil and animal.

3.2. Stool Examination

Fresh stool samples were collected from 175 working children associated with Sobh-e Rooyesh School in Tehran and transferred to Research Center of Pediatric Infectious Diseases, Institute of Immunology and Infectious Diseases, Iran University of Medical Sciences and then examined by

wet mount examination with Phosphate-buffered saline (PBS) and formalin ether concentration and agar plate culture. A direct examination was performed on watery samples for diagnosis of trophozoites of protozoa and standard formalin-ether concentration method was used to conduct the examination under microscope with 100x and 400x as final magnification by an expertise technologist.

The trichrome staining was performed using stool samples conserved in PBS according to the method which was described previously (2). The permanent trichrome staining was performed for some suspected cases. The smears were prepared and after methanol fixation, smears were stained by the modified Ziehl-Neelsen technique to identify coccidia.

3.3. Analysis

The analysis was done using SPSS version 18 (Chicago, IL, USA) and chi-square, Predictive values test were used to analyze statistical relationship.

4. Results

In this study, 175 working children associated with Sobh-e Rooyesh School in Tehran were evaluated in order to trace parasitic infection and the results were as follows: 90 (51.4%) out of 175 were female and 85 (48.6%) were male. Most of the working children (144) were Afghan refugees and just 31 of them were Iranian. All children are studying in this school and working as street vendors or seamstress and porter and also clean vehicles.

The results showed that in total, the frequency of parasitic infection was 77/175 (44%) that 76/175 (43.4%) was related to protozoa infection including: 57 out of 175 (32.6%) parasites were positive for *B. hominis* as the most common parasites and then 16 out of 175 (9.1%) samples were positive for *G. lamblia* followed by 14 out of 175 (8%) samples which were positive for *Entamoeba coli* (*E. coli*). The frequency of *Chilomastix mesnili* (*C. mesnili*), *Dientamoeba fragilis* (*D. fragilis*), and *Iodamoeba butschilli* (*I. butschilli*) were 4/175 (2.3%), 1/175 (0.57%), and 1/175 (0.57%) respectively. In general, the frequency of helminthic infection was 3/175 (1.7%) including 2/175 (1.1%) *H. nana* and 1/175 (0.57%) *A. lumbricoides*.

In this study, five children among 31 Iranian populations were infected with *B. hominis* including 3/31 children who were infected with *B. hominis* and 2/31 children were infected with *B. hominis* and *G. lamblia* as a mix infection.

In this study, 77 cases were infected with intestinal parasitic infection, which 57 (74%) was single infection, 18 (23.4%) parasitic infection was double infection and 2 (2.6%) was triple infection. The most prevalent double infection 9 (11.7%) associated with *B. hominis* and *E. coli* followed by *B. hominis* and *G. lamblia* 5 (6.5%), *B. hominis* and *H. nana* 2 (2.6%), *B. hominis* and *D. fragilis* 1 (1.3%) and *B. hominis* and *C. mesnili* 1

(1.3%). The triple infection was between *B. hominis* and *E. coli* and *G. lamblia* 1 (1.3%), *B. hominis* and *E. coli* and *I. butschilli* 1 (1.3%).

The association between risk factors and parasitic infection among 175 working children was summarized in Table 1. There was no statistically signification between gender, age, and infection in this study. The most parasitic infection was found in 7-9 aged children; however, there was no significant correlation between age and the parasitic infection. Among all the factors, only unwashed hands before eating with soaps or after using toilet are statistically associated with parasitic infection rate ($P = 0.004$).

5. Discussion

Parasites infection is one of the public health issues in children all over the world, but no data is available about parasitic infection in working children in Iran. In this study, parasitic infection was considered among working children in Iran for the first time.

The most common protozoan parasites were *B. hominis* and *G. lamblia* and then followed by *E. coli* among working children in present study. The most common three intestinal protozoa have been reported *B. hominis*, *G. lamblia*, and *E. coli* in children in some previous studies (10, 11).

Intestinal parasitic infection was evaluated among street children who lived in orphanages in Peru. The prevalence of pathogenic and non-pathogenic intestinal parasites was reported (66.3%) that the prevalence of pathogenic ones was (30.6%). The most prevalent nonpathogenic protozoa was *E. coli* (41.9%) and most pathogenic ones was *G. lamblia* (17.1%). Helminthes infection were as follow, *H. nana* (7.8%), *T. trichiura* (4.7%), *A. lumbricoides* (3.5%), *Ancylostoma*/*Necator* (1.2%) (10).

The rate of intestinal parasitic infection among street children in Metro Manila, Philippines was (62.0%) for one or more intestinal parasites. The most common protozoans were *B. hominis* (40.7%) then *G. lamblia* (11.6%) followed by *E. histolytica* (2.9%). The most prevalent helminthes infection was related to *T. trichiura* (44.8%) then *A. lumbricoides* (36%) and Hookworm (7%) (11).

The prevalence of parasitic infection in street children in Addis Ababa, Ethiopia was (71.8%). The most common helminthes infection was related to *A. lumbricoides* (34.9%) followed by *T. trichiura* (22.8%) and *Taenia* species (17.5%) and those related to protozoan were *G. lamblia* (9.6%) and *E. histolytica*/*dispar* (8.2%) (13).

As it is obvious, high rate of protozoan infection among street working children in different countries was found and the most common protozoans were *B. hominis* and *E. coli* and *G. lamblia* (10, 11, 13). These findings are in convenient with the result of protozoans infection in the present study; however, high rate of helminthes infection

like *A. lumbricoides*, *T. trichiura*, *Taenia* species and *H. nana* were found among street working children in other studies in comparison with the present study with low rate of helminthes infection like *H. nana* and *A. lumbricoides*.

In a study which was conducted by Lander et al. parasitic infection rate was reported in (29.2%) of children in Brazil. The most common parasites was *G. lamblia* (12.9%) and the infection rate of *E. histolytica*/*dispar* was (3.7%), and frequency of *Cryptosporidium* sp was (1%). The most prevalent helminthic infection were related to *T. trichiura* (12%) and *A. lumbricoides* (10.5%) and the prevalence of *H. nana* was (0.3%). Double infection was reported in (9.2%) and triple infection in (2.5%) of children (14).

In a study, (74.7%) of the Tanzanian children were infected with at least one intestinal protozoa species. The infection rates of *G. lamblia* (16.4%), *B. hominis* (28.0%), *E. coli* (51.5%) and *E. histolytica*/*E. dispar* (18.0%) were observed in the children (15).

Recent reports in Iran have shown the prevalence of intestinal parasites in the general population to be between (18.4%) and (33.3%) (2, 16, 17), which high level of infection is attributed with protozoan infection. In comparison with protozoan infection, helminthes infection rate is relatively low, about 0% - 3.6%, in some previous studies (17).

At present, the incidence of helminthic infection in Iran has decreased unlike the past when helminthic infection was very common. Recent studies demonstrated the prevalence of ascariasis and strongyloidiasis are between 0.1% and 0.3% and the prevalence of hookworm is almost < 1% in Iranian population; however *Hymenolepis* and *Enterobius* infection are more common in Iran (18). The ruminants were found to be infected with hydatid cyst, fasciolosis, and dicrocoeliasis in different parts of Iran (19), so control of fasciolosis and echinococcosis need more consideration like the treatment of livestock and dogs (18).

According to the findings of the present study, the frequency of helminthic infection was (1.7%) including (1.1%) *H. nana* and (0.57%) *A. lumbricoides*. The results are compatible with other studies in Iran, with high level of protozoa infection and low level of helminthes infection.

The prevalence of infection for protozoa and helminthes infections in general population in Jiroft, Iran was (27.4%) and (1.8%), respectively. The most prevalent protozoans were *B. hominis* (13.7%) and *G. lamblia* (7.8%), and that of helminth was *H. nana* (1.1%). There was no significant correlation between gender and infection rate (2).

In the present study, coinfection was found from two to three parasites. The most common co-infection was identified between *B. hominis* and *E. coli*. This is compatible with result of pervious study that the most common co-infection has been reported between *B. hominis* and *E. coli* (2).

Table 1. The Association Between Risk Factors and Parasitic Infection Among 175 Working Children in Tehran, Iran^a

Risk Factor	Sample	Positive	Negative	P Value
Age, y				0.16
< 10	78	38 (48.7)	40 (51.3)	
≥ 10	97	39 (40.2)	58 (59.8)	
Gender				0.28
Male	85	35 (41.1)	50 (58.8)	
Female	90	42 (46.6)	48 (53.3)	
Eating with unwashed hands				0.004*
Yes	99	53 (53.5)	46 (46.5)	
No	76	24 (31.6)	52 (68.4)	
Contact with animal				0.30
Yes	73	30 (41.1)	43 (58.9)	
No	102	47 (46.1)	55 (53.9)	
Contact with soil				0.22
Yes	91	43 (47.3)	48 (52.7)	
No	84	34 (40.5)	50 (59.5)	
Total	175	77	98	

^aValues are expressed as No. (%).

The parasitic infection rates in males and females were 35 (41.1%) and 42 (46.6%) respectively in the present study. There was no statistically signification between gender and infection. The result of some previous studies suggested that gender is not an important factor in intestinal parasitic infection (2, 17). Among risk factors, unwashed hands before eating with soaps or before using toilet are statistically associated with parasitic infection ($P = 0.004$); however there was no statistically signification between contact with soil and animal and parasitic infection in the present study and the result of this study confirmed that soil-transmitted helminthes were not common in the present survey. It seems person-to-person transmission is an important way to be infected in working children and contaminated food is supposed as another transmission route.

Parasitic infection among children was 25.1% in Bushehr, including *B. hominis* (7.4%), *G. lamblia* (5.9%), and *E. coli* (3.4%). The highest prevalence was found in children at education levels 4 and 5. The prevalence intestinal parasites was slightly higher among the girls 14.8% than the boys 10.3%, but difference was not significant (20).

In general, parasitic infection in schoolchildren Sari, Iran has been reported (33.3%). The most common parasites was *B. hominis* (13.5%) followed by *G. lamblia* (10.6%), *E. coli* (7.2%), *Endolimax nana* (1.5%). The most helminthic infection related to *E. vermicularis* (2.2%), *Trichostrongylus* sp. (2.1%) and *Strongyloides stercoralis* (1.6%) respectively. Al-

though hand washing before eating was significantly associated with intestinal parasitic infection, there was no association between contact with soil and infection (17).

In general, in the present study, the frequency of protozoan infection was (43.4%) and that of helminth infection was (1.7%) among working children in Tehran. In this group of children due to life style and less sanitation condition, the rate of protozoan infection like *B. hominis* and then *G. lamblia* and *E. coli* are high in comparison with other children in different areas in Iran. The helminthic infection related to *H. nana* and *A. lumbricoides* is relatively low. In overall, due to limitation of the present study multicenter studies on working children and street children with large sample size are needed to evaluate parasitic infection in different areas in Iran in the future.

5.1. Conclusions

The frequency of intestinal parasitic infections was relatively high among working children in the present study. In comparison with protozoan infection, helminthes infection rate is relatively low. Training course to improve the level of hygiene and necessary treatment is suggested to prevent transmission.

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Footnotes

Authors' Contribution: Khadijeh Khanaliha and Farah Bokharaei-Salim proposed the study. Khadijeh Khanaliha, Abdoulreza Esteghamati and Shirin Sayyahfar designed the study. Borna Salemi helps in sample collection, technical works and data analysis. Khadijeh Khanaliha, Farah Bokharaei-Salim and Hossein Keyvani revised the manuscript. All the authors approved the final manuscript.

Conflict of Interests: There were no conflict of interests.

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