

## Prevalence of intestinal parasites among children referred to Children's Medical Center during 18 years (1991–2008), Tehran, Iran

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Received 6 April 2011, Revised 31 August 2011,

Accepted 6 September 2011

Epidemiological studies show that parasitic infections are among the most common infections and one of the biggest health problems of the society worldwide. Children at school age have the highest morbidity compared with other ages. Therefore, by treating these children, the disease burden in the total population is reduced. In this study, prevalence of parasitic infection in children referred to Children's Medical Center was compared in different years. In this retrospective cross-sectional study, the subjects were children under 13 years who were referred to Children's Medical Center Laboratory during 18 years (1991–2008) and underwent stool exam by any reason. The specimens were evaluated by different common methods of stool parasitology. In suspected cases, parasites were cultured in specific medium and stained as needed. Required data were obtained from the laboratory files and analysed according to study's purpose. Subjects were 124 366 children. Among them, 0.78% of cases had parasitic infections and 60.54% cases were male. Parasitic infections were related to protozoa in 95.33% cases and intestinal worms in 4.87%. Of them, 50.352% were pathogenic protozoa. The most parasitic infection was *Giardia lamblia*. Among intestinal worms, the highest prevalence was related to *Hymenolepis nana* (40.7%). A comparison between the first 10 years and the next 8 years of the study showed that the prevalence of intestinal parasites were 8% and 1% ( $P < 0.001$ ) and the rate for protozoal infection were 14.9% and 4.3%, respectively ( $P < 0.001$ ). The prevalence of intestinal parasites was reduced during recent years; however, more attempts should be performed to make it lower.

### INTRODUCTION

Intestinal parasitic infections are one of the biggest socioeconomic and medical problems. Epidemiological studies show that parasitic infections are among the most common infections and one of the biggest health problems of the society worldwide. Surveys on the prevalence of various intestinal parasitic infections in different geographic regions are a prerequisite for developing appropriate control strategies. Research carried out in

different countries has shown that the socio-economic situation of the individuals is an important cause in the prevalence of intestinal parasites (Jamaiah and Rohela, 2005).

Two epidemiological factors distinguish parasitic diseases from other infections. The first factor is high prevalence of these infections so that parasitic infection prevalence estimates to be about 3–3.5 billion people, which cause 450 million deaths every year (Lai, 1992; WHO, 1998; Markell *et al.*, 1999). The second factor is the high rate of incidence in poor and disadvantaged communities which is specially seen in school-aged children (Nematian *et al.*, 2004). These infections cause serious damage to children's development in non-developed countries and

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are related to failure to thrive, reduced physical activity and learning power.

As described before, children at school age has the highest rate of morbidity because of intestinal parasites as compared with other ages (Nematian *et al.*, 2008). Statistics shows that by treating these children, the disease burden in the total population is reduced to 70% which is significant (Lai, 1992). The main symptoms of the diseases are related to gastrointestinal. It may also cause anaemia, physical and mental problems such as delayed growth in children, weight loss, fatigue and itching or rash around the anus and vulva. Several studies have been carried out to find the prevalence of intestinal parasites among children and based on the geographical and health status of the study setting the findings differ. In this study, prevalence of parasitic infection in children referred to Children's Medical Center was compared in different years.

## MATERIAL AND METHODS

### Study Design

In this study, the data were obtained from parasitology laboratory files and were ultimately analysed based on the study purposes.

In a retrospective approach, the study was conducted on referred children to Children's Hospital Medical Center, from 1991 to 2008.

Subjects were children aged less than 13 years old who underwent stool exam. Considering that Children's Medical Center is a referral centre for subspecialty services in the country, so through this investigation, valuable information was obtained about epidemiologic pattern of sex distribution and species of the organism causing diarrhea.

### Criteria for Selecting the Sample

Stool exam records of 124 366 children who were referred to Children's Hospital Medical Centre Central Laboratory were reviewed. As a routine, physicians order

stool exam on 3 different days for maximum recovery of parasites. Stools were investigated through different methods of parasitology consisting of concentration, wet preparation and iodine preparation (Stoll *et al.*, 1983; Alles *et al.*, 1995, Idris and Al-Jabri, 2001). In all specimens, the stool was combined with a drop of saline and a drop of Logul, and was checked with light microscope. In formed samples, this procedure was carried out through concentration method (formalin ether method) in which the protozoan cyst and worm ovum are sought in larger amount of stool. Uncertain cases were confirmed by culture in specific medium for parasite (for example, amoeba culture in coagulated serum medium). If needed, specific staining (Trichrome) was confirmed. Other methods consisted of scotch test for *Oxyure* and acid fast staining for cryptosporidium and *Isospora belli* were applied in uncertain cases. Also in this study, occult blood was checked in stool specimens using Guaiac test based on peroxidase activity of haemoglobin colour change (Kumaravel *et al.*, 2011).

### Data Collection

In this study, the data of patients' dossier were used with no intervention.

### Data Analysis

After gathering the data including sex, parasite species, admission type and existence of blood in stool in each year, the data were analysed by SPSS 11.0 based on the study purposes. Ratio and rate for qualitative variables and mean and standard deviation for quantitative variables were used. To compare the qualitative variables, chi-square test was used and *t*-test was used to compare quantitative variables.

All patients' data were absolutely confidential and the Helsinki statement was followed, and the study ethic was approved in the Research Committee of Department of Pathology, Tehran University of Medical Sciences.

TABLE 1. *Distribution of intestinal parasites according to sex*

Sex	Positive		Negative		Total No.
	No.	Percentage	No.	Percentage	
Male	7998	10.62	67 301	89.38	75 299
Female	5410	11.02	43 657	88.98	49 067
Total	13 408	10.78	110 958	89.22	124 366

RESULTS

In this study, a total of 124366 patients who visited Children’s Hospital Medical Central Laboratory underwent stool exam (during 18 years from 1991 to 2008).

**Characteristics of the Study Population**

In total 13 408 cases (10.78%) had parasitic infections and 110 958 cases (89.22%) did not have parasitic infections in their stool exam. In the present study, 75 299 cases (60.54%) were male and 49 067 cases (39.46%) were female.

**Characteristics of the Parasite-positive Group**

The prevalence of parasitic infections including protozoa and intestinal worms was 7998 cases (10.62%) in males and 5410 cases (11.02%) in female which shows higher prevalence of infection in female patients (Table 1); meanwhile, the difference in prevalence of parasitic infection between males and females was statistically significant ( $P=0.025$ ). Of them, 50.352% were pathogenic protozoa including *Giardia*

*lamblia*, *Cryptosporidium*, *Isospora belli* and *Entamoeba histolytica/dispar* (Table 3).

From the total number of subjects, 78 443 cases (63%) were hospitalized at children ward and 45 924 cases (27%) were outpatients. The prevalence of parasitic infection in hospitalized patient at children ward was 4470 cases (5.70%), while this prevalence was 8938 cases (19.46%) in outpatients (Table 2), which showed that the prevalence of the infection was significantly higher in outpatients ( $P<0.001$ ).

Parasitic infection of all positive cases was related to protozoa in 12 782 cases (95.33%) and intestinal worms in 624 cases (4.87%). The most parasitic infection was *G. lamblia* which allocated 43.93% of infections in protozoa group. *Blastocystis hominis* (31.18%) and *Entamoeba coli* (13.76%) were ranked in next stages. Table 3 shows the prevalence of parasitic infections with protozoan parasites. Among intestinal worms, the highest prevalence was related to *Hymenolepis nana* (40.7%), followed by *Ascaris* (24.2%) and *Oxyure* (21.2%) in the performed tests (Table 4).

Total number of test requests for occult blood was 43 457 in 18 years in which 1471 (3.28%) of the cases were positive. The most positive result was related to *G. lamblia* (46.97%) followed by *B. hominis* (31.95%) and *E. histolytica/dispar*.

In this study, comparison of the frequency of parasites between the first 10 years and next 8 years of the study has been carried out which revealed that from the total stool exams carried out in the first 10 years of study (70 112 cases), 571 cases were

TABLE 2. *Distribution of intestinal parasites in outpatients and inpatients*

	Positive		Negative		Total No.
	No.	Percentage	No.	Percentage	
Inpatient	4470	5.7	73972	94.3	78442
Outpatient	8938	19.46	36986	80.54	45924
Total	13 408	10.78	110 958	89.22	124366

positive for intestinal worms (8%), but in the next 8 years (54 254 cases), there were just 55 positive cases of the intestinal worms (1%) that this difference was significant by chi-square test ( $P < 0.001$ ). In performed stool exam in the first 10 years of the study (70 112 cases), 10 461 cases were positive for protozoas (14.9%). but in next 8 years (54 254 cases), there were just 2321 positive cases for protozoas (4.3%) which revealed a significant difference ( $P > 0.001$ ) (Table 4).

### DISCUSSION

In the present study, the overall prevalence was 10.78% with *G. lamblia* as the most common protozoa followed by *B. hominis* and *E. coli* and *H. nana* as the most common intestinal worm followed by *Ascaris* (24.2%) and *Oxyure*. In a study carried out by Morales-Espinoza *et al.* (2003) on children under 15 years old about the prevalence of intestinal parasitic infections, which collected stool specimens and examined them in 32 Mexican border area, the prevalence of parasitic infection was 67% in 1478 cases which was a large number. Also 60% was suffering from different parasitic infections (Morales-Espinoza *et al.*, 2003). Another study carried out by Patel and Khandekar (2006) which determined the prevalence of parasitic infections in school children in

Oman, stool specimens of 467 students between 9 and 10 years were assessed from 2004 to 2005 which revealed that the prevalence of these infections was 38% (Patel and Khandekar, 2006). The overall infection rate in another research carried out by Jamaiah and Rohela on total of 246 stool samples was 6.9% and *Trichuris trichiura* was the most common parasite (Jamaiah and Rohela, 2005). Winsberg *et al.* reported an overall intestinal parasite prevalence rate of 18.6% in Latino residents of Chicago with specific rates of *Trichuris trichiura*, hookworm *Giardia lamblia* and *Strongyloides stercoralis* in their work, although several non-pathogenic protozoa were found, there were no cases of *Ascaris lumbricoides* or *Entamoeba histolytica* (Winsberg *et al.*, 1975). In a similar work performed by Eligail *et al.*, most common infections were due to the non-pathogenic organisms such as *E. coli*, *Iodamoeba buetschlii* and *Endolimax nana*, but among the different pathogenic parasites, *Ascaris* and *G. lamblia* were found to be the most prevalent ones in their study (Eligail *et al.*, 2010).

Magambo *et al.* in a study about the prevalence of intestinal parasites among children in southern Sudan found a prevalence of 13.1% for hook worms and they did not detected *A. lumbricoides* and cestodes in their study population (Magambo *et al.*, 1998). The study carried out by Wani *et al.* in India showed that of the 514 students surveyed, 46.7% had one or more

TABLE 3. Prevalence of parasitic infections with protozoan parasites from 124 366 cases

Parasite	No. of positive	Percentage of positive
<i>Giardia lamblia</i>	6306	49.33
<i>Blastocystis hominis</i>	3986	31.18
<i>Entamoeba coli</i>	1760	3.76
<i>Chilomastix mesnili</i>	74	0.57
<i>Endolimax nana</i>	193	1.5
<i>Trichomonas hominis</i>	95	0.74
<i>Entamoeba histolytica/dispar</i>	194	0.74
<i>Iodamoeba butschlii</i>	137	1.07
<i>Cryptosporidium</i>	29	0.22
<i>Isospora belli</i>	8	0.062
Total	12 782	100

TABLE 4. Prevalence of parasitic infections with intestinal worms from 13 408 cases of positive stool samples

Parasite	No. of positive	Percentage of positive
<i>Hymenolepis nana</i>	255	40.7
<i>Ascaris</i>	152	24.2
<i>Oxyure</i>	133	21.2
<i>Tenia saginata</i>	32	5.1
<i>Fasciola hepatica</i>	7	1.1
<i>Trichuris trichiura</i>	11	1.7
<i>Strongyloides stercoralis</i> larvae	14	2.2
<i>Dicrocoelium dendriticum</i>	19	3.01
<i>Hymenolepis diminuta</i>	3	0.47
Total	626	100

parasites in which the prevalence of *A. lumbricoides* was the highest (Wani *et al.*, 2007). In a similar work, Okyay *et al.* reported 31.8% of parasitic infection with one or more intestinal parasites in school children in Turkey and they revealed *E. vermicularis*, *G. intestinalis* and *E. coli* as the three most common parasites (Okyay *et al.*, 2004). Jacobsen *et al.*'s work on 293 children aged 12–60 months found *E. histolytica* to be the most prevalent infection followed by *A. lumbricoides*, *E. coli* and *G. lamblia* (Jacobsen *et al.*, 2007).

Nematiyan *et al.* performed a study about the prevalence of intestinal parasitic infections on school children and relationship with patients' socioeconomic level: 19 213 subjects participated in their study and 19 209 data were collected (>99.99% participation rate) which showed 18.4% infection and 2% co-infection of two or three parasites (Nematian *et al.*, 2004).

In a study performed by Heidari and Rokni, there was one species of pathogen or non-pathogen parasites in at least 68.1 of children in day-care centres who were tested. They reported a significant difference between the rate of infection and parents' education, but found no relationship between age, sex and health houses (Heidari, 2003). In this study, the prevalence of parasitic infection was higher in females, which was similar to that in the study of Massoud *et al.* (1980), which was significantly higher in females than in males, but there was no significant difference

in age in other similar studies based on the literature review.

Higher prevalence of parasitic infection of outpatients in this study is in good agreement with the findings of the similar studies (Lopez-Brea and Vallejo, 1994), and the findings of this study about the characteristics of occult blood testing and the parasites associated with this feature correspond with the similar studies. In the study of Eligail *et al.* (2010), 5.56% of cases were found to be positive for occult blood and 19.44% of cases were slightly positive.

A comparison between the first 10 years and the next 8 years of the study showed that the prevalences of intestinal parasites were 8% and 1%, respectively ( $P < 0.001$ ) and the rates for protozoal infection were 14.9% and 4.3%, respectively ( $P < 0.001$ ), which means better level of sanitation in the life of residents. The prevalence of intestinal parasites was reduced during recent years (Table 5); however, more attempts should be carried out to make it lower.

### CONCLUSION

Considering the high number of patients participating in this investigation, the present study can be a good reference in demonstrating the epidemiology and the pattern of intestinal parasites in children to that the suitable diagnostic test and treatments could be conducted for the affected patients.

TABLE 5. Comparison of the frequency of parasites between the first 10 years and next 8 years of the study

	First 10 years	Next 8 years	P value
Positive cases for intestinal worms	571 (8%)	55 (1%)	<0.001
Positive cases for protozoas	10 461 (14.9%)	2321 (4.3%)	<0.001

ACKNOWLEDGEMENTS. This research has been supported by Tehran University of Medical Sciences and health Services grant.

## REFERENCES

- Alles, A. J., Waldron, M. A., Sierra, L. S. & Mattia, A. R. (1995) Prospective comparison of direct immunofluorescence and conventional staining methods for detection of *Giardia* and *Cryptosporidium* spp. in human fecal specimens. *Journal of Clinical Microbiology*, **33**, 1632.
- Eligail, A. M., Masawi, A. M., Al-Jaser, N. M., Abdelrahman, K. A. & Shah, A. H. (2010) Audit of stool analysis results to ensure the prevalence of common types of intestinal parasites in Riyadh region, Saudi Arabia. *Saudi Journal of Biological Sciences*, **17**, 1–4.
- Heidaria, R. M. (2003) Prevalence of intestinal parasites among children in day-care centers in DamghanIran. *Iranian Journal of Public Health*, **32**, 3134.
- Idris, M. A. & Al-Jabr, A. M. (2001) Usefulness of Kato-Katz and trichrome staining as diagnostic methods for parasitic infections in clinical laboratories. *SQU Journal for Scientific Research: Medical Sciences*, **3**, 65–68.
- Jacobsen, K. H., Ribeiro, P. S., Quist, B. K. & Rydbeck, B. V. (2007) Prevalence of intestinal parasites in young Quichua children in the highlands of rural Ecuador. *Journal of Health, Population and Nutrition*, **25**, 399–405.
- Jamaiah, I. & Rohela, M., (2005). Prevalence of intestinal parasites among members of the public in Kuala Lumpur, Malaysia. *Journal of Tropical Medicine and Public Health*, **36**, 68–71.
- Kumaravel V., Hayden, S. P., Hall, G. S. & Burke, C. A. (2011). New fecal occult blood tests may improve adherence and mortality rates. *Cleveland Clinic Journal of Medicine*, **78**, 515–502.
- Lai, K. P. (1992). Intestinal protozoan infections in Malaysia. *Southeast Asian Journal Tropical Medicine Public Health*, **23**, 578–586.
- Lopez-Brea, M. & Vallejo, P. (1994). Intestinal parasites in the 90s: new microorganism in new patients. *Revista Clinica Espanola*, **194**, 348–351.
- Magambo, J. K., Zeyhle, E. & Wachira, T. M. (1998) Prevalence of intestinal parasites among children in southern Sudan. *East African Medical Journal*, **75**, 288–290.
- Markell, E. K., John, D. T. & Krotoski, W. A. (1999). Markell and Voge's Medical Parasitology, Philadelphia, W. B. Saunders.
- Massoud, J., Arfaa, F., Jalali, H. & Keyvan, S. (1980). Prevalence of intestinal helminths in Khuzestan, Southwest Iran. *The American Journal of Tropical Medicine and Hygiene*, **29**, 389–392.
- Morales-Espinoza, E. M., Sánchez-Pérez, H. J., García-Gil Mdel, M., Vargas-Morales, G., Méndez-Sánchez, J. D. & Pérez-Ramirez, M. (2003). Intestinal parasites in children, in highly deprived areas in the border region of Chiapas, Mexico. *Salud Pública de México*, **45**, 379–388.
- Nematian, J., Nematian, E., Gholamrezaezhad, A. & Ali Asgari, A. (2004). Prevalence of intestinal parasitic infections and their relation with socio-economic factors and hygienic habits in Tehran primary school students. *Acta Tropica*, **92**, 179–186.
- Nematian, J., Gholamrezaezhad, A. & Nematian, E. (2008). Giardiasis and other intestinal parasitic infections in relation to anthropometric indicators of malnutrition: a large, population-based survey of schoolchildren in Tehran. *Annals of Tropical Medicine and parasitology*, **102**, 209–214.
- Okyay, P., Ertug, S., Gultekin, B., Onen, O. & Beser, E. (2004). Intestinal parasites prevalence and related factors in school children, a western city sample-Turkey. *BMC Public Health*, **4**, 64.
- Patel, P. K. & Khandekar, R. (2006). Intestinal parasitic infections among school children of the Dhahira Region of Oman. *Saudi Medical Journal*, **27**, 627–632.
- Stoll, B. J., Glass, R. I., Banu, H., Huq, M. I., Khan, M. & Ahmed, M. (1983). Value of stool examination in patients with diarrhoea. *British Medical Journal (Clinical research ed.)*, **286**, 2037.
- Wani, S. A., Ahmad, F., Zargar, S. A., Ahmad, Z., Ahmad, P. & Tak, H. (2007). Prevalence of intestinal parasites and associated risk factors among schoolchildren in Srinagar City, Kashmir, India. *Journal of Parasitology*, **93**, 1541–1543.
- WHO (1998). Control of Tropical Diseases. Kashmir, India. *World Health Organization*, Geneva.
- Winsberg, G., sonnenschein, E., dyer, A., schnadig, V. & Bonilla, E. (1975) prevalence of intestinal parasites in latino residents of chicago. *American Journal of Epidemiology*, **102**, 526–532.