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Prevalence of intestinal parasites in Isfahan city, central Iran, 2014

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Abstract Intestinal parasites are important enteric pathogens. Poverty, low quality of food and water supply and poor sanitation systems are the important factors associated with intestinal parasitic infections. These kinds of infections can be a good index for hygienic and sanitation status of the society. This study aimed to determine the prevalence of intestinal parasitic infections among humans referred to Dr. Sharifi Clinical Laboratory, Isfahan, Iran, 2014. In this cross sectional study, 652 fecal samples (286 males and 366 females) from humans who had stool examination test from January to August 2014 were chosen. Microscopic examination for parasitic infections has been carried out using wet mount method. Indistinguishable samples underwent trichrome staining method for accurate identification of protozoa. Intestinal parasitic infections were observed in 68 (10.42 %) out of 652 studied humans. Forty eight *Blastocystis hominis* (7.36 %), thirteen *Endolimax nana* (1.99 %), nine *Giardia lamblia* (1.38 %), five *Entamoeba coli* (0.76 %), four *Chilomastix mesnili* (0.61 %) and two *Iodamoeba butschlii* (0.15 %) were the observed protozoa in the studied population. *B. hominis*, *E. nana* and *C. mesnili* were found to be significantly more prevalent in people with loose stool specimen. Considering the helminthic infections, only one case (0.15 %) that was excreted *Taenia saginata* proglottids has been documented among 652 studied humans. Based on the findings of the present study intestinal parasitic infections in Isfahan city has been dramatically decreased over the past years and shows a good hygienic and sanitation status of the city.

Keywords Parasitic infections · Protozoa · Helminthes · Iran

Introduction

Intestinal parasitic infections are present all around the world, especially in developing countries. These infections are mostly associated with poverty, poor sanitation facilities, low hygienic level and low quality of food and water supply. The parasitic infections can be a good index for hygienic and sanitary level of the society (Jafari et al. 2014; Mehraj et al. 2008; Norhayati et al. 2003).

By 1998 one billion people is estimated to be infected chronically by soil-transmitted helminthes all around the world (World Health Organization 1998). In Iran parasitic infections were prevalent far back to the ancient times (Nezamabadi et al. 2013), but now we faced a dramatic decline in the prevalence of parasitic infections, especially intestinal parasites (Jafari et al. 2014). *Blastocystis hominis* and *Giardia lamblia* are still common in Iran (Fallah et al. 2002; Jafari et al. 2014).

Isfahan Province is located in the central region of Iran, which was known for very high prevalence of parasitic

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infection such as ascariasis; nearly 87–95 % of the rural inhabitants were infected by *Ascaris lumbricoides* in 1977 (Arfaa and Ghadirian 1977). Also cutaneous leishmaniasis is endemic in Isfahan province (Nadim and Faghih 1968) that made Isfahan an interesting area in parasitological researches.

This study aimed to determine the prevalence of the intestinal parasitic infection in Isfahan city and evaluate the present status of the infections comparing to the past.

Materials and Method

In this cross sectional study, 652 fecal samples were collected from 286 males and 366 females referred to Dr. Sharifi Clinical Laboratory, Isfahan, Iran, for stool examination during January to August 2014. The fecal samples were underwent microscopic examination by wet mount preparation of the fecal samples using 400× of microscopic magnification. Lugol's iodine dye was used for staining of wet mount slides.

All indistinguishable samples in wet mount slides preserved in Schaudinn fixative and subjected to trichrome staining technique for accurate determination of the parasites. The procedure of trichrome staining method was as follows: preserved slides in Schaudinn fixative were immersed in iodine alcohol (10 min) and then they were immersed in 70 % alcohol two times (3–5 min). Afterwards, slides were stained by trichrome stain (10 min) and were decolorized in acid alcohol (few sec). Then the slides were immersed in 95 % alcohol and absolute alcohol for dehydration (5 min). The slides were kept in xylene (at least 5 min) and after permanent mounting with Canada Balsam, they were examined under light microscope with 1000× of magnification (Jafari et al. 2014). Photos of parasites which were observed in this study are available in Fig. 1.

Data were analyzed by SPSS (version 16.2, SPSS Inc., Chicago, IL, USA) using Chi square test.

Results

In the present study, 652 fecal samples from 286 males and 366 females were collected and studied. The fecal samples examined about intestinal parasites by wet mount smear. All indistinguishable samples underwent microscopic examination through trichrome staining method.

Protozoa cysts or trophozoites were observed in 67 (10.27 %) out of 652 studied humans. Forty eight *Blastocystis hominis* (7.36 %), thirteen *Endolimax nana* (1.99 %), nine *Giardia lamblia* (1.38 %), five *Entamoeba coli* (0.76 %), four *Chilomastix mesnili* (0.61 %) and two *Iodamoeba butschlii* (0.15 %) were the observed protozoa in the studied population. Considering the helminthic infections, only one case (0.15 %) that was excreted *Taenia saginata* proglottids has been documented among 652 studied humans.

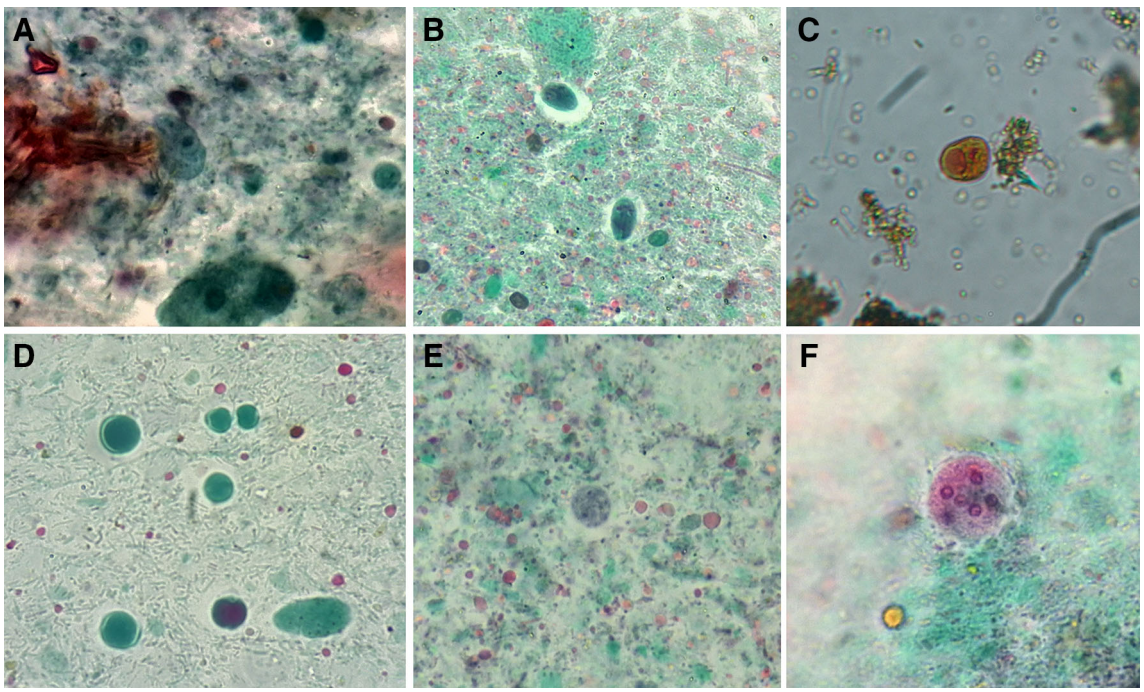

Fig. 1 Observed trophozoites and cysts of protozoa in the samples. **a** trichrome stained *Chilomastix mesnili* trophozoite; **b** trichrome stained *Giardia lamblia* cysts; **c** *Iodamoeba butschlii* cyst stained with Lugol's iodine; **d** trichrome stained *Blastocystis hominis* cysts; **e** trichrome stained *Endolimax nana* cyst; **f** trichrome stained *Entamoeba coli cyst*

Table 1 Odds ratio estimated for intestinal parasitic infections among sexes and stool consistency

Parasite	Sex		OR	95 % CI	*P*	Stool consistency		OR	95 % CI	*P*	Total *n* (%)
	Male	Female				Loose	Formed				
B. hominis											
Positive	19	29	0.827	0.454, 1.507	0.321	33	15	7.761	4.338, 13.884	<0.001	48 (7.36)
Negative	267	337	1			111	493	1			604 (92.64)
E. nana											
Positive	1	12	0.107	0.014, 0.815	0.006	6	7	3.024	1.032, 8.856	0.045	13 (1.99)
Negative	285	354	1			138	501	1			639 (98.01)
G. lamblia											
Positive	5	4	1.600	0.433, 5.903	0.351	2	7	1.008	0.27, 4.906	0.626	9 (1.38)
Negative	281	362	1			142	501	1			643 (98.62)
E. coli											
Positive	2	3	0.853	0.144, 5.072	0.614	1	4	0.881	0.098, 7.945	0.694	5 (0.76)
Negative	284	363	1			143	504	1			647 (99.24)
C. mesnili											
Positive	1	3	0.427	0.045, 4.079	0.409	3	1	10.583	1.109, 100.9	0.035	4 (0.61)
Negative	285	363	1			141	507	1			648 (99.39)
I. butschlii											
Positive	0	1	–	–	–	1	0	–	–	–	1 (0.15)
Negative	286	365	–			143	508	–			651 (99.85)
T. saginata											
Positive	0	1	–	–	–	0	1	–	–	–	1 (0.15)
Negative	286	365	–			144	507	–			651 (99.85)
Total infection											
Positive	25	43	0.744	0.466, 1.188	0.132	36	32	3.969	2.559, 6.155	<0.001	68 (10.42)
Negative	261	323	1			108	476	1			584 (89.58)
n (%)	286 (43.86)	366 (56.14)				144 (22.08)	508 (77.92)				652

In the studied population, intestinal parasitic infections were seen in 68 (10.42 %) out of 652 humans. Total intestinal protozoan and helminthic infections were 10.27 and 0.15 %, respectively.

In humans with loose fecal sample, the infection with *B. hominis*, *E. nana* and *C. mesnili* were seen higher comparing to people with formed stool specimen (Table 1). Additionally, total intestinal parasitic infections were also observed more prevalent in humans with loose stool sample ($P < 0.001$). Co-infection of *B. hominis* with *G. lamblia*, *E. nana* with *G. lamblia* and *B. hominis* with *E. nana* were seen in 3, 2 and 2 cases, respectively. Also triple infection was observed in three cases, which all were infected by *E. nana*, *B. hominis and C. mesnili*.

Discussion

Intestinal parasitic infections were along with mankind from ancient times to now (Goncalves et al. 2003; Nezamabadi et al. 2013) and are present all around the globe especially in developing countries (Haque 2007; Norhayati et al. 2003). During the last decades the good hygienic and sanitation status of human populations of some parts of the world is caused the intestinal parasitic infections to be decreased (Maizels et al. 2014; Yazdanbakhsh et al. 2002), which Iran is not an exception for this fact (Jafari et al. 2014; Sayyari et al. 2005). Intestinal parasitic infections were prevalent in most of the areas of Iran in the past (Arfaa and Ghadirian 1977; Fallah et al. 2002), but nowadays reports shows that the incidence of these kinds of infections are dramatically decreased in the country during last decades (Jafari et al. 2014). This fact is may be a result of good hygienic and sanitation facilities beside the increase of general hygienic knowledge of Iranian people (Sayyari et al. 2005).

The results of the present study are indicating that parasitic infections in Iran are decreasing continually. In Isfahan province the intestinal infections especially ascariasis were prevalent in the past (Arfaa and Ghadirian 1977). Therefore we observed very low prevalence of intestinal parasitic infections especially helminthic infections. Most of the observed protozoa in the present study were non-pathogen, but higher infection by *B. hominis* in the humans with loose stool is considerable.

In a similar study conducted in rural areas of Hamadan city, Iran, 2012, a noticeable reduction in the intestinal parasitic infections has been reported (Jafari et al. 2014), which is similar to findings of the present study. Hamadan and Isfahan cities shared a comment past about the high prevalence of intestinal parasites (Arfaa and Ghadirian 1977; Fallah et al. 2002) and now we see the similar pattern of intestinal infection in both areas, but Hamadan area showed higher rates of intestinal parasitic infections comparing to the Isfahan city.

Arfaa and Ghadirian in 1977 reported the result of mass chemotherapy against ascariasis. In that time the rate of ascariasis were 87–95 % in the six villages of Isfahan city before mass chemotherapy. The prevalence of the infection were reduced to 1–8 % after treatment, but 12 months later the rate of the infection had returned to the level it was before (87 vs. 91 %) (Arfaa and Ghadirian 1977). In the present study we had only observed one helminthic infection in a woman that was excreted *Taenia saginata* proglottids. We observed no *Ascaris lumbricoides* egg in Isfahan city, which was hyper endemic for ascariasis (Arfaa and Ghadirian 1977). The same result has been reported from Hamadan rural areas (Jafari et al. 2014).

Pathogenicity of *Blastocystis* is controversial; some authors consider it as non-pathogen and some as pathogen (Roberts et al. 2014). In the present study, the *Blastocystis* infection was observed higher in humans with loose stool samples. This finding highlights the potential pathogenicity of the infection, but it needs further studies on the subject. Also, interestingly *E. nana* and *C. mesnili* were seen more in humans with loose feces, but we should note that some co-infections between these protozoans has been observed and consequently we don't know which one/ones were responsible for loose feces.

Sayyari et al. (2005) studied 45128 stool specimens from general population of Iran during 1999–2000. They reported that 19.3 % of their studied population was infected by the intestinal parasites. The most common parasites that they had found among 45128 stool specimens were *G. lamblia* (10.9 %), *A. lumbricoides* (1.5 %), *Entamoeba histolytica* (1.0 %) and *Enterobius vermicularis* (0.5 %) (Sayyari et al. 2005). *G. lamblia* and *T. saginata* are the only parasites that the findings of Sayyari et al. and our study shares, but with lower prevalence in our study. If we compare these two studies it can be told that the decline in intestinal parasitic infection is apparently clear from 2005 to 2014.

Conclusion

Based on the results of the present study, the intestinal parasitic infection, especially pathogenic parasites, have been dramatically decreased during the past decades in Isfahan city, Iran. Also our finding suggests the relationship between loose stools with infection by *Blastocystis hominis*.

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Conflict of interest The authors have no conflict of interest.

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