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Original Article

Prevalence of Intestinal Parasites among Food-handlers in Shiraz, Iran

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Abstract

Background: Parasitic intestinal infections are still among socioeconomic problems in the world, especially in developing countries like Iran. Food-handlers that directly deal with production and distribution of foods between societies are one of the most important sources to transmit parasitic infections to humans. The aim of this study was to determine the prevalence of intestinal parasitic infections among food-handlers in Shiraz, Iran.

Methods: In this cross-sectional study, 1021 feces samples were randomly collected from food-handlers in Shiraz, central Iran from August to September 2013. Two different methods, routine direct fecal examination and Formalin –Ethyl acetate concentration as a complementary technique, were done to detect parasites.

Results: The prevalence of parasitic organisms was 10.4% in the food-handlers. The most species of the protozoan parasites were *G. lamblia*, *E. coli* and *B. hominis*; meanwhile, only one infection by *H. nana* (0.1%) was detected in this group. Mixed infections were observed in 13.2% (n=14/106) of positive cases. The majority of participants were male (57%); however, data analysis showed significant statistical difference in the rate of infection between females 11.9% (n=53/444) and males 9% (n=52/577) ($P=0.024$). There was no significant statistical difference in the rate of infection among different educational and occupation groups.

Conclusion: Although decreasing of helminthic infections is distinct, but infecting with protozoan parasites is still important in food-handlers. Concentration technique is more useful than direct smear technique, especially for detection parasites in low number. High level of education in our study showed that training courses in this group could be effective in the implementation of control and prevention programs.

Introduction

Number of infected persons with intestinal parasites estimated more than 2 billion in the world (1, 2). Transmission of intestinal parasites to human is via food, water and environment that indicate high sanitation and hygiene of mentioned factors is the best way to control of these diseases (3-5). The most important route for transmission of intestinal parasitic infections is fecal-oral (3, 6).

Protozoan parasites, such as, *Giardia lamblia*, *Entamoeba histolytica*, some coccidian parasite, helminthic parasites, including *Ascaris lumbricoides*, hookworms (*Necator americanus* and *Ancylostoma duodenale*), whipworm (*Trichuris trichiura*) and some intestinal parasites such as *Entamoeba coli*, *Chilomastix mesnili* that are not medically important, but show contamination of food and water as health indices, could be found in the intestine (4, 6, 7).

Food-handlers that directly deal with production and distribution of foods between societies are one of the most important sources to transmit parasitic infections to humans (3, 6). In this group asymptomatic carrier act as continuous sources of infection within public leading to problems in control of parasitic intestinal infections (7).

To design more effective following system and a regular monitoring of such infections, studying on the rate of intestinal parasitic contamination among food staff is important (8-10). Many residents in the cities migrated from rural areas to these places and now they are adopted with economic activity and urban situations (11). Some of them are working in occupations that can transmit intestinal parasites to people (11). Because of inadequate hygiene in this group they are important sources of intestinal parasites (11-13). Numerous studies in the world have been carried on the prevalence of intestinal parasite among food-handlers and role of these food staff in the transmission of parasitic diseases (12, 14, 15).

Because of lack studies in this field in Iran and the importance of food-handlers in the transmission of parasites, it is necessary to more focus on these guilds.

The aim of this study was to determine the prevalence of intestinal parasitic infections among food-handlers in Shiraz. To prevent and control of these infections, epidemiological studies are important to declare transmission routes, virulence of infections and main sources of mentioned organisms.

Materials and Methods

Study population and sample collection

In a cross-sectional study, 1021 stool samples were randomly collected from Food-handlers in Shiraz (Latitude: 29.6167° N, Longitude: 52.5333° E, Elevation above sea level: 1506 m) in a period of 2 months from August to September 2013. Food-handlers annually refer to health centers to evaluate as intestinal parasitic infections and getting a health certificate. Bio-data of participants were collected in a questionnaire that designed for this survey. Information such as name, gender, age and job of the participant was collected. Fresh specimens of feces were collected in covered plastic containers that reference code of each participant was labeled on it. Stool samples were immediately transferred to the laboratory of the Parasitology Department of Shiraz University of Medical Sciences, Shiraz, Iran.

Stool examination

In order to detect the intestinal parasites, two different methods were used: routine direct fecal examination, staining by Lugol's iodine solution and formalin-ethyl acetate sedimentation as a complementary technique. Direct smear with low sensitivity in comparison with concentration methods that is useful, especially in the detection of protozoan trophozoites (could be seen only by this method) was

applied in watery or bloody fecal samples. In this survey, both direct smear and concentration methods were used for all collected specimens.

Statistical analysis

Bio-data and examination results were inserted in SPSS software (version 16, Chicago, IL, USA) for evaluation.

Results

The prevalence of parasitic organisms was 10.4% in the food-handlers. There was a significant statistical difference in the rate of in-

fection with intestinal parasites in different genders. The parasitic infection in females (11.9% (n=53/444) was more than males 9% (n=52/577): (P-value =0. 024). There was no significant statistical difference in the rate of infection among the different educational groups (P-value =0. 390) (Table1).

The most species of the protozoan parasites were *E. coli* and *B. hominis* (Table 2). Meanwhile, only one egg of *H. nana* (0.1%) was detected in food-handlers by concentration method.

All participants were residents of Shiraz and the majority of them were males (57%).

Table1: Frequency of parasite infectivity between different educational groups of food-handlers

Education: n (%)	Elementary	Guidance school	High school	Academic	Total
	190 (18.6)	223 (21.8)	390 (38.2)	218 (21.4)	1021 (100)
Positive rate: n (%)	21 (11.05)	19 (8.52)	39 (10)	27 (12.38)	106

The most individuals were in group 21–30 yr (48.1%). The highest rate of parasitic infection was in the age group <20 yr (14.1% n=9/64) (Table 3). There was no significant statistical difference between parasitic infection and different age groups.

The most and least occupations between studied participants were in cafeterias and restaurants (23.9%) and vegetable and fruit sellers (1.3%) groups respectively (Fig. 1).

The infection percent among herbal sellers (16%) was more than other different occupations, but there was no significant statistical difference as parasitic infection in this group in comparison with other occupational groups.

Table 2: Relative frequency of infection of food handlers with intestinal Protozoa and helminthes

Parasite	Number	percent
<i>Giardia</i>	27	2.6
<i>E. coli</i>	40	3.9
<i>I. butschlii</i>	7	0.7
<i>Chilomastix</i>	5	0.5
<i>Blastocystis</i>	40	3.9
Helminths egg (<i>H. nana</i>)	1	0.1
Total	120	11.7
Total number of positive cases	106	10.4

Note: in this study, 14 cases were mixed infection.

Table 3: Frequency of parasitic infection between different age groups of food-handlers

Age group (yr)	Frequency (percent)	Parasitic infection (percent)
<20	64 (6.3)	9 (14.1)
21-30	491 (48.1)	47 (9.6)
31-40	276 (27)	32 (11.6)
41-50	125 (12.2)	13 (10.4)
>50	65 (6.4)	5 (7.7)
Total	1021 (100)	106

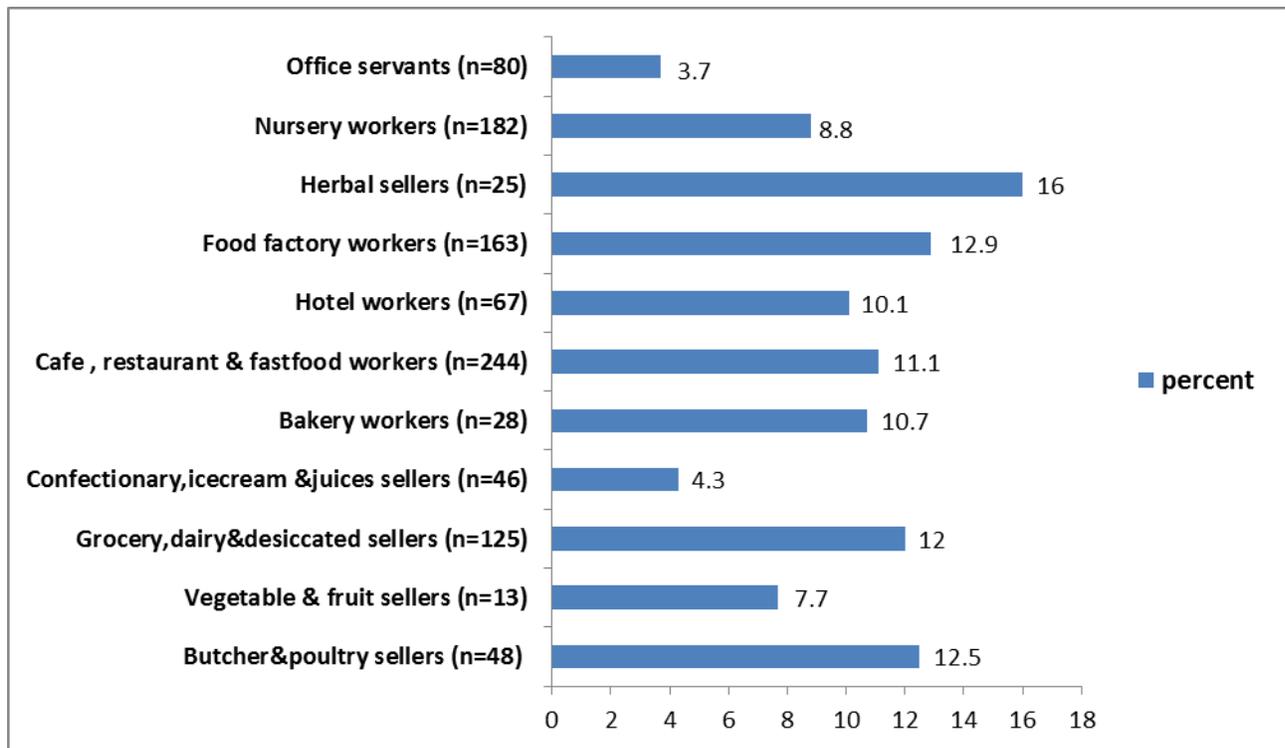


Fig. 1: Frequency of intestinal parasitic infection in different occupational groups of food-handlers (n = number examined)

Discussion

Food handlers have stressed out by several authors as public health threats (3, 6). According to our study, the noticeable prevalence (10.4%) of pathogenic (6.7%) and non-pathogenic parasite (3.7%) could be as a health threatening for people. Our findings are similar to investigation in Thailand (12); however, recent prevalence was lower than the study of Neghab et al. (54.9%) in a university catering in Shiraz with a different diversity in detected parasite (16). Similar to other studies, in the recent study the dominant protozoan parasites, were *E. coli*, *G. lamblia* and *B. hominis* (3, 4). The result of this study indicated the lower prevalence of parasitic infection in comparison with the other studies (4, 8, 9, 17).

The high frequency of non-pathogenic protozoans such as *E. coli* that have a similar spread route (fecal - oral) to other intestinal protozoans indicates the contamination of

water supplies with this parasite and could be a health index for each region. Pathogenic protozoans such as *B. hominis* and *G. lamblia* found in this study showed food-handlers as a very important infectious source and are responsible for distribution of these parasites between societies. Since *B. hominis* is a zoonotic and anaerobic enteric protozoan, pay attention to this parasite is necessary and requires more investigations (12).

In Iran, getting a health certificate is necessary to work in some occupations, especially as a food-handler. Some of food vendors like bakery, confectionery, restaurant workers are screened for parasitological infections twice in a year, but in other occupations like dried goods seller, supermarkets, butchers, chicken shops that are less dangerous to transmit the parasitic infection the number of tests is reduced to once per year. Although in herbal seller group parasitic infection rate was more than (16%) other job groups, but there was no

significant statistical difference between occupation and the risk of parasitic infectivity.

Although 21.4% of participants were in the academic category with highest parasitic infectivity, but there was not any statistically significant difference between education level and the risk of infection. The education level in recent study was higher than some studies like Ayeh-Kumi study in Ghana (6) that showed training course in this group could be effective in the implementation of control and prevention programs (18). Holding the routine training course is a necessary program to lowers the rate of intestinal parasite infectivity.

In Iran, planning for familiarizing food-handlers with intestinal parasites and control strategies should be in more attention. Forasmuch as the higher rate of parasitic infection with a statistical significant difference ($P=0.024$) showed in women in this study and presence of women like men in distribution of foods among societies as food-handlers, the more surveys is needed to emphasize the rule of women in the transmission of intestinal parasite like men. This result may back to behavioral differences between the sexes, although in some surveys a predominance of parasites in men was shown (8).

Decreasing in helminthic parasites prevalence is related to improvements in public health, sanitation, housing and education (8). This statement is supported by the results that obtained in our study. Low prevalence of helminthic parasites in comparison with protozoan parasites that revealed in this study like other studies (8) showed a change in the profile of intestinal parasitic infections. Self-medication leads to the appearance of immune-mediated diseases in societies such as; crohn's disease, reactive airway syndromes, arthritis and diabetes that should not be hidden from view of health officials (7). The absence of natural helminthic exposure with human removes a universal Th2 and regulatory immune affect that induced by these organisms (19).

Conclusion

Concentration technique is more useful than direct smear technique, especially for detection parasites in low number. Because of the short incubation period of some parasites, the screening twice a year cannot be a reliable and it should be increased at least Three times per year. Recording of demographic and laboratory data of food-handlers and archiving the data in digital files could be useful for analyzing and future epidemiological study and occupational health management.

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