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Prevalence of parasitic contamination in fast food salads in Ahvaz, southwest of Iran

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ABSTRACT

Objective: To evaluate the prevalence of parasitic contamination in fast food salads in Ahvaz city, southwest of Iran, in 2016.
Methods: In the current study, 150 samples were randomly collected from 150 fast food shops in Ahvaz City, southwest of Iran. The samples were collected in a clean bucket containing deionized water and detergent. After three times washing, the resultant precipitate was examined in terms of parasites using physiological saline as well as the acid fast and the trichrome staining methods.
Results: Of 150 samples, 17 (11.33%) positive cases were observed, among which 8 (5.34%), 4 (2.66%), 2 (1.34%), 1 (0.67%) and 2 (1.34%) were observed positive for *Entamoeba coli* (*E. coli*), *Cryptosporidium*, *Giardia lambelia*, immature oocyst of Coccidia and mites, respectively.
Conclusions: The results showed a relatively high prevalence of parasitic infections especially *E. coli* in fast food salads in Ahvaz, southwest of Iran. Since the parasitic infections can cause malabsorption, severe diarrhea, intestinal obstruction, cholecystitis, liver inflammation, pulmonary and renal complications, health authorities must pay more attention to the health of fast food shops.

1. Introduction

One of the most common infections in the world is intestinal parasitic infections (IPIs)[1]. IPIs are widely distributed all over the world, especially in developing countries. Approximately, one-third of the people of the world (more than two billion people) are under the influence of IPIs. About 450 million people suffer from IPIs and at least 50% of these individuals are children. Lack of health care, the tropical wet climate, lack of access to safe drinking water, poverty, and illiteracy are some factors associated with IPIs[2,3]. In recent years, studies carried out in countries have shown that the consumption of uncooked vegetables and fruits without the suitable washing or peeling represents an important potential for the extension of parasitic infections[4]. On the other hand, fresh vegetables are an important element of healthy diet[5] and at some countries, vegetables are a significant part of the diet. Therefore, the lack of the hygienic standards in the kitchen of organizations like hospitals, schools, hotels and restaurants, can lead to the widespread of parasitic infections to humans[6]. Morbidity and mortality rate of IPIs are significant. The infections are mainly transmitted via soil, water or food contaminated by cysts and ova of protozoans and helminthes[7]. Consumption of contaminated vegetables and salads, drinking polluted water, lack of health care and humid tropical climate are involved in IPIs. The vegetables infected with parasitic pathogens throughout the process of planting for consumption have a significant contribution in the transmission of parasitic infections[5]. Hence, the

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purpose of this study was to evaluate the prevalence of parasitic contamination in fast food salads in Ahvaz City, southwest of Iran, in 2016.

2. Materials and methods

2.1. Study areas

Ahvaz is a city in the center of Khuzestan Province in southwest of Iran. The city occupies an area of 375 km^2 and its population has been reported to be 1 425 891 until 2006. The city has a desert climate with temperatures above 50 ℃ that is one of the warmest cities in the world. The average annual rainfall is about 230 mm. According to report by the World Health Organization (WHO), Ahvaz has the most polluted climate in the world[8].

2.2. Sampling

A total of 150 samples were randomly collected from 150 fast food shops in Ahvaz City, southwest of Iran, in 2016. We collected 30 salad samples from each district (North, South, East, West, and the Center), with one sample from each shop (150 samples from 150 fast food shops). The samples were collected in a clean bucket containing deionized water and detergent and transported to the laboratory of parasitology in Ahvaz Jundishapur University of Medical Science, Ahvaz, Iran.

2.3. Staining

At first, 150 g of the specimens were processed in a cleaning bath with 1 L of detergent solution (0.1% Tween 80, 1% sodium dodecyl sulfate) and mixed for 10 min. In the next stage, the vegetables were removed and the washing water was collected in a polypropylene tube. After three times washing, the resultant precipitate was examined in terms of parasites using physiological saline as well as the acid fast and the trichrome staining methods. For this purpose, the remaining sediment was used for preparing slides for the staining. After the fixation with methanol, the slides were stained by the modified Ziehl-Neelsen's acid-fast staining procedure. Then, the slides were observed with light microscope for the presence of *Cryptosporidium* oocysts[9]. For the evaluation of other parasites, the trichrome staining was applied[10].

2.4. Statistical analysis

SPSS statistical software of version 16 was used for the data analysis and *Chi*-square test was used to determine significance differences.

3. Results

Figure 1 shows *Cryptosporidium* oocyst with the modified Zihl-Nelseen staining at a magnification of 100× as well as *Giardia intestinalis* in the direct smear at a magnification of 40×. On the other hand, Table 1 demonstrates the prevalence of parasite contamination in fast food salads in Ahvaz City, southwest of Iran, in 2016. According to Table 1, of 150 samples, 17 (11.33%) positive cases were observed, among which 8 (5.34%) of them were positive for *Entamoeba coli* (*E. coli*), 4 cases (2.66%) for *Cryptosporidium*, 2 cases (1.34%) for *Giardia lambelia*, 1 case (0.67%) for immature oocyst of Coccidia and 2 cases (1.34%) were identified as mites.

Table 1
The prevalence of parasite contamination in fast food salads in Ahvaz City, southwest of Iran, in 2016.

Parasite species	Frequency (*n*)	Percentage (%)
E. coli	8	5.34%
Cryptosporidium	4	2.66%
Giardia lambelia	2	1.34%
Immature oocyst of Coccidia	1	0.67%
Mites	2	1.34%
Total	17	11.33%

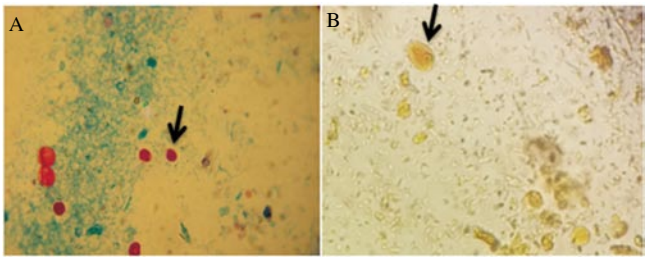

Figure 1. *Cryptosporidium* oocyst with the modified Zihl-Nelseen staining at a magnification of 100× (A); *Giardia intestinalis* in the direct smear at a magnification of 40× (B).

4. Discussion

IPIs are one of the serious concerns of public health in several countries, in particular in the tropical and subtropical developing countries. The infections have mainly been seen in children. The prevalence of IPIs in each community is the indicator of the health status of the area. Some environmental factors such as geographical location, climate, poverty, inadequate health conditions and economic situation, as well as personal factors such as nutrition, safety conditions, health status, cultural habits, literacy, and the high density of population facilitate the prevalence of IPIs[11]. Several evaluations were conducted in the different areas of Iran and showed the highest prevalence of IPIs[8], but in recent years, the prevalence of the infections has been dropped parallel to the development of public health, significantly[12]. The vegetables infected with parasitic pathogens throughout the process

of planting for consumption, have a significant contribution in the transmission of parasitic infections[5]. Hence, the purpose of this study was to evaluate the prevalence of parasitic contamination in fast food salads in Ahvaz City, southwest of Iran, in 2016.

The findings of this study showed that out of 150 samples, 17 (11.33%) positive cases were found in the salads of fast food shops in Ahvaz City. In another study, in Tehran (center of Iran), in 2002, from 263 samples, 147 cases (65%) of vegetable contamination were recorded, and in 43 cases (16/5%), human pathogenic parasites were seen[13]. The comparison of these results represents an improvement in the health status of the cities of Iran during the years. On the other hand, in the present study, *E. coli* was one of the most common parasites in salads. In another study conducted in Ardebil (northwest of Iran), in 2007, it was observed that the most common parasites in vegetables were *Taenia* eggs and *E. coli* cysts[14]. In conclusion, the results showed a relatively high prevalence of parasitic infections in fast food salads in Ahvaz City, southwest of Iran, in 2016, and *E. coli* was more prevalent than other parasites. Since the parasitic infections can cause malabsorption, severe diarrhea, intestinal obstruction, cholecystitis, liver inflammation, pulmonary and renal complications, health authorities must pay more attention to the health of fast food shops.

Conflict of interest statement

We declare that we have no conflict of interest.

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