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ORIGINAL ARTICLE

Microbiological and parasitological investigation among food handlers in hotels in the Dead Sea area, Jordan



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Background/purpose: Intestinal parasitic and bacterial infections constitute a major health issue in developing countries. The present study investigates and assesses infection rates among food handlers with intestinal parasites and microbial agents in luxurious hotels in the Dead Sea area of Jordan.

Methods: A total of 901 stool samples were collected from food handlers (35 females and 866 males) employed in four main hotels in the Dead Sea area. Fecal samples were examined microscopically for intestinal parasites. Standard culture and biochemical techniques were used for the isolation and identification of *Salmonella* and *Shigella* spp. in stool samples.

Results: Five species of protozoan (*Blastocystis hominis*, *Giardia intestinalis*, *Entamoeba coli*, *Entamoeba histolytica*, and *Endolimax nana*), one helminth (*Hymenolepis nana*), and one cylindrical worm (*Enterobius vermicularis*) were recovered with an overall infection rate of 3.7%. *G. intestinalis* was the most prevalent parasitic infection with infection rate of 2.44%. All samples were negative for both *Salmonella* and *Shigella*.

Conclusion: Findings highlight the important role of food handlers in the transmission of intestinal parasites to high-class clients accommodated in luxury hotels, and stress the urgent need for regular health and parasitologic examination of food handlers.

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Introduction

Food handlers employed in hotels and restaurants could be potential sources of various bacterial, viral, and parasitic

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infections. In the Middle East, parasitic and bacterial infections among food handlers have been studied in Iraq,¹ Qatar,² Saudi Arabia,^{3–6} and Turkey.⁷ In Jordan, parasitic and microbial infections among food handlers remain largely very limited. Al-Lahham et al⁸ investigated the prevalence of pathogenic bacteria and intestinal parasites in food handlers in Irbid. An outbreak of *Salmonella* food poisoning was reported at the Jordan University Hospital cafeteria caused by one asymptomatic employee at the kitchen.⁹

Human intestinal parasites in Jordan were the subject of several studies that date back to the mid 1950s. Perhaps the first comprehensive study on the intestinal parasites of human was that of Alicata and Dajani.¹⁰ Abdel-Hafez and Abdel-Hafez¹¹ studied the human intestinal parasites in the Jordan Valley. Nimri^{12,13} found children infected by *Entamoeba histolytica* along with *Blastocystis hominis*, and investigated the prevalence of *Giardia lamblia* among primary school children in northern Jordan and a rural area in the Badia, northeast Jordan.

Youssef et al¹⁴ reported on intestinal parasites and other bacterial and viral pathogens among hospitalized children in northern Jordan. Shehabi et al¹⁵ investigated stool specimens of 400 patients at Jordan University Hospital for the presence of bacterial agents associated with diarrhea. They found that 2.7% of the examined material had *Entamoeba histolytica*. Shakkoury and Wandy¹⁶ examined stool specimens from several Primary Healthcare Centers in Amman distributed in low, medium, and high socio-economic areas. Al Monmani et al¹⁷ investigated parasitic infections among outpatients at the Princess Aisha Center, Amman.

The aim of the present study is to investigate parasitic and pathogenic bacterial infections among food handlers in Jordanian hotels in the Dead Sea area.

Materials and methods

A total of 901 stool samples were collected from food handlers (35 females and 866 males) employed in four main hotels in the Dead Sea area during 2009 and 2010. For each sample, occupation and sex were recorded.

Microbiologic study

Standard bacteria culture on xylose lysine deoxycholate agar and biochemical techniques were used for the isolation and identification of *Salmonella* and *Shigella* spp.

Parasitologic study

Wet mount preparations with physiologic saline and iodine were prepared. The formalin-ether concentration technique was used for the detection of helminth eggs and protozoan cysts.

Results

Microbiologic study

All samples were negative for both *Salmonella* and *Shigella*.

Parasitologic study

A total of 34 samples yielded the presence of five species of protozoans (*Blastocystis hominis*, *Giardia intestinalis*, *Entamoeba coli*, *Entamoeba histolytica/dispar* and *Endolimax nana*), one helminth (*Hymenolepis nana*), and one cylindrical worm (*Enterobius vermicularis*) with an overall infection rate of 3.7%.

Giardia intestinalis was the most prevalent parasitic infection (Table 1), followed by *En. coli*. Fewest infections were caused by *En. histolytica/dispar* and *Endolimax nana*. Infections were restricted to males serving in different facilities of the restaurants. Twenty-eight samples were positive for one parasite. Three cooks were found infected with: *En. histolytica/dispar* and *En. coli*; *B. hominis*, *En. Coli*, and *G. intestinalis*; and *G. intestinalis*, *En. Coli*, and *H. nana*. Three waiters were infected with: *G. intestinalis* and *En. coli*; *G. intestinalis*, *En. Coli*, and *H. nana*; and *B. hominis*, *En. Nana*, and *G. intestinalis*,

Table 2 shows infection rates among food handlers according to their vocation in the restaurants. The highest infection rates were among waiters (35.4%) followed by cooks (26.8%). All females were negative for intestinal parasites. Statistical analysis among the eight food handler categories showed significant results for cooks ($p = 0.001$, 95% confidence interval = 0.309–0.447) and waiters ($p = 0.001$, 95% confidence interval = 0.280–0.422). No significant results were obtained among the other food handler categories.

Discussion

Food handlers in hotels or restaurants pose a threat of spreading bacterial and parasitic infections to customers. We found seven species of intestinal parasite, with *G. intestinalis* being the most dominant infection. Indeed, giardiasis is the most commonly reported intestinal protozoal infection worldwide. In Jordan, our findings are similar to those reported by Al-Lahham et al⁸ among food handlers in the Irbid area.

Al-Lahham et al⁸ reported that *G. intestinalis* was the most dominant infection, reaching a prevalence of 3.9%. Restaurants in Irbid area are considered as public and health inspections are not fully enforced. Food handlers employed in luxurious hotels and restaurants require strict annual medical checkup including bacterial and parasite examinations.

Table 1 Intestinal parasites found among food handlers

Parasite	No. of infected persons	%
<i>Blastocystis hominis</i>	6	0.66
<i>Giardia intestinalis</i>	22	2.44
<i>Entamoeba coli</i>	9	0.99
<i>Entamoeba histolytica/dispar</i>	1	0.11
<i>Endolimax nana</i>	1	0.11
<i>Enterobius vermicularis</i>	2	0.22
<i>Hymenolepis nana</i>	3	0.33

Table 2 Intestinal parasites found among food handlers according to their vocation

Vocation	No.	%
Chef	3	8.7
Cook	9	26.8
Dish washing worker	2	5.8
Hostess	1	2.9
Kitchen worker	3	8.7
Restaurant manager	1	2.9
Waiter	12	35.4
Worker	3	8.8
Total	34	100

Among the Jordanian population, Al Momani et al¹⁷ reported similar pattern of parasites reported in the present study, with *G. intestinalis* as the most dominant parasitic infection, followed by *En. histolytica* with infection rates of 61.5% and 19.6%, respectively. This reflects the general parasite fauna affecting the population. By contrast, the infection rates reported by Al Momani et al¹⁷ are much higher compared to the present study. Low infection rates in our study were perhaps due to the requirement for a health certificate and an annual parasitic examination of food handlers in hotels and restaurants. Similar results were seen among the local population in the Badia, northeast Jordan.¹⁸ Chazal and Adi¹⁹ reported that *En. histolytica* was the most dominant parasitic infection in stool samples collected from Amman, with an infection rate of 27.81%.

Food handlers originating from countries known to have poor hygienic practices are employed in various countries in the Arabian Peninsula. Infection rates ranged from 14% to 50.15% of examined food handlers, harboring 7–17 different species of intestinal parasites.^{2,5,6} In Turkey, 52.2% of food handlers were infected by intestinal parasites including *G. intestinalis*, *Ascaris lumbricoides*, and *Taenia saginata*.⁷

Our study showed that intestinal parasites were highest among waiters and cooks, with infection rates of 35.4% and 26.8% respectively among the total positive samples. Restaurant managers and hostesses exhibited the lowest rate of infection, because both categories are more educated and practice better hygienic habits compared to the other vocations. By profession, Saeeda and Hamid²⁰ found that storekeepers (44.6%), restaurant workers (25%), bakers (17.9%), butchers (5.4%), milk distributors (3.6%), and fruit/vegetable sellers were infected with bacterial pathogens and protozoan parasites in Sudan.

En. coli was found solely or associated with other parasites. This protozoan is not pathogenic; however, that implies that oro-fecal contamination may harbor other pathogenic bacteria such as *Salmonella* and *Shigella*. The finding of a low prevalence of *E. vermicularis* requires more attention. This parasite can easily spread in hotels and can cause a serious health issue.

No bacterial infections were recorded in the present study. Khuri-Bulos et al⁹ found that 11 out of 61 (18%) of the

kitchen employees in the Jordan University Hospital were positive for *Salmonella enteritidis* group D.⁹ Also, prevalences of 6% and 1.4% of *Salmonella* and *Shigella* were reported among food handlers in the Irbid region.⁸ The negative results in our study can be explained on the strict health regulations among employees in such hotels of the Dead Sea area.

The present results indicate the need for seasonal monitoring for parasitic infection among food handlers in all restaurants and hotels all over the country. Such infections among food handlers may affect the reputation of hotels and act as a source of disseminating infections that could be of foreign origin among non-Jordanian food handlers.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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