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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.

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 al[8] 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-Hafez[11] 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 al[14] reported on intestinal parasites and other bacterial and viral pathogens among hospitalized children in northern Jordan. Shehabi et al[15] 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 Wandy[16] examined stool specimens from several Primary Healthcare Centers in Amman distributed in low, medium, and high socio-economic areas. Al Monmani et al[17] 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 al[8] among food handlers in the Irbid area.

Al-Lahhamet al[8] 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	%
Blastocystis hominis	6	0.66
Giardia intestinalis	22	2.44
Entamoeba coli	9	0.99
Entamoeba histolytica/dispar	1	0.11
Endolimax nana	1	0.11
Enterobius vermicularis	2	0.22
Hymenolepis nana	3	0.33