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Bacterial and Parasitic Intestinal Infections among Food Handlers in a Tertiary Care Hospital of Lucknow, Uttar Pradesh, India

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ABSTRACT

Introduction: Worldwide, food handlers play a vital role in spreading intestinal infections. Poor personal hygiene and inadequate knowledge of food safety among food handlers working in food-serving establishments would make the food handler a potential source of infection of enteropathogenic bacteria, many intestinal helminths, and protozoa. The purpose of the study was to assess the prevalence of bacteria and intestinal parasites in food handlers working in our institution. **Methods:** The study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow, Uttar Pradesh, India, and included 100 food handlers working in various institutional sections. The stool samples were collected from all participants and examined by microscopy for intestinal parasites. For detecting Salmonella spp, specimens were cultured on selenite F broth and xylose lysine deoxycholate. **Results:** Most food handlers (85%) were 21-25 years old. Twenty-six (26%) of the food handlers had parasitic infections, while bacterial infections were detected in none. The dominant parasite among food handlers was *Giardia lamblia*, followed by *Ascaris lumbricoides*. **Conclusion:** Food handlers must undergo regular checkups to identify infected employees to safeguard the health of patients, visitors, and health care workers.

INTRODUCTION

Intestinal infections are a significant global health problem, affecting ~3.5 billion people, particularly in the developing world, and about 450 million fall sick because of these infections, the majority being children [1]. Enteropathogenic bacteria and intestinal parasites are transmitted directly or indirectly through objects contaminated with feces, including food, water, and fingers, indicating the importance of the fecal-oral route among humans [2].

Worldwide, food handlers play an important role in spreading such infections. Food handlers, especially those who handle raw or uncooked food not wrapped or covered, have a significant role in spreading many infections in the community and among patients in the hospital. Accordingly, poor personal hygiene and inadequate food safety knowledge among food handlers working in food-serving establishments would make them a potential source of infection of enteropathogenic bacteria, intestinal helminths, and protozoa [3]. Personnel harboring and excreting enteropathogenic bacteria and intestinal parasites may contaminate food with their feces via their fingers [4]. Compared to other hand parts, the area beneath the fingernails maintains most microorganisms and is the toughest to clean [5].

Food handlers with intestinal infections, bacterial or parasitic, may pose a threat in health care settings, especially to patients who are more susceptible to infections, like those who are immune-deficient, justifying the importance of proper food handling in the hospital environment.

Many outbreaks in hospitals, either bacterial, viral, or parasitic, have been initiated by infected food handlers [6,7]. Various studies have shown that intestinal infections among food handlers range from as low as 1.3% to as high as 97% [9-14]. A sick individual who shows any symptoms of illness can be identified and relieved from duties that involve the direct handling of food and food products. It is difficulat to identify

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individuals who harbor the pathogen but do not show any signs and symptoms. Therefore, regular checkups of food handlers are essential to identify infected employees, immediately exclude them from work involved with direct contact with food products, and appropriately treat them to protect the patients, visitors, and healthcare workers.

Therefore, this study aimed to assess the prevalence of bacteria and intestinal parasites in food handlers working in our institution.

MATERIAL AND METHODS

Study Design. From August to September 2018**,** a hospital-based observational cross-sectional study investigated the prevalence of bacterial and parasitic intestinal infections among food handlers in a tertiary care hospital. The present study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow, Uttar Pradesh, India.

Study population. All food handlers, including staff that prepare and serve food, cooks, production staff, butchers, and waiters working in the canteen, cafeteria, and ice cream or fruit juice shop working in the institution, were included in the study. The sample size for the study was 100.

Selection criteria. The study participants who did not take any antibiotics and anti-helminthics in the last month were included in the study.

Data collection. Demographics (age, gender), clinical conditions data (history of antibiotic usage, diarrhea, fever), and other relevant information, such as educational level, socioeconomic status, and hand hygiene practices of the participants, were collected from food handlers in a structured questionnaire at the time of sample collection.

Sample collection. Fresh stool specimens were collected from food handlers in a wide-mouthed, leak-proof plastic universal container, labelled, and immediately transported to the laboratory for further processing. Three stool specimens were collected from each participant.

Direct smear examination of stool samples: For direct wet mount preparation, 1–2 mg of stool was emulsified in a drop of normal saline (0.85% NaCl) on a clean glass slide and covered with a coverslip. An iodine mount was prepared by adding Lugol's iodine to a clean glass slide and mixing it with a small quantity of stool sample. The slides were examined by microscopy under both low-power (10X) and high-power (40X) objective lenses. Direct saline smear examination was used to detect the motile trophozoites in liquid or semi-liquid specimens. Direct iodine smears were used to demonstrate the characteristic features of the diagnostic stages. Cysts and ova were detected by the formalin-ether concentration technique (FECT) [8].

Stool Culture: Stool specimens were initially inoculated into selenite F broth and incubated aerobically overnight at 37°C. The cultures were then sub-cultured on xylose lysine deoxycholate (XLD) agar and incubated at 37°C for 24 h to isolate *Salmonella* spp. The grown bacteria were identified by biochemical tests, including catalase, indole, methyl-red, Voges-Proskauer reaction, Simon's citrate agar, triple sugar iron, lysine, and arginine ornithine decarboxylase, urease, oxidase, and motility [8].

Statistical analysis. All data were collected and recorded in a Microsoft Excel spreadsheet. Different categories of data were analyzed for frequency.

Ethical Considerations. Ethical clearance was obtained from the institutional ethical committee (letter No: TSMMC & H/ADMIN/IEC/2018-02, Dated 07.05.2015) and informed consent before specimen collection.

RESULTS

A total of one hundred asymptomatic food handlers were included in the study. Most food handlers were male (85%) young adults aged 21-25 years (Table 1).

Table 1. The age groups and gender of food handlers

Age group	Number of participants
15-20	14
21-25	46
26-30	23
31-35	11
36-40	6
Total	**100**
Gender	
Male	85
Female	15
Total	**100**

Of 100 stool samples from participants, 26 were positive for various intestinal parasites. Among the protozoa, *Giardia lamblia* was the dominant species (Table 2). *Ascaris lumbricoides* was the most common

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helminthic infection identified, followed by *Taenia* spp. and *Ancylostoma duodenale*. No *Salmonella* species grew in the stool cultures.

Table 2. Distribution of intestinal parasites among food handlers

Intestinal parasite	Species	Number
Protozoa	*Entamoeba histolytica/dispar* (cyst)	1 (3.8%)
	G. lamblia (cyst)	8 (30.8%)
Helminths	*Taenia* spp.	6 (23.1%)
	A. lumbricoides	7 (26.9%)
	A. duodenale	4 (15.4%)
Total		**26**

DISCUSSION

Food handlers may carry different bacterial and parasitic organisms and spread the infection to individuals in the community and, more importantly, to patients, staff, and visitors in the hospital.

The present study was conducted to determine the prevalence of intestinal parasites among food handlers working in our hospital. In this study, 26% of the food handlers had parasitic infections, while bacterial infections were reported in none of them. Many studies have reported higher parasitic and bacterial infection rates among food handlers worldwide, e. g., 47.1%, 48%, 48.7%, and 97% in Brazil, Jordan, Venezuela, and Nigeria, respectively [9-12]. On the other hand, some studies have reported lower prevalence rates, such as 1.3 to 7% in North India, 10.3%, and 24.3% in Thailand and Palestine. This variation might be due to factors such as epidemiology, sanitation, and personal hygiene practices [13, 14]

In our study, the dominant parasite among food handlers was *G. lamblia* (30.8%), followed by *A. lumbricoides* (26.9%), *Taenia* spp. (23.1%), *A. duodenale* (15.4%) and *E. histolytica/dispar* (3.8%), similar to reports from other countries [15, 16]. Likewise, other studies in Ethiopia have identified *E. histolytica* as the predominant parasite among food handlers [17, 18].

In the present study, no food handler was a *Salmonella* carrier. However, *Salmonella* spp. was isolated from food handlers in Ethiopia and Ghana [17, 19].

The limitations of our study were the small sample size and focusing only on the isolation and identification of *Salmonella* spp. Other members of the *Enterobacteriaceae* family are part of the commensal flora, and typing of other diarrheagenic strains could not be performed due to limited resources. Due to the small sample size, analysis cannot be done to draw any association.

The present study showed a high prevalence of intestinal parasites among food handlers. Strict compliance with good personal and hand hygiene is an important measure to prevent the transmission of infections from food handlers. In hospital settings, asymptomatic food handlers must undergo regular checkups to identify infected employees to protect the health of patients, visitors, and health care workers. Also, regular training to increase awareness among food handlers may play an essential role in reducing related infections.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this manuscript.

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