Screening of Food Handlers for Intestinal Parasites and Enteropathogenic Bacteria in a Tertiary Care Hospital

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Received: 26/03/2014 Revised: 19/04/2014 Accepted: 21/04/2014

ABSTRACT

Background and objectives: Food handlers with poor personal hygiene could be potential sources of infections of many intestinal parasites and enteropathogenic bacteria. Infections in food handlers may pose a real threat to those who are more susceptible to infection like hospitalized patients especially those who suffered from immunodeficient conditions. Hence the present study was undertaken to assess the prevalence of intestinal parasites and bacteria among food handlers working in the dietary section of a tertiary care hospital.

Materials and methods: Swabs from both hands and stool samples were collected from 84 food handlers working in dietary section in tertiary care hospital. The stool samples were examined microscopically for parasites by wet mount, iodine mount and modified acid fast staining directly and after the formalin ether concentration technique. All the samples were cultured on blood agar and MacConkey’s agar and organisms were identified according to standard procedure.

Result: Apart from commensals, cultures from hand swabs were positive for Staphylococcus aureus (5.9%), Enterococcus fecalis (7%), Klebsiella pneumoniae (22.7%), Escherichia coli (20.5%), Enterobacter species (1.6%) and Citrobacter species (1.1%). No enteropathogenic bacteria were isolated from the stool samples. Thirty four (40.5%) stool specimens were positive for different intestinal parasites.

Conclusion: Screening of food handlers, training for food handling and hand hygiene practices and regular monitoring of the food handling practices should be done in any Health Care Set up in order to avoid diseases that can be acquired through improper food handling like intestinal parasitic and bacterial infections.

Keywords: Food handlers, intestinal parasites, enteropathogenic bacteria

INTRODUCTION

The spread of food borne diseases via food handlers is a common and persistent problem worldwide. Food handlers with poor personal hygiene could be potential source of infections of many intestinal helminthes, protozoa and enteropathogenic bacteria. Persons with asymptomatic infections and carriers pose greater danger to the public because the worker keeps on working unmindful of the infection he is transmitting. Transmission of intestinal parasites and enteropathogenic bacteria occurs directly or indirectly through food, water, nails, and fingers etc. indicating the importance of fecal-oral human-to-human transmission. 1-3. The bacteria important for transmission by food handlers...
include Salmonella typhi, Shigella species, Campylobacter jejuni, Enterohaemorrhagic Escherichia coli (E.coli), Enterotoxigenic E.coli etc.. Various parasites important for food-borne transmission include Giardia, Entamoeba histolytica, Cryptosporidium and helminthes like tapeworm, roundworm, Enterobius vermicularis etc. These infections in food handlers may pose a real threat to those who are more susceptible to infections like hospitalized patients especially those who are in immunodeficient conditions. Actually it is important to have proper food handling in the hospital environment.\cite{4-6} Therefore, a proper screening procedure is needed in order to detect infections among food handlers, thus preventing possible morbidity and protecting the health of the patients and consumers. Hence, the present study was undertaken to detect the incidence of intestinal parasites and enteropathogenic bacteria among food handlers working in the dietary section of a tertiary care hospital.

**MATERIALS AND METHODS**

This cross-sectional study was conducted among 84 food handlers (male 38, female 46) working in the various kitchens in the premises of a tertiary care hospital. Food handlers who did not take treatment for any intestinal ailment prior to 3 months were included in the study. Information on age, sex, educational level and hand-hygiene practices etc. of each food handler was collected.\cite{7,8}

The project was approved by Institutional Ethics committee. The objective of the study was explained to the participants to get informed consent.

**Sample collection, transport**

Swabs from both hands (palm, webs and beneath finger nail) of each subject were collected using sterile cotton-tipped swab moistened in the Brain Heart Infusion broth and placed into a sterile test tube. Freshly passed stool sample was collected in sterile wide mouth container from all 84 food handlers included in the study. For parasites, at least 2 stool samples were collected since many parasites do not appear in fecal specimens in consistently on daily basis. The stool samples were processed and examined within 2 hours of collection to limit contamination and bacterial overgrowth. All the samples were transported immediately to Microbiology laboratory.

**Sample processing**

Swabs from hands were inoculated on blood agar and MacConkey’s agar and incubated at 37°C and examined for growth of organisms next day. Number of colony forming units (CFU) grown on each plate was counted. The organisms were identified according to standard procedure.\cite{9}

Detection of Methicillin Resistant Staphylococcus aureus (MRSA) using Cefoxitin disc 30 µg and ESBL producing organisms by combined disc method (Ceftazidime 30 µg and Cefdazidime + Clavulanic acid disc 30/10 µg) were carried out as per Clinical Laboratory Standard Institute (CLSI) guidelines.\cite{10}

The stool samples were examined microscopically for parasites by wet mount, iodine mount and modified acid fast staining directly and after the formalin ether concentration technique.\cite{11}

All stool samples were cultured on the plates of Deoxycholate Citrate Agar, MacConkey’s agar and Blood agar. Stool samples were inoculated into Selenite F broth for enrichment and were sub cultured onto Deoxycholate Citrate Agar after 6 hours of incubation at 37°C as per the WHO protocol.\cite{12} Both the primary plates as well as the subculture plates from the enrichment media were examined after incubation for 24 hours at 37°C and bacterial species were identified according to the standard procedures.\cite{9}
Those food handlers identified with parasitic or bacterial infection were kept off work and sent for the treatment. It was decided that if the stool sample will be positive for enteropathogenic bacteria repeat cultures will be performed thrice on alternate days after the cessation of treatment. The follow up samples for parasites were examined a week after the anti-parasite therapy. [13] The food handler was allowed to join work only after follow up of stool samples turned negative.

**RESULTS**

The study included 84 food handlers (male-38, female-46). The age of the food handlers ranged between 18-60 years. 24(28.5%) female food handlers were illiterate, 28 (33.3%) food handlers had education up to 4th standard while 32(38.1%) food handlers had education up to 10th. All belonged to lower socioeconomic strata. About hand hygiene practices, it was observed that most of the time soap was not available for hand washing. Soap was available at some places but they didn’t follow proper hand washing practices. Sometimes detergent powder was used or they washed their hands with water only after touching dirty materials, body parts or even after visiting toilets. Majority of them didn’t cut their nails regularly. (Table 1)

Out of the 84 hand swabs, growth of microorganisms >10^3 colony forming unit (CFU) was observed in all the samples. 23 (27.4%) samples showed growth of single type of bacteria, 30 samples (35.7%) showed growth of two types of bacteria, 22 (26.2%) samples showed three types of bacteria while 9 (10.7%) samples showed four types of bacteria. (Figure 1)

Cultures from hand swabs were found to be positive for Gram positive and negative organisms. Amongst Gram positive organisms, predominant organisms were Micrococcus 52(28.1%), coagulase-negative Staphylococci 13(7.0%), Enterococcus fæcalis 13 (7.0%), Methicillin sensitive Staphylococcus aureus 11(5.9%) and Bacillus species 12(5.4%). (Figure 2) Amongst Gram negative organisms, predominant organisms were Klebsiella pneumoniae 42(22.7%) (Extended spectrum Beta lactamases ESBL-7, NonESBL-35) and E. coli 38(20.5%) (ESBL 7, Non ESBL 31) followed by Enterobacter species 3(1.6%) and Citrobacter species 2 (1.1%). (Figure 3) No enteropathogenic bacteria like Salmonella species or Shigella species etc. was isolated from the stool samples.

Direct microscopic and concentration techniques were used for identifying intestinal parasites from the 84 stool specimens. Thirty four (40.5%) stool specimens were positive for different intestinal parasites. (Table 2)
DISCUSSION

Food handlers play an important role in transmitting the disease. Any contamination of raw materials, equipment and utensils or the hands of food handlers can result in the transmission of intestinal helminthes eggs to the consumers. [3]

In the present study, majority of the food handlers belonged to lower socioeconomic strata with low educational level that correlated well with previous studies. [14,15] It was observed that most of the food handlers didn’t follow proper hand hygiene practices after touching dirty materials or after visiting toilet indicating the lack of awareness about food contamination with poor hygienic practices. This finding was similar to previous reports. [2-14]

In our study, majority of cultures from hands were found to be positive for Gram positive and Gram negative organisms. Amongst Gram positive organisms, high prevalence of isolation of Micrococcii and coagulase-negative Staphylococci was there because they are the normal commensal of the skin. Isolation of Enterococcus fecalis and Staphylococcus aureus indicates poor hand hygiene. Amongst Gram negative organisms, different species of Enterobacteriaceae were
isolated; predominant were Klebsiella and E. coli supporting the concept of contamination by fecal bacteria due to inadequate hand-washing by the food handlers.\(^2\) In this study, ESBL producing E.coli and Klebsiella were isolated from hand swabs of food handlers which are a cause of concern. In addition, none of the food handlers had been appropriately trained in safe food-handling practices. Even none were wearing gloves.

In the present study, prevalence of enteroparasites among food handlers was found to be 40.5%. Such a high prevalence of intestinal parasites is largely due to poor personal hygiene practices, poor environmental sanitation and ignorance of health-promotion practices. The prevalence of enteroparasites in this study (40.5%) is in accordance with other studies i.e. Malhotra et al \(^4\) and Abera et al \(^14\) (41.1%), Espardonato et al \(^5\) reported parasites in 40.7% of food handlers in health and educational institutions while Yazici \(^16\) reported prevalence of 29.3%, Andargie et al \(^2\) 29.1%. Higher percentage was found in study conducted by Chitnis et al \(^17\) (44.5%). Lower percentage of parasitic infection among food handlers was found in study by Lourenco et al \(^18\) (17%) and Mohan et al \(^3\) (12.9%).

**CONCLUSION AND RECOMMENDATIONS**

In the present study, the prevalence of intestinal parasitic infection in food handlers was high (40.5%). No enteropathogenic bacteria were isolated from the stool samples. Good personal hygiene specially hand hygiene and hygienic food-handling practices are an effective means for preventing the transmission of pathogens from food-handlers to consumers. The authors hereby conclude that screening of food handlers and training for food handling and hand hygiene practices has to be given in every Health Care Set up twice a year. The dietician has to closely monitor whether those practices are regularly followed or not in the dietary sections of Health Care Set up. Any new recruit in dietary section has to be trained and screened for any bacterial and parasitic infections.

**Recommendations:**

- All kitchen staffs should follow proper steps of hand washing with soap and water frequently and before handling food.
- Gloves, caps and aprons should be worn by the staff while handling food.
- Periodic educational training about proper hand hygiene and food handling practices should be given to all kitchen staffs.
- Screening of food handlers for various intestinal pathogens should be undertaken twice a year. The screening should be done for any new recruit.
- Regular monitoring of the food handling practices by the food handlers should be done in order to avoid diseases that can be acquired through improper food handling like intestinal parasitic and bacterial infections.

**ACKNOWLEDGEMENT**

Authors are thankful to DMIMS (DU) for the help while conducting the study.

**REFERENCES**


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