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Original Research Article

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

Suvarna Sande (Tathe)[1], Silpi Basak[2], Vaibhav Sande[3], Vidya Tawade[4]

[1]Associate Professor, [2]Professor and Head, [3]Tutor, [4]Laboratory technician;
[1,2,4]Department of Microbiology, [3]Department of Anatomy; Jawaharlal Nehru Medical College, Wardha (MS), India.

Corresponding Author: Suvarna Sande (Tathe)

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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.[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. [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 37^0C 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. [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. [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. [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 subcultured onto Deoxycholate Citrate Agar after 6 hours of incubation at 37°C as per the WHO protocol. [12] Both the primary plates as well as the subculture plates from the enrichment media were examined after incubation for 24 hours at 37^oC and bacterial species were identified according to the standard procedures. [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 4^{th} standard while 32(38.1%) food handlers had education up to 10^{th}.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 Micrococci 52(28.1%), coagulase-negative Staphylococci 13(7.0%), Enterococcus fecalis13 (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)

Table 1: Scio demographic status and hand hygiene practices among food handlers.

Variables	Total subject (n=84)
Sex	
Male	38(45.2%)
Female	46(54.7%)
Age group in years	
18-36	24(28.5%)
37-55	52(61.9%)
>56	8(9.5%)
Literacy level	
Illiterate	24(28.5%)
1-4^{th} standard	28(33.3%)
5-10 standard	32(38.1%)
Hand washing with soap and water	
After visiting toilet	43(51.1%)
After touching dirty material	32(38.1%)
After touching different body parts	20(23.8%)

Table 2: Incidence of parasites isolated from stool specimens. (n=84)

Parasites	No. of positive stool samples
Direct microscopy	
Cyst of Entamoeba histolytica	14(16.7%)
Cyst of E. histolytica and cyst of E. coli	03(3.6%)
Cystof Giardia lamblia	07(8.3%)
Cyst of E. histolytica and cyst of Giardia lamblia	03(3.6%)
Cyst of Entamoeba coli	02(2.4%)
Trophozoite of Giardia lamblia	03(3.6%)
Modified Acid fast staining	
Cryptosporidium oocyst	02(2.4%)
Total	34(40.5%)

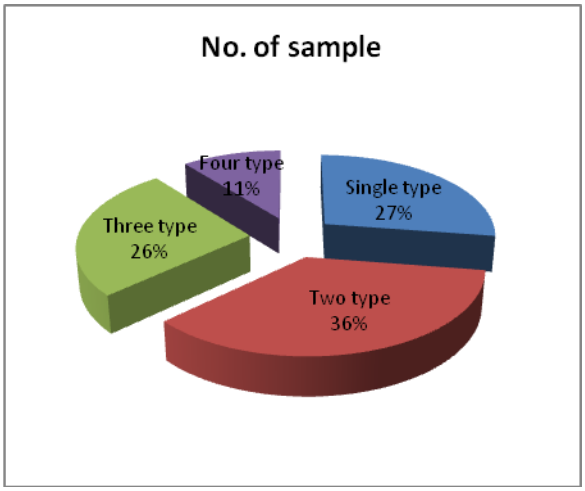

Figure 1: Pie diagram showing percentage of samples having different types of growth from hand swab culture (n=84).

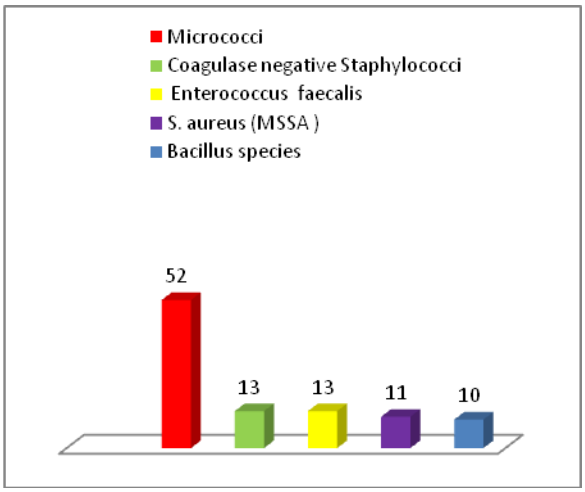

Figure 2: Bar diagram showing incidence of Gram positive organisms isolated from hand swabs of food handlers (total no. of organisms 185).

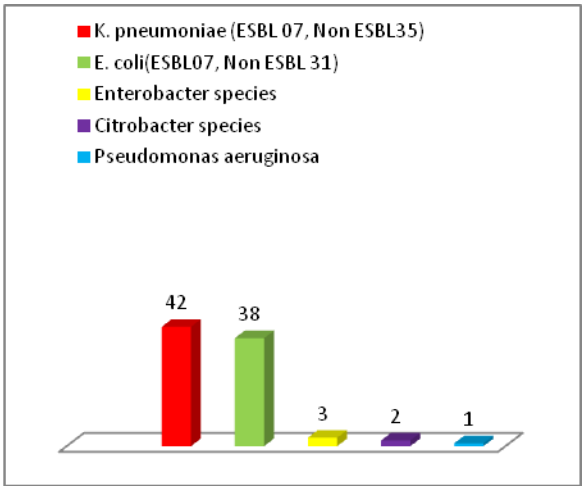

Figure 3: Bar diagram showing incidence of Gram negative organisms isolated from hand swabs of food handlers (total no. of organisms 185).

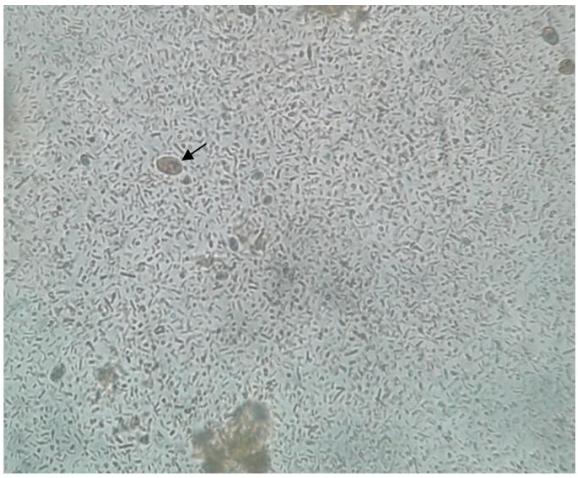

Photo 1: cyst of Giardia lamblia.

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 Micrococci 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.

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REFERENCES

1. Saeed HA, Hamid HH. Bacteriological and parasitological assessment of food handlers in the Odurman area of Sudan. J Microbiol Immunol Infect 2010;43:70-3.

2. Andargie G, Kassu A, Moges F, Tiruneh M, Huruy K. Prevalence of bacteria and intestinal parasites among food-handlers in Gondar town, northwest Ethiopia. J Health Popul Nutr 2008;26:451-5.
3. Mohan U, Mohan V, Raj K. A Study of Carrier State of S. typhi, Intestinal Parasites & Personal Hygiene amongst Food Handlers in Amritsar City. Indian Journal of Community Medicine. 2006;31:60–1.
4. Malhotra R, Lal P, Prakash SK, Daga MK, Kishore J. Study of hand hygiene and enteroparasite infestation among food handlers working in a medical college of North India. Indian J Pathol Microbiol. 2006;49:296–301.
5. Esparar Donato G, Vicente Y. Belizario, Janus Rowlan D. Relos. Prevalence of Intestinal Parasitic Infections among Food Handlers of a Tertiary Hospital in Manila using Direct Fecal Smear and Formalin Ether Concentration Technique. *Phil J Microbiol Infect Dis.* 2004;33:99–103
6. Parikh UN, Murti P. Salmonella carriers in food handlers in Bombay. *Ind J Pub Health*. 1987;31:217–20
7. Zain MM, Naing NN. Sociodemographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: A preliminary report. *Southeast Asian J Trop Med Public Health*. 2002;33:410–7.
8. Khurana S, Aggarwal A, Malla N. Comparative analysis of intestinal parasitic infections in slum, rural and urban populations in and around union Territory, Chandigarh. J Commun Dis. 2005;37:239–43
9. Collee JG, Miles RS, Watt B. Tests for the identification of bacteria. In: Collee JG, Marmion BP, Fraser AG, Simmons A, editors. Mackie and Mc Cartney Practical Medical Microbiology. 14th ed. Edinburg: Churchill Livingstone; 1996 p. 131-50.
10. Clinical Laboratory Standards Institute. Performance standards for antimicrobial disk susceptibility tests. Approved standarad M2-A7, 11th ed. Wayne PA: USA; 2007.
11. Garcia LS. Diagnostic medical Parasitology 5th edition, ASM Press Washington DC. 2007
12. World Health Organization. Manual for laboratory investigation of acute enteric infection,programme for control of diarrhoeal diseases. WHO CDD/83.3 Geneva,198
13. Khurana S, Taneja N, Thapar R,Sharma M, Malla N. Intestinal bacterial and parasitic infections among foodhandlers in a tertiary care hospital of North India.Tropical gastroenterology 2008.29;4: 207-209.
14. Abera B, Biadegelgen F, Bezabih B. Prevalence of Salmonella typhi and intestinal parasites among food handlers in Bahir Dar Town, Northwest Ethiopia. Ethiop J Health Dev 2010;24:46-50.
15. Zeru K, Kumie A. Sanitary conditions of food establishments in Mekelle town, Tigray, north Ethiopia EthiopJHealthDev2007;21:3-11.
16. Yazici V, Siriken F, Ertabaklar H, Ertuð S. Investigation of intestinal parasites in food workers in hospitals in Aydin, Turkey. Turkiye Parazitol Derg. 2007;31:136–8.
17. Chitnis UKB, Ganguli SK, Taneja RN, Ganguly SS. Evaluation of health status of workers of eating establishments in Pune Cantonment.

Medical Journal Armed Force India. 1986;42:39–42
18. Lourenço AE, Uchoa CM, Bastos OM. Hospital food handlers in Niterói, RJ, Brazil: intestinal parasitism. *Arch Latinoam Nutr*. 2004;54:395–401.

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