Research Article

Medical examination of food handlers: A missing link in food safety

Rajeev Kumar[1], Puja Dudeja[1], Anita Maurya[1], Dhananjay Kumar Singh[2]

[1]Department of Community Medicine, Armed Forces Medical College, Pune, Maharashtra, India, [2]Department of Community Medicine, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India

Correspondence to: Puja Dudeja, E-mail: puja_dudeja@yahoo.com

Received: June 03, 2019; **Accepted:** June 21, 2019

ABSTRACT

Background: Unhealthy food handlers have been implicated in occurrence of various foodborne illnesses (FBIs). The benefits acquired by routine medical examination of food handlers are as a strong preventive tool in hands of public health experts in reducing the episodes of FBI. Medical examination of handlers is complementary toward the World Health Day theme of the WHO 2015 "food safety" and Swachh Bharat Abhiyan. **Objective:** The objective of this study was as follows: (i) To study the sociodemographic profile of the food handlers working in food establishment of tertiary care hospital and (ii) to estimate the parasite load among food handlers working in food establishments of a tertiary care hospital. **Materials and Methods:** It was a cross-sectional study carried over a period of 3 months. Sampling method employed was Simple Random Sampling. The total number of subjects was 86. The Institutional Ethics Committee approval was obtained. They were interviewed face to face using a semi-structured questionnaire and were assessed clinically for personal hygiene and head-to-toe examination. Stool examination was done for all using simple floatation technique. **Results:** Mean age of food handlers was 29 ± 2 years. Two-thirds (75%) of food handlers were educated <12th standard. Majority (61%) of them had up to 5 years of experience. The overall personal hygiene of subjects was good except for long hair. At the time of study, 59% had symptoms of infectious disease and had not reported. They had not received typhoid vaccination. The prevalence of Ascariasis, Giardia, and Taenia was 22.5%, 2.5%, and 2.5%, respectively. **Conclusion:** The overall health and personal hygiene of food handlers was good. However, the prevalence of enteropathogenic infections was high. Hence, periodic medical examination of food handlers should be taken seriously.

KEY WORDS: Food Safety; Food Handlers; Medical Examination

INTRODUCTION

Food is the basic human need for survival; necessary for growth and maintenance of life. The health of people depends largely on the food they eat. Food can be responsible for ill-health either due to failure to consume enough of nutrients or consuming contaminated food.[1] The extrinsic contamination of food may occur at any point in its journey from the producer to the consumer. Food handlers are vital link in this journey. Health of food handlers is vital for maintaining hygienic quality of food. Unhealthy food handlers have been implicated in occurrence of various foodborne illnesses (FBIs). Inadequate knowledge of their personal health and hygiene coupled with faulty food handling practices lead to transmission of diseases. The chances of food being contaminated depend largely on the health status of food handlers, their hygiene status, and safe food handling practices. Food handlers can transmit a variety of diseases. This has been most famously demonstrated by the notorious case of "Typhoid Mary," a food handler who was also a chronic carrier of typhoid. She is about 1300 cases of typhoid fever in the USA. The remarkable such episodes of FBI through food handlers highlighted the role of medical examination of these workers as a logical

Access this article online	
Website: http://www.ijmsph.com	Quick Response code
DOI: 10.5455/ijmsph.2019.0616621062019	

step forward in ensuring food safety.[2] Personal hygiene and environmental sanitation are key factors in the transmission of foodborne pathogens. FBIs are caused by eating or drinking contaminated food or beverage.[3] These are the leading cause of illness and death in developing countries.[4] Apart from this contamination of food products with fecal matter has been the potential source of life-threatening FBI in many parts of the world.[5,6] The benefits acquired by routine medical examination are as a strong preventive tool in hands of public health experts in reducing the episodes of FBI. In India, intestinal infection is a huge public health problem with several studies showing a prevalence of 1.45–41.1% among food handlers. It is recommended that ideally, the personnel found positive for enteric pathogens should avail leave on medical grounds until a repeat sample after appropriate medication is negative. In addition, food handlers should submit feces during episodes of diarrhea to rule out infectious causes and take appropriate precautions if found positive. Majority of these food handlers who are carriers of enteropathogens are asymptomatic.[7] Transmission of pathogens from food handlers to the food they handle is implicated in nearly 20% of outbreaks FBI.[8,9] However, workers who have been implicated in such outbreaks are generally not aware of their infections, either because they have been in asymptomatic phase before symptoms began or because they were asymptomatic carriers. It is, therefore, important to have a system in place, where food handlers need to be encouraged to report any illnesses and thus refrain from food preparation to prevent further spread.

There is an urgent need to create awareness among food handlers about various measures along with their food business operators to maintain food hygiene and ensuring their good health through pre-placement and regular medical examinations. Mishandling of food by food handlers along with disregard to hygienic measures enable pathogens to come into contact with food and, in some cases, to survive and multiply in sufficient numbers to cause illness in consumers. The health of the food handlers is of great importance for maintaining the quality of food prepared and served by them. Medical examination of handlers is complementary toward the World Health Day theme of the WHO 2015 "food safety" and Swachh Bharat Abhiyan.

Objectives

The objectives of this study were as follows:

1. To study the sociodemographic profile of the food handlers working in food establishment of tertiary care hospital
2. To estimate the parasite load among food handlers working in food establishments of a tertiary care hospital.

MATERIALS AND METHODS

The present study was carried out in the food establishments situated in campus of medical college in District Pune, Maharashtra, India. The total study period of the present study was about 3 months (August 2015–October 2015). The study population consisted of food handlers working in small- and medium-sized food establishments. Sampling method employed was simple random sampling. The institutional ethical clearance was obtained from college ethical committee. Consent was taken from the study subjects before initiating the interview. Confidentiality of the information was assured. Food handlers were interviewed face to face using a semi-structured questionnaire. They were assessed clinically for personal hygiene and head-to-toe examination done. Stool examination was done for all. Simple floatation technique was used for stool examination: A sterile container was taken, in which 1-g feces and few drops of saturated salt solution were added, after stirring more saturated salt solution added until the container is nearly full. Stirring was done again and convex meniscus was developed. After 30 min, slide was prepared on the convex surface and examined under microscope.

The food handler was defined as any person who is involved in cooking or in the process of serving food.

Inclusion Criteria

Food handlers who were working for more than 3 months in their food establishments and those giving consent for the study were included in the study.

Exclusion Criteria

1. The owners/receptionists were not included as they were not handling the food
2. Food handlers who were working for <3 months, not giving consent or not available for interview.

A total of 86 food handlers were working in different food establishment and fulfilled the inclusion criteria.

Sample Size Calculation

This study includes 86 food handlers registered for cooking and food handling purposes in entire hospital. Literature review revealed that the prevalence of various parasite infections among food handlers was at minimally to be 1.4%. We calculated sample size taking expected frequency of 1.4%, acceptable error of margin 1%, and 99.99% of confidence interval. The calculated sample size based on these parameters came out to be 83 cases.

Sample size was calculated using STATCALC Epi info version 7.2.2.6.

$$\text{Sample size} = Z^2 (p)(1-p)/d^2$$

Z=Z value

p=(estimated) proportion of the population which has the attribute in question
d=desired level of precision (i.e., the margin of error).

All the food handlers were included in the study and total sample size taken was 86. The selected establishments were visited during the non-working hours of the subjects for the purpose of obtaining data. The purpose of the study was explained to each of them and their informed consent was taken before administering the questionnaire-based interview in vernacular language. The questionnaire contained sections on sociodemographic information, personal hygiene, and current and past 6 months of health status. Head-to-toe examination was designed for the evaluation of personal hygiene of food handlers. All the study participants were given health education and handouts regarding the "DO's and Don'ts for Food Safety" after the data collection was over. All food handlers found positive on stool test were treated and followed up with repeat stool sample.

RESULTS

Mean age of food handlers was 29 ± 2 years. Two-thirds (75%) of food handlers were educated <12th standard. Majority (61%) of them had up to 5 years of experience. One-fifth (20%) of subjects were new in job (<1 year experience). Nearly 20% had more than 5 years of experience [Table 1]. Vaccination of subjects was far from satisfactory and majority had not received typhoid vaccination [Table 2].

The prevalence of Ascariasis, Giardia, and Taenia was 22.5%, 2.5%, and 2.5%, respectively. The overall personal hygiene of subjects was good except for long hair. At the time of study, 59% had symptoms of infectious disease and had not reported to the food business operator. Seven of them had suffered from an infectious disease tuberculosis/typhoid/jaundice) in the past 1 year but were asymptomatic now. Head-to-toe examination revealed minor ailments in 5% of subjects [Table 3]

On detailed examination,12% were found anemic and 3.6% having rash [Table 4]. Majority (60%) were wearing clean clothes and footwear at the time of study.

Table 1: Sociodemographic profile of food handlers

Parameters	Total (*n*=86)	Percentage
Age (years)		
15–40	72	83.8
41–60	13	15.1
>60	1	1.1
Education		
Illiterate	12	13.9
Up to 10th std.	64	74.4
Up to 12th std.	8	9.3
Graduate	2	2.3
Nature of work		
Cooking only	20	23.2
Services only	52	60.4
Dishwasher	9	10.4
Storekeeper	3	3.4
Others	2	2.3
Work experience		
3–6 months	0	0
6 months–1 year	17	19.7
1–5 years	33	38.3
>5–10 years	14	16.2
>10 years	22	25.5

Table 2: Vaccination status of food handlers

Vaccination	Yes (%)	No (%)	Do not know (%)
Tetanus	36	58.2	5.8
Hepatitis B	2.3	86.1	11.6
Typhoid	0.0	88.4	11.6

Table 3: Head-to-toe examination of food handlers

Parameters	Satisfactory (%)	Unsatisfactory (%)
Hair	73.2	26.8
Eye	88.6	11.4
Nose	97.6	2.4
Throat	95.4	4.6
Cervical lymph node enlargement	95.4	4.6
Rash	96.4	3.6
Ears	43.1	56.9
Hands	66.4	33.6
Nails	95.3	4.7

DISCUSSION

Food handlers can act as both cases and carriers and cause food safety hazard if undetected and untreated. There is limited research related to food safety, hygiene, and health of food handlers and food handling practices in food businesses and the issue needs to be addressed. The sociodemographic profile of the study subjects had a lot of variation. Maximum number of study subjects (83.8%) belonged to the age group of 15–40 years. Most of the study subjects (74.4%) were educated up to the 10th standard. As per the nature of work, maximum food handlers (60.4%) belonged to service category followed by cooking only (23.2%). Approximately 40% of food handlers had 1–5 years of work experience followed by 25% of food handlers who had work experience more than 10 years. Vaccination status was not satisfactory among food handlers. Only 36% of food handlers were vaccinated for tetanus toxoid and 2.3% for hepatitis B. The overall personal hygiene of food handlers was satisfactory. The prevalence of

Table 4: Signs and symptoms on head-to-toe examination of food handlers

Signs/symptoms	No (%)	Yes (%)
Rash	96.40	03.60
Pallor	89.68	10.32

Ascariasis, Giardia, and Taenia was 22.5%, 2.5%, and 2.5%, respectively. On detailed examination, it was found that 12% of food handlers were anemic and 3.6% had rash.

Ehiri and Morris have pointed out in their data on risk factors for foodborne diseases that most outbreaks result from improper food handling practices. Another study by Howes *et al*. in the USA suggested that improper food handling practices contributed to approximately 97% of FBI in food service establishments and homes.[10] The food handlers play a key role in the spread of foodborne disease. Besides, a good level of education and knowledge in food handling and cooking practices, it is essential that food handlers follow good practices and maintain a good level of personal hygiene for food safety. With changing society in modern times where an increasing number of people go and consume food outside home prepared and served by food handlers, it has become imperative to evaluate the health status of food handlers to prevent spread of FBI.

In the present study, it is evident that the young males from 15 to 40 years of age formed the largest group of food handlers (82.5%). A similar study in Bangkok indicated that majority of the food handlers were in the age group of 31-45 years. The study of food handlers by Musa and Akande showed that 98% of the food vendors were women;[11] however, the present study had 100% of subjects as males. This indicates that in India, food handling in public eating places is predominantly an occupation of the males in contrast to home where cooking and serving are the sole responsibility of the lady of the house. Nearly all 83 (96.5%) were migrants staying away from their families and could not visit their families very often. This made all of them prone to high-risk sexual behavior and vulnerable for the various sexually transmitted diseases also. The respondents fared poor on the level of education and were school dropouts. Majority (74.4%) of food handlers had education level of $\leq 10^{th}$ standard. It is obvious that lack or paucity of education made them unaware of food safety guidelines. Consequently, they could be perceived to be a potential risk to food safety due to their low educational background and, hence, may have little or no understanding of the risks of microbial or chemical contamination of food or how to avoid them. Besides, none of respondent had received training in food safety-related course, implying that they were not aware of the practices to be followed during the processing of food. Out of all the respondents, half (50%) of them worked either in serving and one-fourth (23%) were involved in cooking before the present employment. This indicates that there is always a possibility that as per the needs, the work position of a person in this profession could be changed. Hence, while training, one has to train all food handlers regarding the food safety measures. Most of the respondents (38%) were well experienced with 1–5 years' experience. A study conducted in Turkey by Bas *et al*. shows that 36% of food handlers had experience in the range of 1–5 years, thus showing similar findings.[12] The experience of the individual though quite good would not be meaningful unless they have good knowledge of food handling. The negligent practices of the food handlers would continue unless they are given some form of training in food handling. Similarly, old habits die hard. Hence, if one wants to change the situation, hands-on training for new recruits regarding food safety would prove to be useful.

Most (80%) of the food handlers surveyed had undergone of medical examination after joining, but there was no pre-placement examination. The remaining (20%) had not ever got examined and were missed out due to casual attitude of food business operators. The study by Zain and Naing, in Malaysia, showed that 61.9% of food handlers had undergone routine medical examinations.[13] Another study by Musa and Akande showed that 76.2% of respondents had medical examination done before commencing food-vending activities.[11]

The personal hygiene of the food handlers is a major factor that can directly contribute to FBI. Murat *et al*. showed that knowledge of personal hygiene scores was poor (31.8%) and observed that good personal hygiene was often practiced among the highly educated workers only (77.7%).[13]

The present study showed that a majority of the food handlers had acceptable levels of personal hygiene. However, one-fourth of them (27%) were having long untidy hair and were not wearing cap too. Nearly half (40%) were wearing dirty and unclean clothes and 43% had dirty and unclean footwears. The poor hygiene can be attributed to their poor educational level and lack of training and lackadaisical attitude of their seniors. Around 2% of the food handlers had fungal infection in nails and another 2% had uncut and dirty nails. More than one-third (35%) were wearing band/watch/bracelets/rings and 32% had abrasion and boil in their hand. This can compromise food safety practices. About 17% (17%) were suffering from cold and cough and 3.4% had diarrhea at the time of study. In India, the regulations for sick leave are also not followed, and hence, the food handlers avoid taking a leave from work during sickness. The study in Delhi indicated that most of the participants (94.7%) had one or more morbid conditions, important ones being dental caries (50.3%), worm infestation (41.1%), and injuries/burns on hands (39.7%).[14] The health-seeking behavior, immunization status in relation to enteric group of fevers and tetanus, and pre-placement and in-service medical examination were observed to be unsatisfactory in the study. Another study from Amritsar indicated that 62% of participants showed evidence of some disease or deficiency

while 14% of them had intestinal parasitic infestations.[15] Immunization with typhoid vaccine was found to be worse in the present study as similar to the study conducted in Maharashtra, India, as compared to that in Malaysia.[13,16]

The prevalence of Ascariasis, Giardia, and Taenia was 22.5%, 2.5%, and 2.5%, respectively, in the present study. Intestinal infections among the food handlers were similar to that documented by Mohan *et al*. in their study and lower than other studies.[11] Udigiri *et al*. reported the prevalence of parasitic infestation of 9.7% in 225 stool samples examined.[17] Majority of the studies on health status of food handlers document the fact that the medical examination of food handlers should be taken seriously by the administrative authorities or seniors, especially at places where mass feeding is taking place. This will act as an effective tool in prevention of outbreaks of foodborne infections.

Limitations

The present study was subjected to the following limitations. The study was non-blinded. The sample size of the study was small due to constraint of time and resources. This study did not assess the parasite carriage of the fingernail contents and parasite intensity due to logistic reasons.

CONCLUSION

The overall health and personal hygiene of food handlers was good. However, the prevalence of enteropathogenic infections was high. Since most of the intestinal parasites are transmitted by the feco-oral route, food handlers could be an important source of infection to the general population. Therefore, constant epidemiological surveillance through biannual routine parasitological tests and treatment of the infected cases along with the improvement of personal hygiene and environmental sanitation is recommended to control the parasitic infection in food handlers. Periodic medical examination of food handlers should be taken seriously by the employers.

REFERENCES

1. Prabhu PM, Shah RS. A study of food handlers in public food establishments in Maharashtra, India. Int J Sci Res 2014;3:1485-9.
2. Craster CV, Harris L. The medical examination of food handlers. Am J Pubilc Health 1922; 43:196-200.
3. World Health Organization. Foodborne Disease Outbreaks: Guidelines for Investigation and Control. World Health Organization; 2008. Available from: http://www. who. int/foodsafety/publications/foodborne_disease/outbreak_ guidelines. pdf. [Last accessed on 2012 Mar 12].
4. Mohammed FA. The incidence of *Enterobacteriaceae* causing food poisoning in some meat products. Adv J Food Sci Technol 2011;3:116-21.
5. Centres for Disease Control and Prevention, Outbreak Investigation, Atlanta, USA; 2012. Available from: http:// www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/ index.html. [Last accessed on 2012 Mar 19].
6. Food and Drug Administration. The Bad Bug Book. Foodborne Pathogenic Microorganisms and Natural Toxins Handbook. 2nd ed. Washington, D.C: Food and Drug Administration; 2000.
7. Biswal M, Khurana S, Taneja N, Kaur T, Samanta P, Malla N, *et al*. Is routine medical examination of food handlers enough to ensure food safety in hospitals? J Commun Dis 2012;44:139-44.
8. Todd EC, Greig JD, Bartleson CA, Michaels BS. Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 4. Infective doses and pathogen carriage. J Food Prot 2008;71:2339-73.
9. Nyenje ME, Odjadjare CE, Tanih NF, Green E, Ndip RN. Foodborne pathogens recovered from ready-to-eat foods from roadside cafeterias and retail outlets in Alice, Eastern Cape province, South Africa: Public health implications. Int J Environ Res Public Health 2012;9:2608-19.
10. Howes M, McEwen S, Griffith M, Harris L. Food handler certification by home study: Measuring changes in knowledge and behavior. Dairy Food Environ Sanit 1996;16:737-44.
11. Musa OI, Akande TM. Food hygiene practices of food vendors in secondary schools in Ilorin. Niger Postgrad Med J 2003;10:192-6.
12. Bas M, Ersun AS, Kıvanc GK. The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. Food Control 2006;17:317-22.
13. 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.
14. Malhotra R, Lal P, Prakash SK, Daga MK, Kishore J. Profile of food handlers working in food service establishments located within the premises of a medical college in Delhi, India. Public Health 2007;121:455-61.
15. Mohan V, Mohan U, Dass L, Lal M. An evaluation of health status of food handlers of eating establishments in various educational and health institutions in Amritsar City. Indian J Community Med 2001;26:80-5.
16. Bobhate PS, Shrivastava SR, Gupta P. Profile of catering staff at a tertiary care hospital in Mumbai. Australas Med J 2011;4:148-54.
17. Udgiri R, Yadavnnavar MC. Knowledge and food hygiene practices among food handlers employed in food establishments of Bijapur city. Indian J Public Health 2006;50:240-1.

How to cite this article: Kumar R, Dudeja P, Maurya A, Singh DK. Medical examination of food handlers: A missing link in food safety. Int J Med Sci Public Health 2019;8(9):728-732.

Source of Support: Nil, **Conflict of Interest:** None declared.