

Enteric Pathogen Profile and Knowledge, Attitude and Behavior about Food Hygiene among Food Handlers in a Tertiary Health Care Center

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ABSTRACT

Introduction: The highest estimated cause of death in South East Asian Region (SEAR) attributes to diarrheal diseases (Global Food Infection Network, 2011). According to the CDC, 20 to 40% of foods borne illness associated with the consumption of contaminated food were from catering establishments. The purpose of the study was to assess the enteric pathogen profile and knowledge, attitude and behaviour regarding food hygiene among food handlers in our tertiary care center. **Methods:** Food handlers ($n=123$) were included in the study (June 2013- July 2014) by non-random sampling after obtaining consent. Standardized WHO Five Keys for Safer Food questionnaire was used to assess the knowledge, attitude and behaviour on food hygiene among the food handlers. Stool specimens were collected for saline-iodine wet mount examination for microscopic examination of parasite ova and cysts, culture for bacterial enteropathogens and multiplex PCR for detection of *Entamoeba histolytica*. **Results:** The prevalence of stool pathogens in the hospital kitchen staff was 3.24%. The parasites detected were *Entamoeba histolytica* (1), *Giardia intestinalis* (2) and *Blastocystis hominis* (1) and the bacterium isolated was *Campylobacter jejuni* (1). Moderate level of knowledge (76.4%), favorable attitude (87%) and satisfactory self reported behaviour (92.7%) regarding food hygiene was observed. A significant positive correlation existed between attitude and self-reported behavior of food handlers ($p<0.05$). **Conclusion:** An overall prevalence of 5.12% of enteric pathogens was identified among the food handlers of JIPMER. Positive correlation between attitude and self-reported behaviour regarding food hygiene was observed among food handlers. Food hygiene behaviour was influenced by the work experience of the food handler.

Key words: Enteropathogen, Knowledge, Attitude, Behavior, Food-hygiene.

INTRODUCTION

Food borne diseases are the common cause of diseases, disability and death worldwide. According to Centre for Disease Control (CDC, U.S.A., 2011) estimates, each year around 1 in 6 Americans (or 48 million people) become sick, of which 128,000 are hospitalized and 3,000 die of Food Borne Diseases (FBD).¹ Diarrhea is the most common symptom of food borne illness. The highest estimated cause of death in South East Asian region attributes to diarrheal diseases, i.e., 1181 in 1 lakh deaths (Global Food Infection Network, 2011).² Approximately 70% of diarrheal diseases are food-borne in origin. It is estimated that 30% of the population suffer from food borne illness each year in industrialized countries (W.H.O., 2011). In India, 18.6 million children below the age of five suffers from food borne illness (Indian Veterinary Research Institute, 2010).³ According to CDC reports, approximately 20 to 40% of foods borne illnesses are associated with the consumption of contaminated food from various catering establishments. National Disease Surveillance Centre (NDSC; Ireland), suggested 37% food borne

outbreaks were associated with catering in commercial premises, 19% with educational facilities and 17% with health care settings.⁴ Poor personal hygiene of food handlers could be potential risk for infections by many intestinal helminthes, protozoa and enter pathogenic bacteria. Transmission of pathogens from food handling personnel to consumer can be prevented through good hygiene, both personal and in food handling practices. At present, the reporting and surveillance of food-borne diseases has been grossly neglected in developing countries. So, there exist an urgency in determining the magnitude of the problem, interactions of prevailing food safety beliefs on knowledge and practices among food handlers, with an ultimate aim of setting high degree of personal cleanliness standards and good sanitation practices to prevent food contamination to public. Therefore, the present study was undertaken to assess the enteric pathogen profile of food handlers in our hospital campus and their knowledge, attitude and behaviors on food hygiene.

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MATERIALS AND METHODS

The cross-sectional descriptive study was conducted during the period of July 2013 – June 2014 (1 year), in our tertiary health care center with an out-patient strength of more than 5700 daily and 70000 patients gets admitted annually. The inpatient departments have 2114 beds distributed among various medical, surgical, women and child health, oncology and other super specialties. The estimated number of beneficiaries from all the food establishments incorporating the patients, students and employees were 2754 at the time of the study. A total of 123 food handlers were employed and distributed in a hospital kitchen, 5 hostel messes and 5 hospital canteens. The study was designed in compliance with the Helsinki declaration and the Institute's human ethics committee approved the study. Written consent was obtained from the participants, prior to data and sample collection. The criteria used for selection of study participants were

Inclusion Criteria

Food handlers who were in the age group between 18-60 years and both sex.

Food handlers who can speak and understand Tamil language (Indigenous language)

All 123 food handlers fulfilled the inclusion criteria and were included in assessing the knowledge, attitude and behavior towards food hygiene. However, the enteric pathogen profile was assessed for 117 samples since six refused to provide stool specimens.

A three part questionnaire was used

Part I consisted of a background proforma of food handlers, with demographic and clinical variables of food handlers. It comprises of 10 items, which included type of job and kind of food establishment, age, sex, education, years of experience, sources of information on food hygiene, history of gastro-intestinal illness in the last 3 months and deworming status of the past one year.

Part II contained the enteric pathogen profile with details of individual food handler such as name, type of food establishment, date and time of specimen collection. Stool specimens were collected in Cary-Blair transport medium and submitted to the microbiology laboratory for stool microscopy of intestinal parasites and culture of four intestinal pathogenic bacteria (*Salmonella*, *Shigella*, *Campylobacter jejuni* and *Vibrio cholerae*) Part III was the standardized (W.H.O., 2007) Five keys for safer foods tool to assess and score the knowledge, attitude and behaviour on food hygiene among food handlers.⁵ Five keys for safer food included the five aspects of keeping food and food handlers clean, separation of raw and cooked food, thorough cooking, storage food at safe temperatures and use of safe water and raw materials.

Knowledge section of the questionnaire was used to assess the food handlers' knowledge on food hygiene. It comprises of 11 items with yes or no options.

Attitude part of the five keys for safer food consisted of 10 likert type items scaled as a Agree(2), Not sure(1) and Disagree(0).

Behaviour section of questionnaire consisted of 10 self-reported behaviours on food hygiene with a five point scale. The response items were scaled as always (4), most times (3), sometimes (2), not often (1) and never (0).

Scoring Procedures

Regarding the knowledge questionnaire on food hygiene, the total possible score was 11. A score of '1' mark was given for right answer and '0' for the wrong answer. For the purpose of interpretation, the investiga-

tor had classified knowledge, attitude and self reported behaviour scores into three categories based on their percentages such as $\leq 50\%$, 51-75% and $>75\%$.

The obtained scores were categorized as follows:

Poor knowledge	-	A score from 0 to 5 ($\leq 50\%$)
Moderate knowledge-		A score from 6 to 8 (51-75%)
Good knowledge	-	A score from 9 to 11 ($>75\%$)

With regard to the attitude related to food hygiene, questions were assessed by a 3 point likert scale. The maximum possible score was 20. The likert response items were scaled as 2, 1 and 0.

The scores were ranged as follows:

Unfavourable attitude	-	A score from 0 to 10 ($\leq 50\%$)
Moderately favourable attitude	-	A score from 11 to 15 (51-75%)
Favourable attitude	-	A score from 16 to 20 ($>75\%$)

With regard to self-reported behaviour on food hygiene, the questions were assessed through a 5 point rating scale. The maximum score was 40. The scores for the questions ranged from 0 to

The obtained scores were classified as follows:

Unsatisfactory behaviour	-	A score from 0 to 20 ($\leq 50\%$)
Moderately satisfactory behaviour	-	A score from 14 to 30 (51-75%)
Satisfactory behaviour	-	A score from 31 to 40 ($>75\%$)

The validity of the demographic proforma was obtained from four experts. The instrument was translated into Tamil language and back translation was done. The validity of the Tamil translated tool was evaluated by the experts for content validity. Reliability for knowledge and behavior established through test-retest method on 17 samples with scores 0.78 and 0.82 respectively. A positive correlation of 0.76 was obtained through split half method for the 10 attitude statements.

Statistical analysis

Descriptive (Frequency, percentage, mean, standard deviation and Karl-Pearson's correlation co-efficient) and inferential statistics (Independent 't' test and ANOVA) were used in the study. Descriptive statistics included the distribution profile of enteric pathogens and demographic data were expressed as frequencies and percentages and the data on knowledge, attitude and behavior on food hygiene were expressed as mean with standard deviation. The independent student 't' test or analysis of variance was used to find out the association between knowledge, attitude and behavior and background variables. Correlation analysis was carried out to identify the linear relationship among knowledge, attitude and behavior of food handlers using Karl Pearson's correlation co-efficient. Data analysis was performed in SPSS version 19. All statistical analysis was carried at 5% level of significance.

RESULTS

All 123 food handlers fulfilled the inclusion criteria and were included in assessing the knowledge, attitude and behavior towards food hygiene. However, the enteric pathogen profile was assessed for 117 samples since six refused to provide stool specimens. The frequency and percentage distribution of the background variables of the food handlers are shown in Table 1. Four stool specimens were positive for intestinal parasites (2- *Giardia intestinalis*, 1- *Entamoeba histolytica*, 1- *Blastocystis hominis*) (Figure 1 and 2) *Campylobacter jejuni* was isolated from stool samples of 2 food handlers. Thus the prevalence of enteric pathogens among the food handlers was 5.12 %.

Based on the standardized WHO tool, the following were the observations. 76.4% of the food handlers had moderate level of knowledge regarding food hygiene and 17.1% of them had poor knowledge (less than

50%) (Table 2). 20.2% food handlers were unaware that wiping cloths can spread micro-organisms; 26.6% agreed with the statement "same cutting board can be used for raw and cooked foods provided it looks clean" and only 4% unaware that 'raw food need to be stored separately'. 73.4% responded that cooked foods need to be thoroughly reheated and proper cooking of meat required temperature more than 40°C. 73.4% of food handlers responded that cooked food need not to be left at room temperature overnight to cool before refrigerating' and 84.7% agreed that cooked food should be kept very hot before serving. Only 20.2% were unaware that refrigeration of food can slow down bacterial growth. 81.5% responded that safe water cannot be identified by its appearance and a greater majority (96.8%) of the food handlers responded that the fruits and vegetables are to be washed in safe water. 87% of the food handlers had favorable attitude towards food hygiene and 12.2% of them had moderately favorable attitude (Table 2). 92.7% agreed with the statement "keeping kitchen surfaces clean reduces the risk for illness" and 1.6% stated keeping raw and cooked food separate will not prevent illness. 20.2% of food handlers were not sure about use of thermometer to ensure thorough cooking of meat. Only very few (2.4%) agreed with the statement "soups and stews should not always be boiled to ensure safety". Minority (16.1%) of food handlers stated that it is safe to leave cooked food out of fridge for more than 2 hr. 94.3% agreed that inspecting food for freshness and wholesomeness was valuable. A large number (95.2%) of food handlers agreed that it is necessary to throw away the outdated foods. 92.7% had satisfactory behaviors towards food hygiene and none of them had unsatisfactory behaviors (Table 2). 78.2% of them expressed that they washed their hands always and 80.6% expressed that they clean surfaces and equipment used for food. 88.7% of them expressed that they always separated raw and cooked food during storage. Most of food handlers (85.5%) checked for clear juices to ensure meat cooked thoroughly and 2.4% had never done that. Few (4%) had not reheated cooked food until it is piping hot whereas 84.7% had always done it. Considering the storing of left over in a cool place within 2 hr of serving: 81.4% performed it always but 5.6 % had never done that. Only a minority (7.3%) of them expressed that, they never threw away the food beyond expiry date. With regard to washing fruits and vegetables with safe water before eating them: 90% of them washed it always and 4.8% washed most time. The mean scores and the level of knowledge, attitude and behaviors of the food handlers obtained are shown in Table 2. There was no significant difference between the mean scores of knowledge and any of the selected background variables of the food handlers and no significant difference between the mean scores of attitude and any of the background variables of the food handlers. There was a significant difference between the mean scores of self-reported behaviors and the work experience of the food handlers (Table 1).

DISCUSSION

An overall prevalence of 5.12 % of enteric pathogens was identified among food handlers of JIPMER campus, which is much lower, compared to study findings by Bobhate *et al.* (26.3%) in Mumbai among hospital catering staff and Danchaivijithir *et al.* (40.8%) in Bangkok.^{6,7} Khurana *et al.* had identified that 8.75%, 16%, 16.75% and 6.75% of food handlers infected with enteric pathogens between 2003 and 2006 at PGIMER, Chandigarh.⁸ In accordance with the prevalence of enteric parasites, 2.5% is very low compared to study findings done in Bijapur by Udgiri (9.7%),⁹ in Amritsar by Mohan (14%),¹⁰ in Chandigarh by Khurana *et al.* (7%),⁸ in Thailand by Kausolsuk (10.3%),¹¹ in Turkey by Pavol (12.9%),¹² in Bangkok by Danchaivijithir (21.1%)⁷ and in Ethiopia (49.4%) by Nigusse *et al.*¹³

The proportion of food handlers affected with *Entamoeba histolytica* (0.8%) in present study was much less than the study findings by Udgiri

et al. (4.54%) at Bijapur,⁹ Kusolsuk *et al.* (10%) at Thailand,¹¹ Andargie *et al.* (1.6%)¹⁴ and Nigusse *et al.* (36.6%) at Ethiopia.¹³ The percentage of food handlers affected with *Giardia intestinalis* was 1.7 %. Study findings by Nigusse *et al.* (2012)¹³ at Mekelle University, Donkor *et al.* (2009)¹⁵ in Ghana and Idowu *et al.* (2006) in Nigeria¹⁶ revealed that the prevalence of *Giardia* were 11%, 1% and 13% respectively. The present study showed that only 1.7 % of food handlers were affected with enteropathogenic bacteria, much less than findings reported by Khurana *et al.* (13.3%)⁸ in 2002 from Chandigarh, Andargie *et al.* (3.1%)¹⁴ in Ethiopia and Danchaivijithir *et al.* (18.4%) at Bangkok.⁷ The lower prevalence of enteric pathogens may be due to better personal hygiene, frequent hand washing facilities, clean drinking water, toilet facilities, better wages for the food handlers and free medical services for the food handlers with in the hospital campus.

This study showed that, 76.4% of the food handlers had moderate level of knowledge regarding food hygiene and another 17.1% of them had poor knowledge and only 6.5% had good level of knowledge with an overall mean score of 6.61 (Maximum score-11; Table 2). These findings are consistent with those of Rahman *et al.*¹⁷ in 2001, with a mean knowledge score of 6.7 (Maximum score-9); further 41.6% of the food handlers had average level of knowledge, 20.5% had poor knowledge and 36.8% had good level of knowledge.

In our study, all the food handlers (100%) in the hospital campus were aware of the importance of hand washing. Manning *et al.* (1993) reported that 81% of food handlers in their study were aware of the importance of hand washing.¹⁸ In the present study, 20.2% of food handlers were unaware that kitchen wiping cloths can spread micro-organisms, nearly 72% of them expressed that cooked food need to be thoroughly reheated before serving, while 18.5% were unaware that safe water cannot be identified by its appearance. A very small portion of food handlers (3.2%) did not know fruits and vegetables had to be washed in safe water.

A majority of the food handlers (87%) had favorable attitude towards food hygiene and only 0.8% had unfavorable attitude, with mean score of 18.3 (Maximum score-20; Table 2). Contrary to this finding, a study by Rahman *et al.* revealed that only 19.1% had good attitude and 17.2% had unfavorable attitude towards food hygiene with a mean score of 38.4 (Maximum score-48).¹⁷ About 6.5% of food handlers didn't agree with the statement that, "Frequent hand washing during food preparation is worth the extra time" and 88.7% of them agreed that thawing food in a cool place is safer. Few knowledge statements like 'It is important to wash hands before handling food. 'Wash fruits and vegetables in safe water.' and attitude statements such as 'Inspecting food for freshness and wholesomeness is valuable.' 'It is important to throw away foods that have reached their expiry date.' must have lead food handlers to give socially desirable responses.

Nearly 93% food handlers had satisfactory behaviors regarding food hygiene whereas only 7.3% had moderately satisfactory behaviors with a mean score of 37.35 (Maximum score-40; Table 2). It is noteworthy that none of them had unsatisfactory behaviors. A study conducted at Sarawak reported that 10.8% food handlers exhibited satisfactory behaviors; most of them (71.5%) had moderately favorable behaviors whereas 16.9% demonstrated unsatisfactory behaviors regarding food hygiene with a mean score of 25.5 (Maximum - 30).¹⁷

All food handlers washed hands before food handling; 78.2% washed hands always, 19.4% most times and while 0.8% did not wash often. Regarding cleaning of surfaces and equipment's used for food preparations before reusing on other foods always performed by 80.6%; 16.1% most times and only few (2.4%) had done it sometimes. In our study, 88.7% of the food handlers always separated raw and cooked food during storage. The study finding replicates that of Donkor *et al.* among food vendors of Ghana (2009),¹⁵ who reported 57% of food handlers washed hands

Table 1: Frequency, percentage distribution of background variables and their association with knowledge, attitude and self-reported behavior of food handlers.

Sl. No.	Background Variables	N (%)	Knowledge		Attitude			Self-reported behavior			
			M (S.D)	t or F	p value	M (S.D)	t or F	p value	M (S.D)	t or F	p value
1.	Type of Food Establishments										
	Hospital kitchen(1)	37(30.1)	6.57(1.09)	1.86	0.14	18.95(1.81)	1.50	0.22	38.00(3.93)	2.27	0.09
	Canteen(4)	41(33.3)	6.29(1.6)			18.02(2.59)			37.39(3.15)		
	Hostel mess(5)	44(35.8)	6.91(1.27)			18.02(2.13)			36.95(3.91)		
	OPD Bunk	1(0.8)	8.00 (0)			18.00(2.23)			29.00 (0)		
2.	Type of job										
	Cook	46(37.1)	6.67(1.3)			18.28(2.48)			37.63(4.05)		
	Waiter	18(14.5)	6.61(1.34)			18.22(2.13)			37.00(4.10)		
	Helper	35(28.2)	6.63(1.48)			18.46(2.20)			37.54(3.21)		
	Multitask Workers	24(20.2)	6.46(1.38)	0.13	0.94	18.17(1.90)	0.09	0.94	36.79(3.72)	0.34	0.79
3.	Age of food handlers										
	16-40 years	67(54.5)	6.66(1.49)			18.06(2.35)			37.34(3.58)		
	40-58 years	56(45.5)	6.55(1.19)	0.18	0.94	18.59(2.04)	1.74	0.19	37.36(3.96)	0.00	0.98
4.	Gender										
	Male	80(65)	6.61(1.45)	0.01	0.98	18.19(2.40)	0.59	0.44	37.49(3.96)	0.56	0.58
	Female	43(35)	6.60(1.18)			18.51(1.86)			37.09(3.33)		
5.	Education Level										
	No formal education	10(8.1)	6.00(0.82)	1.06	0.37	19.20(1.14)	0.64	0.59	38.50(1.35)	0.36	0.78
	Primary school	17(13.8)	6.59(0.87)			18.29(2.44)			37.35(3.48)		
	Secondary school	82(66.7)	6.62(1.42)			18.24(2.15)			37.27(3.96)		
	Higher secondary and above	14(11.4)	7.00(1.71)			18.00(2.23)			37.00(4.04)		
6.	Work Experience										
	0-5 years	51(41.5)	6.63(1.33)	0.55	0.58	18.1(2.18)	0.72	0.49	37.57(3.16)	4.22	0.02*
	5-10 years	21(17.1)	6.86(1.82)			18.1(2.36)			35.29(4.87)		
	10-30 years	51(41.5)	6.49(1.73)			18.59(2.23)			37.98(3.52)		
7.	Source of knowledge acquired on food hygiene										
	Informal sources	57(46.3)	6.72(1.33)	0.66	0.52	18.11(2.17)	0.56	0.54	36.65(3.87)	2.04	0.13
	Formal Training	8(6.5)	6.88(2.17)			18.88(1.64)			38.63(1.92)		
	Experience	58(47.2)	6.47(1.26)			18.41(2.35)			37.86(3.71)		
8.	History of GI Symptoms (In past 3 months)										
	Yes	23(18.7)	6.57(1.08)	0.17	0.59	-	-	-	37.92(2.89)	0.80	0.43
	No	100(81.3)	6.62(1.42)			-			37.22(3.91)		
9.	De-worming (In past 1 year)										
	Yes	7(5.7)	6.29(0.48)	0.64	0.52	19.14(1.07)	0.64	0.30	-	-	-
	No	116(94.3)	6.63(1.39)			18.25(2.27)			-		

* - Significant p value (≤ 0.05)

before food preparation; 12% of them washed most times; while 31% did not wash often, 47% used clean surfaces for food preparation; 17% used them most times and 34% did not use them often and 27% always stored raw and cooked foods separately. Other researchers like, Nigusse *et al.* (2012)¹³ at Mekelle University found that, 72.9% of food handlers washed

hands before and after preparing food and 87.7% of them had stored raw and cooked food separately. A study conducted in Malaysia by Slow *et al.* (2011)¹⁹ revealed that, 60% of food handlers washed their hands before and after food handling. In the present study, it was found that 81.4% of food handlers always stored the left-over food in a cool place within 2 hr

of serving but 5.6 % of them had never done that. With regard to washing fruits and vegetables with safe water before eating them: majority (90%) of them washed it always and 4.8% washed most time.

The study showed that most of the food handlers had moderate knowledge, favorable attitude and satisfactory behaviors towards food hygiene with mean score (SD) of 6.61 (1.36), 18.3 (2.22) and 37.35 (3.74) respectively (Table 2). It may be because the food handlers were working in the institutional setting, with all basic hygiene facilities being provided, which is in agreement with a study performed in Solapur by Takalkar et al. (2011).²⁰ A study by Abdul et al. (2012)²¹ in Malaysia reported that the food handlers had excellent knowledge, attitude and favorable practices towards food hygiene with mean score (SD) of 83.98 (13.26), 82.8 (10.94) and 77.04 (14.98). According to Hines et al. (1987)²² both declarative (knowledge regarding issues) and procedural knowledge (knowledge regarding action strategies) are essential for behavior change. Food handlers with less declarative knowledge and more procedural knowledge could be a possible reason for the 17% poor knowledge observed, in contrast to their moderately satisfactory or satisfactory food hygiene behavior (Table 2).

There was a significant positive moderate correlation between attitude of food handlers and their self reported behaviors regarding food hygiene (Pearson's correlation coefficient, $r=0.48$; $p < 0.001$). Attitude, an important factor besides knowledge, ensures a downward trend of food borne illnesses. The correlation reveals that, attitude influenced the behavior through the cascades of intrinsic learning processes. This finding is consistent with that of Ko et al. (2011),²³ who found that there was a significant positive correlation existed between attitude and behavior ($r=0.636$; $p < 0.05$) among food handlers of Taipei.

The present study findings revealed that, there was no significant correlation between knowledge and attitude ($r=-0.15$; $p=0.09$). Ko et al. (2011) found a positive correlation between knowledge and attitude ($r=0.163$). The study also revealed that there was no significant correlation between knowledge and self reported behaviors ($r=-0.03$; $p=0.73$).²³

A study conducted by Park et al. found that food safety knowledge and practices showed negative correlation in the working environment ($r=-0.235$; $p < 0.05$), in which employees tended to evaluate their food safety practices as high regardless of their sanitation knowledge.²⁴ On the contrary, Rahman et al. Abdul et al. Ko et al. and Latif et al. found a positive correlation with food hygiene practice and knowledge of food safety ($p < 0.05$).^{17,21,23,25}

There was no significant association between knowledge and attitude of food handlers and background variables of food handlers. With regard to association between self-reported behaviors and background variables, the present study showed that there was a significant association between work experience of food handlers and their self reported food hygiene behaviors at $p < 0.05$ (Table 1). There was a significant difference on the mean self-reported behavior score between food handlers with 0-5 years and 5-10 years and 10-30 years. Isara et al. (2009) revealed that, food handlers who have been working for longer duration in the fast food restaurants had better food hygiene and safety practices ($p = 0.036$).²⁶ In contrast, Rahman et al. (2012) found that shorter duration of food vending years maintained better food safety practices in Malaysia.¹⁷

The present study supported the conceptual framework based on Rosentoch's health belief model. An individual with a higher perceived susceptibility, higher perceived severity, higher perceived benefits and lower perceived barriers to act favorably. Perceived threat of food borne epi-

Table 2: Distribution of level/range of knowledge, attitude and self-reported behavior and their mean scores among food handlers regarding food hygiene.

Knowledge		Parameter Attitude		Self-reported behavior	
Level of knowledge	N (%)	Range of attitude	N (%)	Range of self reported behaviour	N (%)
Poor knowledge ($\leq 50\%$)	21(17.1)	Unfavorable ($\leq 50\%$)	1(0.8)	Unsatisfactory ($\leq 50\%$)	0(0)
Moderate knowledge (51-75%)	94(76.4)	Moderately favorable (51-75%)	15(12.2)	Unsatisfactory ($\leq 50\%$)	9(7.3)
Good knowledge ($\geq 76\%$)	8(6.5)	Moderately favorable (51-75%)	107(87)	Satisfactory ($\geq 76\%$)	114(92.7)

Possible range - Knowledge: 0-11; Attitude: 0-20; Self-reported behavior: 0-40

Min-Max score - Knowledge: 3-11; Attitude: 10-20; Self-reported behavior: 22-40



Figure 1: Stool iodine wet mount examination showing cysts of *Giardia intestinalis*, 400X magnification (indicated with arrow).

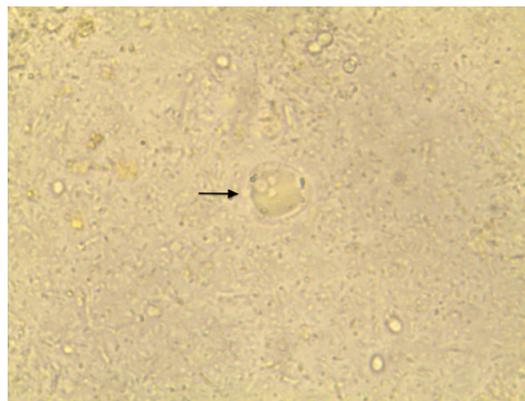


Figure 2: Stool iodine wet mount examination showing a cyst of *Blastocystis hominis* Vacuolated form, 400X magnification (indicated with arrow).

demographic and risk of other health complications aggravated by perceived susceptibility and severity of food borne infections. Health seeking behaviors are influenced by various background characteristics of individual. Enteric pathogen screening acts as a reminder to activate the readiness and trigger the overt behaviors for prevention as an individual measure against FBD epidemic. Subjective weighing of costs and benefits of action through perception influence the likelihood of preventive behavior. All together, these would urge the food handler to adopt preventive actions to reduce his risk for illness and promote public safety.

Regarding the study limitations, responses of the subjects towards knowledge and attitude were not always had been accurate because of the tendency to answer in a socially desirable way. Only food handlers working in JIPMER campus were included. A common questionnaire was used to draw data from various categories of food handlers, which may not have assessed the exact behaviors in relation to their job designations.

CONCLUSION

Three conclusions were drawn from the findings. a) The prevalence of enteric pathogens in food handlers was low, when compared to studies conducted in different parts of India. b) The study shows that three fourth of food handlers have moderate knowledge, favorable attitude and satisfactory behavior towards food hygiene. c) There is a moderate positive correlation between attitude and self reported behavior regarding food hygiene among food handlers

The generalizability of study findings cannot be made because of small sample size and convenience sampling technique. However, it can be utilized as a preliminary investigation towards further research projects among food handlers, as driven by consumer demands on food safety and quality, in a pioneer institute of policy formulation related to health hazards of FBD in hospital catering services.

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CONFLICT OF INTEREST

No competing interests. The manuscript has been read and approved by all the authors, that the requirements for authorship as stated in the instructions to the authors have been met and each of us believe that the manuscript represents honest work.

ABBREVIATIONS

WHO: World Health Organisation; **CDC:** Centre for Disease; **FBD:** Food Borne Diseases; **SEAR:** South East Asian Region; **PCR:** Polymerase Chain Reaction; **JIPMER:** Jawaharlal Institute of PostGraduate Medical Education and Research; **PGIMER:** Post Graduate Institute of Medical Education and Research; **SPSS:** Statistical Package for Social Sciences; **ANOVA:** Analysis of Variance.

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