

Knowledge, attitudes, and practices of food service staff about food hygiene in hospitals in Makkah area, Saudi Arabia

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ABSTRACT: Background: The practice of safety measures by the food service staff in hospitals is necessary for the prevention of foodborne outbreaks. Hospitalized patients are more vulnerable to potential hazards, and neglecting these principles can lead to increased morbidity and mortality. **Objectives:** To assess the knowledge, attitudes and practices of food service staff regarding food hygiene in hospitals in Makkah Area. **Design:** Cross-sectional study. **Participants:** food service staff and their supervisors working in five hospitals in Makkah Area, Saudi Arabia. **Methods:** A non-probability convenience sample comprising of 200 food service staff was included in the study. Two questionnaires were designed, one for food service staff and the other for supervisors. Statistical analysis was performed using (SPSS) version 16. Five models were developed regarding knowledge, attitudes, and practices, and a multiple logistic regression analysis was performed. **Results:** Low level of knowledge about foodborne pathogens was found among food service staff who did not attend educational courses about food hygiene and foodborne diseases (OR= 2.37, $P < 0.05$). Food-service staff with higher educational level (OR= 1.69, $P < 0.05$) and those who worked in hospitals that implemented the HACCP system had higher knowledge of safe temperatures for food storage (OR= 3.34, $P < 0.05$). A positive attitude toward foodborne-diseases prevention was lower in hospitals using the HACCP system (OR=0.41, $P < 0.05$). Most of food service staff routinely used gloves; this practice was greater among those who attended continuing educational courses (OR= 2.94, $P < 0.05$) and those working in hospitals with a lower number of beds (OR= 0.22, $P < 0.05$). **Conclusion:** Full implementation of the HACCP system and continuous training of food service staff regarding safe food handling practices are required.

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1. Introduction

Foodborne diseases remain a major public health problem across the globe. The problem is more severe in developing countries because of lack of personal hygiene and food safety measures. As much as 70% of diarrheal diseases in developing countries are believed to be of foodborne origin [1, 2]. Foodborne disease outbreaks in hospitals have affected patients, staff, and visitors [3]. Mishandling food promotes pathogen growth and disease, especially among patients with weakened immunity or achlorhydria. Although providing safe food to patients who are at risk of getting infections is a major duty of hospitals, epidemiological and surveillance data suggest that faulty practices in food-processing plants, food service establishments and home play an important role in the causal chain of foodborne diseases [4,5].

Training and education are needed to ensure that workers have the awareness and knowledge necessary to comply with food hygiene demands, although these do not always result in a positive change in food handling behavior [6-8]. The need for training of food handlers is an essential part of HACCP (Hazard Analysis and Critical Control Points) and is thus

recognized by European Union legislation, and international organizations such as the World Health Organization [7]. HACCP is a structured and rational approach to the analysis and prevention of potential hazard points at every stage of food operation. Nevertheless, recent studies have suggested that the knowledge, attitudes and practices of food handlers need to be improved [9-13].

In Saudi Arabia, although training programs for food service staff are still limited, the Ministry of Health intends to implement HACCP systems in hospitals. It is likely the current knowledge will need to be augmented before HACCP can be successfully implemented in all hospitals [14]. So far, only limited data exist about the knowledge, attitudes and practices for food hygiene among food services hospital staff in Saudi Arabia, so the aim of this study was to assess the knowledge, attitudes and practices of food service staff regarding food hygiene in hospitals in hospitals in Makkah Area, Saudi Arabia.

2. Material and Methods

Setting

From September, 2011 to February, 2012, a cross-sectional study was conducted for food service

staff and their supervisors working in five selected hospitals in Makkah area: Heraa, King Faisal, King Abdulaziz, King Faisal Specialized hospital and King Fahad. All food services are carried out by the hospitals' food services staff, in the hospitals' own kitchens. HACCP standards have been implemented in Heraa, King Faisal Specialized hospital, and King Fahad Hospital .

Sampling

A non-probability convenience sample comprising of (200) food services staff and their supervisors in the five hospitals were involved in the study:

A total of (69) from Heraa,(23) from King Faisal, (46) from King Abdulaziz, (21) from King Faisal Specialized hospital, and (41) from King Fahad hospital. All food services staff in this study either had direct contact and or delivers food to patients.

Ethical consideration

Ethical clearance was obtained from the hospital board of the selected hospitals. Formal letters were given to each medical director explaining the purpose of the study and consent was obtained. Verbal consent was also obtained from Participants who were assured of confidentiality and anonymity.

Interview questionnaires

This involved applying specifically designed questionnaires based on questionnaires of previous studies [3,4,15,16]. Two questionnaires were prepared: one for food services staff and the other for supervisors .

The questionnaire for food service supervisors included questions focused on hospital characteristics, food service organization, and measures they had adopted for preventing foodborne diseases. The questionnaire for food service staff included six sections: a) Demographic characteristics: age, education, duration of work, and field of activity; b) Knowledge about food hygiene and safety; c) Knowledge about foodborne disease agents; d) Attitudes towards prevention of foodborne diseases; e) Measures to be used in prevention of foodborne diseases .

For questions about the knowledge respondents were asked to choose from three alternatives– yes, no, don't know – about their association with foodborne diseases. For questions about the attitudes respondents were asked to choose from three alternatives – agree, disagree, uncertain- about their beliefs about food hygiene prevention and control. The answers in the section on practices included five choices (always, often, sometimes, rarely and never). The written questionnaire was carried out by a face-to-face interview. Food service staff was encouraged to answer honestly .

The validity of the food service staff

questionnaire was verified by a pilot study in which 15 questionnaires were evaluated. Based on the comments collected several questions from the final questionnaire were modified to improve clarity. These questionnaires were not processed in the final analysis.

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version 16 (SPSS Inc., Chicago, IL, USA.). Descriptive statistics were used to summarize the general characteristics of the hospitals and food-services staff, and to describe their food hygiene and safety knowledge, attitudes and practices. Multiple logistic regression analysis was performed .

Five models were developed to identify the variables that affect the following outcomes of interest: knowledge about food safety and hygiene (other than knowledge about correct temperature for food storage and knowledge about the chosen pathogens) comprised model 1; knowledge about selected pathogens comprised model 2; knowledge about correct temperatures for food storage comprised model 3; attitudes about foodborne diseases prevention and control measures comprised model 4 and the reported use of gloves comprised model 5 .

For analytical purposes, response or outcome variables of multiple categories were reduced to two levels. Food service staff were classified in models 1, and 2 as those who had the correct knowledge equal to or greater than 75% of questions versus all other food service workers; in model 3 as those who had the correct knowledge of temperature storage equal to or greater than 50% of questions versus all others; in model 4 as those who agreed with at least 75% of the statements versus all others; and in model 5 as those who routinely used gloves, at least 75% of the time versus all others. In all models, the independent variables included were age, gender, educational status, work activity, attending continuing education courses on food hygiene and hospital foodborne diseases, length of service in the employment, and application of HACCP system in the hospital. The number of hospital beds was included in model 5 only. *P*- value of less than 0.05 was considered to indicate statistical significance.

3. Results

General characteristics of the study sample

The selected characteristics of the hospitals and of the food service staff are presented in Table 1. The mean number of hospital beds was 415.0 ± 330.3 (range: 200-1000).The mean number of meals served daily to patients were 1213.4 ± 722.8 (range: 630 - 2400). Three of the five hospitals (60 %) were implementing the HACCP system.

The mean age of the food services staff was

(43.8± 11.5) years (range 20 - 55), 62.5 % of the staff were males and 37.5 % were females and 41.0% of them had gained a high school education level. 15.5 % of the food staff were cooks, and only 15.0 % were dietitians, on the other hand; 69.5 percent were

domestic personnel, and their main role was preparing the food. Most of the food service staff was working for fewer than five years in the employment, and 55 % of them had attended continuing education courses on food hygiene and hospital foodborne diseases.

TABLE 1. Selected characteristics of hospitals (N=5) and food service staff (N=200)

Variables	No (%)	Mean ± SD
Number of beds		
≤ 300	3(60.0)	
> 300	2(40.0)	415.0 ±330.3
Number of meals		1213.4 ± 722.8
Implementation of HACCP system		
Yes	3(60.0)	
No	2(40.0)	
Age in Years		
< 25	47 (23.5)	
25 – 30	65 (32.5)	
31 – 35	49 (24.5)	
36 – 40	25 (12.5)	
> 40	14 (7.0)	43.8 ±11.5
Sex		
Male	125 (62.5)	
Female	75 (37.5)	
Nationality		
Saudi	42 (21.0)	
None Saudi	158 (79.0)	
Education		
Illiterate /Read and write	9 (4.5)	
Complete primary school	37 (18.5)	
Complete secondary school	72 (36.0)	
University and above	82 (41.0)	
Work activity		
Cooks	31 (15.5)	
Dietitian	30 (15.0)	
Domestic staff	139(69.5)	
Length of service in the employment (years)		
< 5	142 (71.0)	
5 – 10	38 (19.0)	
11 – 15	11 (5.5)	
> 15	9 (4.5)	1.4 ±0.8
Have continuing education courses about food hygiene and hospital foodborne diseases		
Yes	110 (55.0)	
No	90 (45.0)	

Abbreviations: SD, standard deviation.

Food safety knowledge

The knowledge section of food-services staff about food hygiene and safety is presented in Table 2. Almost all the staff knew that the use of caps, masks, protective gloves and satisfactory closing reduce the risk of food contamination, washing hands before handling food reduce the risk of contamination, and take care of personal hygiene ensures safe food, and avoids cross contamination (98.5%, 96.5%, and 92% respectively). On the other hand, 81.0% of the respondents were unaware of the correct working temperature of a refrigerator; 22.0% did not know that

refrigerators and freezers should be controlled periodically.79.0% and 87.5%, respectively, did not know the proper storage temperature of hot and cold ready to eat foods.

Food service staff knowledge about recognition of selected foodborne (Table 3) showed low level of awareness about certain food pathogens, since 50.5% and 43.5%, respectively, could identify *Salmonella species* and *S. aureus* as being responsible for foodborne diseases. There were lower percentages for Hepatitis A (39.5%), and *Vibrio cholerae* or other *Vibrio species* (36.0%), with the lowest being only

(33.5%) for *Clostridium botulinum*.

Attitudes toward preventing and controlling of foodborne diseases

A positive attitude was reported by most of the food service staff, 92.5% agreed that raw foods should be kept separately from cooked foods. 88.5% of the staff believed that use of caps, masks and gloves reduces the risks of food contamination and wearing gloves while handling food protects patients and food service staff from transmitting infection; 87% of them agreed that washing hands before handling food reduces the risk of contamination. On the contrary, only 29% of respondents agreed with the statement that food services staff with abrasions and cuts on hands should not touch unwrapped foods (Table 4).

Self reported practices

Practices toward foodborne disease prevention are presented in table 5. 86.5% of food services staff was always using gloves while touching and delivering food items and respectively 92.2% and 88.9% of those using gloves were always washing their hands before and after using gloves. 82.5% of staff was always using protective clothing when touch or deliver foods, 85.5% were using mask, and caps were worn by 85% of the food service staff. Moreover, food handlers had given a positive response about washing their hands before and after touching unwrapped raw food (86%, 83.5% respectively), and before and after touching unwrapped cooked food (87.5%, 86% respectively).

Results of multiple logistic regression analysis

Knowledge about food safety and hygiene was significantly higher among food-services staff who worked in hospitals that had performed the HACCP system (OR= 2.31, $P < 0.05$) (Model 1 in Table 6). Knowledge about the pathogens associated with food was significantly higher among those who had attended continuing educational courses about food hygiene and hospital foodborne diseases (OR= 2.37 $P < 0.05$) (Model 2 in Table 6). Moreover, Knowledge about the correct temperature for food storage was significantly higher among food-services staff with a higher educational level (OR= 1.69, $P < 0.05$) and among those who worked in hospitals that had implemented the HACCP system (OR= 3.34, $P < 0.05$) (Model 3 in Table 6).

Positive attitudes toward foodborne disease control and preventive measures were significantly less among those who worked in hospitals that had implemented the HACCP system (OR, 0.41, $P < 0.05$) (Model 4 in Table 6).

Glove use was significantly more obvious among older food service staff (OR, 1.11, $P < 0.05$), and among those who had attended continuing educational courses about food hygiene and hospital foodborne diseases (OR= 2.94, $P < 0.05$) and significantly more frequent among those working in hospitals with fewer than 300 beds (OR= 0.22, $P < 0.05$) (Model 5 in Table 6).

TABLE 2. Food hygiene and safety knowledge among food service staff (N=200)

Statements	Correct / Incorrect / Don't know		
	No (%)	No (%)	No (%)
1. Correct application of cleaning procedures of equipment decrease the risk of infection transmission to patients	183(91.5)	6 (3.0)	11 (5.5)
2. Washing hands before handling food reduce the risk of contamination	193(96.5)	3 (1.5)	4 (2.0)
3. The use of caps, masks, protective gloves and adequate closing reduce the risk of food contamination	197(98.5)	3 (1.5)	0 (0.0)
4. It is important to know the temperature of the refrigerator to reduce the risk of food contamination	174(87.0)	7 (3.5)	19 (9.5)
5. Food service staff with cuts and abrasions on hands should not touch unwrapped foods	172(86.0)	12 (6.0)	16 (8.0)
6. Preparation of food in advance is likely to contribute to foodborne illnesses	171(85.5)	7 (3.5)	22 (11.0)
7. Improper reheating of food is likely to contribute to food contamination	167(83.5)	13 (6.5)	20 (10.0)
8. Take care of personal hygiene ensures safe food, and Avoid Cross Contamination	184(92.0)	9 (4.5)	7 (3.5)
9. The thermostat settings of the refrigerators and freezers should be controlled periodically once a month	141(70.5)	15 (7.5)	44 (22.0)
10. Chilling or freezing eliminates harmful germs in food	138(69.0)	24 (12.0)	38 (19.0)
11. It is compulsory to carry out periodic examinations four times a year	144(72.0)	21 (10.5)	35 (17.5)
12. The correct temperature for a refrigerator is (c°)	38(19.0)	162 (81.0)	/
13. The correct temperature for storage of hot ready-to-eat foods is (c°)	42(21.0)	158 (79.0)	/
14. The correct temperature for storage of cold ready-to- eat food is (c°)	25(12.5)	175 (87.5)	/

TABLE 3. Food service staff ' recognition of foodborne pathogens (N=200)

Statements	Correct	Incorrect	Don't know
	No (%)	No (%)	No (%)
1. <i>Hepatitis A virus</i> pathogens is related to foodborne diseases	79(39.5)	14(7.0)	107(53.5)
2. <i>Clostridium botulinum</i> pathogens is related to food- borne diseases	67(33.5)	10(5.0)	123(61.5)
3. <i>Salmonella</i> species pathogens is related to food- borne diseases	101(50.5)	12(6.0)	87(43.5)
4. <i>Vibrio cholerae</i> or other <i>Vibrio species</i> pathogens is related to foodborne diseases	72(36.0)	10(5.0)	118(59.0)
5. <i>Staphylococcus aureus</i> pathogens is related to foodborne diseases	87(43.5)	8(4.0)	105(52.5)

TABLE 4. Attitudes of food service staff toward foodborne disease prevention and control (N=200)

Statements	Agree	Disagree	Uncertain
	No (%)	No (%)	No (%)
1. Safe food handling is an important part of my job responsibilities	163(81.5)	8(4.0)	29(14.5)
2. Learning more about food hygiene is important to me	161(80.5)	8(4.0)	31(15.5)
3. Washing hands before handling food reduces the risk of food contamination	174(87.0)	4(2.0)	22(11.0)
4. Using cap, masks, protective gloves reduces the risk of food contamination	177(88.5)	2(1.0)	21(10.5)
5. Raw foods should be kept separately from cooked foods	185(92.5)	8(4.0)	7(3.5)
6. Defrosted foods may be refrozen only once	153(76.5)	17(8.5)	30(15.0)
7. It is important to know the temperature of the refrigerator to reduce the risk of foodborne illnesses	167(83.5)	11(5.5)	22(11.0)
8. It is necessary to check the thermometer setting of refrigerator and freezers once per month	160(80.0)	20(10.0)	20(10.0)
9. Improper storage of foods may be hazard to health	140(70.0)	5(2.5)	55(27.5)
10. Food service staff with abrasions or cuts on hands should not touch unwrapped foods	58(29.0)	3(1.5)	139(69.5)

TABLE 5. Respondents' practices toward foodborne disease prevention (N=200)

Questions	Always	Often	Sometimes	Rarely	Never
	No (%)	No (%)	No (%)	No (%)	No (%)
1. Do you use gloves when you touch or distribute unwrapped foods?	173(86.5)	2(1.0)	5(2.5)	0(0)	20(10)
2. Do you wash your hands before using gloves? ^a	166 (92.2)	4(2.2)	7(3.9)	0(0.0)	3(1.7)
3. Do you wash your hands after using gloves? ^a	160(88.9)	7(3.9)	9(5.0)	2(1.1)	2(1.1)
4. Do you use protective clothing when you touch or distribute unwrapped foods?	165(82.5)	3(1.5)	7(3.5)	0(0)	25(12.5)
5. Do you use mask when you touch or distribute unwrapped foods?	171(85.5)	3(1.5)	9(4.5)	0(0)	17(8.5)
6. Do you wear a cap when you touch or distribute unwrapped foods?	170(85)	4(2.0)	5(2.5)	2(1.0)	19(9.5)
7. Do you wash your hands before touching unwrapped raw foods?	172(86)	5(2.5)	2(1.0)	1(0.5)	20(10)
8. Do you wash your hands after touching unwrapped raw foods?	167(83.5)	5(2.5)	4(2.0)	0(0)	24(12)
9. Do you wash your hands before touching unwrapped cooked foods?	175(87.5)	4(2.0)	3(1.5)	2(1.0)	16(8.0)
10. Do you wash your hands after touching unwrapped cooked foods?	172(86)	2(1.0)	7(3.5)	0(0)	19(9.5)

a: Analysis was performed for (180) food services staff who reported using gloves .

TABLE 6. Results of the logistic regression models

Variables	OR	SE	CI ₉₅	P
Model 1 : Knowledge about food safety and hygiene				
Age	1.07	0.03	1.00 – 1.13	0.05
Sex	0.83	0.39	0.39 – 1.80	0.65
Education level	1.44	0.21	0.95 – 2.18	0.09
Work activity	1.42	0.27	0.84 – 2.40	0.19
Length of service in the employment	1.03	0.05	0.94 – 1.14	0.51
Attending Continuing education courses	1.57	0.37	0.75 – 3.26	0.23
Implementation of HACCP System	2.31	0.38	1.10 – 4.83	0.03
Constant	0.04	1.11		0.00
Log-likelihood =217.858, Chi-square=23.002 (7df) , P = 0.002				
Model 2 : Knowledge about the pathogens associated with food				
Age	0.99	0.03	0.94 – 1.05	0.82
Sex	0.83	0.36	0.41 – 1.68	0.60
Education level	1.53	0.22	0.99 – 2.36	0.06
Work activity	0.88	0.23	0.63 – 1.56	0.98
Length of service in the employment	1.02	0.04	0.94 – 1.10	0.69
Attending Continuing education courses	2.37	0.37	1.15 – 4.90	0.02
Implementation of HACCP System	0.99	0.37	0.48 – 2.03	0.97
Constant	0.08	1.04		0.02
Log-likelihood =237.062, Chi-square=13.686 (7df) , P =0.057				
Model 3: Knowledge about the correct temperature for food storage				
Age	0.95	0.04	0.88 – 1.02	0.13
Sex	0.59	0.41	0.27 – 1.30	0.19
Education level	1.69	0.25	1.04 – 2.75	0.03
Work activity	0.63	0.28	0.36 – 1.08	0.09
Length of service in the employment	0.92	0.05	0.83 – 1.02	0.12
Attending Continuing education courses	0.75	0.41	0.79 – 3.88	0.17
Implementation of HACCP System	3.34	0.43	1.45 – 7.70	0.01
Constant	0.39	1.21		0.43
Log-likelihood =200.064, Chi-square =33.240 (7df) , P = 0.000				

Model 4: Attitudes about foodborne diseases prevention and control measures				
Age	0.98	0.03	0.93 – 1.04	0.51
Sex	1.18	0.37	0.57 – 2.41	0.61
Education level	1.01	0.21	0.67 – 1.52	0.98
Work activity	0.91	0.24	0.57 – 1.44	0.67
Length of service in the employment	0.99	0.04	0.91 – 1.07	0.82
Attending Continuing education courses	1.50	0.36	0.79 – 3.05	0.26
Implementation of HACCP System	0.41	0.37	0.20 – 0.85	0.02
Constant	6.02	1.00		0.07
Log-likelihood=240.608, Chi-square=7.033 (7df), P=0.425				
Model 5 : Use of gloves				
Age	1.11	0.05	1.01 – 1.21	0.03
Sex	1.16	0.52	0.42 – 3.22	0.78
Education level	1.20	0.31	0.65 – 2.19	0.56
Work activity	0.62	0.34	0.32 – 1.20	0.16
Length of service in the employment	0.93	0.06	0.82 – 1.04	0.20
Attending Continuing education courses	2.94	0.51	1.08 – 7.98	0.04
Implementation of HACCP System	0.64	0.66	0.17 – 2.34	0.50
Number of beds	0.22	0.65	0.06 - 0.80	0.02
Constant	0.66	1.47		0.78
Log-likelihood =140.530, Chi-square=17.783 (8df), P = 0.023				

Abbreviations: OR, odds ratio; SE, standard error; CI, confidence interval; p, significance level.

4. Discussion

This survey provides information and reveals many critical features about the knowledge, attitudes and practices of food service staff in Makkah area, Saudi Arabia. An important finding from this study was that HACCP standards have not been widely used and this had a negative impact on the general knowledge and food handling practices of food service staff. This supports the notions that, the HACCP approach, when adopted and administered in hospitals, is a useful teaching tool that provides useful information about food-hygiene practices to food-service staff through continuous training and refinement of proper hygienic technique and to involve everyone at each operation. Previous studies have highlighted that food-service staff are more willing to be involved with HACCP if they have already experienced it [15].

In the current study, there was lack of knowledge among the food service staff about the etiologic agents associated with some foodborne diseases. Food service staff who had attended educational courses on food safety and hygiene were more knowledgeable about pathogens responsible for foodborne diseases, similar results have been reported in other studies [3,4,15,16].

The survey also revealed a similar lack of knowledge among the food service staff about the critical temperature for storage of hot or cold ready-to-eat foods, this appeared to be related to the absence of in-service training since nearly half of the food service staff in this study had not received information regarding food safety and hygiene through educational courses. A similar lack of knowledge has been

reported among food service staff in hospitals in other countries [3,4,9,15,16]. However, this finding is of special concern since food-services staff with a higher educational level and those who had worked in hospitals that had implemented the HACCP had a significantly higher knowledge of safe temperatures for food storage. Nevertheless, the importance of storing foods at correct temperatures has been widely documented and is a basic issue in the implementation of HACCP and in food safety legislation since this knowledge is evidently needed to identify all hazards and to become alert to the critical control points from which the HACCP system devises [16].

This study showed general positive attitudes toward food safety and hygiene involving cross-contamination, using adequate clothing and gloves, and temperature control but respondents fared worse when they were asked about handling unwrapped food with cuts or abrasions on hands, proper storage, and refreezing, comparable results have been obtained from previous studies [3,4,15,16]. However an unexpected finding in this study is that, this positive attitude was observed more in employees who worked in hospitals that had not adopted the HACCP standard, this might be the consequence of lack of specific training, empirical adoption of safe attitudes and behaviors' based on skill in the working and domestic setting, perpetuation of traditional approaches and erratic achievement of information through informal sources [4,16].

Inconsistencies between knowledge, attitudes and practices towards food hygiene have been previously detected in previous surveys of food service staff in hospitals [3,4,15,16].

This survey revealed a discrepancy between stated knowledge and practices for routine protective measures, suggesting that knowledge alone is probably insufficient to promote positive attitudes and safe behaviors. Routine use of gloves was related to attending educational courses and the number of hospital beds. Better practices in smaller hospitals may suggest that a smaller workload is associated with greater care in applying food hygiene practices, since those working in hospitals with less than 300 beds tended to be more careful in applying food hygiene practices, similar results have been reported in other studies [3,15].

The limitation of this study was that, the information gathered from it are not amenable to generalization due to the use of convenient sample, so further study on adequate random sample is needed. Other limitations include using self-report to determine practices, that individuals gave the socially acceptable answer rather than what they really do. This is always a challenge when using a self-report method to determine practices/behaviors.

However, this study suggests the need for full implementation, and adherence to, the HACCP system and better infection control policies through a rigorous training program, for all staff involved in hospital food services.

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