



Food Safety Knowledge, Attitude, and Practice among Restaurant Food Handlers in Kerman, Iran

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Abstract

Food safety is a crucial strategy to control foodborne diseases and improve communities' health. The study aimed to evaluate the knowledge, attitude, and practice level of public restaurant food handlers. This cross-sectional study was carried out from May to July 2019 in Kerman city, southeast of Iran. Data were collected using World Health Organization questionnaires on food safety. The mean (SD) scores of knowledge, attitude, and practice of the respondents were 61.2 (16.9), 76.4 (12.3) and 63.1 (10.2), respectively. The mean scores of knowledge, attitude, and practice were not significantly different in terms of the independent variables. There were direct correlation between food safety knowledge and practice ($r=.305$, $P<.0001$), the knowledge and attitude ($r=.271$, $P<.0001$) ($r=.415$, $P<.0001$) as well as between food safety attitude and practice. Thawing frozen food in the refrigerator or other cool places (44.8%), storing any left-overs of cooked meal in a cool place within two hours (43.7%), reheating cooked food until it is piping hot throughout (42.6%), and using separate utensils and cutting boards when preparing raw and cooked food (42.3%) were the areas with the maximum unsatisfactory practice, respectively. as a result, the food handlers had a relatively positive attitude toward food safety but their knowledge and practice level were not satisfactory.

Keywords: Food safety, Foodborne diseases Knowledge, Restaurants, Iran

1 Introduction

Foodborne diseases cause million cases of illness and thousands of death and are regarded as an important public health problem in both developed and developing countries (1). World Health Organization estimated 600 million cases of foodborne diseases, 420 000 mortality, and 33 million healthy life years lost in 2010 worldwide (1, 2). Foodborne diseases are more prevalent in developing countries with 40% of all the diseases cases as well as 125000 annual deaths occurring among children under five year as a high risk group (2, 3). Furthermore, the economic burden of food borne diseases carries a significant cost in the world (2). It was estimated that these diseases annually cost more than US\$ 95 billion due to lost productivity and US\$ 15 billion due to medical care in low- and middle-income countries (3). Thus, the different threats posed to the human health and economic burden associated with the disease make them an important challenge for the public health (4).

Food safety is recognized as a global public health priority to control and prevent foodborne diseases by World Health Organization (5). By definition, food safety refers to "the conditions and measures that are necessary during the production, processing, storage, distribution, and preparation of food to ensure that it is safe, sound, and wholesome and fit for human consumption" (6). Food handlers play an essential role in providing safer food for communities (7). They can transmit

foodborne pathogens passively from contaminated sources which themselves can be reservoirs of foodborne diseases during or after active phases of the diseases. Furthermore, they may be asymptomatic and transmit the pathogens as a carrier (7). Being armed with good knowledge about food safety such as transmission modes of foodborne diseases, sources of food contamination, proper storing of foodstuff, food processing methods and handling, personal hygiene, environmental health and clean utensils can lead to better practice for providing safer food in the community (8).

According to some studies, restaurants are one of important routes of transmission of foodborne diseases and occurrence of food-borne outbreaks (9, 10). Studies on food safety knowledge, attitude, and practice in restaurants' food handlers have reported different results (9, 11). Some Studies have demonstrated food safety knowledge and practice gaps in restaurants' food handlers, while some others have observed good knowledge and adequate compliance with food safety standards (9, 11). In Iran, there have been some studies evaluating the knowledge and attitude of consumers or university students. However, very few studies have dealt with food handlers and to the best of our knowledge, there was only one study on assessing food safety knowledge and practice amongst public restaurants' food handlers (12, 13).

Identifying the status of food safety knowledge and practice among food handlers is an essential step to improving the food

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safety standards and preventing foodborne diseases (14). Regarding the insufficient studies on food safety knowledge and practice amongst restaurant food handlers in Iran, this study was conducted to evaluate the knowledge, attitude, and practice level of public restaurant workers in Kerman city, southeast of Iran.

2 Material and Methods

This cross-sectional study was carried out from May to July 2019 in Kerman city southeast of Iran. The study population consisted of food handlers of public restaurants. A total of 350 restaurant staff who had direct or indirect contact with food with at least one-year work experience as food handlers were enrolled in the study.

Data were collected using World Health Organization questionnaires on food safety. The questionnaire was designed based on five core components (keys) of food safety and safer food including “keep clean” (washing hands, surfaces and equipment), “separate raw and cooked food”, “cook food thoroughly, keep food at safe temperatures” and “use safe water and raw materials” (15, 16). This questionnaire evaluates the knowledge, attitude, and practice of staff dealing with food on food safety according to the five keys of food safety. The first part of the questionnaire had 12 questions to assess the knowledge of the participants through ‘Yes/No/I don’t know’ answers. The second part included 11 items on attitude toward food safety which were answered through ‘agree, not sure, and disagree’. The third part had 10 items whose answers were based on five-point Likert scale including ‘always, most times, sometimes, seldom, and never’. The original questionnaire had 11 and 10 items for knowledge and attitude sections, but in a study for validating the Persian version of the questionnaire, the researchers recommended to add a question to each of the sections. Finally, there were some questions on age, sex, marital status, educational level, job category, work experience, education about food safety. In a study in Iran, the Persian version of the questionnaire showed acceptable validity and reliability among food handlers (17).

After obtaining consent from the participants and explaining about the goals of the study for them, the questionnaire was completed by the participants. For illiterate

people, the questions were asked by an interviewer and the questionnaires were completed based on the answers. For scoring the knowledge section, score 1 was given to a correct answer while score 0 was given to incorrect as well as “I don’t know” answers for the knowledge questions. For scoring the attitude section, scores 1, 2, and 3 were assigned to “agree”, “not sure”, and “disagree” responses, respectively. Also scores 0-4 were given to “never” to “always” answers of the practice section of the questionnaire. Thus, the overall raw scores of knowledge, attitude, and practice ranged within 0-12, 11-33, and 0-40, respectively. Finally, the raw scores of knowledge, attitude, and practice were converted to a scale of 0 to 100 through dividing the raw score minus the minimum possible score by the scale ranges (maximum minus minimum), and then multiplying by 100. Also, for practice questions, we reported the “sometimes, seldom, and never” answers as unsatisfactory condition, while the question answered as “always” or “most times” were considered as satisfactory status.

The SPSS version 22 was used to analyze the collected data. The descriptive results were presented as mean, standard deviation, percentages, and tables. We used Independent T-test and One-Way ANOVA to compare the scores of knowledge, attitude, and practice in terms of the independent variables. An alpha of 0.05 was used as the cutoff for the statistical significance.

3 Results and Discussion

The mean (SD) and median of the participants’ age were 35.2(12.1) and 33 years, respectively. More than half (52.3%) of the respondents were female and 56.6% of them were chef or chef assistant. Approximately, two-thirds (66%) of the food handlers were married, with the educational level of 25.7% being high school or higher. The mean (SD) of work experience of the participants was 6.4 (5.7) years, and 51.4% of them had a work experience 5 years or less. Approximately 90% of the respondents had a history of food safety and hygiene education while 10.3% did not (Table 1).

Table 1: Frequency distribution of the independent variables and comparison of mean score of knowledge, attitude, and practice in terms of independent variables across the studied sample

Variables	Category	N (%)	Knowledge score	*P-value	Attitude score	*P-value	Practice score	*P-value
			Mean(SD)		Mean(SD)		Mean(SD)	
Age group	< 30 year	132(37.7)	61.3(16.3)	.990	76.8(11.6)	.615	62.4(15.7)	.524
	≥30 year	218(62.3)	61.2(17.3)		76.2(12.7)		63.5(14.7)	
Gender	Female	183(52.3)	60.8(15.7)	.216	76.3(11.2)	.826	62.9(14.7)	.822
	Male	167(47.7)	61.7(17.3)		76.6(13.4)		63.3(15.5)	
Marital status	Single and widow	119(34.0)	60.5(16.7)	.574	76.5(12.1)	.964	61.6(15.3)	.230
	Married	231(66.0)	61.6(17.0)		74.4(12.4)		63.8(14.9)	
Education level	Illiterate and Primary	125(35.7)	59.9(16.8)	.431	75.0(12.7)	.204	63.0(15.1)	.501
	Secondary school	135(38.6)	61.4(18.2)		76.8(12.7)		62.1(15.1)	
	High school and higher	90(25.7)	62.9(14.9)		77.9(10.9)		64.6(15.0)	
Job category	Chef	198(56.6)	61.8(17.9)	.463	75.9(13.1)	.363	63.1(15.0)	.981
	worker	152(43.4)	60.5(15.5)		77.1(11.2)		63.1(15.2)	
Work experience	≤ 5 year	180(51.4)	61.0(16.2)	.762	75.8(12.1)	.343	62.9(15.8)	.798
	>5 year	170(48.6)	61.5(17.6)		77.1(12.5)		63.3(14.3)	
Food safety education	Never	36(10.3)	55.8(17.6)	.086	77.7(10.2)	.656	62.5(16.4)	.187
	1-2 year ago	205(57.7)	62.5(16.2)		76.6(12.2)		64.3(14.6)	
	3 year and higher	112(32.0)	60.8(17.7)		75.7(13.1)		60.9(15.3)	

*Independent T test (for variables with two subgroups) or One way analysis of variance (for variables with more than two subgroups)

The mean (SD) scores of knowledge, attitude, and practice of the respondents were 61.2 (16.9), 76.4 (12.3), and 63.1 (10.2), respectively. The mean scores of knowledge, attitude, and practice were not significantly different in terms of the independent variables. There were direct correlations between practice scores and knowledge ($r=.305$, $P<.0001$) as well as attitude ($r=.415$, $P<.0001$). Also, the knowledge scores and attitude showed a significantly positive correlation ($r=.271$, $P<.0001$). At presented in Table 2, a significant percentage of the participants had no knowledge about 4 items of knowledge questionnaire including; how to detect if meat and poultry were cooked thoroughly, Cooked food should be kept very hot before

serving ,how to keep cooked meat and need to reheat cooked food. Moreover, majority of the participants had positive attitude toward all items of the attitude questionnaire except one item that only 26% of them were agree to use different knives and cutting boards for raw and cooked foods (Table 3). At presented in table 4, thawing frozen food in the refrigerator or other cool places, storing any left-overs of cooked meal in a cool place within two hours, reheating cooked food until it is piping hot throughout, and using separate utensils and cutting-boards when preparing raw and cooked food showed the major unsatisfactory practice areas, respectively (Table 4).

Table 2: Frequency distribution of answers to the items of food safety and hygiene knowledge among the food handlers

Item	correct N (%)	Incorrect/ Don't know, N (%)
1.Washing hands with water and soap for 20 second before handling food is important	287(82.0)	63(18.0)
2.Wiping cloths can spread microorganisms	191(54.6)	159(45.4)
3.The same cutting board can be used for raw and cooked foods provided it looks clean	205(58.6)	145(41.4)
4.Raw food needs to be stored separately from cooked food	281(80.3)	69(19.7)
5. Cooked foods do not need to be thoroughly reheated.	170(48.6)	180(51.4)
6. When meat and poultry were cooked thoroughly (e.g. for kebab and chicken barbeque) their color should be pink.	77(22.0)	273(78.0)
7.Cooked meat can be left at room temperature overnight then put them in the refrigerator	140(40.0)	210(60.0)
8.Cooked food should be kept very hot before serving	126(36.0)	224(64.0)
9. Refrigerating foods only slows Food spoilage	192(54.9)	158(45.1)
10.Safe and plumbing water must be used for preparing and cooking	295(84.3)	55(15.7)
11. Damaged or rotting fruits and vegetables should be separated and then fresh and safe ones should be washed.	305(87.1)	45(12.9)
12. Insects (for examples flies and beetles) and rattles (e.g. mouse) can cause and spread disease.	305(87.1)	45(12.9)

Table 3: Distribution frequency of respondents' attitude towards food safety

Items	Agree N (%)	Not sure N (%)	Disagree N (%)
1. Frequent hand-washing during food preparation is important	309(88.3)	26(7.4)	15(4.3)
2. Keeping kitchen surfaces clean reduces the risk of illness	314(89.7)	27(7.7)	9(2.6)
3. Keeping raw and cooked food separate helps to prevent illness	247(70.6)	77(22.0)	26(7.4)
4. Using different knives and cutting boards for raw and cooked foods is worth the extra effort.	91(26.0)	124(35.4)	135(38.6)
5. Looking at the color of meat and poultry, touching and testing them or thermometer are necessary for ensuring food is cooked thoroughly	226(64.6)	81(23.1)	43(12.3)
6. Soups and stews should always be boiled to ensure safety	212(60.6)	106(30.3)	32(9.1)
7. Thawing frozen food in a cool place is safer	183(52.3)	134(38.3)	33(9.4)
8. it is unsafe to leave cooked food out of the refrigerator for more than two hours	238(68.0)	92(26.3)	20(5.7)
9. Inspecting food for freshness and wholesomeness is valuable	275(78.6)	55(15.7)	20(5.7)
10. It is important to throw away foods that have reached their expiry date.	154(44.0)	93(26.6)	103(29.4)
11. I think I can distinguish safe foods and spoiled ones by looking at them and this is a safe way.	269(76.9)	51(14.6)	30(8.6)

Table 4: Frequency distribution food safety practice status among the studied sample

Items	Satisfactory N (%)	Unsatisfactory N (%)
1. I wash my hands before and during food preparation	270(77.1)	80(22.9)
2. I clean surfaces and equipment used for food preparation before re-using on other food.	262(74.4)	88(25.6)
3. I use separate utensils and cutting-boards when preparing raw and cooked food.	202(57.7)	148(42.3)
4. I separate raw and cooked food during storage.	251(71.7)	99(28.3)
5. I check that meats and poultry are cooked thoroughly looking at the color, touching and testing them or by using a Thermometer.	214(61.2)	136(38.8)
6. I reheat cooked food until it is piping hot throughout	201(57.4)	149(42.6)
7. I thaw frozen food in the refrigerator or other cool place.	193(55.2)	157(44.8)
8. After I have cooked a meal I store any left-overs in a cool place within two hours.	197(56.3)	153(43.7)
9. I check and throw away food beyond its expiry date	278(79.5)	72(20.5)
10. I wash fruit and vegetables with safe water before eating them	289(82.6)	61(17.4)

The results the current study revealed that knowledge of the food handlers was moderate (mean score 61.2 out of 100) with between 41.4% and 78% of the respondents lacking any awareness of seven items out of 12 items of the knowledge questionnaire. A study among food handlers of public restaurants in Alexandria found that the knowledge of food handlers regarding food safety was below than the average with a mean of 45.2 (11). The results of another study in Switzerland showed that there were considerable food safety knowledge gaps among restaurant food handlers (10). Studies in Malaysia, Italy, and Brazil have reported knowledge mean scores among restaurant food handlers as 65.5, 65, and 72.7 (out of 100), respectively (14, 18, 19). A study in Iran showed that the mean score of food knowledge among food handlers was 21.1 out of 24 reporting it as a good status (14). Although these studies were conducted using different questionnaires, in most studies as with as ours, there was a considerable gap in the knowledge of food hygiene and safety among restaurants' food handlers. Education about food safety is the basic factor to improve the knowledge and compliance with food safety which can finally lead to reduced incidence of foodborne diseases (20, 21).

The result of current study showed that the food handlers had relatively favorable attitude toward food hygiene and safety. Mean score of food hygiene and safety attitude among restaurants' staff in Saudi Arabia, Kuwait and Malaysia were reported as 66.0, 69.1 and 93.9 respectively (22-24). The attitude of the participants in the current study was relatively closer to the results of studies in Kuwait and Saudi Arabia, but significantly lower than the Malaysia attitude scores. Further, a study in Iran concurring with our findings revealed that restaurants' staff had a relatively satisfactory attitude toward food safety (25). Although the majority of the respondents had a positive attitude toward of the most items of attitude, a considerable percentage of them had poor attitude toward three items including 'using separate knives and cutting boards for raw and cooked foods, throwing away foods that have reached their expiry date, and thawing frozen food in a cool place'. Consistent with these results, studies in Malaysia and Ghana demonstrated that the food handlers had unsatisfactory attitude toward defrosted and refrozen foods (8, 26). As a highlighted result, in our study unlike most studies, the food handlers had a poor attitude toward using expired date foodstuff and employing separate equipment for processing and storing raw and cooked foods (8, 24, 26-28). A good attitude toward food hygiene and safety in food handlers can lead to improved practice and diminished incidence and economic burden of foodborne diseases (1, 8).

The present study found that the participants had a moderate level of food hygiene and safety practice. Hanan et al. reported that the mean score of food safety practice in Egyptian restaurant staff was 49.6 out of 100 (11). Another study in Nigeria revealed that only 24.7% of food handlers had adequate food safety practice (20). Unlike our study, a study in Malaysia showed that restaurant workers with a mean score of 92.9 (out of 100) had an excellent food safety practice (24). Good compliance with food hygiene and food safety practice is an essential standard to prevent food-borne diseases (8, 22). The majority of the respondents had satisfactory practice for most of the practice items, but more than 40% of the food handlers did not show satisfactory performance regarding four items including "thawing frozen food in the refrigerator or other cool places, storing leftovers of cooked food in a cool place, reheating cooked food adequately and using separate knives and cutting boards for raw and cooked foods". In contrast to this finding, Razeaghi et al. et al. in a study in Iran

using the same questionnaire revealed that more than 90% of food handlers had compliance with all practice items (12).

The current study showed that there was a positive correlation between the scores of practice and those of knowledge as well as attitude. Consistent with these findings, studies in Malaysia, Kuwait, and Brazil demonstrated the direct influence of knowledge and attitude level on food safety practice among food handlers (14, 23, 24). Also consistent with the results, a study in Indonesia found that food handlers with good knowledge and positive attitude had a better food safety practice (28). In general, there are three basic lines of interventions to prevent foodborne disease including improving the hygienic quality of raw foodstuff, utilizing safe food processing, and educating all food handlers to better understand and practice the food safety (29). Indeed, improving food safety knowledge and attitude level can lead to better practice among food handlers and ultimately diminished incidence of foodborne diseases.

The present study revealed there were no significant differences in knowledge, attitude, and practice mean scores in terms of individual characteristics of the food handlers. Unlike this result, several studies have found that the food safety knowledge and practice were associated with individual factors such as sex, age, and educational level (20, 30). Several studies consistent with the findings of the present study have reported no relationship between demographic variables such as age, sex, as well as marital status and food safety knowledge, attitude, and practice (14, 31-34). It is suggested that other factors such as working conditions, management factors, effective and deterrent laws and regulations, and continuous monitoring of food supply centers as more important factors may lead to improved food safety in restaurants and should be considered in further research. The findings of this study should be seen in light of some limitations. Firstly, this was a cross-sectional study so it cannot confirm any cause and effect relationships. Secondly, the data about food safety practice of the food handlers were collected by a self-report method; measuring human behavior via self-reported methods usually results in overestimation compared to the actual status.

4 Conclusions

This study demonstrated that although the food handlers had a relatively positive attitude toward food safety, the statuses of food safety knowledge and practice were not satisfactory. Furthermore, the study revealed that food safety knowledge, attitude, and practice had a significantly positive correlation. Note that food safety knowledge, attitude, and practice scores did not show a significant association with individual characteristics such as age, sex, educational level, job category, and professional work experience. Thus, we suggest inclusion of the relationship between food safety knowledge, attitude, and practice and other factors such as working place conditions, managerial factors, the food safety inspection system, and the food control system in future studies.

Data Availability

The data of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there is no conflict of interest.

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