

Assessment of Food Handlers' Knowledge Related to Food Safety



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ABSTRACT

Background: Foodborne diseases remain a significant global public health concern, primarily resulting from improper food handling and unsanitary conditions practices. The key contributors to foodborne illness outbreaks is insufficient knowledge also poor practices concerning food safety among food handlers. **Aim:** This study aimed to assess the knowledge of food handlers regarding essential food safety practices. **Design:** A descriptive cross sectional research design was used. **Subject:** Food handlers working in various restaurants. **Tools:** Two tools were used. **First Tool:** A structured questionnaire to gather demographic and occupational data of food handlers. **Second Tool:** A structured interview questionnaire it was used to assess food safety knowledge among food handlers. **Results:** The findings indicated that 61% of the participants demonstrated poor level of knowledge related to food safety, whereas only 1% had a good overall knowledge level. **Conclusion:** a substantial proportion of food handlers lacked adequate knowledge regarding food safety, which could potentially contribute to public health risks. **Recommendation:** It is recommended that Regular educational sessions and targeted training for food handlers are necessary to enhance their awareness and adherence to core food safety principles.

Keywords: Food Handlers, Knowledge, Food Safety

Introduction:

Food safety concerns have become increasingly associated with restaurant settings, with the global rise in foodborne disease outbreaks linked to the consumption of contaminated food or water continues to rise globally. Food safety defined as "the assurance that food will not cause harm to the consumer when it is prepared and/or consumed according to its intended use" (de Araújo et al. 2023).

Food handlers have a crucial role in ensuring food safety and are defined as individuals working in food-related businesses who handle food or utensils and surfaces that interact with food, as utensils and dishes. Their responsibilities may cover the entire food handling process, from manufacturing and collecting to processing, transporting, delivering, thawing, and preserving food (Qanche et al., 2021).

Globally, restaurants serve meals to millions of individuals daily; however, a significant number of food poisoning cases are reported annually from these establishments. The World Health Organization (WHO, 2020) identifies improper food handling as a leading cause of foodborne diseases. Food handlers include individuals involved in the preparation, catering, and retail of

food products, as well as those responsible for maintaining or restoring equipment in food processing environments. Therefore, following Good Manufacturing Practices (GMP) is crucial to preventing foodborne illnesses (Nawarathne et al., 2022).

Food and nutritional well-being are fundamental to overall health and human growth. Nevertheless, food may become contaminated chemically or microbiologically throughout the processes of production, handling, or storage, potentially compromising its safety for consumption. This contamination significantly contributes to the global health burden, with 600 million cases of foodborne illness, 420,000 deaths, and a loss of 33 million healthy life years annually. (Gargiulo et al., 2022; Pires et al., 2021).

Food handlers are key contributors to the risk of foodborne disease outbreaks. Therefore, gaining a clear understanding of the food-handling practices used by individuals in food service establishments is vital for mitigating these risks. However, comprehensive and detailed information on the specific practices of food handlers across different service facilities is limited, especially data that directly connects these practices to incidences of foodborne illnesses. (Chen et al., 2024).

Community health nurses play a crucial role in advancing public health through education. They can provide essential guidance on food safety practices, including the proper refrigeration of perishable items, discarding food that is spoiled or past its expiration date, thoroughly cooking food, and boiling water when necessary to eliminate harmful microorganisms (World Health Organization [WHO], 2019). In addition to educating individuals, community health nurses can raise public awareness about the hygiene standards of restaurants and food handlers. They also contribute to promoting community-wide food safety by supporting the development and enforcement of relevant policies, legislation, and public health standards (Stanhope & Lancaster, 2019).

Poor food handling practices, such as wearing unclean clothing, coughing or sneezing near food, and improper hand washing, can introduce pathogens into food, because of the lack of sufficient data on the hygiene and sanitation practices of restaurant food handlers (Bulto et al., 2022).

1. Method

3.1 Study Design:

Descriptive cross sectional research design was used in this study.

2.3.2Setting

The research was carried out in establishments serving prepared, ready-to-eat meals. This restaurants included in the study were tourist restaurants, popular local restaurants, and fast-food establishments located in Jerash City, in the northwest region of Jordan. Jerash is situated approximately 40 kilometers from the capital city, Amman.

3.3 Participants

Food handlers who were employed in restaurants for at least one year, actively involved in food storage, preparation, and preservation, and accepted to participate in this study

3.4 Restaurants sampling:

Sampling Technique

A stratified random sampling method was used in this study. The sample included restaurants that provide food services in Jerash Governorate, which has an estimated population of 350,000. The selected restaurants were located primarily in the city center and in close proximity to each other. The sample consisted of three types of establishments: popular restaurants, tourist restaurants, and fast-food restaurants. Jerash

Governorate has approximately 92 restaurants in total, distributed across various categories, including eight tourist restaurants. These tourist establishments offer a full range of meals and are frequented by citizens from outside the governorate. Notably, a single tourist restaurant can accommodate more than 100 guests, and the number of employees in each may exceed 40.

The sampling size calculated according to the 2.0 % of the restaurant in the Jordon applied educational health program in the restaurant (Al-saad, 2016):

The sampling size was calculated based on 2.0% of the total number of restaurants in Jordan. This percentage was chosen to represent the establishments that have implemented an educational health program related to food safety.

$$n = Z^2 P(1 - P) / d^2$$

$$Z = 1.96$$

$$d = 0.05 \text{ (Margin of error)} \quad n = Z^2 P(1 - P) / d^2$$

$$= (1.96)^2 \times 0.02 \times (1 - 0.02) / (0.05)^2$$

$$= 3.8416 \times 0.02 \times 0.98 / (0.05)^2 = 0.180075 / 0.0025 = 30.11 = 30 \text{ restaurant.}$$

In Jerash Governorate, the distribution of restaurants was as follows: 20% were tourist restaurants, 40% were popular restaurants, and 40% were fast food or junk food restaurants.

So:

$$1\text{-The number of tourists' restaurants is} = 0.20 \times 30 = 6 \text{ restaurants.}$$

$$2\text{-The number of popular restaurants is} = 0.40 \times 30 = 12 \text{ restaurants.}$$

$$3\text{-The number of Junk restaurants is} = 0.40 \times 30 = 12 \text{ restaurants.}$$

Food Handlers Sampling

food handlers sampling was calculated based the number of individuals who held a valid health certificate related to the professional food handlers' program which represented 7 % of the total food handler population (Al-saad, 2016):

$$n = Z^2 P(1 - P) / d^2$$

$$Z = 1.96$$

$$d = 0.05 \text{ (Margin of error)} \quad n = Z^2 P(1 - P) / d^2$$

$$= (1.96)^2 \times 0.07 \times (1 - 0.07) / (0.05)^2$$

$$= 3.8416 \times 0.07 \times 0.93 / (0.05)^2 = 0.2500 / 0.0025 = 100 = 100 \text{ food handlers}$$

A stratified random sample of 100 food handlers was included in the study so:

- 1-The number of food handlers from tourist's restaurant is = $0.20 \times 100 = 20$ food handlers.
- 2-The number of food handlers from popular restaurants is = $0.40 \times 100 = 40$ food handlers.
- 3-The number of food handlers from the Junk restaurant is = $0.40 \times 100 = 40$ food handlers.

2.5 Data Collection Tools:

First Tool: A structured questionnaire: the researcher used a structured questionnaire to assess the sociodemographic characteristics and occupational characteristics of food handlers, including age, gender, level of education, marital status, department of work, years of experience, and whether they had obtained a health certificate prior to being hired.

Second Tool: A structured interview questionnaire; this used to assess knowledge of food handlers regarding food safety across four domains: handwashing (8 items), general food safety (9 items), food preparation (6 items), and food storage (10 items).

Scoring system

The researcher was awarded one mark for each correct answer, while incorrect, missing, incomplete, or unknown responses were awarded zero marks. The total score was then categorized into three levels:

- Poor scored (< 50%)
- Fair score (50%-75%)
- Good score (75% or more).

Ethical Considerations

Approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Mansoura University (N. 334). Prior to data collection, an official letter was secured from the Dean of the Faculty of Nursing and submitted to restaurant directors to request their permission and cooperation in accessing the selected study settings. Verbal consent was obtained before data collection from all participants. The researcher introduced himself, explained the aim of the study, and assured participants. Participants were informed that all collected data would remain confidential and be used solely for research purposes. Furthermore, they were allowed to choose to participate or not in the study and they have the right to withdrawal from the study at any time.

Validity and Reliability

The researcher designed the data collection tools after reviewing the related literature. The following steps were taken to ensure the tools' validity and reliability:

- **Content Validity.** it was ascertained by (5) experts in the fields of community health nursing, and health education, were consulted to assess the designed tools and determine whether they adequately cover all relevant aspects of the construction they aim to measure.
- **Face validity.** This step involves testing the clarity, relevance, and appropriateness of the tools to ensure they adequately measure the intended variables.
- **Pilot Study:** was carried out involving 10% of the total study sample ($n=10$ food handlers). The results of the pilot study were used to guide the methodology for the larger-scale investigation and to assess the feasibility of the study.
- The reliability for knowledge tool was 0.903

Statistical Analysis:

Data collected from the studied sample was revised, coded, and entered using Personal Computer (PC). Computerized data entry and Statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS version 22). Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (χ^2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association.

Significance of the results:

- Highly significant at $p\text{-value} < 0.01$.
- Statistically significant was considered at $p\text{-value} < 0.05$.
- Non-significant at $p\text{-value} > 0.05$.

3. Results

Socio-demographic characteristics and occupational condition of the food handlers **table 1** presented that, nearly half (48%) of the participants were aged between thirty and forty years, with Mean \pm SD was 33.3 ± 8.6 years. Regarding educational background, 56% had attained a university-level education, and approximately 71% were married.

Regarding the current occupation, 50% of the participants worked as chefs, and 61% were employed inside the kitchen. Concerning professional experience, 40% had from five to ten years of work experience, with Mean \pm SD was 9.5 ± 4.5 years. The majority (72%) reported obtaining a health certificate prior to employment, and 94% renewed this certificate periodically.

Regarding food safety training, 38% of the participants attended at least one training course, with 33% having completed one to two courses. More than half (56%) were employed in medium-sized restaurants. While all participants (100%) confirmed that their restaurant had a clear policy on sick leave for employees experiencing symptoms that could impact on food safety, 69% indicated that no specific procedures were implemented when such symptoms occurred among staff.

Figure 1 illustrates that 40% of the food handlers reported working in popular or fast-food establishments restaurants, while approximately 20% reported working in tourist restaurants.

Table 2 represents that 63%, 60%, and 60% of the participants had poor level of knowledge regarding hand washing, food safety and food storage respectively. Moreover 58.0% of the participants demonstrated poor level of knowledge related to food preparation.

Table 3 displays the mean score related to hand washing and food safety were (5.5 ± 2.0 & 5.1 ± 1.4) respectively. Moreover, the mean score for food preparation, and food were (3.5 ± 0.9 & 3.8 ± 1.5) respectively. The overall mean of knowledge was 17.9 ± 6.0

Figure 2 shows that, 61% of food handlers had poor food safety knowledge, while only 1% demonstrated good level of food safety knowledge.

Table 1. Sociodemographic Characteristics of the Studied Food Handlers

Items	N	%
Age (Years)		
< 20	5	5.0
20 < 30	22	22.0
30 < 40	48	48.0
≥ 40	25	25.0
Mean \pm SD	33.3 \pm 8.6	
Educational level		
Preparatory	21	21.0
Secondary	14	14.0
University	56	56.0
Post – graduate	9	9.0
Marital status		
Single	29	29.0
Married	71	71.0
Current occupation		
Chef	50	50.0
Assistant Chef	17	17.0
Food Server	5	5.0
Worker	28	28.0
Work Department		
Inside the kitchen	61	61.0
Outside the kitchen	39	39.0
Years of experience working in restaurants		
< 5	12	12.0
5 – 10	40	40.0
10 – 15	36	36.0
> 15	12	12.0
Mean \pm SD	9.5 \pm 4.5	
Health Certificate Before Employment		
No	28	28.0
Yes	72	72.0
Renewal of Health Certificates		
No	6	6.0
Yes	94	94.0
Attendance at Food Safety Training Courses		

No	62	62.0
Yes	38	38.0
Number of Food Safety Training Courses Attended		
None	62	62.0
1 – 2	33	33.0
3 or more	5	5.0
The size of restaurant you work in		
Small (Fewer than 10 tables or Fewer than 40 seats)	44	44.0
Medium (Between 10 to 30 tables or Between 40 to 120 seats)	56	56.0
Sick Leave Policy for Employees with Symptoms Affecting Food Safety	100	100.0
Actions Taken if an Employee Experiences Symptoms Affecting Food Safety		
Replace the employee immediately	21	21.0
Provide medical support to the employee	10	10.0
No specific procedures are in place.	69	69.0

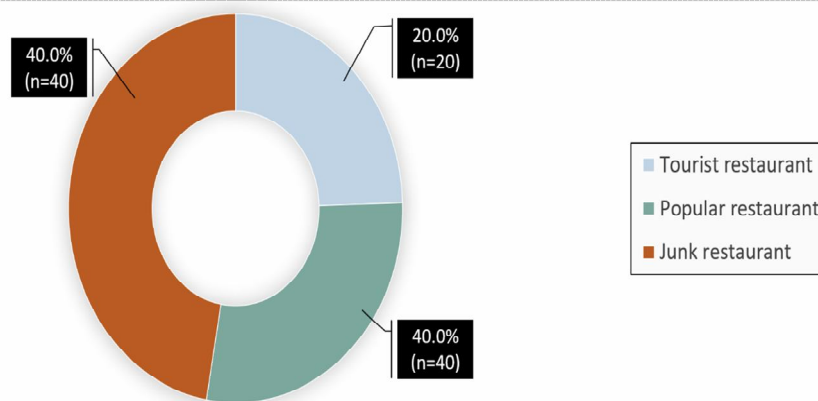


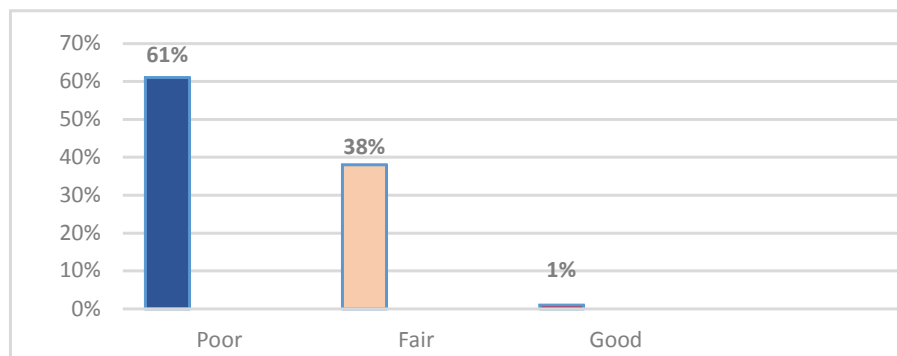
Figure 1. Type of Restaurant According to the Studied Food Handlers

Table 2 Total Knowledge of Food Handlers' Concerning Hand Washing, Food Safety, Food Preparation, and Food Storage

Items	n	%
Hand Washing		
Poor	63	63.0
Fair	37	37.0
Good	0	0.0
Food Safety		
Poor	60	60.0
Fair	39	39.0
Good	1	1.0
Food Preparation		
Poor	58	58.0
Fair	40	40.0
Good	2	2.0
Food Storage		
Poor	60	60.0
Fair	40	40.0
Good	0	0.0

Table 3 Food Handlers' Knowledge Total Score Rrelated to Hand Washing, Food Safety, Food Preparation, and Food Storage

Knowledge domains	Mean \pm SD
Hand washing	5.5 \pm 2.0
Food safety	5.1 \pm 1.4
Food preparation	3.5 \pm 0.9
Food storage	3.8 \pm 1.5
Total knowledge score	17.9 \pm 6.0

**Figure 2** Food Handlers' Total Knowledge Score Level

4. Discussion

Understanding and improving knowledge of food handlers about food safety is essential for reducing foodborne diseases risks. In the present study result showed that, less than half of the participants were between thirty and forty years old, with Mean \pm SD was of 33.3 \pm 8.6 years.

This result contrasts with **Amaiach., (2024)**, who applied a study titled "Food Safety Knowledge, Attitudes, and Practices Among Food Handlers in Collective Catering in Central Morocco," where only one-quarter of the participants fell within the 30–40 age range.

Regarding educational level, more than half of the participants had a university education. This result aligns with the findings of **Limon (2021)** in the study titled "Food Safety Practices of Food Handlers at Home Engaged in Online Food Businesses During the COVID-19 Pandemic in the Philippines," which also reported that more than half of the participants had completed university education. This trend may be attributed to limited employment opportunities, leading some individuals to take food service jobs temporarily while pursuing careers related to their field of study.

Concerning current occupation and department work, half of the participants were chefs, and less than two-thirds worked inside the kitchen. These findings are consistent with **Eltabey and Hafez (2022)** study "Food handlers' knowledge, attitude, and practices about safe and hygienic food in Egyptian government hospitals",

and reported that highly percentage of food handlers were also employed within the kitchen environment.

Regarding years of experience, two-fifths of food handler had between five and ten years of work experience, with a mean \pm SD of 9.5 \pm 4.5 years. From the researcher's perspective, this may be attributed to the age distribution of the sample, and less than half of them were aged between 30 and 40 years. These findings contrast with those of **Olaimat and Al-Nabulsi, (2022)**, who applied a study in Jordan titled "The effect of the knowledge, attitude, and behavior of workers regarding COVID-19 precautionary measures on food safety at foodservice establishments in Jordan", where it was reported that less than half of the participants had 1–5 years of experience.

Regarding health certification, less than three-quarters of the participants reported obtaining a health certificate prior to being hired. This result contrasts with **Al Banna and Disu, (2021)**, findings in a study titled "Factors associated with food safety knowledge and practices among meat handlers in Bangladesh", and revealed that highly percentage of food handler did not possess a health certificate.

In relation to training, two-fifths of the food handler attended training courses concerning safety of food, also, approximately one-third attended between one to two courses. This finding may reflect a lack of perceived importance of training among employees, especially in the absence of strict enforcement or incentives. Furthermore, time

constraints and associated costs may act as barriers to participation in training programs. This result agree with **Tuglo and Agordoh, (2021)** a study in Ghana entitled "Food safety knowledge, attitude, and hygiene practices of street-cooked food handlers in North Dayi District, Ghana," which revealed that a high percentage of participants didn't attended any training courses concerning food safety

Concerning size of restaurant, more than half of the participants reported working in medium-sized establishments restaurants. Notably, all participants indicated that their restaurant had a clear policy regarding sick leave for employees who exhibited symptoms that could affect food safety. However, less than three-quarters reported that no specific procedures were in place to manage such cases.

These findings in the same line with **Chatzimpyrou, (2025)**, study entitled "Health inspections of restaurant establishments in the Attica Region, Greece that reported more than half of the participants reported working in Medium-sized.,," which reported that more than half of the participants worked in medium-sized restaurants. Additionally, **Boutros and Roberts (2023)**, study "assessing food safety culture: a comparative study between independent and chain Mexican and Chinese restaurants," found that participants stated their restaurant or chain had policies regarding food safety and procedures that enhance detailed guidance for safe practices.

The current study results illustrated that two-fifths of the food handlers reported working in restaurants categorized as popular or fast-food establishments, while approximately one-fifth worked in tourist restaurants. This distribution may be attributed to the high demand and frequent job openings in popular and fast-food venues, which tend to offer more consistent employment opportunities. In contrast, tourist restaurants often provide seasonal employment that fluctuates with tourism trends, resulting in fewer permanent positions.

This result contrasts with **Abughoush., (2023)**, a study in Jordan and indicated that less than one-fifth of the participants were employed working in restaurants, which differs from present study where a substantially higher proportion of participants reported working in popular or fast-food establishments.

Regard total level of knowledge about hand washing, the current study revealed that less than two-thirds of the participants exhibited a poor level

of knowledge in this domain. This finding contradicts the results of **Putri, (2021)**, whose study titled " Food safety knowledge, attitudes, and practices of food handlers at kitchen premises in the Port 'X' area, North Jakarta, Indonesia (2018)" reported that most participants demonstrated adequate knowledge regarding personal hygiene, including correct practice toward hand washing.

Similarly, **Fekadu et al. (2024)**, a study in Ethiopia to assess knowledge, attitudes, and practices toward food safety and found that food handlers had good knowledge regarding hand washing.

The difference between current study's findings and those of previous research may be attributed to variations in training frequency, educational background, or regulatory enforcement in different settings and countries. These differences highlight the need for context-specific health education interventions to improve practices of food safety, particularly hand hygiene.

The current study result found that more than half of food handler demonstrated poor knowledge regarding food safety and food storage. This result consistent with **Ahmed, (2021)**, in a study in Pakistan and the study sample had poor knowledge regarding food safety.

Conversely, these findings do not align with those of **Kanaan et al. (2023)** revealed that less than half of the participants had good level of knowledge regarding food safety and food storage, indicating better awareness in that population.

Furthermore, more than half of the participants had poor knowledge regarding food preparation. This result contradicts with **Olaimat, Al-Nabulsi, et al. (2022)**, reported that over three-quarters of participants had correct knowledge concerning food preparation practices.

These differences may reflect varying degrees of training access, institutional food safety policies, or cultural and educational differences in food handling practices across regions.

Concerning the total knowledge score level of food handlers, the current study revealed that less than two-thirds of the participants demonstrated poor level of food safety knowledge. This finding agree with **Hamed, (2020)**, in a study in Egypt and reported that study sample exhibited poor knowledge of food safety.

However, this result disagree with **Tuglo and Agordoh, (2021)**, who found that more than half of study sample possessed good levels of food safety knowledge. Furthermore, it differs from the findings of **Idris, (2024)** reported that less than

two-thirds of study sample had moderate knowledge concerning food safety.

These inconsistencies across studies may be due to differences in educational backgrounds, the extent of prior food safety training, institutional enforcement of hygiene practices, or regional variations in food safety regulations and enforcement.

5. Conclusion and Recommendation

Conclusion

Food handlers exhibited significant knowledge gaps regarding fundamental food safety practices. Specifically, less than two-thirds of the participants demonstrated a poor level of knowledge related to hand washing, food safety, and food storage, while more than half showed poor knowledge regarding food preparation.

Recommendation

Designing and delivering structured health education and training sessions focused on the basic principles of food safety, including personal hygiene, food handling, storage, and preparation. Create a standardized checklist for monitoring food safety practices in food establishments. This checklist should be used by supervisors for daily reporting and follow-up to ensure continuous improvement and accountability. Recruit qualified personnel.

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