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# Knowledge, Attitude, and Practices Regarding Safe and Hygienic Food among Food Handlers in some Benghazi Hospitals

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**ABSTRACT**

**Background**: In the healthcare sector, hospitals play a pivotal role in patient care, with food services being a vital component.

**Aim:** This study focused on the knowledge, attitudes, and practices (KAP) of food handlers in some hospitals in Benghazi, Libya, who are instrumental in preventing foodborne illnesses through proper food safety and hygiene.

**Methods:** A descriptive study of a cross-sectional design was conducted in Benghazi, the research assessed 70 food handlers from Benghazi Medical Center, Benghazi Children's Hospital, and Dar-Alshifa Hospital, aged 18 to 48 years. Data was collected via interviews using a questionnaire covering socio-demographic information and KAP-related questions.

**Results:** The participants, encompassing various roles such as waiters, cooks, nutritionists, and cleaners, mostly had 1-5 years of experience, with 58.6% having undergone prior training. Despite a generally positive attitude towards food safety, the study uncovered a deficiency in food hygiene knowledge. However, practices for periodic analysis were commendably executed. Further scrutiny indicated that knowledge levels regarding hygiene and sanitation did not significantly differ among food handlers based on age, gender, occupation, education, experience, training, or hospital type.

**Conclusion:** The findings suggest that while the attitude towards food safety is commendable, there is an imperative need to enhance the food handlers' knowledge of hygiene. This improvement is crucial for ensuring the implementation of safe and hygienic food handling practices within hospital settings, thereby safeguarding patient health against foodborne diseases.

**KEYWORDS:** Food Safety, Food Hygiene, Food Safety Knowledge, Attitude, Practice, Food Handlers.

## 1. INTRODUCTION

Food hygiene is a set of practices and conditions that are necessary to ensure food safety throughout the entire food supply chain from production to consumption. Food contamination can occur at any stage of the process, including during slaughter or harvesting, processing, storage, distribution, transportation, preparation, and handling [1].

Food handlers are individuals who handle unpackaged food and beverages and are involved in various activities such as preparation, manufacturing, serving, testing, and packaging of food and beverages. Food handlers must use appropriate hygiene measures when handling food to prevent the spread of foodborne illnesses [2].

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Food handlers play a crucial role in the transmission of foodborne pathogens, particularly through contaminated food and from raw meat to prepared-to-consume meals. Food handlers can carry human-specific foodborne pathogens such as Hepatitis A, noroviruses, Salmonella, Staphylococcus aureus, and Shigella species on their fingers, cuts, sores, mouth, skin, and hair, which can then be transmitted to food [3].

Data indicates that foodborne illnesses are prevalent worldwide. However, due to limitations in surveillance systems, only a small proportion of actual cases are reported. Estimates suggest that approximately 600 million people worldwide fall ill from consuming contaminated food annually, with diarrheal diseases being the most common form of these illnesses. It has been reported that foodborne illnesses cause up to 70% of diarrheal sickness in developing countries. This is due in part to a lack of personal hygiene and food safety measures among food handlers [4].

Hospital food hygiene is critical in ensuring the health of patients. Studies have shown that incorrect practices and lack of knowledge among food handlers are contributing

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factors to foodborne illnesses, which remain a common problem in healthcare settings. Food poisoning is a condition caused by the ingestion of food contaminated with pathogenic microorganisms or toxins produced by such microorganisms in sufficient amounts to cause pathological conditions. Studies have linked lack of knowledge and poor handling of food as a major cause of food poisoning; The knowledge, attitudes, and practices (KAP) of food handlers have been identified as having a significant impact on the incidence of food poisoning [5,6,7,8].

A cross-sectional study was conducted between January and June 2020 to assess the food safety knowledge (FSK) of food handlers (FHs) in hospitals' food services in Amman, Jordan. The study included 264 FH participants and found that the overall FSK was moderate. The study recommends additional food safety training in specific areas, including food handling operations and foodborne pathogens [4].

a cross-sectional study conducted at a psychiatric hospital in Magelang, Central Java Province, Indonesia, the researchers investigated the knowledge, attitude, and practice of hygiene and sanitation among 37 food handlers. The findings revealed that while knowledge and attitude were generally positive (with 89% having good knowledge and 84% exhibiting a positive attitude), more than one-third (38%) of food handlers had poor hygiene and sanitation practices. Surprisingly, there were no significant correlations between knowledge, attitude, and practice, indicating that knowledge did not necessarily translate into better practices. Additionally, the majority (73%) of food handlers had never received formal training related to hygiene and sanitation, which significantly impacted their practices. In conclusion, addressing this gap between knowledge and practice is crucial for improving food safety among hospital food-handlers [9].

A cross-sectional descriptive study was conducted in governmental hospitals affiliated with Daqahlia Governorate, Egypt, to assess the knowledge, attitude, and practices of food handlers regarding safe and hygienic food in Egyptian government hospitals. The study involved 542 food handlers, and the findings showed that the overall knowledge, attitude, and practices of food handlers were less than half of what they should be. Based on the findings of the study, there was a strong correlation between food handlers' knowledge, attitude, and practices, which suggests that improving one of these factors may lead to improvements in the others. Therefore, the study recommends that educational and training programs be implemented to improve food handlers' knowledge, attitudes, and practices. To achieve this goal, the study suggests that community health nurses use a variety of teaching methods and modes to ensure that the training is effective [10].

Hospitals serve a significant population, including patients, doctors, nurses, and visitors, and the hospital kitchen produces a large amount of ready-to-eat food that is particularly susceptible to contamination. Thus, food handlers play a critical role in preventing food poisoning and promoting food safety. They must ensure that food preparation, processing, and serving meet hygienic standards. However, it is essential to acknowledge that food handlers may carry various foodborne pathogens, which can pose health risks to others.

The purpose of this research was to evaluate the knowledge, attitude, and practice of hospital food handlers about safe and hygienic food; it also aimed to explore the potential association between the hospital category and the employees' knowledge as well as to explore if individual characteristics influence their awareness about food safety.

## 2. METHODOLOGY:

***Designs:***

A cross-sectional descriptive study was utilized to conduct this study.

***Setting:***

The study was carried out at Benghazi Medical Center (BMC), Benghazi Children's Hospital, and Dar-Alshifa Hospital.

***Study Period:***

The Data of the study was collected between February 2023 and June 2023.

***Study Participants:***

All food handlers who worked at the three hospitals, including cookers, cleaners, waiters, and nutritionists, were recruited for the study. The study involved 70 food handlers who were available during data collection and willing to participate in the study.

***Study tools and methods of data collection:***

To assess the knowledge, attitude, and practices of food handlers in food preparation and safety, direct face-to-face interviews were conducted. A self-administered questionnaire for this study was prepared based on the questionnaires used in studies undertaken in Italy, and Turkey[24,22];consisting of 25 multiple-choice questions, which were divided into four sections. The first section of the questionnaire comprised seven questions that focused on the demographic information of the participants, including gender, age, type of employment, educational level, number of years of service, previous training, and hospital sector. The second section of the questionnaire was designed to test the participants' knowledge of food safety in hospital kitchens, and it included nine questions. The third section focused on the attitudes of food handlers toward food safety. Finally, the fourth section assessed the practices of food handlers related to food safety, and it included six questions

***Statistical Analysis:***

The gathered data were organized, encoded, and processed using IBM SPSS Statistics for Windows, Version 21. Descriptive statistical measures such as frequency and percentage were computed for all pertinent variables. Additionally, the chi-square test was employed to assess the statistical significance of relationships between various variables, with a threshold for significance set at ($P < 0.05$).

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***Ethical consideration:***

Before conducting the study, ethical approval was obtained from the Faculty of Public Health, Benghazi Medical Centre, Dar-Alshifa, and Benghazi Children's Hospital. In addition, informed consent was obtained from food handlers before administering the questionnaires.

## 3. RESULTS

***Demographic Characteristics***

In this study, participants were70 food handlers from three hospitals in Benghazi. Specifically, there were 24 from Dar-Alshifa, 27 from Benghazi Medical Centers, and 19 from Benghazi Children's Hospital. The gender distribution among the surveyed food handlers was 39 males and 31 females. The participants held various occupations: 24 were waiters, 23 were cooks, 9 were nutritionists, and 14 were cleaners. The age range of the participants was 18 to >48 years, with the majority falling between 18 and 38 years, followed by those aged between 38 and 48. In terms of education, 34.3% (n=24) had less than a high school education, 42.9% (n=30) held a high school certificate, and 22.9% (n=16) were BSc certified. Their employment experience varied from 1 to 20 years, with the majority having 1 to 5 years of experience. Additionally, 58.6% of the participants received previous training, and most of them worked in the public sector (66%), (see Table 1).

Table 1 provides details of the demographic profile for each hospital included in the study. The BMChad the largest number of participants (n=27), followed by Dar Al Shifa (n=24). The pediatric hospital had 19 participants. Notably, Dar-Alshifa is the only private-sector hospital in this study. The highest age group of employees who participated in the study were aged 38-48 years for BMC, 28-38 years for the Benghazi Children's Hospital, and 18-28 years for Dar Al Shifa, constituting 37.3%, 36.8%, and 37.5%, respectively. The table also reveals that 55.6%, 75.9%, and 54.2% of the participants in BMC, Benghazi Children's Hospital, and Dar Al Shifa hospitals were male. Among the food handlers, 51.9% worked as waiters in BMC, 36.8% worked as cleaners in Benghazi Children's Hospital, and 41.7% worked as cooks in Dar-Alshifa.

Regarding education, 48.1% of participants in BMC had a secondary degree, 42.1% had a basic degree in pediatric hospital employment, and 45.8% had a secondary degree of employment in Dar-Alshifa. According to (Table 1) Examining employment experience, 40.7% of BMC participants had 6-10 years of experience, whereas 63.2% and 62.5% of those in the Benghazi Children's Hospital and Dar-Alshifa Hospital, respectively, had 1-5 years of experience. Additionally, 51.9%, 36.8%, and 83.3% of food handlers received training in BMC, Pediatric, and Dar-Alshif Hospital, respectively.

**Table 1. Sociodemographic & Setting States Overview (n=70)**

| | | Hospitals No (%) | | | Total No (%) |
|---|---|---|---|---|---|
| | | Dar-Alshifa | BMC | Benghazi Children's | |
| **Sample size** | | 24 (34.3) | 27 (38.6) | 19 (27.1) | 70 (100) |
| **Variables** | | | | | |
| **Age** | **18 - 28** | 9 (37.5) | 5 (18.5) | 8 (42.1) | 22 (31.4) |
| | **28 - 38** | 6 (25.0) | 9 (33.3) | 7 (36.8) | 22 (31.4) |
| | **38 - 48** | 5 (20.8) | 10 (37.0) | 3 (15.8) | 18 (25.7) |
| | **>48** | 4 (16.7) | 3 (11.1) | 1 (5.3) | 8 (11.4) |
| | | | | | |
| **Sex** | **Male** | 13 (54.2) | 15 (55.6) | 11 (57.9) | 39 (55.7) |
| | **female** | 11 (45.8) | 12 (44.4) | 8 (42.1) | 31(44.3) |
| | | | | | |
| **Occupation** | **cooker** | 10 (41.7) | 7 (25.9) | 6 (31.6) | 23 (32.9) |
| | **cleaner** | 5 (20.8) | 2 (7.4) | 7 (36.8) | 14 (20.0) |
| | **Waiter** | 5 (20.8) | 14 (51.9) | 5 (26.3) | 24 (34.3) |
| | **Nutritionist** | 4 (16.7) | 4 (14.8) | 1 (5.3) | 9 (12.9) |
| | | | | | |
| **Education** | **Basic** | 7 (29.2) | 9 (33.3) | 8 (42.1) | 24 (34.3) |
| | **Secondary** | 11 (45.8) | 13 (48.1) | 6 (31.6) | 30 (42.9) |
| | **Higher** | 6 (25.0) | 5 (18.5) | 5 (26.3) | 16 (22.9) |
| | | | | | |
| **Years of experience** | **1 – 5** | 15 (62.5) | 7 (25.9) | 12 (63.2) | 34 (48.6) |
| | **6 - 10** | 2 (8.3) | 11 (40.7) | 5 (26.3) | 18 (25.7) |
| | **11 - 15** | 5 (20.8) | 7 (25.9) | 1 (5.3) | 13 (18.6) |
| | **16 - 20** | 2 (8.3) | 2 (7.4) | 1 (5.3) | 5 (7.1) |
| | | | | | |
| **Previous training** | **No** | 4 (16.7) | 13 (48.1) | 12 (63.2) | 29 (41.4) |
| | **Yes** | 20 (83.3) | 14 (51.9) | 7 (36.8) | 41(58.6) |
| | | | | | |
| **Hospital sector** | **Public** | - | 27 (100) | 19 (100) | 46 (66) |
| | **Private** | 24 (100) | - | - | 24 (34) |

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***Respondent's Food Safety Knowledge***

Table 2 indicates that the majority of food handlers in the study had knowledge about the preparation of food in advance and how it can contribute to food poisoning and contamination, as well as the importance of wearing gloves (with 100% correct answers) in all three hospitals. Additionally, 86.4% of food handlers knew about proper cleaning, and 72.8% knew about detergent use.

In terms of foodborne disease transmission, the study found that 50% of food handlers in Dar-Alshifa and 40.7% in BMC were incorrect in believing that hepatitis B could be transmitted through food. However, in Benghazi Children's Hospital, 73.7% of respondents correctly recognized that hepatitis B can indeed be transmitted via food.

Additionally, 54.2%, 40.7%, and 73.7% of food handlers in Dar-Alshifa, BMC, and Benghazi Children's Hospital, respectively, were aware that cholera can also be transmitted through food. Notably, the highest percentage of correct responses regarding food items associated with the transmission of Vibrio cholera was observed across all three hospitals (as indicated in Table 2).

This table presents the knowledge of food handlers regarding temperature and its impact on food safety (Table 2).

Among the participants at Dar-Alshifa, 45.8% correctly identified the appropriate refrigerator temperature as 8°C. In BMC, 40.7% of participants answered incorrectly or were unsure, while in Benghazi Children's Hospital, 68.4% of respondents provided the correct answer. However, across all three hospitals, most participants were unaware that cold ready-to-eat foods should be maintained at -11°C.

Additionally, food items associated with the transmission of Vibrio cholera were correctly identified by 50% of Dar-Alshifa participants, 48.1% of BMC participants, and 73.7% of Benghazi Children's Hospital respondents.

**Table 2. Assessment of Food Handlers' Safety Awareness**

| Statements | | Hospitals | | |
|---|---|---|---|---|
| | | Dar-Alshifa | BMC | Benghazi Children's Hospital |
| | | N (%) | N (%) | N (%) |
| **Preparation of food in advance is likely to contribute to food poisoning** | Correct | 21 (87.5) | 18 (66.7) | 19 (100) |
| | Incorrect | 3 (12.5) | 9 (33.3) | |
| | I don't know | | | |
| | **Total** | **24** | **27** | **19** |
| **Reheating food is likely to contribute to food contamination** | Correct | 15 (62.5) | 17 (63.0) | 16 (84.2) |
| | Incorrect | 6 (25.0) | 10 (37.0) | 3 (15.8) |
| | I don't know | 3 (12.5) | | |
| | **Total** | **24** | **27** | **19** |
| **Wearing gloves while handling food minimizes the risk of transmitting the infection to food-service staff** | Correct | 24(100%) | 27 (100) | 19 (100) |
| | Incorrect | | | |
| | I don't know | | | |
| | **Total** | **24** | **27** | **19** |
| **The correct temperature for a refrigerator is (8°C)** | Correct | 11 (45.8) | 5 (18.5) | 13 (68.4) |
| | Incorrect | 7 (29.2) | 11 (40.7) | 4 (21.1) |
| | I don't know | 6 (25.0) | 11(40.7) | 2 (10.5) |
| | **Total** | 24 | 27 | 19 |
| **Hot ready to eat foods should be maintained at (40°C)** | Correct | 10 (41.7) | 10 (37.0) | 10 (52.6) |
| | Incorrect | 10 (41.7) | 11 (70.7) | 4 (21.1) |
| | I don't know | 4 (16.7) | 6 (22.2) | 5 (26.3) |
| | **Total** | 24 | 27 | 19 |
| **Cold ready to eat foods should be maintained at (-11°C)** | Correct | 4 (16.7) | 7 (25.9) | 4 (21.1) |
| | Incorrect | 17 (70.8) | 13 (48.1) | 11 (57.9) |
| | I don't know | 3 (12.5) | 7 (25.9) | 4 (21.1) |
| | **Total** | 24 | 27 | 19 |
| **Hepatitis B can be transmitted by food** | Correct | 9 (37.5) | 8 (29.6) | 14 (73.7) |
| | Incorrect | 12 (50.0) | 11 (40.7) | 4 (21.1) |
| | I don't know | 3 (12.5) | 8 (29.6) | 1 (5.3) |
| | **Total** | 24 | 27 | 19 |
| **Cholera can be transmitted by food** | Correct | 13 (54.2) | 11 (40.7) | 14 (73.7) |
| | Incorrect | 2 (8.3) | 7 (25.9) | 4 (21.1) |
| | I don't know | 9 (37.5) | 9 (33.3) | 1 (5.3) |
| | **Total** | 24 | 27 | 19 |
| **Food items associated with the transmission of Vibrio cholera** | Correct | 12 (50.0) | 13(48.1) | 14 (73.7) |
| | Incorrect | 2 (8.3) | 5 (18.5) | 4 (21.1) |
| | I don't know | 10 (41.7) | 9 (33.3) | 1 (5.3) |
| | **Total** | 24 | 27 | 19 |

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Table (3) conducted a chi-square test of independence P-value in the table indicates whether there is a statistically significant difference in knowledge levels across different hospitals. The test did not find a statistically significant difference in knowledge levels across the different hospitals. In other words, the type or name of the hospital does not seem to affect the knowledge levels of the employees.

**Table 3. Hospital Knowledge Comparison Overview**

| | Classification of knowledge | | | Total | P –value |
|---|---|---|---|---|---|
| **Hospitals** | **Poor knowledge** | **Moderate knowledge** | **Good knowledge** | | |
| **Dar-alshifa** | 10 | 13 | 1 | 24 | 0.221 |
| | 41.7% | 54.2% | 4.2% | 100.0% | |
| **BMC** | 10 | 15 | 2 | 27 | |
| | 37.0% | 55.6% | 7.4% | 100.0% | |
| **Benghazi Children's Hospital** | 3 | 16 | 0 | 19 | |
| | 15.8% | 84.2% | 0.0% | 100.0% | |
| **Total** | 23 | 44 | 3 | 70 | |
| | 32.9% | 62.9% | 4.3% | 100.0% | |

*** (significant at p-value< 0.05).**

### *Food Safety Attitudes Of Food Handlers*

Table (4) regarding the attitudes of food handlers toward the prevention and control of foodborne diseases; The study examined the attitudes of food handlers across three hospitals concerning food safety practices. Notably, all respondents unanimously agreed that raw foods should be kept separate from cooked foods, demonstrating a 100% consensus on this crucial practice. Additionally, the majority of food handlers concurred that defrosted food should not be refrozen. The agreement rates varied across hospitals: 70.8% in Dar-Alshifa, 74.1% in BMC, and a higher 84.2% in the Benghazi Children's Hospital. Furthermore, findings emphasized the importance of hygiene: food handlers with abrasions or cuts on their fingers or hands should avoid touching unwrapped foods. Compliance rates were 83.3% in Dar-Alshifa, 96.3% in BMC, and a perfect 100% in Benghazi Children's Hospital.

**Table 4. Food Safety Attitudes Among Handlers**

| Respondent's food safety attitudes | Answer | Hospitals | | |
|---|---|---|---|---|
| | | **Dar-Alshifa** | **BMC** | **Benghazi Children's Hospital** |
| | | N (%) | N (%) | N (%) |
| **Raw foods should be kept separate from cooked foods** | No | | | |
| | Yes | 24 (100) | 27 (100) | 19 (100) |
| | Uncertain | | | |
| **Total** | | 24 | 27 | 19 |
| **Defrosted food should not be refrozen** | No | 5 (20.8) | 4 (14.8) | 3 (15.8) |
| | Yes | 17 (70.8) | 20 (74.1) | 16 (84.2) |
| | Uncertain | 2 (8.3) | 3 (11.1) | |
| **Total** | | 24 | 27 | 19 |
| **Food service staff with abrasions or cuts on their hands should not touch unwrapped food** | No | 4 (16.7) | | |
| | Yes | 20 (83.3) | 26 (96.3) | 19 (100) |
| | Uncertain | | 1 (3.7) | |
| **Total** | | 24 | 27 | |

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### *Food Safety Practices*

The study on self-reported hygienic practices among participants in three hospitals revealed several noteworthy trends. Firstly, most participants in these hospitals diligently wash their hands before and after handling unwrapped raw and cooked food, emphasizing the importance of this practice for preventing cross-contamination and maintaining food safety. Additionally, a significant number of food handlers in all three hospitals use separate kitchen utensils when preparing cooked and raw food, minimizing the risk of transferring harmful microorganisms between different food items.

However, when it comes to the practice of thawing frozen food at room temperature, there are variations across hospitals.

At Dar-Alshifa, 41.7% of food handlers reported always following this method.

In contrast, at BMC, the percentage was higher, with 74.1% answering always, while in Benghazi Children's Hospital, 52.6% responded similarly. These findings underscore the need for consistent adherence to hygienic practices among food handlers, ensuring the well-being of both patients and staff see Table (5).

**Table 5. Food Safety Practices Among Handlers**

| Respondent's food safety practices | Answer | Hospitals | | |
|---|---|---|---|---|
| | | Dar-Alshifa | BMC | Benghazi Children's Hospital |
| | | N (%) | N (%) | N (%) |
| Do you wash your hands before touching unwrapped raw food? | Always | 23 (95.8) | 19 (70.4) | 19 (100) |
| | Often | 1 (4.2) | 5 (18.5) | |
| | Occasionally | | 3 (11.1) | |
| Total | | 24 | 27 | 19 |
| Do you wash your hands after touching unwrapped raw food? | Always | 22 (91.7) | 20 (74.1) | 18 (94.7) |
| | Often | 1 (4.2) | 4 (14.8) | 1 (5.3) |
| | Occasionally | 1 (4.2) | 3 (11.1) | |
| Total | | | 27 | 19 |
| Do you wash your hands before touching unwrapped cooked food? | Always | 22 (91.7) | 19 (70.4) | 18 (94.7) |
| | Often | 1 (4.2) | 5 (18.5) | 1 (5.3) |
| | Occasionally | 1 (4.2) | 3 (11.1) | |
| Total | | 24 | 27 | 19 |
| Do you wash your hands after touching unwrapped cooked food? | Always | 22 (91.7) | 18 (66.7) | 18 (94.7) |
| | Often | 1 (4.2) | 5 (18.5) | 1 (5.3) |
| | Occasionally | 1 (4.2) | 4 (14.8) | |
| Total | | 24 | 27 | 19 |
| Do you use separate kitchen utensils to prepare cooked and raw food? | Always | 19 (79.2) | 17 (63.0) | 14 (73.7) |
| | Often | 5 (20.8) | 7 (25.9) | 5 (26.3) |
| | Occasionally | | 3 (11.1) | |
| Total | | 24 | 27 | 19 |
| Do you thaw frozen food at room temperature? | Always | 10 (41.7) | 20 (74.1) | 10 (52.6) |
| | Often | 10 (41.7) | 4 (14.8) | 9 (47.4) |
| | Occasionally | 2 (8.3) | 3 (11.1) | |
| | No answer | 2 (8.3) | | |
| Total | | 24 | 27 | 9 |

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### *Individual Characteristics and Knowledge of Hygiene and Sanitation*

During the interview, several participants highlighted that individual characteristics could be linked to one's hygiene knowledge. Subsequently, a more detailed analysis was conducted to explore the relationship between these individual traits and the knowledge levels of food handlers. The findings summarized in Table 6 indicate that there is no significant difference in hygiene and sanitation knowledge across various individual characteristics, including (age, sex, occupation, education, years of experience, previous training, and hospital sector).

**Table 6. Individual Variability in Hygiene & Sanitation Knowledge**

| Individual characteristic | | Poor knowledge | Moderate knowledge | Good knowledge | Total | P-value |
|---|---|---|---|---|---|---|
| | | No | No | No | No | |
| **Age** | 18-28 | 7 | 14 | 1 | 22 | **0.579** |
| | 28-38 | 4 | 17 | 1 | 22 | |
| | 38-48 | 8 | 9 | 1 | 18 | |
| | >48 | 4 | 4 | 0 | 8 | |
| **Sex** | Male | 13 | 24 | 2 | 39 | **0.916** |
| | Female | 10 | 20 | 1 | 31 | |
| **Occupation** | cooker | 7 | 15 | 1 | 21 | **0.656** |
| | cleaner | 5 | 9 | 0 | 14 | |
| | Waiter | 10 | 13 | 1 | 24 | |
| | Nutritionist | 1 | 7 | 1 | 9 | |
| **Education** | Basic | 8 | 13 | 2 | 23 | **0.117** |
| | Secondary | 15 | 17 | 12 | 44 | |
| | Higher | 1 | 0 | 2 | 3 | |
| **Years of experience** | 1 – 5 | 13 | 20 | 1 | 34 | **0.205** |
| | 6 - 10 | 5 | 13 | 0 | 18 | |
| | 11 - 15 | 2 | 9 | 2 | 13 | |
| | 16 - 20 | 3 | 2 | 0 | 5 | |
| **Previous training** | Yes | 15 | 24 | 2 | 41 | **0.672** |
| | No | 8 | 20 | 1 | 29 | |
| **Hospital sector** | Public | 13 | 34 | 2 | 49 | **0.211** |
| | Private | 10 | 10 | 1 | 21 | |

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## 4. DISCUSSION

The frequency of food poisoning outbreaks and related concerns is increasing, leading to demands for improved hygiene and quality practices. The European Commission has recognized the importance of limiting food poisoning outbreaks, particularly due to the rise in meals consumed outside the home and the availability of pre-prepared meals. This changing consumer behavior highlights the need for more effective food hygiene controls. [10,11].

According to statistics, caterers are responsible for the majority of food poisoning outbreaks compared to any other food industry, accounting for 70% of all bacterial food poisoning incidents. Inadequate time and temperature management of food accounts for 70% of food poisoning outbreaks, while cross-contamination is responsible for the remaining 30% [8].

Indeed, the study aimed to assess the knowledge, attitudes, and practices of food handlers concerning safe and hygienic food preparation in Benghazi Medical Center, Dar-Alshifa, and Benghazi Children's Hospital.

Previous studies have suggested that inadequate knowledge of food safety can result in poor hygienic practices among food handlers [12,13]. However, Clayton *et al*., [14] reported that 63% of food handlers demonstrated knowledge of food safety but did not exhibit a corresponding positive behavior towards food safety and hygiene practices. This finding contrasts with the present study, which showed good practice among food handlers despite moderate knowledge of food safety.

In a study conducted by Akabanda et al., [15] the majority of food handlers demonstrated knowledge of the importance of general sanitary practices, such as wearing gloves (77.9% correct answers). This finding is consistent with the present study which also reported a high level of knowledge (100%) and another study conducted in Al Madinah Hospitals in Saudi Arabia which also found that all food handlers demonstrated knowledge regarding the importance of sanitary practices.

Food composition varies, and as a result, a single cooking temperature cannot ensure both the desired culinary quality and safety for all types of food. To inactivate pathogenic vegetative bacteria, different combinations of time and temperature are required; Temperature treatment is often the critical control point in the food production process, and a lack of understanding of temperature-related issues could significantly hinder the effective implementation of Hazard Analysis and Critical Control Points (HACCP) [17].

According to the present study, a lack of knowledge existed among food handlers regarding acceptable refrigerator temperature ranges and the critical temperatures of hot ready-to-eat foods in Benghazi Children's Hospital (68.4%, 52.6%) and Dar-Alshifa hospitals (41.8%, 45.7%), as a significant proportion of food handlers provided incorrect answers; Similar findings have been reported in other studies. For instance, in a study conducted by (Baş M *et al.*,2006) in Turkey, only 42% of food handlers knew the correct temperature for food storage. In addition, a study by (Walker et al., 2003); found that less than half of the 444 food handlers surveyed knew the correct temperature of hot food holding. [17,18] Both the studies by Baş *et al*. in Turkey and Walker *et al.* reported a lack of knowledge regarding critical temperatures among food handlers, which is consistent with the findings of the present study conducted in Benghazi Children's Hospital and Dar-Alshifa hospitals; These studies highlight the importance of improving food safety knowledge among food handlers to ensure the proper handling and preparation of food.

In a study conducted in a hospital in Turkey, 93.2% of food handlers considered that reheating food might contribute to food contamination, This finding corresponds to the result of the present study conducted in Benghazi Children's Hospital, where 84.2% of food handlers held the same belief [19].These findings suggest that food handlers have an understanding of the risks associated with improper food handling practices, such as reheating, but further education and training may be necessary to ensure that food safety protocols are followed correctly.

The transmission of Hepatitis B, primarily through blood and body fluids rather than food, is a fact grasped by nearly half (50%) of the food handlers in Dar-Alshifa. Similarly, 40.7% of their counterparts at BMC are also aware of this truth. Intriguingly, these findings echo a prior study conducted in Turkish hospitals, where up to 41.1% of food handlers held the correct understanding of this matter [19]. This thread of knowledge, weaving its way through different cultures and countries, underscores the importance of accurate health awareness in the global community.

The majority of the food handlers in Dar-Alshifa, BMC Center, and Benghazi Children's Hospital (54.2%, 40.7, and 73.7%, respectively) knew that food could be a mode of cholera transmission. This finding is in line with a study in Turkey that reported a 64.4% rate of correct knowledge about food-borne cholera. The same study in Turkey also revealed that the percentage of food handlers who had good knowledge scores on hygiene and sanitation was 89.19%. This differed from the knowledge level of this study, which was only fair and had a low percentage of good knowledge [19].

The findings of a study conducted in Pakistan were similar to this study's results regarding knowledge and attitudes but differed in practices [20].

According to a report from Ghana, 96% of uncooked food was separated from cooked food, which is consistent with the current study. However, the current study had higher rates of separation in three hospitals (Dar-Alshifa, BMC Hospital, and Benghazi Children's Hospital), where 100% of food handlers followed this practice. The Ghana report also showed that 87.2% of food handlers agreed with the current study that unwrapped food should not be touched by staff with abrasions or cuts on their hands. However, Contrary to the current study, the Ghana study reported that only 30% of food handlers supported the idea that defrosted food should not be refrozen. Meanwhile, in Dar-Alshifa, BMC, and Children's Hospitals, (70.8%, 74.1%, and 84.2%) of food handlers, respectively, agreed with this statement [15].

A study in a Brazilian hospital found that 41.0% of food handlers thawed frozen food at room temperature. This practice aligns with a recent study conducted at Dar-Alshifa Hospital, BMC, and Benghazi Children's Hospital, where 41.7%, 74.1%, and 52.6% of food handlers, respectively, consistently thawed frozen food at room temperature [21].

A study conducted in a military hospital reported the food handling practices of food handlers, where almost all staff (94.5%) reported that they always wash their hands before preparing food. This finding is consistent with the results of the cur-

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rent study, in Dar-Alshifa, BMC, and Benghazi Children's Hospital which reported rates of 95.8%, 70.4%, and 100%, respectively [22].

There was no significant association ($p > 0.05$) between having food hygiene/safety training and food knowledge in this study. However, a study conducted in Al-Madinah hospitals in Saudi Arabia found a significant association between respondents' training and food safety knowledge ($p < 0.05$). al-Madinah hospital study reported a significant association between food safety knowledge and participant education level, which disagrees with the results of this study. However, this study's findings were consistent with the Al-Madinah hospital study regarding the association between food safety knowledge and years of experience. This study found no significant association ($p \geq 0.05$) between years of experience in food service and food safety knowledge. This may be due to the advanced training tools that new staff are equipped with, which enable them to have better food safety knowledge regardless of their experience in the field [23].

## 5. CONCLUSION:

Food handlers working in hospital food services had low to moderate levels of food safety knowledge, despite having satisfactory attitudes and practices. The study also revealed that there were no significant differences in knowledge levels among employees in the three hospitals, regardless of the type or name of the hospital. After examining different individual characteristics such as age, sex, occupation, education, years of experience, previous training, and hospital sector, it was concluded that there were no significant differences in hygiene and sanitation knowledge between different groups of food handlers.

To enhance food safety, it's crucial to conduct more research to improve food handlers' knowledge. Health awareness programs for producers and consumers, hygienic practices during food production, and regular training for food handlers are all recommended.

## 6. LIMITATIONS OF THE STUDY

One of the limitations of this study is that not all hospitals had kitchens to meet the needs of patients, Additionally, some hospitals refused to participate in the study, which limited the number of participants that could be included and may have impacted the generalizability of the findings.

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