

The effect of food safety training program on food safety knowledge and practices in hotels' and hospitals' food services

Hekmat Al-Akash,¹ Abdelhakeem Abu Arrah,² Feysa Bhatti,²

Roqia Maabreh,³ Riham Abu Arrah⁴

¹Applied Science Private University, Amman, Jordan; ²Faculty of Business Management, Girne American University, North Cyprus; ³Paramedic Department, Prince Al-Hussein Bin Abdulla II Academy for Civil Protection, Amman, Jordan; ⁴Faculty of Medicine, University of Jordan, Amman, Jordan

Abstract

Food Safety Knowledge (FSK) among Food Handlers (FHS) in the food services in both hotels and hospitals has a crucial role in food protection and combating against foodborne diseases. The aim is to check the food safety (FS) training program upon FSK in the Jordanian hotels' and hospitals' food services. A pre-test-post-test design was used. A convenience sample of 412 food handlers from randomly selected hotels and hospitals were recruited. Data were collected using 118-questions Food Safety Knowledge Questionnaire (FSKQ); 40- questions tool for FS Practices. A significant improvement in FSK mean scores in the post-test (85.48±17.07/118 points corresponded to 72.44%) compared with the pre-test (78.50±13.69/118 points, corresponding to 66.66%). The overall mean FSK score was considered to be "moderate" in pre and post-tests. FS Practice level mean was 26.86±4.38/40 points (67.14%), regarded as "moderate" in the pre-test and continued to be "moderate" after the training despite a significant increase in the post-test scores (27.92±4.45/40 point, corresponded to 69.80%, P=0.000). FHS worked in organizations where HACCP principles are implemented, possessed higher FSK and better FS practices. Although continued to be "moderate", FSK and FS Practices among FHS in the Jordanian hotels and hospitals have been significantly improved after the FS Training Program.

Introduction

Food Safety (FS) is the assurance that food will not cause any harm to the con-

sumer when it is prepared or consumed according to its intended use (WHO, 2020). Across the world, it has been estimated that foodborne diseases cause the death of about 2.2 million people annually, where 1.9 million of them are children (WHO, 2017). It has been documented that many foodborne diseases are transmitted by consumers when they are travelling (Ravel *et al.*, 2011) or to patients in hospitals that may worsen their condition, especially if they are immunosuppressed (Muhammad *et al.*, 2020).

Food handlers (FHS) may contaminate food by malpractices linked to a lack of knowledge about the basics of FS, including personal hygiene, proper cooking and storage temperature, and cross-contamination (Hardstaff *et al.*, 2018). This knowledge can be enhanced by training of FHS in safe food handling. A training program of FHS about FS is a widely used strategy to improve FSK (Addo-Tham *et al.*, 2020) and recognized as one of the most critical interventions in preventing foodborne disease outbreaks (WHO, 2020).

In one of the Jordanian studies, Osaili *et al.* (2017) found that FSK means score among FHS was 56.3/90 and indicated the urgency for FS education and training programs. For the FHS, it was indicated that they must possess a "good" FSK level (above 75%) and "good" practice level to be able to protect the consumers' meals against foodborne diseases (Osaili *et al.*, 2013). This study responded to these recommendations by planning for the FS training program and evaluating its effect since research in Jordan evaluating the effect of the FS training program upon FSK and FS practices are lacking. Therefore, the aim of this study is to evaluate the effect of the FS training program on FSK and practices at hospitals' and hotels' food services in Jordan.

Research hypotheses

H1: The FS training program will positively influence FHS' FSK in Hospitals & Hotels.

H2: Training Program will significantly influence FS Practices in Hospital & Hotels.

H3: FSK will significantly influence FS Practices by FHS in Hospitals & Hotels

Materials and methods

A pretest-Posttest design was used for this study. The population of this study were all FHS from hospitals of different sectors and hotels of different rating in Amman (Jordan). The FHS that were ≥18 years and could read and understand Arabic were recruited through convenience sampling.

Correspondence: Hekmat Al-Akash, Faculty of Nursing, Applied Science Private University, Al Arab St 21, Amman, Jordan.
E-mail: hikmat.akash@yahoo.com

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The sample size of 375 was calculated using G* power 3.1 software (Faul, Erdfelder, Lang, & Bushner, 2007) with a power of 0.80, an alpha level of 0.05, and a medium effect size of 0.3. Furthermore, 10% (37) participants were added considering possible dropout of participants, non-response, or no return of the questionnaire, making sample size of 412 FHS. An online FS training was developed by the WHO (2006) and administered for the participants by the researchers. A total of 189 FHS, in private hospitals (58 FHS), public hospitals (65 FHS) and hotels (66 FHS) after the baseline data relevant to FSK and practices was gathered. A 3-hours session/day/2-weeks (5 days/week) was arranged. Two weeks later, after completion of the program, FSKQ and FS practices questionnaire were re-administered to collect the post-test data. The data were collected online (after signing the informed consent by the participants) using a three-part questionnaire (in the Arabic Language) where part one involved questions about socio demographic characteristic of FHS. Part two was the Food Safety Knowledge Questionnaire (FSKQ). The FSKQ is 118 self-reported questions on FSK that fall under six categories/subscales (Personal Hygiene & Hand Washing, Health Problems Affecting FS, Food Borne Diseases & their Symptoms, Cross -Contamination & Sterilization, Safe Storage, Thawing, Handling, Transport, Catering, Heating/ Reheating, and Food

Borne Pathogens). Part three was the FS Practices Questionnaire. It included 40 self-reported questions covering three areas; Personal hygiene practices, Cross - Contamination Prevention Practices, and Food Handling Practices. Both the FSKQ and the FS practices Questionnaire were validated through national and international studies (Alqurashi *et al.*, 2019; Ayaz, Priyadarshini, & Jaiswal, 2018; Moreb, Priyadarshini, & Jaiswal, 2017; Osaili *et al.*, 2013; Osaili *et al.*, 2017). For the reliability of the instruments, an external pilot study on 40 Jordanian FHS was done. Cronbach's α coefficient of internal consistency was used for the reliability of the questionnaires, which was 0.948 for the total FSKQ and 0.734 for the FS Practices. To evaluate the FSK and FS practice level, scores of respondents were calculated by summation of the correct answers (1 point for a correct answer): maximum score is 118 for FSK and 40 for FS Practices (Osaili *et al.*, 2017). Additionally, the score was converted to a percentage for the total score and for each subscale of both the FSK and the FS practice. The score that was lower than 50% was considered as 'poor', between 50% to 74% was considered as 'average', and the score \geq of 75% was considered as 'good' FSK/FS practice level.

Data were entered and analyzed statistically using Statistical Package for Social Science (SPSS) version 21. For testing research hypotheses, a paired sample t-test was used. Whereas, Correlation Coefficients Analysis was used to test the relationships of FSK and practices and age, experience, and previous exposure to FS training. An independent sample t-test was used to compare FSK and practices based on gender, hotels and hospitals, and hospitals' sectors. A one-way ANOVA was used to compare FHS for FSK and practices according to their education.

The study was approved by the research and ethical committee at Girne American University. Institutional Review Board (IRB) approval was also obtained from two public and private hospitals and two hotels.

Results

A total of 412 FHS (260 from hospital and 152 from hotels) were recruited, among which 380 responded (245 from hospitals and 135 from hotels), making a response rate of 92% that were included in the analysis. The demographic characteristics of the FHS can be seen in Table 1.

Analysis of the overall FSK and FS practices showed that they were "moderate". In the analysis of categories, the high-

est area of FSK was relevant to "Personal Hygiene and Hand Washing", while the lowest was relevant to "Foodborne Pathogens" in both the pre-test and the post-test. Whereas the highest level of FS practices was also in "Personal Hygiene". Practices relevant to "Food Handling" scored as the lowest, as shown in Table 2. Table 2 also shows the improvement in the categories of FSK and FS practices in the post-test.

Paired sample t-test was conducted to compare the FHS FSK scores before and after the FS training program. On average, FHS scored higher in the post-test ($M=85.12$, $SD=17.07$) than in the pre-test ($M=78.50$, $SD=13.69$). This improvement (the mean difference = 6.62) was statistically significant, [$t(350) 8.117$, $P=0.000$] (Table 3). Results support the first hypothesis (H1: The FS training program significantly influences FHS' FSK in Hospitals & Hotels).

Similarly, as shown in Table 3, paired sample t-test was conducted to compare the FS Practices scores in the pre-test and in the post-test. There was a significant difference in the scores for the pre-test ($M=26.9$, $SD=4.38$) and the post-test ($M=27.9$, $SD=4.45$), [$t(350) = -10.481$, $P=0.000$]. FHS in the post-test possessed statistically significant better practice than in the pre-test. Results support the H2: FS Training Program will significantly influence FS Practices in Hospitals & Hotels.

Table 3 also shows the t-test values with regards to FHS differences in their FSK/FS Practices based on their categorical sociodemographic variables (gender, area of work: hospital Vs hotel, sector of the hospital: public Vs private, and previous exposure to FS training), and adoption of HACCP. Pearson R correlation (Supplementary Table 1) was done to test that if there a statistically significant relationship between continuous demographic variables (age, years of experience) and FSK/FS practices scores, and Pearson product-moment correlation (Point-Biserial) to test that if there is a statistically significant relationship between "previous training of FS" and FSK scores or FS Practices. Results showed that there are significant statistical mean differences in the total FSK scores with respect to gender ($P<0.01$) and to working area (hotel/hospital) ($P=0.003$). Whereas, there are no significant statistical mean differences in the total FS Practices scores with respect to the gender ($P=0.507$), to working area (hotel/hospital) ($P=0.518$), and between hospital sectors ($P=0.167$). Results also showed there is no statistically significant correlation between age and FSK score ($R=0.021$, $n=380$, $P=0.690$) or FSK with the years of experience ($R=0.052$, $n=380$, $P=0.317$). Whereas, FS Practices results showed that there is a statistically significant negative association between age and FS Practices score ($R=-0.114$, $n=380$, $P=0.026$), and years of experience

Table 1. Descriptive statistics of sample socio-demographics and settings characteristics (n=380).

Category	Subcategory	N.	%	Mean(SD)
Gender	Male	321	84.5	
	Female	59	15.5	
	Total	380	100	
Age (years)				35.0 (9.2)
Experience (years)				11.7 (7.6)
Educational level	Less than high school	99	26.1	
	High school	183	48.2	
	Diploma	67	17.6	
	BSc	31	8.20	
	Total	380	100	
Previous training	Yes	30	8.00	
	No	350	92.00	
	Total	380	100	
Adopting HACCP	Yes	2	33.33	
	No	4	66.67	
	Total	6	100	
Working Area (4 hospitals) (2 hotels)	Hospital	245	64.5	
	Hotel	135	35.5	
	Total	380	100	
Hospital Sector (2 hospitals) (2 hospitals)	Public	134	55	
	Private	111	45	
	Total	245	100	

and FS Practices score ($R=-0.106$, $n=380$, $P=0.039$). Younger FHS with fewer years of experience were found to have better FS Practices. However, there was no statistically significant correlation between FSK and FS Practices ($R=0.091$, $n=380$, $P=0.077$) in the pre-test scores. Moreover, results show that there is a statistically significant positive association between FSK and FS Practices in the post-test scores ($R=0.160$, $n=328$, $P=0.002$). Hence, H3 is accepted that FSK will significantly influence FS

Practices by FHS in Hospitals & Hotels. Moreover, results show that there was no statistically significant correlation between the previous training and the FSK ($R_{pb}=-0.025$, $n=380$, $P=0.625$) or FS Practices ($R_{pb}=0.046$, $n=380$, $P=0.370$) in the pre-test scores.

Regarding the educational level, one-way ANOVA was conducted (supplementary Tables 2 and 3), which indicates that there is a significant effect of the level of education on the FSK at the $P\leq 0.05$ level

for the four educational levels, $F(3, 375)=14.93$, $P=0.000$. Post-Hoc comparison using Tukey HSD test indicates that the mean score for the “less than high school educational level” was significantly lower than the other categories while there were no significant statistical mean differences at the $P\leq 0.05$ in FS Practices scores among the educational categories $F(3, 375)=0.485$, $P=0.693$.

Table 2. Means and percentages of FHS according to their FSK & FS practices scores on each category.

FSKQ Subscale	Pre-test		Post-test	
	Mean \pm SD	%	Mean \pm SD	%
Personal hygiene and hand washing	18.28 \pm 1.93	87.05	19.03 \pm 2.00	90.62
Health problems affecting FS	7.51 \pm 1.50	83.33	7.91 \pm 1.30	87.90
Food borne diseases and their symptoms	8.26 \pm 2.32	69.16	24.00 \pm 6.06	75.00
Cross-contamination and sterilization	21.38 \pm 6.16	66.88	20.82 \pm 6.46	67.16
Safe storage, thawing, handling, transport, catering, heating/ reheating	19.106 \pm 4.84	61.29	6.98 \pm 2.23	53.69
Food borne pathogens	3.95 \pm 3.05	32.91	6.36 \pm 3.94	53.00
Total FSK score	78.50 \pm 13.69	66.66	85.48 \pm 17.07	72.44
FS practices				
Personal hygiene practices	9.42 \pm 1.71	72.49	9.63 \pm 1.52	74.08
Cross-contamination prevention practices	10.44 \pm 2.67	65.23	11.00 \pm 2.00	68.75
Food handling practices	6.69 \pm 2.29	63.58	7.30 \pm 1.90	66.36
Total FS practice score	26.86 \pm 4.38	67.14	27.93 \pm 2.22	69.82

Table 3. T-test analysis of the pre and post FSK and FS Practices according to various variables.

Variables	Mean \pm SD	Df	T value	P value
FSK				
Pre-test (379)	78.50 \pm 13.69	360	-7.734	0.000
Post-test (328)	85.12 \pm 17.07			
FSK & Gender				
Male (320)	80.03 \pm 12.96	377	*5.271	0.000
Female (59)	70.15 \pm 14.61			
FSK & Work Settings				
Hospitals (245)	85.48 \pm 10.54	377	18.551	0.003
Hotel (134)	65.72 \pm 8.63			
FSK & Hospital Sectors				
Public Hospitals (134)	86.15 \pm 12.21	242	5.294	0.274
Private Hospital (111)	84.67 \pm 8.07			
FSK & HACCP Adoption				
Adopting HACCP	89.12 \pm 11.21	360	*7.271	0.000
Not Adopting HACCP	72.93 \pm 9.21			
FS Practices				
Pre-test (380)	26.86 \pm 4.38	350	-10.48	0.000
Post-test (328)	27.92 \pm 4.45			
FS Practice & Gender				
Male (320)	26.81 \pm 4.30	378	-0.664	507
Female (59)	27.20 \pm 4.78			
FS Practice & Work Settings				
Hospitals (245)	26.9 \pm 6.33	378	0.647	0.518
Hotel (134)	26.7 \pm 0.15			
FS Practice & Hospital Sectors				
Public Hospitals (134)	27.26 \pm 3.15	243	1.385	0.167
Private Hospital (111)	26.60 \pm 4.27			

*Significant.

Discussion

The objective of this study was to evaluate the effectiveness of the FS training program upon the FSK, FS Practices of FHS in both hospitals and hotels in Jordan.

The overall FSK and FS Practices mean score in the pre-test analysis for the current study were found to be “moderate” and below the cut-off point. Compared with the available studies, it was found to be consistent with one of the available studies where most of the participants had moderate FSK (Shokri *et al.*, 2018). The current finding could be attributed to that only 8.2% of participants were exposed to some form of FS training. This finding also highlighted the necessity for FS training in order to enhance FSK as well as practices, thus, protect consumers’ meals against food contamination and foodborne diseases.

In the area of “Personal Hygiene and Hand Washing” and “Knowledge about health problems and conditions”, FHS possessed a “good” knowledge in both pre & post-test and for the control and the intervention groups. Similar conclusions were drawn from recent studies in Jordan (Osaili *et al.*, 2017). A possible explanation for this finding in the current study is that the assessment of FHS in this regard was a self-reported method; overestimation of the knowledge or practice places a possible bias for this result. Accordingly, FHS must be checked for their real adherence to hand hygiene practices through several measures such as random swab cultures from their hands before or during food processing, cultures of the processed food for presence of FHS-induced pathogens, and observational studies of FHS to confirm their absolute adherence to appropriate hand washing practices.

Knowledge in the area of foodborne diseases and their symptoms was “moderate” in both the pre-test and the post-test results. Insufficient knowledge about the foodborne disease and health problems affecting FS can lead to the inability of FHS to be aware of the seriousness of the issue of food poisoning and other foodborne diseases. Our findings came in line with previous studies (Osaili *et al.*, 2017; Parry-Hanson *et al.*, 2016). Although the overall score of the subscale of the foodborne diseases and their symptoms is low, respondents correctly responded to well-known symptoms of food poisoning, including nausea, vomiting, abdominal pain, and diarrhoea.

Younger FHS with less experience demonstrated better self-reported practice scores, although there was no variation in the FSK level based on age or years of

experience. The age and experience in food handling did not improve the overall FSK assessment outcomes. Mixed findings were found in this regard. Consistently, a supportive conclusion relevant to age and experience was found in one of the studies (Marquitta & Abigail, 2015). In many other studies, age, long years of experience with education were found to be positively influencing FSK (Alqurashi *et al.*, 2019; Taha *et al.*, 2019). In Jordan, food workers are noticed to be of lower educational achievements. This notion necessitates the provision of formal training and certification for FHS about FSK and practices. A possible explanation for the finding in our study about age and experience is the improved curriculum at the academic level in the field of food safety and hygiene, younger food handlers are holding a diploma or university degree, or younger people are of higher learning abilities so they could have greater benefit from the training than older ones. Further studies are indicated to explain this finding.

FHS with higher educational levels achieved higher knowledge scores in both the pre-test, post-test, and in the intervention group while not for the FS practices. This positive association between the educational level and the FSK was reported in many studies (Hossen *et al.*, 2020; Azanaw *et al.*, 2021). The higher the level of education the FHS possess, the easier it becomes for them to acquire and retain FSK (Farahat *et al.*, 2015).

Before the training program, only 8% of food handlers were exposed to some form of FS training. So, the association between FSK and previous training couldn’t be revealed in this study before the training program. In line with most of the reported conclusions about the importance of FS training (Stangarlin *et al.*, 2016; Habiballah *et al.*, 2018), findings from the current study supported the premise of this importance. Studies investigating barriers to FS training are indicated.

The HACCP FS system is a standardized framework that can ensure a proper implication of food hygienic practices across the food production phases. Its implementation in food services was reported to be of marked impact upon both FSK and FS practices. FHS at the food organizations adopting HACCP were found to be of higher FSK levels than those where HACCP is not implemented as its implementation can positively change FSK and practices (El-Wehedy *et al.*, 2019).

Despite the effort made, the overall FSK remained below the intended and the desired level. Knowledge is often emphasized to have a great role in guiding and

directing practices, behaviours, and attitudes of individuals (Shen *et al.*, 2015). Although FSK and FS practices were not changed enough to reach the desired level, self-reported practice scores relevant to FS was associated with improved FSK after training. FHS’ training about how to identify FS hazards and implement good practices regarding FS is essential in order to ensure the safety and quality of the food-stuff (Azanaw *et al.*, 2021). However, this assumption has been contradicted as the success of training programs that rely only on providing the information is doubtful as significant changes of improper practices in food handling are not usually achieved (Akabanda *et al.*, 2017). Based on this fact, auditing and observation of FHS during their food handling is still indicated to confirm the transferability of their knowledge into real and safe practices.

In the current study, the limitations include the test/retest bias from the repeated administration of the instrument, the duration of the program was limited to 2 weeks; randomization was not possible as many hotels and hospitals declined the approval to conduct the study and administer the training program, and decreased responses in the post-test (dropout of participants).

The study revealed several recommendations. Such as, further training is required in the areas where FSK levels were low. Moreover, further studies are indicated using various approaches such as observational studies to check the transferability of the knowledge into practice, and studies investigating barriers to involvement of FHS in FS training are indicated. Also, the adoption of HACCP as a standardized FS approach to ensure the adherence to standardized FS and studies investigating barriers toward HACCP implementation is recommended.

Conclusions

FHS of food services in hospitals and hotels were found to have a moderate FSK and practices prior to the FS training program administration. The administered training program had significantly improved the FSK, FS practices of FHS. Male gender, those with higher educational levels, and who are working in hospitals compared to hotels were found to have higher levels of FSK. Younger FHS with shorter experience were found to have better practice level.

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