

Effect of Educational Guidelines Regarding Safety Food Measures on Food Handlers Practices at Fayoum University Restaurants

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Abstract

Background: Foodborne diseases are a preventable public health problem, through following the principles of food safety by food handlers. **Aim:** The aim of the study was to evaluate effect of educational guidelines on food handlers' practices at Fayoum University restaurants. **Design:** A quasi-experimental research design was used in this study. **Settings:** At Fayoum University restaurants. **Sample:** A convenience sample consisting of 80 food handlers was recruited. **Tools:** Two tools were utilized in this study: **Tool I:** A structured interviewing questionnaire which included three parts; part I: Socio-demographic characteristics of food handlers; Part II: Food handlers' knowledge about foodborne diseases, and safety food measures to prevent food contamination; and part III: reported practices regarding safety food measures. **Tool II:** Observational checklist concerning food handlers personal hygiene, hand washing, and use of personal protective equipment. **Results:** The results revealed that 61.2% of the study sample were female, and 57.5% aged 40 years or more. There were improvements in food handlers' knowledge and satisfactory practices' scores regarding safety food measures. **Conclusion:** The study concluded that the application of the educational guidelines had a positive effect on improving food handlers' knowledge, and practices. **Recommendations:** Application of the educational guidelines and regular training programs at University restaurants to improve food handlers' knowledge, and practices regarding safety food measures.

Key words: safety food measures, educational guidelines

Introduction:

Food safety is defined by the World Health Organization (WHO) as methods and procedures for ensuring that food is produced, preserved, distributed, and consumed safely, whereas unsafe food is defined as food that includes dangerous microorganisms such as bacteria, viruses, parasites, and chemical compounds (Aung et al., 2019).

Consuming contaminated foods with pathogens or their toxins can lead to a wide range of foodborne diseases including viral hepatitis, typhoid, dysentery, salmonellosis, and amoebiasis. Moreover, a significant proportion of

foodborne diseases were attributable to improper food processing practice, preparation, storage, lack of personal hygiene, and safety food measures (Soliman et al., 2018).

Previous studies indicate that food handlers can cause foodborne diseases through cross-contaminating raw and processed foods, storing and cooking foods in unsanitary conditions, and using contaminated utensils and equipment, as well as the possibility of carrying pathogens and transmitting them to food via food handlers who are symptomless. In addition to food handlers, can be a vehicle that carries organisms resulting in

foodborne illness (Al-Kandari, Al-abdeen & Sidhu, 2019).

A foodborne illness is a preventable public health problem and most foodborne illnesses' cases can be prevented by following the principles of food safety in all steps, from production to consumption (Vandeputte 2014; Saeed, Osaili & Taha, 2021).

Food safety is a shared responsibility of all the stakeholders along the food chain, including food handlers, therefore education and training for food handlers are significantly important in the prevention of foodborne diseases (Bari & Yeasmin, 2018).

The community health nurse has a basic role in the prevention of foodborne diseases and promoting awareness regarding food safety through conducting active educational and training programs for food handlers (Mohamed et al., 2020); therefore, this study aimed to evaluate effect of educational guidelines on food handlers' practices at Fayoum University restaurants.

Significance of the study

The World Health Organization reported that every year there is 1 of 10 people who fall ill globally due to consuming unsafe food, resulting in 420,000 deaths. The global burden of foodborne diseases affects individuals of all ages, in particular persons living in low-income countries (WHO, 2021).

The Middle East and North Africa countries including Egypt are classified as having the third-highest estimated burden of foodborne diseases per population. Annually, an estimated 100 million people living in these regions fall

ill with a foodborne illness, in addition to 70% of the burden of foodborne diseases in these regions are caused by non-typhoidal Salmonella, Escherichia coli, norovirus, and Campylobacter (Faour-Klingbeil & Todd, 2020).

Centers for disease control and prevention (CDC) reported that approximately 20% of food-related infections are due to food handlers (Assefa et al., 2015). Moreover, inappropriate food handling practices in food service establishment are resulting in many food-borne diseases' outbreaks in Egypt (Latif, Elkarmalawy & Esmail, 2013). In this respect, Todd (2017) added that food poisoning is not uncommon in Egyptian University residences where basic hygiene standards are often not observed. Therefore, there is an urgent need to improve the food safety knowledge and practices of food handlers (Malavi, Abong & Muzhingi, 2021).

Aim of the study:

This study aimed to evaluate the effect of educational guidelines on food handlers' practices at Fayoum University restaurants through:

1. Assessing knowledge of food handlers regarding safety food measures.
2. Assessing practices of food handlers regarding safety food measures.
3. Developing and implementing educational guidelines according to their needs.
4. Evaluating the effect of educational guidelines regarding safety food measures on food handlers' practices at Fayoum University restaurants.

Research hypothesis:

Implementation of the educational guidelines will improve knowledge and practices regarding safety food measures among Fayoum University restaurants' food handlers.

Subjects & Methods**Research design:**

A quasi-experimental research design of one group pre- post-tests was used in the current study.

Setting: The current study was carried out at University restaurants for male and female students located at Fayoum University students' residence.

Sampling : A convenience sample of 80 food handlers, were included in the study according to inclusion criteria; food handlers who worked in Fayoum University restaurant with at least one year experience and involved food storage, preparation, and preservation, and who accepted to participate in the study.

Tools of data collection:

I- A structured interview questionnaire (pre/post) was developed by the researchers guided by five keys to safer food manual (**WHO, 2020**), and modified by the researchers in a simple clear Arabic language based on the related literature review and experts opinions in light of relevant references to assess restaurant food handlers' knowledge and reported practices, it consists of three parts:

First part: sociodemographic characteristics of food handlers: age, gender, job title, level of education, years of experience, and training courses received related to food safety.

Second part: Knowledge assessment tool, it dealt with:

1. Food handler's knowledge regarding foodborne diseases: It includes types of foodborne diseases, methods of transmission, signs and symptoms, treatment and complications.
2. Food handler's knowledge about safety food measures to prevent food contamination such as: personal hygiene, hand washing, cleaning and disinfection of food contact surfaces and kitchen equipment, prevention of cross contamination, safe food storage thawing, and cooking using safe water and keeping food at a safe temperature.

Scoring system:

All questions concerned with knowledge were categorized as follows: Correct answer scored=1, and incorrect answer or I don't know scored = 0.

Total knowledge scores were 35

Poor knowledge <50% of the total knowledge scores.

Fair knowledge 50 - < 60%

Good knowledge \geq 60%

Third part: It includes 14 questions to assess the reported food practice handlers concerning food safety it dealt with proper food storage, preparation and separation, keep food at safe temperature and cook food thoroughly, using safe water, and cleaning and disinfection of kitchen equipment and food contact surfaces.

II- Observational checklist: It included 14 items to assess food handler's practices regarding safety food measures as personal hygiene,

hand washing, and use of personal protective equipment.

Scoring system:

Scoring system for food handlers reported practices regarding food safety, observational checklist concerning safety food measures (personal hygiene, hand washing, and use of personal protective equipment). It was categorized into two levels Done scored= 1, and Not done = 0, then a total practices' score was calculated to be 31.

Good practice $\geq 50\%$

Poor practice $< 50\%$

Pilot study

A Pilot study was carried out on eight food handlers representing 10% of the recruited study sample, to assess clarity and completeness of the questionnaires and test the feasibility of the research process. It was also used to estimate the time needed to fill in the tools.

Content Validity and Reliability:

Validity:

The tools of the study were translated by the researchers to Arabic language and were validated by a jury of nursing professors to assure the content validity of the translated version by the original one.

Reliability

The reliability test of translated version was established by using the Cronbach alpha coefficient test; it was 0.789 for questionnaire questions.

Fieldwork:

Before starting the study, an official letter was addressed from the Dean of the Faculty of Nursing to the directors of both Fayoum University

restaurants to request their permissions and cooperation to collect data from the selected settings.

For the purpose to evaluate the effect of the educational guidelines on food handlers practices at Fayoum University restaurants, the current and previous available literatures as well as theoretical knowledge were reviewed, using the tools for data collection being developed, and utilizing books, journals, and periodicals.

Data collection took 4 months (from the beginning of October 2020 to the end of January, 2021) from the pre-assessment until the ending of the implementation and evaluation phases. Food handlers were interviewed at both University restaurants and filled in the structured questionnaire, which is considered as a basis for developing the educational guidelines (pre-test) after explaining the aim of the study to participants and obtaining a written approval from them.

The educational guidelines was designed and implemented in four phases:

1. Assessment phase:

The used program was designed and prepared by the researchers, depending on the assessment's findings (pre-test and using the interviewing questionnaire).

2. Planning phase:

This phase included analysis of the pre-test findings; the researchers designed the program's objectives and content according to the food handlers needs.

The general objective of the program was to evaluate the effect of the educational guidelines regarding safety food measures on food handlers' practices at Fayoum University restaurants

The content of the program:

The educational guidelines content involved two parts; first part (theoretical part), it contains meaning and types of foodborne diseases, causes, methods of transmission, basic information of safety food measures, and importance of applying safety food measures in handling, preparing and serving food. The second part (practical part) consists of personal hygiene, hand washing and use of personal protective equipment, food contact surfaces and kitchen equipment cleaning and disinfection, safety food measures used for food preparation, storage and serving.

3. Implementation phase:

The designed educational guidelines content was conducted in two sessions; the first session covers the theoretical information about foodborne diseases, definition, types, the modes of transmission, and safety food measures. The second practice session was applied including hand washing and use of personal protective equipment, each session lasted 45 minutes to one hour. Different educational methods were used by the researchers; including a booklet containing the basic information regarding food borne diseases, and safety food measures, as well as discussions, demonstrations, and re-demonstrations.

4. Evaluation phase:

The evaluation was done immediately after implementation of the

educational guidelines to assess the effect of educational program by using the same tools of pretest.

Statistical Analysis:

Prior to entry, data were checked. For data analysis and tabulation, the statistical program for social sciences (SPSS), version 17 was utilized. The data in this study was analyzed using descriptive statistics such as frequency, mean, and standard deviation. The independent t-test was used to compare quantitative variables between two groups, while the ANOVA test was used to compare more than two groups. The paired t-test was used to compare quantitative variables in the study group before and after intervention. Pearson correlation was used to determine the correlations between quantitative variables. Statistical significance was considered at p-value ≤ 0.05 .

Results:

Table (1) reveals that the less than two thirds (61.2%) of the study sample were female, 57.5% aged 40 years or more. As regards education, less than one third (31.2%) of them had university education, while 52.5% had more than 15 years of experience, and 60.0% of the study sample received training in the past two years.

Table (2) declares that there was improvement in food handlers' practices scores regarding safety food measures after implementation of the educational guidelines (pre education, 8.8% had satisfactory practices which increased at post education to reach 48.8%).

Figure (1) illustrates that the study sample knowledge regarding safety

food measures has been improved after implementation of the educational guidelines as the food handlers' good knowledge level had improved from 3.8% to 32.5%.

Table (3) shows that the mean knowledge scores were significantly higher in males than females, both at pre and post educational guidelines. There were increased levels of scores among nutrition supervisors, followed by chefs and assistant chefs, while the lowest knowledge level reported was in workers. No statistically significant relations were reported between food handlers total knowledge scores and study participants age, experience, and receiving training.

Table (4) indicates that the mean practices' scores were significantly higher in males than females, at pre and post educational guidelines. There were significant relations between practices and occupation as increased levels of practices' scores were detected among nutrition supervisors, followed by chefs and assistant chefs, and the lowest practices' level was reported in workers. No statistically significant relations were reported regarding age, experience, and receiving training.

Table (5) reveals that there was

highly statistical significant differences (p value <0.001) between food handlers' knowledge regarding foodborne diseases, safety food measures, and their total knowledge score after implementation of the educational guidelines.

Table (6) presents that the mean practices' scores of personal hygiene, hand washing, and use of personal protective equipment, food preparation and cooking, food storage and serving, and total practices score significantly increased after implementation of the educational guidelines (p value = <0.001). This indicates that a significant improvement of food handlers' practices was gained regarding safety food measures, after application of the educational guidelines.

Figure (2) demonstrates that there was a positive correlation (p value = <0.001) between total knowledge scores and total practices' scores of food handlers regarding safety food measures before implementation of the educational guidelines.

Table (7) clarifies that there was a positive correlation between total knowledge scores and total practices' scores of food handler's before and after implementation of the educational guidelines.

Table (1): Percentage Distribution of Food Handlers' According to their Socio-demographic Characteristics (n=80).

Variables	Items	No.	%
Age (in years)	20-<30	7	8.7
	30-<40	27	33.8
	40 +	46	57.5
Gender	Male	31	38.8
	Female	49	61.2
Occupation	Nutrition supervisor	43	53.8
	Chef	9	11.2
	Assistant chef	6	7.5
	Workers	22	27.5
Years of experience	5-<10	12	15.0
	10-15	26	32.5
	>15	42	52.5
Education	Illiterate	23	28.8
	Elementary	11	13.8
	High school	21	26.2
	University	25	31.2
Training regarding safety food measures	Yes	48	60.0
	No	32	40.0

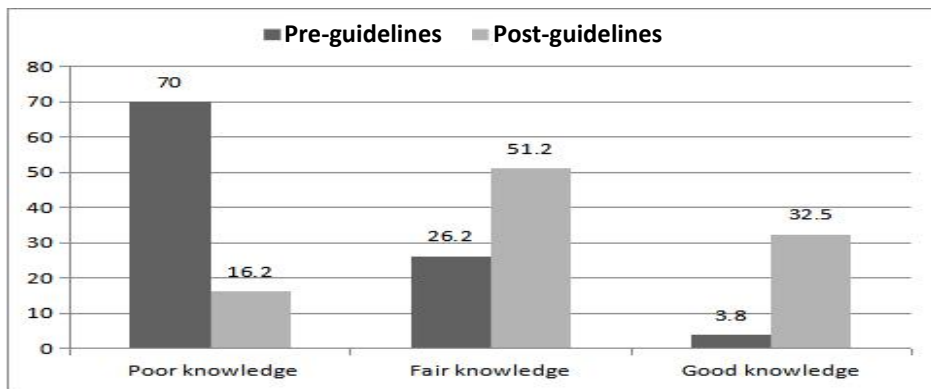


Figure (1): Distribution of Food Handlers According to their Satisfactory Knowledge Regarding Safety Food Measures Pre, Post Educational Guidelines (n=80).

Table (2): Distribution of Food Handlers' According to their Total Practices Scores Regarding Safety Food Measures Pre, Post Educational Guidelines (n=80).

Practice level	Post-educational guidelines		Pre-educational guidelines	
	No.	%	No.	%
Unsatisfactory practices	73	91.2	41	51.2
Satisfactory practices	7	8.8	39	48.8

Table (3): Relationship between Food Handlers' Total Knowledge Scores and their Personal Data Pre, Post Educational Guidelines Regarding Safety Food Measures (n=80).

Demographic data	Pre educational guidelines		post educational guidelines	
	Mean ± SD		Mean ± SD	
Age (in years)				
< 30	18.43 ± 2.6		22.43 ± 2.23	
30-<40	15.11 ± 3.27		19.96 ± 2.97	
40 +	15.43 ± 3.6		20.9 ± 3.32	
P value	0.69	F=2.7	0.819	F=0.157
Gender				
Male	17.7 ± 3.62		22.06 ± 2.9	
Female	14.24 ± 2.62		19.9 ± 3.07	
P value	.000	t=4.6	.002*	t=3.2
Education				
Illiterate	14.9 ± 3.21		20.8 ± 3.1	
Elementary	15.18 ± 2.44		19.9 ± 2.26	
High school	15.81 ± 4.02		20.8 ± 3.6	
University	16.24 ± 3.6		20.96 ± 3.22	
P value	.558	F=1.21	.837	F=0.544
Job title				
Nutrition supervisor	17.33 ± 3.46		21.7 ± 3.09	
Chef	15.8 ± 1.6		20.6 ± 1.8	
Assistant chef	15.7 ± 1.2		19.33 ± 1.03	
Worker	12.09 ± .97		19.14 ± 3.43	
P value	.000	F=18.38	.009*	F=4.7
Experience				
5-<10	16.42 ± 3.7		21.58 ± 3.9	
10-15	15.3 ± 3.5		20.5 ± 3.0	
>15	15.55 ± 3.4		20.6 ± 3.08	
P value	.640	F=0.449	.588	F=0.588
Received training				
Yes	15.88 ± 3.5		20.65 ± 3.15	
No	15.16 ± 3.45		20.81 ± 3.25	
P value	.367	t=.907	.819	t=0.229

* Highly Significant at p<0.01

Table (4): Relationship between Food Handlers' Total Safety Practices' Scores and their Personal Data Pre, Post Educational Guidelines Regarding Safety Food Measures (n=80).

Demographic data	Pre educational guidelines	Post educational guidelines
	Mean ± SD	Mean ± SD
Age (in years)		
< 30	15.9 ±1.9	20.0 ± 4.47
30-<40	15.0±1.6	17.48 ± 2.8
40 +	15.09 ±1.5	18.02 ± 3.2
P value	.436 F=0.839	1.86 F=1.719
Gender		
Male	15.94 ±1.7	19.3±3.61
Female	14.6 ±1.32	17.18 ±2.69
P value	.000 t=3.95	.003* t=3.03
Education		
Illiterate	15.0435 ± 1.36	17.41 ± 3.116
Elementary	14.9091 ± 1.22	17.18 ± 2.993
High school	15.3333± 1.82	18.43± 3.44
University	15.1200 ± 1.76	18.52± 3.29
P value	.894 F=1.588	.516 F=1.1
Occupation		
Nutrition supervisor	15.44±1.8	18.8 ± 3.6
Chef	15.8 ±.97	18.11 ±1.8
Assistant chef	15.7±1.21	18.7 ±2.8
Worker	14.09 ±.87	16.32 ±2.48
P value	.003 F=5.12	.031* F=3.114
Experience		
5-<10	15.9±1.6	19.25 ± 2.6
10-15	14.8 ±1.45	17.7 ±3.6
>15	15.12±1.6	17.9 ±3.15
P value	.116 F=2.2	.346 F=1.077
Received training		
Yes	15.31 ± 1.6	17.9 ±3.17
No	14.8 ±1.5	18.22 ±3.36
P value	.197 F=1.3	.644 t=0.464

* Highly Significant at p<0.01

Table (5): Relationship between Food Handlers' Knowledge Scores Pre, Post Educational Guidelines Regarding Safety Food Measures

Items	Pre-educational guidelines	Post-educational guidelines	T-paired	P-value
	Mean ± SD	Mean± SD		
Knowledge of foodborne diseases	3.27 ± 1.09	5.19 ±1.02	16.9	<0.001*
Prevention of food contamination				
Personal hygiene and hand washing	4.56±1.19	6.79± 1.38	15.3	<0.001*
Cleaning of food contact surfaces, and kitchen equipment	2.97±.42	3.18 ±.471	3.8	<0.001*
Safety food measures used for storage, preparation, and serving food	4.78±1.46	5.56±1.7	4.9	<0.001*
Total knowledge score	15.59±3.47	20.7± 3.17	16.8	<0.001*

* Highly significant at $p<0.01$

Table (6): Relationship between Food Handlers' Safety Practices Scores Regarding Safety Food Measures Pre, and Post Educational Guidelines

Items	Pre-educational guidelines	Post-educational guidelines	T paired	P value
	Mean ± SD	Mean ± SD		
Personal hygiene, hand washing, and use of personal protective equipment	4.34±1.15	5.79±2.23	6.253	<0.001*
Food preparation and cooking	5.12±.85	5.64±1.25	3.995	<0.001*
Food storage and serving	2.82±.44	3.11± .5	5.330	<0.001*
Cleaning and disinfection of food contact surfaces	2.84±.46	3.48±.81	6.63	<0.001*
Total practices' score	15.12±1.6	18.01±3.23	9.004	<0.001*

* Highly Significant at $p<0.01$

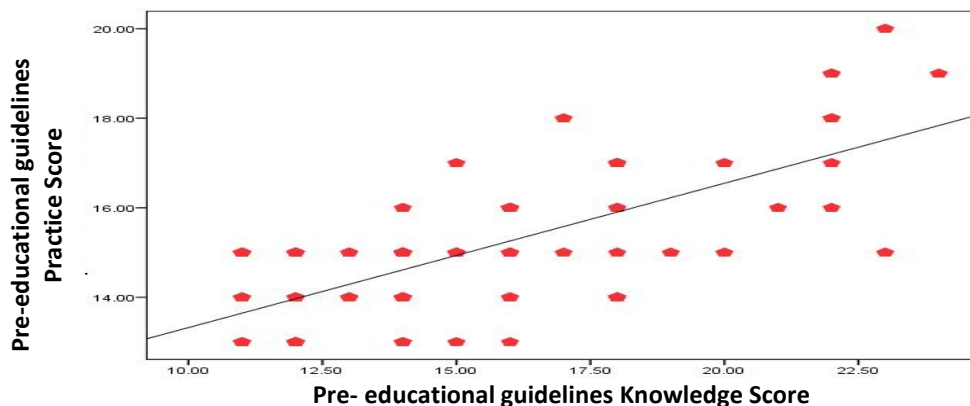


Figure (2) Correlation between Food Handlers’ Knowledge and Safety Practices’ Scores Pre Educational Guidelines Regarding Safety Food Measures (n=80).

Table (7): Correlation between Food Handlers’ Total Knowledge and Practices’ Scores Pre, Post Educational Guidelines Regarding Safety Food Measures (n=80).

Items	Pre-educational guidelines		Post-educational guidelines	
	P-value	r	P-value	r
Total practices scores VS total knowledge scores	.000**	.705	.001**	.358

Discussion

Diseases caused by foodborne diseases affect millions of people around the world each year. The real tragedy of food borne diseases happens in developing countries. Much of these diseases have been the result of a lack of knowledge of food safety practices (Alqurashi et al., 2019 ; Okouret al., 2020). The world has made tremendous efforts to improve food safety at all levels of the food chain including universities, in order to minimize food hazards, that can affect teenage students who are considered as vulnerable groups of the society (Zalatt, 2013).

A finding of this study concerning personal data of the study participants, revealed that slightly more than three fifths of the study participants were female, this finding disagreed with that of Abdalfata and Osman (2020), who carried out a study to evaluate the effectiveness of the educational health program concerning food safety for food services’ employees at Assiut University restaurants, and found that more than two-thirds of the study sample were male. The present study result found that slightly less than one third of participants have university education, this agreed to some extent

with **Al-Kandari et al. (2019)**, who found that 39.6% of the study respondents were having an education at university level.

As regards training on food safety measures, three-fifths of the current study participants received training in the past two years. This finding goes in the same line with that of **Taha et al. (2020)**, who evaluated food handlers' food safety knowledge, attitude, commitment, and behavior in restaurants in Jebel Ali, Dubai, United Arab Emirates, as well as the effects of food safety knowledge and attitude on employee commitment and, ultimately, food handlers' food safety behavior, and discovered that three-quarters of the participants received food safety training courses. Incongruent with the previous study results **Wahdan et al. (2019)**, reported that only half of food handlers in governmental hospitals of an Egyptian governorate had previous food safety training courses.

The present study result revealed that after implementation of the educational guidelines, the food handlers' knowledge about safety food measures was improved, this result is supported with that of **Abdalfatah & Osman (2020)**, who in their recent study found improvement of food services employees' knowledge regarding safety food measures after application of the education program.

Concerning the practices of the food handlers, the present study finding revealed that the majority of them had unsatisfactory practices level regarding safety food measures before implementation of educational guidelines. This result is supported

with the finding of a study conducted by **Haghi, Ahamadi & Khaniki (2019)** in Tehran which revealed that, the majority (94.9%) of university food handlers had insufficient practices regarding safety food measures. However, the previous findings are inconsistent with that of **Abdalfatah and Osman (2020)**, who reported that food services employees had proper practices regarding safety food measures before the education program application.

On the other hand, the present study result showed improvement in participants' total practices scores after application of the educational guidelines. In accordance with **Mohamed et al. (2020)**, study conducted in Egypt to evaluate the effects of educational program on preventing food borne diseases at restaurants of Suez Canal University, they found improvement in food safety practices of food handlers between the pre-test and the post-test.

The current study results revealed that the mean knowledge scores was significantly higher in males than females, at both pre and post educational guidelines. This finding is contradicting with those of **Abdullahi et al. (2016)**, who recorded that the females had a higher level of knowledge than the males. On the other hand, **Abdalfatah and Osman (2020)**, in their very recent study stated that gender of food services' employees had no effect on their knowledge after the education program implementation.

The results of the present study results showed that no statistically

significant relations were reported between food handlers total knowledge scores with socio-demographic characteristics as; age, experience, and receiving training. These findings are consistent with **Ncube et al. (2020)** which revealed that no differences were detected in food handlers those of knowledge of food safety measures based on their age and work experience. The current study results revealed that occupation had an effect on the study participants knowledge level which increased among nutrition supervisors and was the lowest knowledge level reported in workers. This finding is consistent with that of **Zain & Naing (2002)**, who stated that there was a direct relationship between the study sample knowledge and their occupation type.

The present study result clarified that significant increase in mean knowledge scores of food handlers regarding foodborne diseases, personal hygiene and hand washing, cleaning of food contact surface, and kitchen equipment, applying safety food measures used for storage, preparation, and serving food after implementation of the educational guidelines. These results agreed with those of **Cempaka, Rizki, and Asiah (2019)**, who reported excellent knowledge of food handlers regarding personal hygiene, and mentioned that 99% of the study participants answered correctly on washing hands' questions. However, these results were inconstant with those of **Bilge and Demir (2019)** which revealed that almost half of their participants in a study about evaluation of food safety knowledge among food handlers did not have adequate

knowledge about personal hygiene and food safety.

The results of the current study showed that the mean practices' scores of personal hygiene, hand washing, and use of personal protective equipment, food preparation and cooking, food storage and serving and total practices scores significantly improved after implementation of the educational guidelines. This could be due to the positive effect of educational guidelines on improving food handlers' practices regarding safety food measures. These results were consistent with those of **Mohamed et al. (2020)**, which reported that the total mean scores of food handlers' practices was increased after the intervention indicating improvement in food safety practices in post-test. The previous findings go in same line with those of **Wahdan et al. (2019)**, who stated that the mean scores of hand hygiene, personal protective equipment, hygienic practices, cleaning of used equipment and utensils showed a significant increase after intervention as well as, all food hygiene practices of their study participants were significantly improved. However, these results were inconsistent with those of **Elsersy et al. (2018)**, which reported that the majority of food handlers in hospital kitchens, in Tanta City, Gharbia Governorate, Egypt had insufficient practice regarding safety food measures.

The results of the current detected a positive correlation between total knowledge, and practices scores regarding safety food measures. This study result go in same line with those of **Mohamed et al. (2020)**, who in a similar study found a positive

correlation between food handlers' knowledge with their practices, the previous results agreed with those of **Cempaka, Rizki and Asiah (2019)** study, conducted in Indonesia, to assess the level of knowledge, attitudes and practices of food street handlers at a public elementary school and reported that there was a significantly positive correlation between knowledge and practices of their study participants.

From the researchers' perspective, this could be due to that food handlers have gained sufficient knowledge regarding safety food measures, which affected significantly on their practices.

Conclusion

In the light of the present study results, and research hypothesis one can conclude that, the implementation of the educational guidelines was significantly effective in improving the food handlers' knowledge, and practices regarding safety food measures.

Recommendations

- Periodic application of educational guidelines at university restaurants to improve food handlers knowledge about safety food measures.
- Conducting regular training programs to equip food handlers with skills regarding safety food measures.

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