



Mansoura University  
Faculty of Tourism and Hotels

# Effectiveness of food safety and hygiene course for undergraduate students

*By*

**Dr. Suzan Elsayed Abdelrassoul**

*Assistant professor, Department of Hotel  
Studies - High Institute of Tourism and  
Hotel Management and Monuments  
Restoration  
Abu Kir, Alexandria*

**RESEARCH JOURNAL OF THE FACULTY OF TOURISM AND HOTELS  
MANSOURA UNIVERSITY  
ISSUE NO. 12, DECEMBER. 2022 PART 2**



## مدى كفاءة تدريس منهج صحة وسلامة الأغذية للطلبة قبل التخرج

سوزان عبد الرسول

أستاذ مساعد قسم إدارة الضيافة

المعهد العالي للسياحة والفنادق وترميم الآثار - أبو قير

### الملخص العربي:

**المقدمة:** ان تدريب متداولى الأغذية من المتطلبات الاساسية لضمان صحة وسلامة الأغذية والذي يعنى ان الغذاء صالح للاستهلاك الأدمى. صحة الأغذية هى مجموعة من الاجراءات التى تضمن سلامتها من المزرعة وحتى المائدة وحتى وصولها الى المستهلك النهائى. **هدف الدراسة:** الدراسة لتقييم مدى استجابة الطلبة لكورس صحة وسلامة الاغذية ودراسة كفاءة كورس صحة وسلامة الاغذية لطلبة قسم الفنادق المنهجية: العينة مقطعية والاداة تدخل بتدريس الكورس وقياس مستوى الطلبة قبل وبعد تدريس الكورس تم ادخال البيانات وتحليلها بعد جمع اسئلة الاستقصاء الموزع على الطلبة قبل وبعد الكورس. **النتائج:** أظهرت النتائج ان المنهج هو الاقل تأثيرا على معلومات الطلبة لصحة وسلامة الاغذية بينما المحاضر هو الاكثر تأثيرا. استجابة الطلبة للكورس كانت استجابة ايجابية. **التوصيات:** تحتاج الطلبة إلى تقوية في المعلومات الخاصة بصحة وسلامة الأغذية وخاصة بالنسبة للصحة الشخصية واستلام الأغذية. **الكلمات الدالة:** سلامة الأغذية، منهج تعليمى، صحة الأغذية، التسمم الغذائى، مخاطر تلوث الاغذية.

### Abstract:

**Introduction:** Food hygiene the group of measures needed to ensure food safety from farm to table, that is, from the moment they are obtained until they reach the final consumer. The overall aim of this research is the influence of food safety education course on the food safety response among undergraduate students. Study the effectiveness of

food safety and hygiene course for undergraduate students. A cross-sectional design was used; an intervention approach (one group pre-test post-test design) was conducted among undergraduate students. Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. The curriculum was the less importance of who is responsible for teaching the students food safety and hygienic measures. The lecturer was the most important one of whose teach the students the food safety and hygienic course. Student response to the course is significantly changed and improved as the as P value was 0.005. It is recommended that food safety education might be integrated into the preschool curriculum to minimize the influence of these factors on the food safety behavior of people.

**Key words:** Food safety, educational course, food hygiene, food poisoning, food hazards

### **Introduction**

A well designed food safety program is good for both the food premises and their customers. Repeat business from customers and higher job satisfaction for employees can lead to higher profits and better service (Ministry of Health and Long-Term Care, 2018).

Training of food handlers is a pre-requisite for ensuring food safety which means assurance that food is acceptable for human consumption according to its intended use (FSSAI, 2020).

Food hygiene is the group of measures needed to ensure food safety from farm to table, that is, from the

moment they are obtained until they reach the final consumer(Gozalo & Gallego, 2021).

The best way to avoid food poisoning is to ensure high standards of food hygiene are maintained when storing, handling and preparing food. Knowledge of food hygiene is essential for any person who handles food in order to know about.

The steps that need to be taken to prevent the risks associated with food poisoning.

Food borne diseases are an important public health issue, and young adults are an important demographic to target with food safety education.

**By the end of the course the student should be able to:**

1. Understand the importance of food safety measures when providing food and drink for individuals
2. Identify potential food safety hazards when preparing, serving, clearing away and storing food and drink
3. Be able to maintain hygiene when handling food and drink
4. Be able to meet safety requirements when preparing and serving food and drink for individuals.
5. Be able to meet safety requirements when clearing away food and drink.

6. Be able to store food and drink safely.
7. Know how to access additional advice or support about food safety.
8. Describe practices to control hazards when preparing and serving food and drink.
9. Controlling hazards or maintaining good standards of food hygiene when preparing and serving food and drink is about:
  - Protecting food from contamination
  - Preventing bacteria that may be present in food from multiplying
  - Destroying any harmful bacteria by ensuring food is thoroughly cooked.

There are four main things to remember to control hazards when serving food and drink:

- Cleanliness
- Cooking
- Chilling
- Cross-contamination (Courtney et al., 2016).

### **Cooking**

Inadequate cooking enables harmful bacteria to survive and is a serious hazard. Prolonged cooking at low temperatures, for example a large joint of meat, allows bacteria to multiply at the center which may not be destroyed if a satisfactory final temperature is not achieved. Cooking food at a high temperature will kill harmful bacteria. Most bacteria will die if cooked above 63°C. Checking the temperature of food is a good way to ensure food is safe to eat. When serving food it must be at or above 63°C. Frozen joints of meat and poultry must be completely thawed prior to cooking.

Anyone involved in preparing food and drink should have a high standard of personal and general hygiene. High standards of hygiene will help to reduce the risk of contamination and help to prevent food poisoning. In order to minimize risks to your own safety and that of others when preparing food and drink it is important to follow some basic rules (Dudeja & Singh, 2017).

**The key points to follow the food safety requirements are:**

- Ensure equipment and surfaces are clean before preparing food.
- Separate raw and cooked foods and use separate chopping boards and utensils for different types of foods.
- Ensure hands are washed regularly, including palms and backs of hands, especially: before preparing food, between handling raw and cooked food, after using

the toilet, after eating, drinking and smoking breaks, after handling refuse and waste materials,

- Cover wounds with waterproof high visibility dressings such as blue plasters.
- Follow good personal hygiene guidelines, for example ensuring long hair is tied back.
- Ensure clothing is clean. Wear PPE to prevent contaminating food. Ensure food is thoroughly defrosted before cooking.
- When reheating any food, ensure that it is heated above 82°C for at least two minutes.
- After cooking food, cool it as quickly as possible if it is to go in the fridge (University of West London, 2022).

In addition, ensuring good sources of food, proper inspection and storage, the most important practices that must be followed by food handlers during preparation and handling of food are: hand hygiene, use of personal protective equipment (PPE) [clean coats, head covers, gloves and masks], sanitary practices during handling food and environmental measures including cleaning of equipment (Agyei-Baffour *et al.*, 2013; Salam, 2015). Food safety education and training for food handlers is crucial in impacting their practices in food handling process and hence being fundamental in preventing Food borne diseases FBDs (Ngivu, 2016; Wahdan *et al.*, 2019).



Insufficient food safety practices are major contributors to the transmission of foodborne illness (FBI) (Mitchell *et al.*, 2007).

A food handler should never work while sick. A sick person can spread illness by touching food, dishes, counters, utensils, other surfaces, other people or by coughing and sneezing (Lake Region District Health Unit, 2020).

**Cross-contamination:** It is the passing of contaminants from one food to another. It can be produced by mixing raw and cooked foods (in cooked foods we have eliminated most of the bacteria but not in raw foods, and they can pass from one to another, making cooked foods dangerous to health). Cross contamination can also occur when using the same utensils (cutting board, knife....) to treat raw and then cooked food without cleaning them first. To prevent cross contamination raw meat can spread bacteria to ready – to –eat food (e.g salad) unless it is kept separate all times. Bacteria can be spread by contact with hands, utensils or equipment (Abu Dhabi Food Control Authority, 2010).

#### **The aim of the study**

- 1- This study evaluated the influence of food safety education course on the food safety response among undergraduate students.
- 2- Study the Effectiveness of food safety and hygiene course for undergraduate students.

#### **Research Population and Sampling Techniques Research Design**

A cross-sectional design was used; an intervention approach (one group pre-test post-test design) was conducted among all undergraduate students.

#### **Data Collection:**

The study was conducted in October 2022. According to the data collection structured questionnaires were applied to 120 students before they had the food safety course and then collected. The same questionnaires were distributed again to the students and collected after the course. The questionnaires 93 were collected which divided into: 30 students from Hospitality department grade 4 from High Institute for Tourism and Hotel Management Alexandria City (EGOTH) institutes and 63 students from hospitality department grade 4 High Institute of Tourism and Hotel Management and Monuments Restoration (HITHR) Abukir. The questionnaire was valid for statistical analysis.

**The intervention course:**

The researcher presented video relating to our program include Personal Hygiene, Environmental Hygiene and Food Handling Practices as aiding mean to the lecture.

The questionnaire was divided into four parameters: Personal hygiene, receiving of food ingredient, safety practices of food process, serving of meals and food safety knowledge. The questionnaire constructed of multiple choices (Ozilgen, 2011).

The questionnaire which was developed, in line with the preventive measures laid down by FAO, IFAD, UNICEF, WFP, and WHO (2018)(FAO *et al.*, 2018).

**Statistical analysis of the data**

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The **Kolmogorov-Smirnov** test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean,

standard deviation and median. Significance of the obtained results was judged at the 5% level.

**Statistical tools:**

**1- McNemar Test**

Used to analyze the significance between the different stages.

**2-Wilcoxon signed ranks test**

For abnormally distributed quantitative variables, to compare between two periods.

**3-Cronbach's Alpha**

Reliability Statistics was assessed using Cronbach's Alpha test.

**Food safety questions course**

**Research Hypotheses:**

- 1- Teaching food safety and hygiene course to the undergraduate student are effective.
- 2- If this study evaluated the influence of food safety education course on the food safety response among undergraduate students or not.

**Results:**

Test of reliability can be thought of as precision; the extent to which measurement occurs without error. From table (1) the reliability was above 0.8 which indicated that the data confirmed to be used in the study.

**Table (1): Reliability Statistics**

	Cronbach's Alpha	No. of Items
Student response	0.819	30

Table (2) shows the demographic data of the undergraduate students. All students were in grade four

Hospitality department which is the last grade as they are about to be graduated and need this course of food safety and hygiene. 45.2% of the students had worked before which means that they had got practical information. 52.7% of the students had studied before in Holes school before they had joined to High Institutes.46.2% had trained before in the kitchen.73.1% of the students were males while 26.9% were females which indicated that Hospitality studies attract more males than females students.

**Table (2): Distribution of the studied student according to demographic data (n = 93)**

Demographic data	No.	%
<b>Place</b>		
EGOT	30	32.3
HITHR	63	67.7
<b>Sex</b>		
Male	68	73.1
Female	25	26.9
<b>Age</b>		
<25	89	95.7
≥25	4	4.3
Min. – Max.	20.0 – 27.0	
Mean ± SD.	22.11 ± 1.23	
Median	22.0	
<b>Grade</b>		
4	93	100.0
<b>Secondary school</b>		
Public	23	24.7
Hotels	49	52.7
Agriculture	1	1.1
Commercial	17	18.3
Other	3	3.2
<b>Have you ever trained in a kitchen before</b>		
Yes	43	46.2
No	50	53.8
<b>Have you ever worked in a kitchen before</b>		
Never worked before	18	19.4
Have worked before	42	45.2
Still worked till this time	33	35.5
<b>Number of experience years</b>		
No experience	59	63.4
<5	26	28.0
≥5	8	8.6
Min. – Max.	0.17 – 10.0	
Mean ± SD.	2.66 ± 2.38	
Median	2.0	

**SD: Standard deviation**

In table (3) we asked the students try to give serial numbers to the following points according to the importance of who is responsible for teaching you food safety and hygienic measures (curriculum, the lecturer, teaching chef, practical chef).

As number one is the most important and numbers four is the least important.

The results indicated that curriculum was in the rank 4 agreed with 39.8% of the students' opinions, while 20.4% of them chose rank 3. While 32.3% of them chose rank 2, and 7.5% of the students chose rank 1.

The curriculum was the less importance of who is responsible for teaching the students food safety and hygienic measures.

The results indicated that the lecturer was in the rank 4 agreed with 1.1% of the students' opinions; while 25.8% of them chose rank 3. While 28% of them chose rank 2, and 43% of the students chose rank 1.

The lecturer was the most important one of whose teach the students the food safety and hygienic course.

The results indicated that the teaching chef was in the rank 4 agree with 19.4% of the students' opinions, while 26.9% of them chose rank 3. While 25.8% of them chose rank 2, and 28% of the students chose rank 1.

The results indicated that the practical chef was in the rank 4 agree with 39.8% of the students' opinions, while 26.6% of them chose rank 3. While 11.8% of them chose rank 2, and 21.5% of the students chose rank 1.

**Table (3): Distribution of the studied student according to the importance of who is responsible for teaching you food safety and hygienic measures (n = 93)**

Try to give serial numbers to the following points according to the importance of who is responsible for teaching you food safety and hygienic measures	1		2		3		4	
	No.	%	No.	%	No.	%	No.	%
Curriculum	7	7.5	30	32.3	19	20.4	37	39.8
The lecturer	40	43.0	28	30.1	24	25.8	1	1.1
Teaching chef	26	28.0	24	25.8	25	26.9	18	19.4
Practical chef	20	21.5	11	11.8	25	26.9	37	39.8

Table (4): indicated that Personal Hygiene as the results of the first parameter of student response of this study before and after the intervention

The questions: Chlorine is considered as and Used as insecticide in the kitchen the percent of right answer increased after the course but this parameter not significantly changed. As the P value was 0.177.

**Table (4): Comparing between before and after the intervention according to personal hygiene (n = 93)**

Personal Hygiene	Pre		Post		Test of Sig.	p				
	Incorrect	Correct	Incorrect	Correct						
	No.	%	No.	%						
Complete through washing of hands when Soap is considered as Chlorine is considered as Used as insecticide in the kitchen	1	1.1	92	98.9	12	12.9	81	87.1	McN	0.003*
	6	6.5	87	93.5	13	14.0	80	86.0	McN	0.092
	36	38.7	57	61.3	31	33.3	62	66.7	McN	0.424
	35	37.6	58	62.4	34	36.6	59	63.4	McN	1.000
<b>Total score</b>	<b>(0 – 4)</b>									
Min. – Max.	1.0 – 4.0				0.0 – 4.0					
Mean ± SD.	3.16 ± 0.70				3.03 ± 0.94					
Median	3.0				3.0					
<b>% score</b>									Z=	0.177
Min. – Max.	25.0 – 100.0				0.0 – 100.0				1.351	
Mean ± SD.	79.03 ± 17.40				75.81 ± 23.44					
Median	75.0				75.0					

SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test

p: p value for comparing between pre and post

\*: Statistically significant at  $p \leq 0.05$

Table (5): indicated that receiving of food ingredient the percent of right answer significantly increased after the course in the question of the Receiving fresh food will be at. But this parameter not significantly changed As the P value was 0.155.



**Table (5): Comparing between before and after the intervention according to receiving of food ingredient (n = 93)**

Receiving of food ingredient	Pre		Post		Test of Sig.	p				
	No.	%	No.	%						
Receiving of frozenfood package will be rejected if	4	4.3	89	95.7	24	25.8	69	74.2	McN	<0.001*
Receiving fresh food will be at	71	76.3	22	23.7	59	63.4	34	36.6	McN	0.012*
<b>Total score</b>	<b>(0 – 2)</b>									
Min. – Max.	0.0 – 2.0				0.0 – 2.0					
Mean ± SD.	1.19 ± 0.47				1.11 ± 0.56					
Median	1.0				1.0					
<b>% score</b>									Z=	0.155
Min. – Max.	0.0 – 100.0				0.0 – 100.0				1.421	
Mean ± SD.	59.68 ± 23.61				55.38 ± 28.04					
Median	50.0				50.0					

SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test; p value for comparing between pre and post\*: Statistically significant at  $p \leq 0.05$

Table (6): indicated that Safety Practices of food process the question If fresh vegetables contaminated by raw meat this contamination will be removed by, and the question When we freeze the food at -18C what happened to the microorganisms and Food which stored in refrigerator have to be in a way, To confirm the internal food temperature should be checked The internal cooked meat temperature should not be less than Raw food should be washed with Washing food preparing boards should be by using, These questions they answers improved after the course and there are significantly changed As the P value was:0.011,0.031and 0.001

When food is tested it should be, to confirm the internal food temperature should be checked by and the internal cooked meat temperature should not be less than.

**Table (6): Comparing between before and after the intervention according to safety practices of food process (n = 93)**

Safety Practices of food process	Pre		Post		Test of Sig.	p				
	Incorrect	Correct	Incorrect	Correct						
	No. %	No. %	No. %	No. %						
If fresh vegetables contaminated by raw meat this contamination will be removed by:	49	52.7	44	47.3	40	43.0	53	57.0	McN	0.137
When we freeze the food at -18C what happened to the microorganisms	41	44.1	52	55.9	39	41.9	54	58.1	McN	0.832
When food handler person get injured he must	68	73.1	25	26.9	71	76.3	22	23.7	McN	0.648
The optimum temperature of dry food is	60	64.5	33	35.5	67	72.0	26	28.0	McN	0.167
Food which stored in refrigerator have to be in a way	35	37.6	58	62.4	30	32.3	63	67.7	McN	0.424
When food is tested it should be	39	41.9	54	58.1	52	55.9	41	44.1	McN	0.011*
There is a food storage rule which is	22	23.7	71	76.3	24	25.8	69	74.2	McN	0.804
To confirm the internal food temperature should be checked by	31	33.3	62	66.7	18	19.4	75	80.6	McN	0.031*
The internal cooked meat temperature should not be less than	72	77.4	21	22.6	28	30.1	65	69.9	McN	<0.001*
Raw food should be washed with	23	24.7	70	75.3	21	22.6	72	77.4	McN	0.824

Washing food preparing boards should be by using	71	76.3	22	23.7	58	62.4	35	37.6	McN	0.037*
<b>Total score</b>	<b>(0 – 11)</b>									
Min. – Max.	0.0 – 11.0		2.0 – 10.0							
Mean ± SD.	5.51 ± 1.94		6.18 ± 1.84							
Median	6.0		6.0							
<b>% score</b>									Z=	0.006*
Min. – Max.	0.0 – 100.0		18.18 – 90.91						2.772*	
Mean ± SD.	50.05 ± 17.66		56.21 ± 16.68							
Median	54.55		54.55							

SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test

p: p value for comparing between pre and post \*: Statistically significant at  $p \leq 0.05$

The whole parameter: Safety Practices of food process is significantly changed as the P value was 0.006

Table(7): The results of the fourth parameter serving of meals, the answers of these questions Hot food should be served at, Cold salads serving time should not to be exceed than and Cooked meat serving time should not exceed than .The answers are significantly changed as the P value for the parameter was:0.1001.

**Table (7): Comparing between before and after the intervention according to serving of meals (n = 93)**

Serving of meals	Pre		Post		Test		p			
	Incorrect	Correct	Incorrect	Correct	of	Sig.				
	No.	%	No.	%	No.					
Hot food should be served at	77	82.8	16	17.2	75	80.6	18	19.4	McN	0.804
Cold salads serving time should not to be exceed than	19	20.4	74	79.6	6	6.5	87	93.5	McN	0.004*
Cooked meat serving time should not exceed than	69	74.2	24	25.8	49	52.7	44	47.3	McN	0.001*
<b>Total score</b>	<b>(0– 3)</b>									

Min. – Max.	0.0 – 2.0	0.0 – 3.0	
Mean ± SD.	1.23 ± 0.61	1.60 ± 0.72	
Median	1.0	2.0	
<b>% score</b>			Z=
Min. – Max.	0.0 – 66.67	0.0 – 100.0	4.219* < 0.001*
Mean ± SD.	40.86 ± 20.34	53.41 ± 24.15	
Median	33.33	66.67	

SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test

p: p value for comparing between **pre** and **post**

\*: Statistically significant at  $p \leq 0.05$

Table (8): The results of the fifth parameter food safety knowledge there are many answers of question had improved after the course: Hazardous food is, Microorganisms in food are considered as .....Pollutant and Factors that affect microbial growth are: warmth, moisture and..... Food microorganisms are killed at.... And the question: The internal cooked meat temperature should not be less than..... The whole parameter did not significantly changed as the as P value was 0.707

**Table (8): Comparing between pre and post according to food safety knowledge (n = 93)**

	Pre		Post		Test of p
	Incorrect No.	Correct %	Incorrect No.	Correct %	
<b>Food safety knowledge</b>					
Food safety hazards are: biological, physical and....	17	18.3	76	81.7	30 32.3 63 67.7 McN 0.055
Elder people are more susceptible to food transmitted diseases that is because	4	4.3	89	95.7	13 14.0 80 86.0 McN 0.035*
Hazardous food are	51	54.8	42	45.2	41 44.1 52 55.9 McN 0.078
Microorganisms in food are considered as .....pollutant	55	59.1	38	40.9	41 44.1 52 55.9 McN 0.022*
Factors that affect microbial growth are: warmth, moisture and.....	70	75.3	23	24.7	62 66.7 31 33.3 McN 0.096
Eating eggs or peanuts are dangerous to people who suffering from	28	30.1	65	69.9	34 36.6 59 63.4 McN 0.327
Food poisoning happened when people eat food contaminated by: chemical substance, poisoned food or.....	14	15.1	79	84.9	18 19.4 75 80.6 McN 0.503
Hand washing is considered as the most important factors of food poisoning regarding	8	8.6	85	91.4	14 15.1 79 84.9 McN 0.210
Food microorganisms are killed at:	39	41.9	54	58.1	34 36.6 59 63.4 McN 0.486
Before serving and	72	77.4	21	22.6	68 73.1 25 26.9 McN 0.503

eating refrigerated food  
it should be

<b>Total score</b>	<b>(0– 10)</b>		
Min. – Max.	3.0 – 9.0	2.0 – 9.0	
Mean ± SD.	6.15 ± 1.41	6.18 ± 1.69	
Median	6.0	6.0	
<b>% score</b>			Z= 0.375 0.707
Min. – Max.	30.0 – 90.0	20.0 – 90.0	
Mean ± SD.	61.51 ± 14.06	61.83 ± 16.87	
Median	60.0	60.0	

SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test

p: p value for comparing between **pre** and **post**

\*: Statistically significant at  $p \leq 0.05$

Table (9): Shows Comparison between before and after food safety and hygiene course according to % scores of student response **which** is significantly changed and improved as the as P value was 0.005.

**Table (9): Comparing between pre and post according to % scores of student response (n = 93)**

	Pre	Post	Z	p
	Mean % score	Mean % score		
Personal Hygiene	79.03	75.81	1.351	0.177
Receiving of food ingredient	59.68	55.38	1.421	0.155
Safety Practices of food process	50.05	56.21	2.772*	0.006*
Serving of meals	40.86	53.41	4.219*	<0.001*
Food safety knowledge	61.51	61.83	0.375	0.707
Student Response	57.46	60.36	2.793*	0.005*

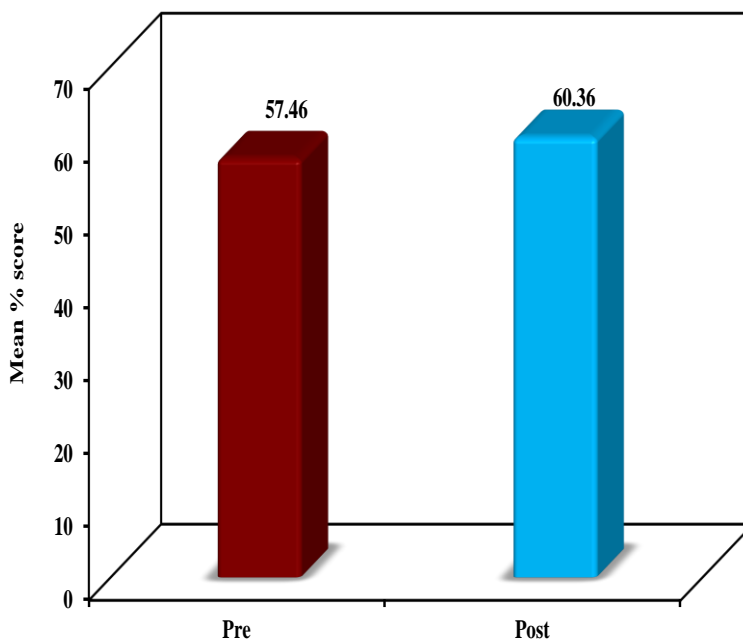
SD: Standard deviation

Z: Wilcoxon signed ranks test

McN: McNemar test

p: p value for comparing between pre and post

\*: Statistically significant at  $p \leq 0.05$



**Figure (1): Comparing between pre and post according to % scores of student response (n = 93)**

**Discussion:**

There is a study showed that the majority of the respondents (62.5%) were female, while 37.5% were male. Their age ranged from 16 to 65, with a mean age of 22 years old. The respondents represent thirty-six different majors from ten colleges. For data analysis, the researchers formed two groups, non-hotel majors and hotel majors. 401 (42.8%) of the respondents were non-hotel majors while 538 (57.2%) were hotel majors (Farrish et al., 2009).



There a study demonstrated a significant increase in the food safety knowledge of students after the delivery of Food Safety Short Course FSSC curriculum(Ercan Oruc et al., 2020).

There is a study showed that there was a significant improvement of all food hygiene practices following the intervention. The mean scores of all practices (hand hygiene, PPE, hygienic practices, cleaning of used equipment and utensils) showed a significant increase in the post intervention score(Wahdan et al., 2019).

In another study, overall mean percentage of knowledge before the training program was significant increased from 56.1% to 77.7% after the training ( $p < 0.001$ )(Elmadbouly et al., 2017).

In another study a majority of respondents strongly agreed on five issues begin with proper hand washing ,preventing foods from becoming contaminated, all types of food should be properly stored, prepared and preserved meats and vegetables should be placed in airtight containers in the freezer, and practicing food safety helps maintain good health (Joseph & Boateng, 2015).

In another study 83.3% of the students were aware that hands should be washed with disinfectant soap and warm running water after handling raw meat and vegetables. The research findings show that 16.7% did not have this information about hand hygiene(Cumhur, 2021).

In another study the results of correlation analysis indicated that a significant difference was found in the food safety practice of the participants who had poor and good food safety knowledge ( $p$  value  $< 0.05$ ). However, there is no significant difference between practices among

respondents due to variations in their attitude(Azanaw et al., 2021).

There a study revealed that in practice, a significant number of Kenyan university students both prepared and served foods with wounds, bruises, or injuries, and 70% of the participants stored raw food away from cooked foods (Serrem et al., 2021).

**Conclusions:**

- The curriculum was the less importance of who is responsible for teaching the students food safety and hygienic measures
- The lecturer was the most important one of whose teach the students the food safety and hygienic course
- Personal Hygiene this parameter is not significantly changed. As the P value was 0.177.
- Receiving of food ingredient this parameter not significantly changed As the P value was 0.155.
- The whole parameter: Safety Practices of food process is significantly changed as the P value was 0.006
- The results of the fourth parameter serving of meals are significantly changed as the P value was less than 0.001.
- Food safety knowledge the whole parameter did not significantly changed as the as P value was 0.707.

- Student response to the course is significantly changed and improved as the as P value was 0.005.
- This study resulted in that undergraduate hospitality students need more food safety knowledge, personal hygiene precaution and receiving of food information.

### **Recommendations:**

- Conducting regular training courses to all food handlers as part of their continuous education.
- Ensuring the regular supply of required equipment to ensure the ability to perform the required duties for food safety. There is also a need to ensure effective supervision of food handlers.
- Food safety education might be integrated into the preschool curriculum to minimize the influence of these factors on the food safety behavior of people.

### **References**

- Abu Dhabi Food Control Authority, EFST Advisory Guide: Essential food safety: A guide for food handlers: Abu Dhabi Food Control Authority, (2010).
- Agyei-Baffour, P., Sekyere, K. B. and Addy, E. A. (2013), "Policy on Hazard Analysis and Critical Control Point (HACCP) and adherence to food preparation guidelines: a cross sectional survey of stakeholders in food service in Kumasi, Ghana". BMC research notes, vol. 6 p. 442.

- Azanaw, J., Dagne, H., Andualem, Z. and Adane, T. (2021), "Food Safety Knowledge, Attitude, and Practice of College Students, Ethiopia, 2019: A Cross-Sectional Study". *BioMed Research International*, vol. 2021 p. 6686392.
- Courtney, S. M., Majowicz, S. E. and Dubin, J. A. (2016), "Food safety knowledge of undergraduate students at a Canadian university: results of an online survey". *BMC public health*, vol. 16 No. 1, p. 1147.
- Cumhur, Ö. (2021), "The Effect of Food Safety and Hygiene Education on The Knowledge Levels of Tourism Students in Turkey". *Gastroia: Journal of Gastronomy And Travel Research*, vol. 5 No. 3, pp. 505-521.
- Dudeja, P. and Singh, A. (2017). Safe cooking practices and food safety in home kitchen and eating establishment. In R. K. Gupta, Dudeja & M. Singh (Eds.), *Food Safety in the 21st Century* (p.p. 373-385). San Diego: Academic Press.
- Elmadbouly, M., Ashshi, A., Hegazy, H., Osfor, M., Elsayy, N. and ElSawy, N. (2017), "Effectiveness of Food Safety and Hygiene Training Program for Hospital Food Services Staff in Holly Makkah". *Journal of Health, Medicine and Nursing*, vol. 38 pp. 65-72.
- Ercan Oruc, D., Pokharel, S., Anantheswaran, R. C., Bucknavage, M. W., Gourama, H., Shanina, O. and Cutter, C. N. (2020), "A comprehensive food safety short course (FSSC) improves food safety knowledge, behaviors, attitudes, and skills of Ukrainian participants". *Journal of Food Science Education*, vol. 19 No. 4, pp. 263-277.

- FAO, IFAD, UNICEF, WFP and WHO, The state of food security and nutrition in the world 2018. Building climate resilience for food security and nutrition (Rome: FAO, 2018).
- Farrish, J., Kitterlin, M. D., Hertzman, J. and Stefanelli, J., Work Experience and Education: Their effect on food safety practices of university students (USA: University of Massachusetts Amherst, 2009).
- Food Safety and Standards Authority of India (FSSAI), Training Manual Food Safety Supervisor Course Advance (Level 2) Manufacturing Food safety and standard authority of India
- Inspiring trust, assuring safe & nutritious food (India: FSSAI, 2020).
- Gozalo, B. and Gallego, J., Food Hygiene Certification (Madrid: Coformacion, 2021).
- Joseph, A. and Boateng, R. (2015), "College Students Food Safety Practices". Journal of Agriculture and Environmental Sciences, vol. 4 No. 1, pp. 118-126.
- Lake Region District Health Unit, Environmental Health Division 524 4th Avenue NE – Unit 9: Devils Lake, ND 2020).
- Ministry of Health and Long-Term Care, Food safety a guid for ontarios food handler Food Safety: A Guide for Ontario's Food Handlers (Egypt: Ministry of Health and Long-Term Care, 2018).

- Mitchell, R. E., Fraser, A. M. and Bearon, L. B. (2007), "Preventing food-borne illness in food service establishments: Broadening the framework for intervention and research on safe food handling behaviors". *International journal of environmental health research*, vol. 17 No. 1, pp. 9-24.
- Ngivu, J. (2016), "Impact of Food Handlers' Food Safety Training in a Paediatric Hospital in East Africa". *American Journal of Infection Control*, vol. 44 p. S63.
- Ozilgen, S. (2011), "Food safety education makes the difference: Food safety perceptions, knowledge, attitudes and practices among Turkish university students". *Journal fur Verbraucherschutz und Lebensmittelsicherheit*, vol. 6 pp. 25-34.
- Salam, H. H. B. (2015), "Evaluation of food hygiene and safety practices in Bahri hospitals 2015–Khartoum-SUDAN". *International Journal of Health Sciences*, vol. 3 pp. 191-194.
- Serrem, K., Illés, C. B., Serrem, C., Atubukha, B. and Dunay, A. (2021), "Food safety and sanitation challenges of public university students in a developing country". *Food Science & Nutrition*, vol. 9 No. 8, pp. 4287-4297.
- University of West London, Unit 4222-233 Meet food safety requirements when providing food and drink for individuals (HSC2029) (London: University of West London, 2022).
- Wahdan, I. H., Gad, Z. M., Habib, I. M. and Elshazly, O. A. (2019), "Effect of an educational program on food safety practices in food preparation and handling

procedures in governmental hospitals of an Egyptian governorate". Journal of High Institute of Public Health, vol. 49 No. 2, pp. 90-96.