

Assessment of food safety knowledge and practices in a sample of University of Tripoli students

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Abstract

Although Food safety is a public health issue and has been widely discussed for many years. However, food poisoning continues to occur among different community groups and may be related to the level of their food safety knowledge and practices. The study aimed to evaluate food safety knowledge and practices in a random sample of 785 students of university of Tripoli. The survey was carried out by the face-to-face questionnaire which was prepared for this purpose. The questionnaire consisted of three parts; the first: questions about food safety knowledge, the second part: questions about food safety practices. The third part: personal information. The students were randomly selected from different faculties to answer the questionnaire. The sample included 323 males (41.1%) and 462 females (58.9%). The results showed that a large percentage of students (77.7%) had a good level of knowledge of food safety. The mean of the food safety knowledge scores of the respondents was 20.14 ± 3.761 . The results also showed that more than half of the university students (430) had a high level of food safety practices (54.8%). The mean of food safety practices score of the respondents was 45.10 ± 7.308 . The results of this study showed a significant association between the age and gender of the responding students and the scores of food safety knowledge while, there was a significant association ($P < 0.05$) between sex and source of information on food safety and food safety practices ($P < 0.05$). The results also showed insignificant small, positive linear correlation between food safety knowledge and practices of the students ($P < 0.05$). The findings of the study show that although there is a good level of food safety awareness and a higher than moderate level of food safety practices, there is a need to raise the level at some points where the students' responses were wrong and improving some improper practices.

Keywords: Food safety, Knowledge, Practices, Students, University, Libya.

1. Introduction

Food safety and health practices are an important issue because they relate to human health and the development of societies in addition to the economic burden and the absence of the human element from the performance of the functions entrusted to it within the society. In the United States and Canada, foodborne diseases cost annually around 9.3 to \$12.9 USD billion and \$1.3 billion, respectively (Temitayo, 2017). Therefore, foodborne disease surveillance is important to monitoring food safety and evaluating the preventive measures taken for food borne disease (Puteh et al., 2013).

Foodborne diseases are defined as any illness caused by the consumption of food, water or beverages contaminated with one or more of the pathogens, including bacteria, parasites, viruses, fungi and their products, as well as non-microbial toxic substances (Puteh et al., 2013). Redmond and Griffith (2003) reported that foods prepared or consumed in the home was the reason for 87% of recorded foodborne disease outbreaks in the United Kingdom, Europe, Australia, New Zealand, the United States, and Canada. According to data recorded in different countries and international statistics, the prevalence of foodborne diseases is increasing every year (Notermans and

Food Safety Knowledge and Practices

Hoogenboom-Verdegaal, 1992; Norazmir et al., 2012). Consequently, to ensure food safety, it requires effective collaboration between governments, producers and consumers.

One of the 15 diseases reported in Libya in 2010 was food poisoning, with 904 registered cases (WHO, 2011). Food poisoning is one of types of foodborne diseases, its symptoms include acute onset of vomiting and/or diarrhea and/or other symptoms associated with ingestion of food, as well as neurological symptoms may appear such as paresthesia, motor weakness and cranial nerve palsies (Puteh et al., 2013).

The studies have shown that youth tend to consume foods that are at higher risk of foodborne diseases than other age groups (Byrd-Bredbenner et al., 2007; Nesbitt et al., 2009; Osaili et al., 2011). Numerous studies have been conducted on knowledge and food safety practices in different regions of the world for different groups, including university students (Stratev et al., 2017; Ferk et al., 2016; Unklesbay et al., 1998). However, there are almost no previous local studies on knowledge and food safety practices for all groups of society in Libya, including University of Tripoli students. Therefore, this study was conducted to obtain information concerning the level of knowledge and practices of food safety among university of Tripoli students in order to achieve the safety of this category and raise the level of awareness of food safety.

2. Methods

2.1. Questionnaire design and data collection

The present study targets the undergraduate students at university of Tripoli, Tripoli city, Libya. The study was conducted between October, 2017 and March 2018 and the survey carried out in random way in various faculties included Faculty of Agriculture, Dentistry, Economics and Political Sciences, Education, Engineering, Fine Arts and Media, Information Technology, Languages, Law, Medicine, Pharmacy, Physical Education, Sciences, and Arts.

The questions of questionnaire, which used to carried-out this survey was based on previous studies (Almansour et al., 2016; Norazmir et al., 2012; Stratev et al., 2017). The face to face questionnaire consisted of 47 questions that addressed four topics: 1) knowledge of food safety (29 questions), 2) food safety practices (15 questions), and 3) Demographic characteristics of the study sample (3 questions).

The correct and wrong answers for the food safety knowledge part were calculated by giving 1 point for the correct answer and 0 point for the wrong answer. Scores scale of this part range from 0 to 29. The range scores from 0 to 14 represent the weak level of knowledge of food safety while from 15 to 24 are the good level and scores from 25 to 29 represent the excellent level. Answers to the questions on food safety practices were graded as follows: 'almost never', 1 point, 'sometimes', 2 point, 'often', 3 point and 'always', 4 point. Scores regarding food safety practices vary from 15 to 60. Scores from 15 to 29 represent low level of food safety practices and from 30 to 45 is moderate level while scores from 46 to 60 consider high level.

2.2. Questionnaire validation and reliability

The questionnaire was examined by two experts in the field of food science and technology to verify validity and confidence of the questions included in the questionnaire and almost all the recommended observations were taken.

2.3. Statistical Analysis

The statistical analyses were carried out using software statistical Minitab 15. Descriptive statistics were conducted to determine means and standard deviations. Chi squares test was used to determine the association between variables of sample characteristics and food safety knowledge and also between variables of sample characteristics and food safety practices of the respondents. A significance level of $P \leq 0.05$ was used to establish significance. Also, the correlation between food safety knowledge and practices of undergraduate students of the University of Tripoli, Tripoli city, Libya was determined.

3. Results

3.1. Characteristics of the students' sample

The total sample of students that was targeted and answered the questions in the study were 785 respondents. The number of males who participated in the study was 323 (41.1%) while the number of females was 462 (58.9%) as shown in table 1. The age of students participating in the study ranged between 18 to >25 years. The highest percentage of age was between 20 and 21 (24.6%), while age of students (>25) was the lowest percentage (12.7%). Source of information on food safety, as shown in table 1 family represented the largest percentage (61.9%) of students' sample as source of information about food safety, followed by internet (37.2%), specialization of study (27.4%), media (25.9%), books related to food safety (18.2%) and course in food safety (6.0%).

Table 1. Characteristics of the students' sample (N = 785).

Characteristic	Numbers	Percentage of sample (%)
Gender		
Male	323	41.1
Female	462	58.9
Age group		
18-19	179	22.8
20-21	193	24.6
22-23	162	20.6
24-25	151	19.2
>25	100	12.7
Source of information on food safety		
Family	486	61.9
Books related to food safety	143	18.2
Internet	292	37.2
Media	203	25.9
Specialization of study	215	27.4
Course in food safety	47	6.0

3.2. Food safety knowledge levels of the students' sample

The results show that majority of the respondents (610) have good level of food safety knowledge with percentage of 77.7%. Only 8.2% (64) respondents have poor level of food safety knowledge while 14.1% (111) of respondents have excellent level as in table 2. The mean of the food safety knowledge score of the respondents was calculated to be 20.14±3.761 with the scores ranging from 0 -29.

The results of the total number and the percentages of correct and incorrect responses given by the undergraduate students of university of Tripoli, on the whole questionnaire on food safety knowledge are presented in table 3.

Table 2. Food safety knowledge levels of the students' sample

Scores	Level	n ^a	%
0-14	Poor	64	8.2
15-24	Good	610	77.7
25-29	Excellent	111	14.1
Total	-	785	100

n^a = number of respondents

Food Safety Knowledge and Practices

Table 3. Food safety knowledge among students' sample (N =785).

Question	Correct Answer %(N)	Incorrect Answer %(N)
Food poisoning is caused by pathogenic microorganisms.	92.4 (725)	7.60 (60)
Food poisoning can cause serious illnesses that end in the hospital and sometimes lead to death.	89.4 (702)	10.6 (83)
The numbers of pathogenic bacteria rapidly multiply at room temperature.	64.1 (503)	35.9 (282)
Food poisoning can cause health and economic effects on society.	88.0 (691)	12.0 (94)
The most susceptible to food poisoning are children, pregnant women and the elderly.	82.2 (645)	17.8 (140)
Washing hands before cooking reduces the risk of food contamination.	87.8 (689)	12.2 (96)
Washing hands before handling raw food prevents foodborne diseases.	54.9 (431)	45.1(354)
Food vendors having diarrhea, flu or sore throat can be a source of food contamination.	80.4 (631)	19.6 (154)
Landing flies on the food makes it harmful.	88.2 (692)	11.8 (93)
After coughing or sneezing, you should always wash your hands.	79.9 (627)	20.1 (158)
To determine the safety of milk, you should taste it first as well just look at the expiry date only.	57.5 (451)	42.5 (334)
Good smelling leftover food is still safe to eat.	61.4 (482)	38.6 (303)
Eating canned food from a swelling can is harmful to health and may lead to death.	85.1 (668)	14.9 (117)
Raw chicken, fish and red meat are not placed in the same place in the refrigerator.	52.2 (410)	47.8 (375)
Hand washing under running water only will be enough to remove the bacteria before touching the food.	36.6 (287)	63.4 (498)
Food poisoning from fruits and vegetables can be avoided by wash them under running water.	72.4 (568)	27.6 (217)
Food poisoning can be avoided by cleaning the kitchen sink drain every week.	56.6 (444)	43.4 (341)
Do the following foods cause poisoning?		
Leftover chicken eaten cold.	42.8 (336)	57.2 (449)
Food is exposed without cover.	87.1 (684)	12.9 (101)
Rice left overnight in the kitchen.	77.6 (609)	22.4 (176)
Chocolate cake left overnight in the kitchen.	60.3 (473)	39.7 (312)
Do the following foods increase the risk of food poisoning?		
A slice of melon.	37.1 (291)	62.9 (494)
Half-boiled eggs.	48.7 (382)	51.3 (403)
Unpasteurized milk.	71.6 (562)	28.4 (223)
Raw seafood or undercooked seafood.	73.2 (575)	26.8 (210)
Undercooked chicken and red meat.	77.1 (605)	22.9 (180)
Dry food stored in the cabinet near the oven.	59.1 (464)	40.9 (321)
Canned vegetables consumed without pre-heating.	63.8 (501)	36.2 (284)
Salmonella bacteria can cause food poisoning.	86.2 (677)	13.8 (108)

N = number of total respondents

3.3. Food safety practices levels of the students' sample

The results in table (4) show that more than half of the respondents (430) have high level of food safety practices with percentage of 54.8% while percentage respondents with moderate level was 42.3% (332) and only 2.90% (23) respondents were with low level. The mean of the food safety practices score of the respondents was calculated to be 45.10 ± 7.308 with the scores ranging from 15-60. The results of the total number and the percentages of food safety practices given by the undergraduate students of university of Tripoli, on the whole questionnaire are displayed in table 5.

Food Safety Knowledge and Practices

Table 4. Food safety practices level of the students' sample

Scores	Level	n ^a	%
15-29	Low	23	2.90
30-45	Moderate	332	42.3
46-60	High	430	54.8
Total	-	785	100

n^a = number of respondents

Table 5. Food safety practices among students' sample (N = 785)

Practices	Almost never (%)	Sometimes (%)	Often (%)	Always (%)
I always ensure buying clean and fresh food.	49(6.24)	71(9.06)	167(21.3)	498 (63.4)
I wash my hands with water and soap after using the bath (urinating or defecating).	91(11.6)	36(4.60)	23 (2.90)	635(80.9)
I do not prolong my nails.	84(10.7)	125(15.9)	203 (25.9)	373 (47.5)
I wash my hands before preparing and eating at home.	62(7.90)	110(14.0)	154 (19.6)	459 (58.5)
I wash my hands before eating in the cafeteria.	270(34.4)	202(25.7)	152 (19.4)	161 (20.5)
I check the expiry date on food packages before buying.	105(13.4)	140(17.8)	152 (19.4)	388 (49.4)
I read conditions of use and storage of packaged food.	234 (29.8)	170(21.7)	135 (17.2)	246 (31.3)
I wash fresh eggs before cooking them.	163(20.8)	146 (18.6)	133 (16.9)	343 (43.7)
I do not eat raw eggs without cooking and foods made from raw eggs.	107(13.6)	77(9.80)	124 (15.8)	477 (60.8)
I put the perishable food in the refrigerator as soon as I buy them.	118(15.0)	80(10.0)	140(18.0)	447(57.0)
I do not taste foods to know if they are safe or not.	266(33.9)	184(23.4)	160(20.4)	175(22.3)
I dry my hands after washing them with a paper towel or tissue .	174(22.2)	174(22.2)	163(20.7)	274(34.9)
I eat well done meat and I do not eat rare meat.	46(5.80)	58(7.40)	131(16.7)	550(70.1)
I wash fruits and vegetables before eating.	36(4.60)	36(4.60)	113(14.4)	600(76.4)
I prefer to reheat leftovers by using microwave oven.	203(25.9)	197(25.1)	155(19.7)	230(29.3)

3.4. Association between characteristics of sample and food safety knowledge level of the students

The association between characteristics and food safety knowledge level of the students was examined by using X² chi- square test. The results shown in table 6 that there is significant association between food safety knowledge scores and gender and also between food safety knowledge scores and age (P<0.05). The findings disclosed there is no statistically significant association between food safety knowledge scores and source of information on food safety (P> 0.05).

Table 6. The association between characteristics of sample and food safety knowledge level of the students.

Variable	Total knowledge scores			P-value
	Poor	Good	Excellent	
*Gender				
Male	12.70	75.20	12.10	0.000
Female	5.00	79.40	15.60	
**Age				
18-19	4.50	87.10	8.40	0.040
20-21	10.30	76.20	13.50	
22-23	8.00	77.20	14.80	
24-25	10.60	72.20	17.20	
> 25	7.00	73.00	20.20	
***Source of information on food safety				
Family	5.90	48.20	7.77	0.795
Books related to food safety	1.50	13.90	2.80	
Internet	3.30	20.90	3.80	
Media	2.70	19.60	2.40	
Specialization of study	1.90	22.40	3.70	
Course in food safety	0.76	4.80	0.89	

*Chi-Sq = 15.968; DF = 2; P-Value = 0.000

**Chi-Sq = 16.158; DF = 8; P-Value = 0.040

***Chi-Sq = 6.230; DF = 10; P-Value = 0.795

3.5. Association between characteristics of sample and food safety practices level of the students

The association between university students' sample characteristics and the level of food safety practices is shown in table 7. Using an X² chi- square test, there was a significant association (P<0.05) between gender and source of information on food safety and food safety practices while the association was insignificant (P>0.05) between age and scores of food safety practices.

3.6. Correlation between safety food knowledge scores and food safety practice scores of the respondents

The correlation between scores of food safety knowledge and practices was determined. The result indicated that there was an insignificant small, positive linear relationship between the two variables (r =0.195, p>0.05).

4. Discussion

This study was conducted to assess level of the food safety knowledge and practices among a sample of students, and to determine the relationship between the characteristics of the sample of students and the level of food safety knowledge and practices, as well as to discover the correlation between the food safety knowledge and practices among University of Tripoli students, Tripoli, Libya.

The results showed that the distribution of sex in this study was uneven, where the number of males was less than the number of females (table 1). This can be attributed to fact that proportion of male (44.98%) lower than female (55.01%) of the total number of students (75877) who registered at university of Tripoli in the academic year 2017. The results of the study were similar to that of Ferk et al. (2016), Courtney et al. (2016), Xiong (2017) and Stratev et al. (2017) in which female respondents number higher than males.

Table 7. The association between characteristics of sample and food safety practices level of the students.

Variable	Total practices scores			P-value
	Low	Moderate	High	
*Gender				
Male	5.90	77.7	16.4	0.000
Female	0.90	39.8	59.3	
**Age				
18-19	4.00	64.2	31.8	0.084
20-21	3.10	72.5	24.4	
22-23	3.00	69.8	27.2	
24-25	2.00	66.9	31.1	
> 25	7.00	54.0	39.0	
***Source of information on food safety				
Family	2.29	18.5	30.4	0.000
Books related to food safety	1.15	5.61	10.3	
Internet	1.15	12.6	20.4	
Media	1.02	9.04	13.8	
Specialization of study	0.89	12.4	13.9	
Course in food safety	1.27	1.78	2.55	

*Chi-Sq = 149.539; DF = 2; P-Value = 0.000

***Chi-Sq =13.9; DF = 8; P-Value = 0.084

***Chi-Sq = 40.589; DF = 10; P-Value = 0.000

The mean of the food safety knowledge score of the respondents was 20.14±3.761 which reflects good level. The results obtained are consistent with the results obtained by Ferk et al. (2016) who found that the sample of university of Maine students had a good understanding of some aspects of food safety and the average score among students' sample was 60% correct. Also, Al-Shabib et al. (2017) found that students of King Saud university displayed good knowledge concerning food safety. The results of this study is in contrast to similar study conducted by Courtney et al. (2016) which reported that the level of knowledge of food safety was poor among a sample of students from the university of Waterloo in Ontario, Canada.

The mean of the food safety practices scores of the respondents indicated to level higher than moderate. The results of this study in the line with that of results conducted by Hassan and Dimassi (2014) Who found that average scores of practices of Lebanese university students were 44.7±14.3%. Booth et al. (2013) on the contrary in their study found that the level of basic nutritional knowledge including food safety of Andrews University students is insufficient and lacking, only 34.2% of students demonstrated adequate knowledge.

The results of this study showed a significant correlation between the age and gender of the responding students and the scores of food safety knowledge and the absence of a significant correlation between source of information on food safety and the scores of food safety knowledge. A significant correlation was found between gender and the source of information on food safety and scores of food safety practices, while the correlation between age and food safety practices was insignificant. Compared with a study conducted by Stratev et al. (2017), age and sex were found to have no effect on knowledge and food safety practices among students of the Veterinary College of in Bulgaria.

Finally, the result indicated that there was a small, positive linear relationship between the two variables ($r = 0.195$). The correlation was insignificant ($P > 0.05$). The results of this study differ from the results obtained by Hassan and Dimassi (2014) who found that food handling practices and food safety knowledge scores of Lebanese university students were significantly related with a weak to moderate correlation coefficient ($r=0.231$). Also, the results obtained are no consistent with the results obtained by Temitayo (2017) who found that a significant correlation between food safety knowledge and food safety practices of the students.

In The light of The results of this study, although there is a good level of food safety awareness and a moderate level of food safety practices, there is a need to raise the level at some points where the students' responses were wrong and improving some improper practices. The science of food safety and hygiene practices should be included as a primary course in the early stages of education. If the person used to do wrong hygiene

Food Safety Knowledge and Practices

habits, it will be difficult to change them in adulthood (Wills et al., 2005). However, to treat to the current situation, a rational policy should be adopted by awareness raising and guidance through seminars, bulletins and manuals to raise the level of awareness in this category. In addition, the education role of the specialists in food science and technology should cover all university colleges that do not teach this discipline (Weber et al., 1995).

5. Conclusions

As a result of the scarcity of studies in this area, this study provides a clear vision and guidance for further studies on food safety knowledge and practices. The results of this study revealed that the level of food safety knowledge of the responding students was good and that the level of food safety practices for the sample was moderate. The statistical analysis showed that age and gender had an effect on food safety knowledge among participants, while gender and food safety information source had an effect on the food safety practices of the sample of students. Continuous education programs are needed to improve food safety practices among university students. There is also a need to expand this study to include other students in public and private universities and higher institutes. As well as, effective policies from Libyan authorities on food safety is recommended.

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Food Safety Knowledge and Practices

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