

Knowledge based study related to food safety and food handling practices among students of University at Agriculture Peshawar Pakistan

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Abstract

The plan of this study was to determine the level of food safety knowledge and practices among 350 students (mean age $21 \pm$) enrolled in University of Agriculture Peshawar, Pakistan, to find out the association between these variables, the demographic and educational characteristics. The collected responses were analyzed using SPSS for descriptive, frequency distribution and percentages. Pearson chi square calculated the relationship between food safety knowledge and practices in relation to gender. Findings concluded 80% of the students have knowledge that uncooked chicken, fish and meat should place separately, while 92% students knew the importance of clean the cutting board before using different types of food like tomatoes and mutton. Female students (46%) always wash their hands before cooking in the kitchen as compare to male students (20.7%). Similarly, female respondents (45%) always consider the expiry date of the product before its use and 72.1% respondents reported that bacterial load cannot completely removed from hands by washing under tape water without using soap. Results concluded for females shows that there was a very small but positive correlation between the two variables [$r = 0.002$, $n = 200$, $p > 0.05$]. However, for male students' data showed that, there was a negative correlation between the food safety knowledge and food safety practices responses [$r = -0.052$, $n = 150$, $p > 0.5$]. The average food safety knowledge scores of female were calculated as $1.3140 \pm .164$ while male scored $1.3613 \pm .172$. Knowledge base score of male respondent is higher than female students and

relationship between them is non-significant ($p>0.05$). However, in term of practices on food safety scores, female student showed similar results with male students, which is $2.596\pm.418$ and $2.595\pm.327$ respectively. These results strengthen the need for continuous educational programs to improve food safety awareness skills of male and female students.

Keywords: Food Safety, Knowledge, Practices, Demographic and Educational programs.

INTRODUCTION

Food safety is of utmost importance related to public health issues from the past few decades. (Jevsnik, Hlebec, & Raspor, 2008; Mullan et al., 2013; Sumeet, Cates & Morales, 2005; Tach & Carpentier, 2014). With the introduction of food safety concept, the modern age and technology has changed the way food is grown, processed, packed and delivered. Cases due to eat unhealthy food is on alarming stage not only in general public but also more severe in students as they do not understand the significance of knowledge about food safety. (Angelillo et al. 2001). Food safety is the applicable knowledge and related practices to improve the level of consumer confidence that the food may not cause any ill effect in the human body when it is consumed (WHO 2003). However, food borne illnesses are ailments, either contagious or noxious in nature, resulting from consumption of contaminated food (WHO 2007).

Food related diseases are more common and promptly rising in developing countries including Pakistan because of poor hygiene and inadequate conditions in food production, handling, storage, lower levels of literacy and education (Frank 1991). Food borne diseases can lead to liver and kidney failure, neurological disorders, cancer, reactive arthritis, acute respiratory infection, pneumonia and measles, paralysis and death (Lindqvist et al. 2001 and WHO, 2000). In 2006 only diarrhea claimed around 40,000 lives making it the fourth highest cause of mortality in the Pakistan. Pakistan Demographic and Health Survey 2006-07. The global number of foodborne incidents and outbreaks is considered likely to increase in future (Noerrung et al. 2012).

In less developed countries, many people are poisoned because of the consumption of food produced under unhygienic conditions and bad handling like news report indicated that 147 people were infected with *Salmonella* poisoning in Jordan after eating contaminated food at a restaurant (Dough P 2014). Another severe case of food poisoning in Bihar, India which took the life of more than 20 children due to consumption of contaminated food from school cafeteria, another report from the same source revealed that at least 23 people died from eating contaminated sweets in

central Pakistan (Paracha 2003). One of intense food poisoning hospitalized almost 500 students and many hundreds were sickened in an event at the al-Azhar University in Cairo, Egypt (Food Safety News 2013). Similarly food poisoning caused a family seriously ill shortly after eating an evening meal; yoghurt due to contaminated food. All ten members of the family were taken to hospital, where two children a teenage boy and seven year old girl died (Asghar 2013).

Earlier studies conducted on adults have indicated that food safety knowledge tends to increase with age, female have higher scores than males, and younger respondents show the greatest need for additional food safety education (Bruhn & Schutz 1999; Unusan 2007). Number of studies have been summarized on the evaluation of food safety knowledge's and practices among students of various age groups, genders and economic backgrounds (Jevsnik, Hlebec & Raspor 2008; Redmond & Griffith 2003; Tache & Carpentier 2014). Food safety knowledge and practices were studied among secondary school students (Norazmir et al. 2012), people who prepare food for others, such as kitchen employees at school (Lilan 2012), military hospitals (Labib et al. 2013), street food vendors (Comfort 2010). Categorically, the prevailing food safety situation is highly uncertain in Pakistan among students of various ages. Students are most likely to suffer food poisoning in school and universities so it is very important to identify the level of food safety knowledge and practice in students.

Not surprisingly, Pakistan has made no legislations that specifically address food safety of university students that comes with a major health risk. Recent challenges like the rapid growth in population of country, increasing demand for food and food borne outbreaks requires the students to be educated in terms of food safety knowledge's and practices so to ensure better health of the community. Although this is such an important issue, there is no education program in Pakistan to enhance food safety knowledge and practices of consumers in any age group, or to ensure that this knowledge becomes part of their everyday practice.

To the best of our knowledge, limited studies focused on university students have been performed, and there are no gender based studies concerning food safety knowledge of students enrolled at University of Agriculture Peshawar. Targeted population for food safety knowledge and practices (KP) were university students because they generally engaged in risky eating behaviors. This type of survey also carried by (Li-Cohen & Bruhn 2002; McArthur, Holbert & Forsythe 2007; Medeiros et al. 2004). This study was conducted 1) to check the knowledge of

students both male and female with respect to some aspects of food safety. 2) to assess their practices applicability related to food safety.

MATERIALS AND METHODS

Research Study design

A cross-sectional study conducted to assess the level of food safety knowledge and practices among male and female students of University of Agriculture Peshawar, Pakistan. Subject of the study belonged to different age groups, departments, residence and parental status. The researchers met with students to inform them about the study, its objectives, significance, and the protocol.

Instrumentation

The research data was collected through a self-administrated questionnaire that divided into three sections which are demographic, food safety knowledge (9 questions) and food safety practices section (11 questions). All these questions were a modified from the previous studies (Osaili et al. 2010; Sanlier 2010).

For food safety knowledge questions, answers were graded by giving 1 point for the incorrect answers and 2 point for the correct answers whereas for food safety practices responses were graded as follows: 'never', 1 point, 'ocassionally, 2 points, 'mostly, 3 points and 'always', 4 points.

Pilot study

The questionnaire was pilot tested by 25 respondents in a university students to confirm question reliability and validity.

Data collection

350 sets of questionnaires were distributed and collected back (200 respondents were females and 150 respondents males). Researcher asked teachers to distribute the survey forms to their students randomly and then survey forms were returned after the end of class period.

Statistical analysis

Results of survey were analyzed by using the Statistical Package Social Sciences, Version 17.0. Descriptive statistical (means, percentages, standard deviations and frequencies) were used for all variables. In addition, in terms of the association between gender and the level of food safety knowledge and practices independent t-test was used. Bivariate correlation analysis was used to determine the correlation between knowledge level and practices.

Table 1. Demographic characteristics of respondents

Demographic Characteristics	Number of respondents(n)	Number of respondents (%)
Gender		
Male	150	42.9
Female	200	57.1
Faculties		
Food and Nutrition Sciences	137	39.1
Other faculties of University	213	60.9
Age		
21-22	211	60.3
22-23	85	24.3
23-24	53	15.1
Residence		
Boarders	236	67.4
Day scholars	114	32.6
Mother Status		
Working women	36	10.3
Housewives	314	89.7

Profile of respondent

Questionnaires were obtained from 350 students of University of Agriculture Peshawar. Demographic characteristics of respondents are listed in Table 1. Female respondents were 57.1% (200) while the rest were 42.9% (150) male. The majority of respondents were aged between 21-

22 of a total of 60.3% (211) followed by those who aged 22-23, around 24.3% (24.3) and 23-24 were 53(15.1). Percentage of respondent from food department were 9.1% (137) and other departments were 60.9% (213). Hostels respondents were 67.4% (236) while who daily go to home were 32.6% (114). Respondents of working women mothers were 10.3% (36) and housewives mothers were 89.7% (314).

RESULTS

Table 2. Responses to food safety knowledge questions (N = 350)

Questions	Incorrect	correct
1. It is better to check the expiry date on milk packaged instead of taste it?(Yes,No)	26.3(92)	73.7(258)
2. Pasteurized milk can be stored at refrigeration conditions for maximum of three days? (Yes,No)	25.7(90)	74.3(260)
3. It is necessary to cook meat at high temperature for complete cooking? (Yes,No)	34.9(122)	65.1(228)
4. Uncooked chicken, fish and meat should not place on each other? (Yes,No)	20(70)	80(280)
5. Food thermometer is good indicator of complete cooking of meat? (Yes,No)	23.1(81)	76.9(269)
6. Bacteria suitably grows at refrigeration temperature? (Yes,No)	31.4(110)	68.6(240)
7. Bacteria transfers from hand to food and contaminate it? (Yes,No)	10.6(37)	89.4(313)
8. Bacterial load completely removed from hands by washing under tape water without using soap? (Yes,No)	28.9(101)	71.1(249)
9. It is important to clean the cutting board before using different types of food like tomatoes and mutton? (Yes,No)	8(28)	92(322)
	23.26	76.74

Food safety knowledge level

To determine the level of food safety knowledge the answers were coded as 1 for No and 2 for Yes. The respondents comprised both female and male students. This study revealed that 76.74% of the respondents have a good knowledge on food safety while 23.26% respondents shown poor level of knowledge. Table 2 shows the percentages of correct and incorrect responses for the food safety knowledge section. Consumers (73.7%) knows that tasting pasteurized milk is dangerous for health without checking its expiry date mention on packaging of milk. On the other hand (74.3%) of respondents also knows that pasteurized milk starts spoiling after three days of refrigeration. Students (80%) gave a true answers about uncooked chicken, fish and meat that these foods must not place on each other. 71.1% respondents replied that bacterial load cannot completely removed from hands by washing under tape water without using soap. In addition, this study also indicated that there was no significant difference in the level of food safety knowledge between male and female respondents based on ($p > 0.05$). Mean and Standard Deviation (SD) for food safety knowledge among female is quite closer with mean for male which is 1.31 ± 0.164 and 1.36 ± 0.172 respectively. Overall result matches with (Norazmir et al. 2012) carried out in Malaysia.

Table 3. Responses to food safety practices questions (N = 350)

	Never %	Ocassionall y%	Mostl y%	Always %
Do you dry your hands with any piece of cloth?				
Female	19.5	36.5	27	17
Male	28.7	50	12.7	8.7
Do you wash your hand before cooking in the kitchen?				
Female	5.5	17	31	46.5
Male	34	34.7	10	20.7
Do you wash your hands in university canteen before eat something?				
Female	18.5	30	20	31.5
Male	36.7	32	18.7	12.7
Do you wash your hands before preparing uncooked meat?				
Female	10.5	18	33	38.5

Male	30	28.7	13.3	2.8
Do you use chlorine cleaner to clean the place for preparing food?				
Female	58	18	11.5	12.5
Male	58.7	26	9.3	6
Do you place the boil milk in refrigerator?				
Female	26	21	22.5	30.5
Male	32.7	28.7	14.7	24
Do you check the expiry date written on food packages?				
Female	8	26	21	45
Male	22	36.7	9.3	32
Do you visually observed the food to check whether it is safe or not?				
Female	13.5	28	32.5	26
Male	28	29.3	21.3	21.3
Do you eat meat after it cook well?				
Female	12	12	28.5	47.5
Male	30.7	28	10	31.3
Do you eat raw egg or egg products?				
Female	40.5	33.5	13.5	12.5
Male	48.7	40	6.7	4.7
After buying, do you immediately put food that may spoil into refrigerator?				
Female	32	25.5	25.5	2.5
Male	47.3	28	8.7	16
Total	29.15	28.5	18.26	22.28

Food safety practices level

Overall, majority of respondent have low to moderate level of practices on food safety with mean and SD 2.595 ± 0.372 respectively that involved 57.76 % of total respondents, while 40.54% shown a moderate to high level of practices on food safety in their daily lives. Food safety practices of female and male respondents are presented in Table 3. There is no statistically significant difference in the mean of food safety practices for male and female students. (Based on Sig 2 tailed is more than 0.05). 31.5% of female respondents and 12.7% of male respondents stated that they

always washed their hand before eating in canteen of university. In addition, they also express that they wash their hand before cooking food in kitchen with percentages, 20.7% for male and 46.5% for female. Furthermore, both of groups also responded that 31.3% of male and 47.5% of female always eat meat after it cooked well.

Table 4. Correlation between food safety knowledge and food safety practices level of female and male students Correlations between food knowledge level and practices

Gender		Knowledge	Practices
Females	Knowledge	Pearson Correlation	1
		Sig. (2-tailed)	.002
		N	.974
	Practices	Pearson Correlation	200
Sig. (2-tailed)		200	
N		200	
Males	Knowledge	Pearson Correlation	1
		Sig. (2-tailed)	-.052
		N	.528
	Practices	Pearson Correlation	150
Sig. (2-tailed)		150	
N		150	

Correlation is not significant difference when $p = 0.974$ (female) and $p=0.528$ (male)

Table 5. Food safety knowledge and food safety practices scores of female and male students.

Gender		Mean	Std. Deviation	N
Females	Knowledge	1.3140	.16413	200
	Practices	2.5960	.41828	200
Males	Knowledge	1.3613	.17215	150
	Practices	2.5953	.32776	150

Comparison of food safety knowledge and practices between female and male students of university

The relationship between food safety knowledge and food safety practices was investigated using Pearson product-moment correlation coefficient. For girls, there was a very small positive correlation between the two variables [$r = 0.002$, $n = 200$, $p > 0.05$] (Table 4). However, for male students data showed that, there was a negative correlation between the food safety knowledge and food safety practices responses [$r = -0.052$, $n = 150$, $p > 0.5$] (Table 4). The average of the food safety knowledge scores of females was calculated as 1.3140 ± 0.164 while for males obtained 1.3613 ± 0.172 (Table 5). There was found that, knowledge score of respondents from male student is higher than female students and relationship between them is non-significant ($p > 0.05$). However, both male and female students demonstrated comparable food safety practices, which is 2.596 ± 0.418 and 2.595 ± 0.327 respectively. These results shows contradiction with the results of (Sanlier, 2010; Nasser et.al 2016).

DISCUSSION

In healthy societies, each consumer and food handler must have enough awareness so they may not undergo any food borne illness. Students are usually targeted to investigate their skills in information about food safety knowledge and handling practices because they are the important tool of transferring knowledge to upcoming generation. So, study has been made among Greek university students in which undergraduate students were judge on the bases of their food safety knowledge and food handling practices. Even students from health department did not answer well related to food safety (veterinary medicine students) and only 38% students gave true answer of food handling practices) and gave only 37% true answers of food safety knowledge questions (Lazou et al. 2012).

One of the survey revealed that there is no significant difference between female and male respondent on food safety knowledge and practices. One of the similar research shows that food mishandling is more common in some consumer groups than other young adults (18-29 years old) and survey reports showed that female have higher practices on food preparation

compared to male but in terms of knowledge, male and female are in the same level (Sanlier 2010;Byrd-Bredbenner et al. 2007; Lazou et al. 2012; Unklesbay et al. 1998).

Gender difference were also visible in one the research when the students were investigated for nine food safety concerns that related to food, food handlers and the environment in which the food was being served. According to survey of 534 respondents, majority of the students (96%) were apprehensive about clean eating tables, wellness of cooked food and cleanliness of serving area. Similarly, 93.8, 89.3, 88.4 and 86.8% student respondents were concerned about cleanliness of eating area, appearance of food handlers, freshness of food and food temperature, respectively. Surprisingly only 67.9% students showed concern regarding food taste. Least number of respondents (61%) were concerned about presentation of the food served. Among male student's major food safety concern was the wellness of cooked food and cleanliness of the serving area (98.2%). Most of the female students were mainly concerned about clean eating tables (96.4%). Similar response regarding clean eating tables (96.5%) was recorded for male students also. Statistically significant ($p < 0.05$) difference in the responses of male and female students was recorded for food safety concerns like food taste, food temperature, food presentation, wellness of cooked food, cleanliness of serving area and appearance of food handlers (Nasser et.al 2016).

Unsafe food safety handling and practices found more common in men than women. Gents generally use to stay out of the home for job and business purpose and they usually engaged with street vendors, restaurants and hotels for food and ladies mostly stays at home and prepare their own food as researchers choose one of Lebanese university for investigation and they find out the relation among their knowledge/practices and the socio-demographic and academic characteristics and the results about knowledge and handling practices were 53.6 15.8% and 44.7 14.3% respectively and the difference of knowledge among male and female was calculated as minor difference but female scored higher but on the other hand a major difference was calculated where female students scored higher then male on practice part as ($p < 0.001$) (Hussein and Dimassi 2014).

Though primary and secondary students are immature but they are generally guided by their guardians to adopt food safety practices and students of college consider to be mature and well aware of food safety knowledge but they are not strictly ask to follow the food safety precautions so one of the study conducted to compare knowledge of food handling and practices between primary, secondary and college students in Kenya that showed mean score in knowledge

test of college students were 80.8%, 63.4% of secondary students and primary students scored only 50.8% and the mean score of food handling practices of college students were 52.5%, secondary students were 49.2% and of primary students scored 48.2% ($p= 0.05$). Results revealed that the college level food handlers who scored high in food safety knowledge responded poor in application of the same practices e.g. only twenty five percent of the students washed their hands after visiting toilet and before handling food and 80% of college level respondents had knowledge on when hands should be washed. Still eighty percent of college students had information on why food handlers maintain high personal cleanliness but only 52% wore clean uniform and the rest had uniforms with either stains, dirt or both so only food safety knowledge is not enough to bring positive change in food handling practices but it should be necessary to held educational programs that enhance put the importance of food handling practices along with food handling knowledge (Githiri et al. 2013).

In some of researches there is a gap of information and application of food safety between men and women. The significant variances indicate that boys are more at risk compare to girls as mostly boys gave the responses which could be linked to a higher risk of suffering from food-borne infections. Perhaps, the awareness toward food safety among male was increased. According to this study finding on a food borne pathogen Salmonella, 44.4% of respondents approximately who did not know that Salmonella can cause food illnesses. Salmonella is the pathogen involved in most outbreaks of food borne illness in around the world no exception to Malaysia. Salmonella also was the pathogen involved in most outbreaks of food borne illness in Slovenia, especially with food prepared at home (Norazmir et al. 2012).

Similarly important study was carried out to assess the level of food safety concerns, knowledge and practices among male and female university students of King Saud University, Saudi Arabia. Students displayed good knowledge concerning food safety. Respondents were most knowledgeable about the cleanliness of kitchen surfaces and utensils, prevention of cross contamination and hand hygiene but demonstrated poor knowledge about heat treatment of food and temperature. Good knowledge of food safety was reflected in food safety practiced by the students except temperature control. Chi-square test results revealed that both male and female students demonstrated comparable food safety knowledge and practices. This is probably the first gender-based report on the food safety concerns, knowledge and practice among students of King Saud University, Saudi Arabia. The study highlights the need for educational programs that aim

not only to provide knowledge but also encourage the students to practice the food safety measures strictly (Nasser et.al 2016).

The object of this survey is to find out the scale of food safety related knowledge and relating food handling practices for male and female students of university of agriculture Peshawar. Result showed that, male students have higher means of knowledge compared with the means of female students. However, the practices on food safety for both genders are quite similar. So educational study related to food safety is essential for young consumers because in future their unsafe food handling practices result in high food borne risks Therefore, it is important to set awareness educational program among the different age group students. This study was involved only students of university of agriculture Peshawar therefore the result was not representing to all population in the entire district. Involvement from others universities in the same area should be consider for the future research. Other than that, by using self-administrated questionnaires to obtain data may cause occurrence of bias by the respondents. Consequently, varieties of data collection techniques are needed to upkeep the accuracy and precise of the study.

CONCLUSION

First time gender based study carried out about food safety and food handling practices among students of University of Agriculture Peshawar, Pakistan. Results of concerned study indicated the importance of imparting food safety education among students in order to enhance their awareness. The purpose of awareness should aim not only to provide knowledge but also appreciate the students to properly practice the food safety measures. University setting is an important platform to promote key food safety concepts to youngsters as they are the future cooks, chefs, food handlers and home makers.

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Data availability

The data that support the findings of this study are listed in the article and are available from the corresponding authors upon reasonable request.

Declaration of Interest

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. The authors certified that there is no conflicts of interest associated with this publication, and there has been no significant financial support for publishing this work that could have influenced its outcome. As corresponding Author, I conform that the manuscript has been read and approved for submission by all the named authors.

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