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Research Article

Food Safety Knowledge and Decision-making Process among College Students in Lanzhou, Western China

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Abstract: In the study, a questionnaire survey containing three parts (general characteristics of the study sample, 15 food safety knowledge questions and 3 questions about decision-making process on food safety problems) was conducted among college students in Lanzhou City. The results indicated that food safety knowledge levels was closely related to engaged major and sex of college students. Food safety knowledge scores of students in food science major were higher than ones of liberal arts and engineering students. Female college students gained higher scores in food safety knowledge than male students and male students are more concerned about food safety cases and easily inclined to participate in solving these problems about food safety. Moreover, the results revealed that the levels of food safety knowledge for college students in China were low and there is an urgent need for more food safety education.

Keywords: College students, decision-making process, food safety knowledge, questionnaire

INTRODUCTION

The cases of food safety issues occur daily in all countries, from the most to the least developed. Food safety is an great public health problems increasingly (Rossvoll *et al*., 2013). It not only affects the lives of people in harmful ways, but also pose a number of manufactured risks that are difficult to calculate and control. Some of these outbreaks were caused by food prepared in the home. Some incidents are caused by improper consumer handling of food.

College students which have good education will be high-incomings groups in the future and are considered the new future force of the country. They are potentially important targets for the promotion of healthy lifestyles among the adult population, thus ensuring their health is important. Previous studies (Williams *et al*., 1992) showed that the young were usually unaware of food safety. Many college students are preparing meals for the first time in life. College students engage in behaviors that place them at risk, not only risky food handling but also food consumption. The need for enhanced food safety education has begun to gain recognition in undeveloped countries with the launch of national initiatives that determine effective methods of educating consumers, particularly young individuals (Sanlier, 2009). College students instead of high school are more likely to engage in jobs associated with food handling and preparation than others (Li-Cohen and Bruhn, 2002; McArthur *et al*., 2007; Medeiros *et al*., 2004), thus they should be paid more attention.

Each year, a considerable number of people suffer from illness due to the consumption of foods with quality problems in China. Chinese society has been affected more by food safety issues than has others on earth. But to our surprise, there are very litter survey data about food safety knowledge and related issue of college students.

This study was conducted in Lanzhou (an important western city of China) to investigate the knowledge and attitude of college students in the city. Primarily, this research investigated on the knowledge levels of college students on food safety knowledge and decision-making process to identify food safety education needs and the significant differences between food science and non-food science students. Another focal point was on distinguishing the differences between male and female students.

MATERIALS AND METHODS

Research design: A cross-sectional study was conducted from August 2014 to January 2015 to assess the levels of food safety knowledge among college students from colleges in the Lanzhou Province in China. A total of 1500 students participated in the study. However, only 1305 accomplished questionnaires from 780 males and 525 females were considered valid.

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Data collection: Research data were collected from the survey responses of 1305 students. The questionnaire used during the survey contained three parts. The first part inquired on basic information, including profession, sex. The second part comprised choice questions that the level of knowledge on food safety (15 questions). The total score of students' knowledge was calculated by the summation of correct answers to 15 knowledge questions. A high score represented high level of knowledge. The third part of the questionnaire aimed to identify decision-making process toward food safety problems, including methods in obtaining food safety knowledge and in handling and addressing food safety issues.

Statistical analysis: Data in this study were analyzed using the Statistical Package for the Social Sciences (SPSS), version 20.0. Descriptive statistics (means and standard deviations, or frequencies) was used for all variables. Mean responses and percentages of the responses in each category were calculated and presented in tabular form. Mean and standard deviation values were used to evaluate the scores. In addition, the questions were evaluated based on the results of the t-test in terms of the correlation between specialization and gender, the scores obtained on food safety and the decision-making process toward food safety knowledge. Statistical significance was set at a p-value of <0.01.

RESULTS

General characteristics of the study sample: A total of 1305 students participated in the study, with a mean age of 20.08 and composed of 59.77% males and 41.23% females. Among the participants, 51.5% had food science-related majors, whereas 24.14 and 24.37% had specializations related to liberal arts and engineering, respectively.

Table 1: Correct responses to food safety scale questions among college students

Questions	Total responses (n)	Correct rate (%)
The most important law for food safety risk assessment which indicates that a national assessment system of food safety risks shall be established to assess the risks of biological and chemical hazards in foods is: (a) Food safety Law (FAL) (b) Agricultural product quality safety law (c) Food Safety Law Implementation Measures (FSLIM) (d) Food Safety Risk Assessment Management Regulation (FSRAMR)	1305	27.22
What is the recommended freezer temperature for preventing food poisoning? (a) -18°C; (b) -8°C; (c) -4°C; (d) 0°C	1304	59.67
All foods are considered safe when cooked to an internal temperature of: (a) 54°C; (b) 60°C; (c) 66°C; (d) 74°C	1305	20.61
You should test milk rather than look at its expiry date to understand if it is safe: (a) Agree; (b) Disagree; (c) Not sure	1305	76.35
Raw chicken, fish and meat should not contact each other: (a) Agree; (b) Disagree; (c) Not sure	1304	82.31
What is the maximum temperature refrigerators should be to preserve the safety of food? (a) -18°C; (b) 4°C; (c) -4°C; (d) 7°C	1305	18.89
You may contaminate the next food you touch with salmonella bacteria if you don't wash your hands after touching: (a) Raw pork; (b) Raw vegetables; (c) Raw beef; (d) Raw chicken	1305	72.83
Pasteurized milk can be stored at refrigerator temperature for a maximum of 3 days in its unopened box: (a) Agree; (b) Disagree; (c) Not sure	1305	68.93
In order fried eggs to be safe to eat, how should their texture be after cooking? (a) Semi-solid albumen and yolk; (b) Solid albumen and semi-solid yolk; (c) Solid albumen and yolk; (d) Solid albumen and liquid yolk	1305	33.79
Which of the following is considered the most important way to prevent food poisoning? (a) Spray for pests in the kitchen are at least every week; (b) Rarely or never serve left over; (c) Keep foods refrigerated until it's time to cool or serve them; (d) Clean kitchen counters with solutions weekly	1305	73.78
After you have used a cutting board to slice raw meat or chicken and need to cut tomatoes, what do you do? Use the cutting board as it is: (a) Wipe the cutting board off with a paper tower; (b) Rinse the cutting board under water; (c) Turn the board over and use the other side; (d) Wash the cutting board with soap and rinse it under hot water	1305	14.68
When has FSL been effective: (a) 29 April 2006; (b) 1 June 2009; (c) 2 July 2010; (d) 1May 2008	1304	17.60
When preparing food, you wash your hands after touching which one of these? (a) Clean pots and pans; (b) Utensils that are being used to prepare food; (c) Clean countertop; (d) None of these	1305	68.35
In case your electricity went off and the meat, chicken and/or seafood in your freezer thawed and felt warm, what do you do? (a) Throw them away; (b) Cook them right away; (c) See how they smell or look before deciding what to do; (d) Immediately re-freeze until solidly frozen, then cook them	1305	41.37
Have you ever served left raw/cooked foods at room temperature (29-32°C) longer than 2 h? (a) Yes; (b) no	1305	43.92

Table 2: Food safety knowledge scores of students

	Liberal arts X±S.D.		Engineering X±S.D.		Food science X±S.D.	
Survey content	Male	Female	Male	Female	Male	Female
Food safety knowledge	18.50±3.42	20.00±2.00	18.23±4.36	21.15±4.51	24.00±1.63**	26.33±1.50**

**: Comparison with food science majors $p<0.01$

Table 3: Approaches of learning food safety knowledge of students

Approaches	Male (%)	Female (%)
TV	33.72	46.48
Network	35.26	29.90
Class	1.79	6.10
Two or more	29.23	17.52

Table 4: The attitude to the food safety issues of students

Attitude	Male (%)	Female (%)
Not concern	5.77	20.38
Concern	67.69	68.00
Concern and interested to implement food safety reforms through their own efforts	26.54	11.62

Table 5: Behavior to the food safety issues of students

	Male (%)	Female (%)
Do you encounter food safety problems?		
Usually	5.89	2.09
Sometimes	75.00	71.62
Never	19.11	26.29
How to deal with these problems		
No care	34.70	50.13
No care and eat	2.38	7.75
Deal with sellers	37.72	31.01
Lodge a complaint	25.20	11.11

Food safety knowledge levels of students: As Table 1 shown, the food safety knowledge mean score was 21.37 (score ranging from 0 to 45). Among the participants, 27.22% participants know about the food safety laws, while only did 17.6% knew the time which these important laws were effective. About 20.61% participants were aware of the safe temperature for cooking and 18.89% participants aware of temperature for preserving food. About 43.92% had experienced serving leftover raw/cooked foods under room temperatures (29 to 32°C) at >2 h. About 76.35% knew that raw chicken, fish and meat should not come into contact with each other.

About 72.83 and 68.35% were aware of the importance of washing hands when they touch meat or cooking utensils, respectively and 14.68% for cleaning cutting boards after cutting raw meat. Among the participants, 33.79% were aware that the egg were safe to eat when the albumen and the yolk of eggs were fried to become solid and about 76.35% understand whether milk is safe by tasting milk rather than looking at its expiry date.

As Table 2 shown, the food safety knowledge scores of male liberal arts students were 18.50±3.42, while those among females were 20.00±2.00. For engineering majors, male students got 18.23±4.36 of scores and females got 21.15±4.51. Among food science major students, males scored 24.00±1.63 and females at 26.33±1.50. The results indicated that Food safety knowledge scores of food science students were higher than those of liberal arts and engineering students and food safety knowledge scores among college student from different majors had highly significant difference.

Methods of acquiring food safety knowledge: As Table 3 shown, the college students obtained food safety knowledge from networks, television programs and school courses. Females more likely acquired knowledge from television programs, while males more likely acquire information from networks. About 29.23% of males and 17.52% of females acquired knowledge in varied ways.

Attitude toward food safety issues: As Table 4 shown, majority of the participants exhibited concern on food safety problems and 26.54% of male students and 11.62% of female are interested to implement food safety reforms through their own efforts.

Behavior toward food safety issues: Behavior patterns of male and female students toward food safety issues are presented in Table 5. About 19.11% of male students and 26.29% of female stated that they had not encountered food safety problems previously, while 75% of males and 71.62% of females stated that they usually encountered these problems. Among those who had encountered food safety problems, 37.72% of males and 31.01% of females had argued with sellers, while 25.20% males and 11.11% females openly expressed their intent to forward a complaint.

DISCUSSION

Lanzhou, is an representative western city of China, especially northwest city of China (except for Xi'an city, Lanzhou like the other northwest provinces and it's economy, education and other aspects are whole relatively backward). Moreover, a huge number of college students in Lanzhou come from western China. So the study can goodly show present situation of food safety knowledge and decision-making process among the western college students in China.

Although during the past few decades, the Chinese government had focused on the development of western China and carried out a series of measures. However, there are few studies about food safety knowledge levels of college students in western China (Luo *et al*., 2011). Thus, this study aims to fill this gap by providing data on the knowledge and attitudes of

college students in Lanzhou on food safety and decision-making process.

According to previous report (Alsaffar, 2011), the levels of food safety knowledge of college students from China were low, compared with developed countries, such as Australia, UK and Turkey. The level of participants from Australia and Turkey for the same questions were slightly higher than those of Chinese participants, while the level of participants from the UK were the highest. A survey about the eating habits and food safety knowledge of Japanese female students (Qiong, 2013) proved the student with good awareness of acquiring food knowledge had a healthy body. Thus, more opportunities of obtaining related knowledge should be provided to college students for increasing their food safety knowledge levels.

The results of the present study that students of food science major had the highest average food safety knowledge scores, are consistent with the findings in previous studies (Abbot *et al*., 2009; Byrd-Bredbenner *et al*., 2007; Osaili *et al*., 2011; Sharif and Al-Malki, 2010; Thomai, 2012). It was reported that students enrolled in food science major had better food safety knowledge scores, which can be attributed to the exposure of these students to a more systematic education on food knowledge and to their involvement in relevant practice. Moreover, the results from us demonstrated that students were highly aware of cross-contamination prevention procedures, but had less knowledgeable on food poisoning and on the safe time/temperature for cooking/storing food. Therefore, the development of an education program on food safety knowledge is necessary.

The results from us that female college students obtained higher scores in food safety knowledge than male students fairly support data from previous studies (Unklesbay *et al*., 1998), which may also be related to the fact that females traditionally prepare and cook food at home in the Chinese culture. It was found that male college students had more positive attitude toward food safety problems than female students. About 26.54% of male students were concerned on food safety problems and intent on changing the present situation through their own efforts. About 62% of males and 36% of females had the actions in protecting consumers' rights, which were contrary to the results mentioned in previous studies (Sanlier, 2009).

The data gathered revealed an urgent need for food safety education among college students in Lanzhou. In order to help students develop and acquire more food knowledge and promote a positive attitude toward food safety knowledge, the state policy on food knowledge education should be established. The university curriculum can be an ideal setting in providing safety knowledge and in increasing the positive cognition, attitude, behavior to food safety issues of college students.

CONCLUSION

This study showed food safety knowledge levels and decision-making process are closely related to sex and engaged major of college students. College students in west China generally have poor food safety knowledge, but their attitude toward food safety problems remained positive. The need for educational measures aimed at improving food safety knowledge among college students is proven to be essential.

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