

Knowledge and Attitudes of Food Safety among Hospitality and Culinary Students

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Abstract

A significant number of cases of illness has been attributed to food consumption in restaurants, and as the number of meals eaten away from home continues to rise, the potential for large-scale, foodborne illness outbreaks will continue to increase. It is critical that hospitality and culinary arts students preparing for careers as professionals in foodservice establishments or restaurants have an appropriate understanding of food safety. The level of food safety knowledge was similar between hospitality and culinary arts students, and an analysis of 266 questionnaires indicated that specific areas, such as hand washing, cross contamination in refrigerator, reheating leftovers, refrigeration of cooked food within two hours, proper temperature of food storage, using of thermometers to monitor temperatures, proper egg handling, and possible foodborne illness caused by fruits, should be the primary focus of educational resources. Student respondents showed a higher awareness level of responsibility in their roles for food safety, but more emphasis needs to be given to the correct understanding of food safety issues. Hospitality and culinary arts educators can use this precise information to develop food safety education materials and programs to assist in the prevention of foodborne illness and to knowledgeably educate their graduates about food safety.

Key words: food safety knowledge, hospitality, culinary students

INTRODUCTION

There are 76 million cases of foodborne illness reported in the U.S. and in 9.4 million in the U.K. per year (1), and these reports indicate that there are still needs for emphasis of food safety in the food-production chain. According to data from the Centers for Disease Control and Prevention (CDC), 22% of food poisonings are caused by poor personal hygiene. It is reported that 34% of 81 foodborne outbreaks in the U.S. have been caused by the improper practices of food handlers, and 70% of foodborne illnesses are associated with catering or food service functions, which suggests the importance of food safety in foodservice areas (1). Food safety is among the most crucial of all issues facing the restaurant industry, as improper handling techniques can lead to foodborne illness (2). Previous research shows that education emphasizing food safety and proper food handling are needed and will help the food service personnel have a better understanding of proper food hygiene practices, which can improve the level of food safety (3).

According to the Food and Drug Administration of Korea (4), in 2003 most of the documented foodborne

illness outbreaks were a result of food consumed in foodservice organizations (95.7%), such as schools, businesses and industries, or in restaurants (3.8%), and the public health burden of foodborne diseases in Korea is substantial (5). The rigorous enforcement of regulations and the constant surveillance of the food supply by the Food and Drug Administration of Korea have reinforced the concept of absolute food safety to foodservice employees (4). However, it is not enough to regulate to be most effective in reducing incidents of foodborne illness, foodservice employees will need to be educated to reinforce food safety knowledge and attitudes that reflect a concern for food safety practices.

Foodservice managers have a critical responsibility to educate and train their employees in the prevention of foodborne illness (6,7). According to Herman Cain, the former CEO and President of National Restaurant Association, foodservice operators should share safe food handling practices with employees and consumers (8). Walczak (6) emphasized that restaurant managers must provide food safety training, time for appropriate cleaning, necessary equipment, and high standards of sanitation for employees.

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Today's hospitality students will have great opportunities for promoting safe food handling habits among foodservice employees and consumers by becoming managers and educators of the future in their professional careers. Trained foodservice managers with safety expertise to work in the foodservice industry and restaurants, as well as well-prepared students who are knowledgeable of food safety, will be in great demand. Therefore, hospitality and foodservice educators need to prepare graduates to become successful professionals with knowledge, expertise and proper attitudes toward food safety.

Departments teaching hospitality or culinary arts have opened in over 70 colleges and universities, and they are considered to be the principal programs for producing hospitality and foodservice professionals in Korea (9). In light of prevalent data concerning foodborne illness (1,4,5), it is important for hospitality educators to prepare the next generation of hospitality and foodservice organizations' managers by strengthening food safety issues in their curriculum.

This research study sought to identify and compare the hospitality- and culinary-majoring students' knowledge and attitudes toward food safety. The result of this study will provide necessary information for hospitality and culinary educators to develop an effective food safety education module.

MATERIALS AND METHODS

Questionnaire

The research instrument was facilitated by borrowing items from past literature and by generating new items for scales, which had no precedence in the literature. The questionnaire was developed based on both studies of Unklesbay et al. (3) and Scheule (10), which contained general knowledge and attitudes relating to food safety, as well as demographic information. The knowledge statements consisted of true/false questions. A cumulative knowledge score was obtained by assigning one point for each correct response and zero points for each incorrect response. The maximum cumulative score was 25 points. The attitude scale about food safety measured the degree to which students perceived the importance of food safety using a 5-point scale of agreement (1=strongly disagree, 5=strongly agree). A pilot test was conducted with 85 college students, and the reliability of attitude measurements were assessed using Cronbach's coefficient alphas: measurement items for attitudes were acceptable as 0.72 (11). The questionnaire was modified to improve reliability and clarity of wording based on the results of a pilot study. The demographic

information requested from participants included age, gender, previous work experience in foodservice facilities, previous academic courses containing food safety issues, and possession of certification.

Sampling

The specific population of this study was Korean college students majoring in hospitality or culinary arts. With the permission of the instructors, the researchers administered the survey in classes at five colleges in Korea during the spring semester of 2004. One researcher announced the purpose of this study and encouraged students to participate in this study prior to the survey administration. Data questionnaires were self-administered and returned in classrooms. A total of 300 questionnaires were distributed to all students in five classes, and 266 questionnaires were completed. A response rate of 89% (266/300) was obtained from the class survey.

Statistical analysis

Statistical analyses were performed using SPSS 11.5 for Windows. Descriptive analyses used for analysis were means, standard deviations, frequency distributions, and percentages. A comparison of mean differences was analyzed Student's *t*-test. The reliability of the knowledge and attitude dimensions was assessed using reliability coefficient alphas. The level of statistical significance was determined at $p < 0.05$.

RESULTS

Demographic characteristics

Among the student respondents, 53% ($n=141$) of students were culinary arts majors, and 47% ($n=125$) of students identified themselves as hospitality majors. The majority of the respondents (68%) were seniors. The gender was evenly divided in both groups. Most of the students (91%) were 20~24 years of age (Table 1).

Table 2 showed students' previous experiences with food safety courses, licenses, work experiences and internship experiences. Both culinary and hospitality respondents had similar previous experiences. Over 60% of the students had taken a course including food safety information with no significant differences between major groups. However, a significantly higher percentage of hospitality students ($p < 0.05$) had experience in a hotel or foodservice organization than culinary students.

Food safety knowledge

Among the 266 students, the lowest food safety score was 6 points out of a possible 25 points, and the highest score was 23 points. The knowledge level for the ma-

Table 1. Demographic characteristics of students' respondents

Demographic characteristics	Total (N=266)		Culinary majoring students (N=141)		Hospitality majoring students (N=125)	
	N	%	N	%	N	%
Age						
<20	5	1.9	3	2.1	2	1.6
20~21	199	74.8	101	71.6	98	78.4
22~23	17	6.4	9	6.3	8	6.4
24~25	27	10.2	19	13.5	8	6.4
>25	19	6.8	10	6.4	9	7.2
Gender						
Male	107	40.2	67	47.5	40	32.0
Female	159	59.8	74	52.5	85	68.0
Academy status						
Juniors	182	68.4	96	68.1	86	68.8
Seniors	84	31.6	45	31.9	39	31.2

Table 2. Previous experiences of culinary and hospitality students

Previous experience	Culinary students (N=141)		Hospitality students (N=125)	
	N	%	N	%
Previous college food safety course				
Yes	91	64.5	71	56.8
Acquiring of the certified license relating food				
Yes	27	19.1	31	24.8
Part-time job experience in hotel or foodservice organizations				
Yes	57	40.4	53	42.4
Internship experiences in hotel or foodservice organizations				
Yes	28	19.9	38	30.4*

*Indicates significant difference ($p < 0.05$) of previous experiences between culinary students and hospitality students.

majority of the students was in the medium range (16.09 ± 3.13), and no significant difference between majors was found. The mean knowledge score of hospitality students was 16.37 ± 3.02 , whereas the culinary students' knowledge score was 15.84 ± 3.23 .

Eighty percent of the students provided the correct response for 5 out of 25 statements (Table 3). Only about 50% of the students knew that cold foods must be held at or below 0°C , foods containing raw eggs possess a risk of causing foodborne illness, a quick hand wash of 5~10 seconds is adequate before handling foods, and uncooked meat in the refrigerator should be stored below other foods. The type of information that students were least likely to know dealt with the safety of specific food products, such as melons, as well as the usage of thermometers and recommended temperatures for cooking and safe delivery.

Food safety attitudes

Most students strongly agreed that it is the responsibility of foodservice employees, chefs, and managers to provide safe food served in their organizations. Two of six items that received relatively lower mean scores than the other four items were the statements that food-

borne illness is common and maintaining a clean kitchen is less important than serving the foods rapidly. This finding indicated that more emphasis needs to be placed on the physical, social, and economic burden of foodborne illness and the importance of preventing of foodborne illness.

Significant differences between culinary and hospitality students for food safety attitudes were found in two statements (Table 4). Although most students agreed that the individual (foodservice organizations' employees, chefs, and managers) is responsible for the safety of food eaten, only hospitality majors stated a significantly favorable attitude toward the managers' responsibilities in the training of staff. Also, culinary students were found to have a significantly greater awareness that the cleanliness of a kitchen should be of greater concern than the speed of food delivery as compared to hospitality students.

DISCUSSION

Recent data indicate that the majority of reported foodborne illness outbreaks occurs outside the home (2). Even though illness would be expected to be reported

Table 3. Comparison of culinary and hospitality students' food safety knowledge score

Food safety knowledge ¹⁾	Total (N=266)		Culinary students (N=141)		Hospitality students (N=125)		Sig. ²⁾
	N	%	N	%	N	%	
80~100% of total responses correct							
Cooked food ingredients must be separated from raw food ingredients.	235	88.3	120	85.1	115	92	0.080**
Uncooked foods can be identified by the way they look.	229	86.1	116	82.3	113	90.4	0.075**
Pathogenic microorganism can growth at food in the refrigeration.	228	85.7	115	81.6	113	90.4	0.053**
Opened frozen food can be preserved for 5~6 months in refrigerator.	218	82.0	113	80.1	105	84.0	
Children and elderly are more vulnerable to foodborne illness than adults.	218	82.0	111	78.7	107	85.6	
60~79% of total responses correct							
Washing hands with soap before you prepare food makes food illness less likely to occur.	211	79.3	107	75.9	104	83.2	
Freezing food kills pathogenic microorganism such as bacteria.	199	74.8	99	70.2	100	80.0	0.089**
Cooked foods should be refrigerated within 2 hours of preparing and serving them.	197	74.1	110	78.0	87	69.6	
Few foodborne illness are the result of inadequate hand washing.	197	74.1	111	78.7	86	68.8	0.070**
Potentially hazardous foods are generally high protein.	196	73.7	106	75.2	90	72.0	
Refrigerators should be always kept at 4°C.	192	72.2	96	68.1	96	76.8	
Using the same cutting board to cut up raw chicken and then cut raw vegetables for a salad is safe as long as you wipe the board off with the warm soapy water between different foods.	188	70.7	101	70.2	100	80.0	
Leftover should be reheated over 75°C to eat.	182	68.4	91	64.5	91	72.8	
A worker infected with hepatitis A often has no symptoms.	177	66.5	82	58.2	95	76.0	0.003*
Cooked food at room temperature for more than 2 hours is safe to eat.	170	63.9	91	64.5	79	63.2	
It is safe food handling to thaw the frozen chicken on the countertop.	168	63.2	87	61.7	81	64.8	
Food should be heated with rotation and cover using microwave oven.	166	62.4	83	58.9	83	66.4	
Less than 59% of total responses correct							
Cold foods must be held at or below 0°C.	158	59.4	82	58.2	76	60.8	
Foods containing raw eggs possess any risk of causing foodborne illness.	144	54.1	77	54.6	67	53.6	
A quick hand wash of 5~10 seconds is adequate before handling foods.	143	54.0	75	53.2	68	54.4	
Uncooked meat in the refrigerator should be stored below other foods.	122	45.9	69	48.9	53	42.4	
Melons are considered hazardous due to possibility of Salmonellosis.	97	36.5	51	36.2	46	36.8	
Thermometer must be used to determine if the food is completely cooked or not.	87	32.7	50	35.5	37	29.6	
Chicken should be cooked until the temperature in the middle is 70°C.	86	32.3	47	33.3	39	31.2	
Meat or poultry that has been delivered under 10°C should not be accepted.	72	27.1	44	31.2	28	22.4	

¹⁾Based on a true or false questions.

²⁾Chi square test.

*p < 0.05, **p < 0.1.

Table 4. Culinary and hospitality students' attitudes ratings toward food safety

Attitudes statements toward food safety ¹⁾	Total (N=266)	Culinary (N=141)	Hospitality (N=125)	Sig.
	Mean ± SD	Mean ± SD	Mean ± SD	
Chefs and foodservice employees are responsible to the safety of the food served.	4.38 ± 0.87	4.31 ± 0.99	4.46 ± 0.72	
Foodservice managers are responsible for the safety of the food served in their restaurants.	4.20 ± 0.92	4.16 ± 0.94	4.24 ± 0.88	
Foodservice managers are responsible for the training of staff.	4.17 ± 0.99	4.06 ± 1.04	4.30 ± 0.91	0.045*
Foodservice managers need to understand HACCP.	4.08 ± 0.87	4.01 ± 0.94	4.15 ± 0.79	
I believe that food borne illness are common.	2.69 ± 1.28	2.83 ± 1.27	2.53 ± 1.28	
Maintaining a clean kitchen is less important than serving the foods rapidly.	2.51 ± 1.34	2.72 ± 1.37	2.27 ± 1.28	0.006*

¹⁾Scales based on a 5 point scale from 1=strongly disagree to 5=strongly agree.

*Indicates significant difference ($p < 0.05$) of attitudes mean scores between culinary students and hospitality students.

more often when it occurs as a result of eating in restaurants, the numbers are nonetheless large. The Food Code provided by the National Standards for Restaurant Safety included temperatures for cooking, cooling, refrigeration, reheating, and holding food in foodservice establishments (12). Based on several reports in the literature, food service outside the homes is big business, with sales of more than \$300 billion in the U.S. annually (13) and 33.6 billion in Korea (14). As the number of meals eaten away from the home continues to rise, it is clear that the potential for large-scale foodborne disease outbreaks will continue to rise and, therefore, food service establishments play a critical role in food safety (13). The increasing numbers of people patronizing restaurants has been accompanied by an increased risk of illnesses being transmitted by food handlers (15).

Food handling practices are critical in the prevention of foodborne illness. Most cases of foodborne illness occur due to poor food handling by foodservice workers (16). Today's culinary and hospitality students will become leaders who will be charged with promoting food safety within foodservice establishments in the future; therefore, it is essential that they have a thorough understanding of safe food practices through proper education and training (17). Before specific education and training programs can be developed and provided to the students, the hospitality and culinary educators must first learn what their students know about food safety and then they can begin to develop attitudes toward food safety to meet the demands of the students' future careers (18).

With 60% of the student respondents reporting having had a college course that included food safety information, but only scoring 16 out of 25 points, it can be concluded that there is a definite need for continued and improved food safety education. Previous studies (19,20) have demonstrated the effectiveness of food safety education in reducing the frequency of foodborne illness.

Three questions relating to hand washing showed a medium (79% and 74%) to low knowledge level (54%), which indicates that educators must provide additional emphasis on this topic. Zhang et al. (21) stated that improper hand washing is a prominent factor causing foodborne illness, and concluded that specific hand washing should be the primary focus of educational resources.

Regarding safe food handling in order to prevent cross contamination, even though 88% and 70% of respondents were correct in identifying the need to separate raw and cooked food ingredients and to clean the kitchenware after preparing raw food ingredients respectively, over 50% of respondents were unaware of the potential risks associated with storing raw meat and poultry on the upper shelves of the refrigerators, and were unaware that these items could cause cross contamination of food stored below (22). With regard to freezing and thawing procedures, 63.2% of respondents said that the thawing of frozen chicken at room temperature is improper.

According to the results of food storage practice statements, it is necessary to stress the importance of reheating leftovers, the correct temperatures of refrigerators and freezers, and the refrigeration of cooked food within two hours. The greater the time span between cooking foods and their consumption increased, the greater the risk of developing foodborne illness. Also, leftovers may be contaminated by microorganisms during storage. Therefore, it is recommended that meat and poultry be kept at room temperature no longer than two hours (23), and that leftovers must be reheated thoroughly to kill microorganisms or vegetative forms of microorganisms (24). Moreover, questions relating to the safe temperature for meat and poultry distribution had only 27% correct responses, which indicates that students need to identify the proper storage temperature of each food category.

Students were more likely to answer incorrectly ques-

tions relating to the use of thermometers to monitor temperatures, egg handling, and hazards associated with fruits, like melons, which are not common in Korea. Therefore, encouraging students to refer frequently to worldwide food trade literature and newspaper reports will be helpful in understanding the significance of these issues.

The culinary and hospitality students assigned an overall higher level of responsibility to the roles of managers and chefs for food safety in this study. However, responses to the items about the seriousness of foodborne illness and the importance of food safety in discussing the speed of serving food was in the neutral-to-disagree range. This finding indicates that more emphasis needs to be given to the correct understanding of food safety issues pertaining to the substantial burdens due to the number of incidences, medical costs, and simple discomfort these illnesses place on our society.

A basic knowledge of food safety may motivate students to use safe food handling practices, and the use of food safety knowledge should be extended into employee training. Knowledge of what students know and believe about food safety is essential if educators are to develop effective programs and materials. Precise information through this study about culinary and hospitality students' food safety knowledge and attitudes will facilitate the development of proper educational modules and will encourage culinary and hospitality educators to continue in their efforts to educate students in food safety. In a future study, we can then develop educational materials and programs that address the specific needs of professionals in the foodservice industries.

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