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Amit Sharma
Pennsylvania State University

Rama Radhakrishna
Pennsylvania State University, brr100@psu.edu

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Consumer Knowledge and Perceptions Towards Food Safety Practices: Implications for Consumer Education Programs

Amit Sharma

Rama Radhakrishna

The Pennsylvania State University

Food safety knowledge and perceptions of consumers are important factors in preventing incidence of foodborne illnesses. The purpose of this study was to determine consumers' knowledge and perceptions towards food safety and practices. In particular, this study assessed knowledge level of consumers related to key food safety practices and determined the perceptions of consumers regarding food safety practices in foodservice operations. Additionally, it determined consumers' ability to observe food safety practices in foodservice operations. Results revealed that, in general, consumers were knowledgeable about food safety but did not understand certain basic processes of food safety, such as handwashing and preventing food safety hazards. This study also found that respondents were concerned about food safety and adhered to foodservice operations' food safety practices. Implications and recommendations for Extension programming were drawn from study results.

Keywords: food safety, foodservice, consumer education, knowledge, perceptions, practices

Introduction

Food safety is an important topic of concern for consumers. A number of food scares, such as the recent *E. coli* outbreak, have heightened consumers' awareness of food safety issues (Andrews, 2013). Despite this growing concern, consumers often lack sufficient knowledge to assess relevant food safety risks which differ depending on whether the food was purchased in a grocery store or in a restaurant.

Perceptions towards an issue are an important psychological construct found to influence and predict many behaviors (Kraus, 1995). According to Brewer, Sprouls, and Russon (1994), consumer perceptions towards food safety can be categorized into six factors based on the food safety issues of concern: 1) chemical issues (hormones in milk, food additives), 2) health issues (cholesterol contents, nutritional imbalances), 3) spoilage issues (microbial contamination), 4) regulatory issues (food inspection, labeling), 5) deceptive practices (weight reduction diets), and 6) ideal situations (length of time for pesticide safety assessment) (Brewer et al., 1994).

Direct correspondence to Rama Radhakrishna at brr100@psu.edu

A host of researchers have conducted studies relative to food safety knowledge, attitudes, and behaviors of consumers (Albrecht, 1995; Brewer et al., 1994; Bruhn & Schutz, 1999; Ergönül, 2013; Tobin, Thomson, & LaBorde, 2012). Other researchers have examined food safety knowledge of consumers, employees, food handlers, college students, and Spanish-speaking workers in foodservice establishments (Gurudasani & Sheth, 2009; McArthur, Holbert, & Forsythe, 2007; Sneed & Strohhahn, 2008). Consensus from these studies suggests that consumers, students, and employees lack sufficient food safety knowledge. These authors consistently recognize that food safety knowledge and food handling practices must be improved among these audiences and recommend the development and delivery of educational programs that would help translate knowledge to behavior.

Albrecht (1995) found that consumers had adequate knowledge regarding safe food handling practices, but they did not implement those practices. Bruhn and Schutz (1998) found that consumers conflated nutritional changes that occur within food with food safety. In the same study, nearly 20% of the respondents did not know how to reduce the microbiological risks of food contamination. The authors recommended enhancing consumer knowledge of temperature control and sanitation and more appropriate methods to ensure food safety rather than tasting food for nutritional appropriateness. In another study, Gurudasani and Sheth (2009) found that most consumers in foodservice establishments, such as restaurants and grocery markets, had positive perceptions towards food safety. They also found a positive association between the education level of consumers and the frequency with which they received food safety education information.

Another study observed 108 consumers during all stages of the purchase, preparation, and cooking and storage process and documented multiple examples of poor food handling practices (Worsfold & Griffith, 1997). For example, 58% of the consumers stored chilled ingredients above 5°C, 66% did not wash hands before preparation, 41% did not wash vegetables, and 60% used a single board for all cutting tasks.

McArthur et al. (2007) investigated compliance and the awareness of food safety knowledge among college students employed in foodservice establishments. The study found that the mean score in a food safety knowledge test was 39%. Students were least aware of microbial aspects of food safety. Still, students were interested to know more about food safety practices.

Collectively, these studies indicate that the food safety practices of consumers are based on faulty assumptions and misperceptions, yet consumers' desire to improve their food safety knowledge and behaviors. Given that knowledge, perceptions, and behaviors are essential to consider in designing and implementing educational programs that enhance food safety behavior, a need exists to identify the specific aspects of food safety handling and preparation practices among consumers that must be emphasized in programming.

Purpose and Objectives

The overall purpose of the present study was to determine consumers' knowledge and perceptions towards food safety and practices. The following objectives guided the study:

1. Describe the demographic profile of study participants;
2. Assess the knowledge level of consumers relative to key food safety practices;
3. Determine perceptions of consumers relative to food safety practices in foodservice establishments; and
4. Determine consumers' observation of food safety practices by employees in foodservice establishments.

Methods and Procedures

Data for this study came from a larger study intending to enhance the consumer orientation of Farm to School programs funded through the Agriculture and Food Research Initiative (AFRI) program of the United States Department of Agriculture (USDA). The population for the study consisted of all consumers participating in a study that examined consumer perceptions of food safety and practices and consumers' willingness to pay for food safety. The survey was conducted in person, and respondents were offered a financial incentive to participate. Participants were treated as a purposive sample. A total of 880 consumers agreed to participate.

The design used for the study was descriptive-correlational. In order to investigate food safety knowledge among consumers, a three-section survey instrument was developed to collect data. The first section contained questions relative to perceptions of consumers on food safety practices in foodservice establishments, measured on a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*). The second set of questions in the first section also used a four-point Likert Scale (1 = *never* to 4 = *always*) to measure consumers' observations of food safety practices in foodservice establishments. The second section contained eight multiple choice knowledge questions relative to food safety, while the third section elicited information on demographic characteristics (i.e., gender, ethnicity, age, marital status, number of people in the household, income, and education level).

Content and face validity of the instrument were established using a panel of experts drawn from Food Science, School of Hospitality Management, Agricultural and Extension Education, and Cooperative Extension. The instrument was pilot tested using staff and undergraduate students in a large northeastern public university. The pilot test results were used to improve the survey instrument for clarity of questions (Dillman, Smyth, & Christian, 2009). The instrument was found to have acceptable reliability ranging from a low of .81 (section one) to a high of .83 (section two). Data were analyzed using descriptive statistics.

Findings

Objective 1: Demographic Profile

Most respondents were of White ethnicity (86.9%), followed by Asian or Pacific Islander (6.3%), African American (3.1%), Hispanic (2.2%), and others (1.5%). Descriptive analysis indicated that 58% were married, 33% were single, 6% were divorced, and 3% were widowed. Working respondents accounted for 58% of the consumers, 23% were students, 4% were not working, and 7% were retired. In addition, 62% reported that there were no children living in the home, while the remaining 38% had children ranging from 5 to 18 years of age living in the home.

Objective 2: Knowledge Level

Consumers were asked to complete eight multiple choice questions designed to assess food safety knowledge. The questions, the number and percent of correct answers, and the answer key to food safety questions are shown in Table 1. Three of the eight questions were answered correctly by more than 80% of the consumers: *Cutting board and knife should be washed with* (92.4%), *Example of cross contamination* (86%), and *Best ways to assure foods are cooked sufficiently* (81.7%). Two of the questions were answered incorrectly by over 75% of the consumers: *Most foods should not be left out at room temperature for more than* (15.4%), and *How long you wash your hands with hot water and soap* (22.1%). Overall, 57% of the consumers answered questions correctly (See Table 1).

Table 1. Knowledge and Understanding of Food Safety (n = 883)

| Statement [Answers] | n | Percent Correct |
|---|-----|-----------------|
| 1. Best way to cool a large pot of hot soup [<i>Divide the soup into smaller containers, and place it in the refrigerator.</i>] | 407 | 46.1 |
| 2. Best way to assure foods are cooked sufficiently [<i>Use a thermometer.</i>] | 721 | 81.7 |
| 3. Most foods should not be left out at room temperature for more than [<i>2 hours</i>] | 136 | 15.4 |
| 4. What is the “temperature danger zone” of food? [<i>40 to 140 degrees Fahrenheit</i>] | 441 | 49.9 |
| 5. Cutting board and knife should be washed with [<i>Hot water and soap</i>] | 816 | 92.4 |
| 6. Example of cross contamination [<i>An outdoor cook uses a plate to carry raw meat to a barbecue grill. He/she then places the cooked meat on the sample plate without washing it.</i>] | 756 | 86.0 |
| 7. How long you wash your hands with hot water and soap [<i>20 seconds</i>] | 195 | 22.1 |
| 8. Which situation is the best for allowing bacteria to grow [<i>Beef stew left to cool on counter top for 5 hours</i>] | 529 | 59.9 |
| Overall Average | | 56.69 |

Objective 3: Consumers' Perceptions

Consumers' perceptions of food safety practices in restaurants were measured by a series of Likert items ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The three statements with the highest means were *I think the food products I buy are safe* ($M = 3.23, SD = 0.57$), *Overall, I am very concerned about food safety* ($M = 3.18, SD = 0.81$), and *I would like to see stronger food safety standards in the U.S.* ($M = 3.15, SD = 0.75$). The statements with the lowest means were *I do not eat meat prepared by someone outside my household* ($M = 1.33, SD = 0.65$) and *If food safety were not a concern, I would eat out more often* ($M = 1.72, SD = 0.82$) (See Table 2).

Table 2. Perceptions of Consumers on Food Safety Aspects of Food Served in Restaurants

| Statement | n | M* | SD | Interpretation |
|---|-----|------|------|--------------------------|
| I think the food products I buy are safe. | 878 | 3.23 | 0.57 | <i>somewhat agree</i> |
| Overall, I am very concerned about food safety. | 879 | 3.18 | 0.81 | <i>somewhat agree</i> |
| I would like to see stronger food safety standards in the U.S. | 878 | 3.15 | 0.75 | <i>somewhat agree</i> |
| I think foodservice establishments need to inform consumers/customers that they are using safe food practices. | 879 | 3.08 | 0.76 | <i>somewhat agree</i> |
| I prefer to eat in foodservice establishments where food safety assurance is clearly stated. | 878 | 2.97 | 0.81 | <i>somewhat agree</i> |
| I am confident that food in foodservice establishments is safe to eat. | 877 | 2.95 | 0.64 | <i>somewhat agree</i> |
| I feel more secure eating in foodservice establishments if I see food safety certificates for employees posted. | 876 | 2.91 | 0.82 | <i>somewhat agree</i> |
| I would be interested in knowing more about food safety issues while eating away from home. | 877 | 2.89 | 0.76 | <i>somewhat agree</i> |
| I would not pay more money to buy "certified safe food" in foodservice establishments. | 878 | 2.83 | 0.87 | <i>somewhat agree</i> |
| I would pay more for a product with a higher than average level of food safety. | 877 | 2.64 | 0.87 | <i>somewhat agree</i> |
| I worry about the safety of food I buy. | 876 | 2.56 | 0.93 | <i>somewhat agree</i> |
| Relative to others, I am a risk taker. | 877 | 2.47 | 0.83 | <i>somewhat disagree</i> |
| I don't think foodservice establishments are doing enough to provide safe food. | 879 | 2.41 | 0.74 | <i>somewhat disagree</i> |
| Recently, I decided not to eat out in foodservice establishments because of media coverage of food illness outbreaks. | 877 | 2.01 | 1.04 | <i>somewhat disagree</i> |
| If food safety were not a concern, I would eat out more often. | 879 | 1.72 | 0.82 | <i>somewhat disagree</i> |
| I do not eat meat prepared by someone outside my household. | 877 | 1.33 | 0.65 | <i>disagree</i> |

*Mean computed on a scale 1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *somewhat agree*, 4 = *strongly agree*

Objective 4: Observation of Food Safety Practices

Consumers' observations of food safety practices by food sector employees were also measured using a four-point Likert scale (1 = *never* to 4 = *always*). Responses with the highest means were *A kitchen employee does not have a hair restraint* ($M = 2.36, SD = 0.65$), *An employee does not wear gloves while preparing the food* ($M = 2.32, SD = 0.72$), and *An employee touches his/her face while preparing the food* ($M = 2.08, SD = 0.71$). The practices with the lowest means were *The food that is served to you is undercooked* and *A kitchen employee is visibly sick* ($M = 1.54, SD = 0.63$) (See Table 3).

Table 3. Observation of Food Safety Practices in Foodservice Establishments

| Statement | <i>n</i> | <i>M*</i> | <i>SD</i> | Interpretation |
|--|----------|-----------|-----------|----------------|
| A kitchen employee does not have a hair restraint (cap, hairnet) while preparing food. | 877 | 2.36 | 0.65 | <i>rarely</i> |
| An employee does not wear gloves while preparing the food. | 875 | 2.32 | 0.72 | <i>rarely</i> |
| An employee touches his/her face while preparing the food. | 879 | 2.09 | 0.71 | <i>rarely</i> |
| An employee touches his/her hair while preparing the food. | 879 | 2.01 | 0.66 | <i>rarely</i> |
| The kitchen appears dirty (garbage overflowing, excessive debris on food preparation areas, etc.). | 872 | 1.98 | 0.49 | <i>rarely</i> |
| The food you ordered has pieces of other food on it. | 878 | 1.78 | 0.63 | <i>rarely</i> |
| Ants or other insects are seen within the facility. | 878 | 1.69 | 0.64 | <i>rarely</i> |
| The food that is served to you is undercooked. | 877 | 1.54 | 0.63 | <i>rarely</i> |
| A kitchen employee is visibly sick. | 876 | 1.54 | 0.63 | <i>rarely</i> |

*Mean computed on a scale 1 = *never*, 2 = *rarely*, 3 = *frequently*, 4 = *always*

Discussion and Conclusion

Knowledge

The low scores on questions related to food storage (question 3) and handwashing (question 7) showed that respondents follow poor handling practices, particularly those related to temperature control and sanitation. This means that participants' knowledge about sanitation and temperature control needs to be improved. Similar findings were reported in Albrecht's (1995) study.

Perceptions

Most respondents expressed a high concern about food safety and wanted to see stronger food safety standards in the United States. Yet, they perceive that the food products they purchase in restaurants are safe, reflected by the low scores of the last two statements in Table 2: *If food safety was not a concern, I would eat out more frequently* and *I do not eat meat prepared by someone outside my household*. However, the findings in this study also indicate gaps in knowledge related to proper preparation and handling of food. For example, the low percentage

of correct answers regarding the length of time that food can be stored at room temperature and the length of time that hands should be washed before handling food indicate inadequate knowledge related to food storage and sanitation practices. Therefore, a disconnect appears to exist between consumers' trust regarding whether the food they purchase is actually safe and the criteria they apply to assess whether food is safe. This reflects the lack of assessment studies of food safety mentioned previously in the literature.

Observation

The most commonly observed risky behaviors by employees in the foodservice establishments were *not wearing hair restraints or gloves* and *touching their faces*. This means that the consumers have seen employees in foodservice establishments failing to adhere to best practices that decrease the risk of food contamination. These findings match those found by Brewer et al. (1994), who documented the various risk factors associated with food safety issues and concerns. Furthermore, these findings mirror results from previous studies regarding consumers' concerns in food safety. Thus, more food safety control measures should be undertaken to address the risk of contamination.

Overall, consumers in this study were fairly knowledgeable (57%) of food safety practices. However, their knowledge relative to foods kept at room temperature and handwashing was inadequate. Lack of knowledge regarding these specific aspects of food safety practices mirror earlier studies by Albrecht (1995) and Worsfold and Griffith (1997).

In addition, most respondents expressed their concerns about food safety and have observed food safety practices in the foodservice establishments. These observations were associated with correct answers to knowledge questions. Having more knowledge will allow consumers to better assess food safety.

Recommendations

Based on the findings, this study recommends educational programs be developed that:

- Target the food safety practices of food sector employees with specific attention given to the importance of wearing hair nets and gloves, as well as not touching the face during preparation;
- Educate consumers about basic food safety knowledge, especially related to food storage and handling practices; and
- Provide consumers with criteria to assess risks of contamination during home preparation and eating out in foodservice establishments.

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Amit Sharma, Ph.D., is an Associate Professor of Hospitality Finance and Director of the Food Decisions Research Laboratory in the School of Hospitality Management at The Pennsylvania State University.

Rama Radhakrishna, Ph.D., is a Professor of Agricultural and Extension Education and Assistant Dean for Graduate Education at The Pennsylvania State University.