Research Note

Consumer Food Safety Perceptions and Practices in a Turkish Community

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ABSTRACT

Research has shown that most reported foodborne outbreaks are caused by food prepared and consumed at home, thus emphasizing the importance of consumer food safety knowledge. In this study, 2,000 randomly selected residents from Çanakkale, Turkey, participated in face-to-face interviews to assess their food safety perceptions and practices. Questions covered the attention given to expiration dates, safety certificates, and food additives during shopping; consumption of high-risk foods; safe food handling; storage knowledge; and their source of food safety knowledge. Statistical analyses were done to clarify the differences according to three main aspects: gender, age, and educational level. Results showed that women and middle-aged respondents were significantly more careful during shopping and more interested in food safety issues than men and younger individuals. A significant relationship was found between gender and consumption of high-risk foods, with men consuming more of these foods than women. Furthermore, high-risk foods were more frequently consumed by young participants than by older participants, with more highly educated consumers shopping more consciously. Although most respondents appeared to know proper food handling and storage practices, almost all participants lacked some information on some issues. In order to remove these deficiencies, a brochure was prepared and distributed to people in various parts of the city. In addition, public seminars were organized. However, to ensure that this information results in positive attitude and behavioral changes, seminars should be repeated at specific intervals, and education procedures and processes should be controlled regularly.

The World Health Organization defines the term “food safety” as any measure taken to avoid physical, chemical, biological, and any other kind of damage that may occur in food. Millions of people have fallen ill, and many of them have died, as a result of consuming unsafe food. In addition to health problems, there are also losses in economic productivity, increases in medical cost, and delays in studies and work (17). When World Health Organization surveillance programs for the control of foodborne diseases in Europe investigated the outbreaks reported from 42 countries from 1993 to 1998, private homes were identified as the single location where more than 40% of foodborne outbreaks occurred (26). Limited food safety knowledge, poor personal hygiene, improper food handling, inadequate raw materials and cooking, cross-contamination, and unsuitable storage and thawing conditions are the main reasons for foodborne illnesses associated with private homes (6, 10, 15, 26). In Turkey, there is no comprehensive data source related to foodborne illnesses or their effects on human health and the economy. There are also no data related to the places where outbreaks occur, although 8,340 and 77,515 cases of foodborne diseases were reported in 1999 and 2000, respectively. In these cases, brucellosis, typhoid, amoebic dysentery, botulism, and mushroom poisoning were the most important food and waterborne diseases, according to data taken from the Turkish Health Ministry (23, 27).

Prevention of foodborne disease requires the cooperation of all those who are involved in the food chain (25). Gilbert (9) described consumers as the “final defenders” in the prevention of foodborne diseases. Therefore, educating consumers on food safety issues is very important. Several studies have been conducted to assess consumer knowledge, attitudes, and awareness about food safety. Numerous studies show that consumers are aware of and concerned about food safety, but there is still a need for the continued education of consumers about food safety issues (1, 2, 4, 6–8, 10–12, 15–18, 20, 22, 23).

In Turkey, one study showed that 47.8% of people working in food companies lack basic knowledge of food safety (5). In addition, Unusan (23) examined the knowledge and behaviors related to food safety among consumers who had the primary responsibility of food preparation at home in Konya, Turkey. The study showed that there were significant differences among the education levels concerning attitudes towards food safety and knowledge. In another study, the meat purchasing, storage, preparation, cooking, and serving behaviors of Turkish consumers in the domestic kitchen were investigated, and it was found that many individuals failed to store meat at the...
TABLE 1. Characteristics of the participants from Çanakkale, Turkey, May to July 2006a

<table>
<thead>
<tr>
<th>Variables</th>
<th>No. (%) of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>980 (49.0)</td>
</tr>
<tr>
<td>Male</td>
<td>1,020 (51.0)</td>
</tr>
<tr>
<td>Age group (yr)</td>
<td></td>
</tr>
<tr>
<td>15–24</td>
<td>658 (32.9)</td>
</tr>
<tr>
<td>25–34</td>
<td>424 (21.2)</td>
</tr>
<tr>
<td>35–44</td>
<td>442 (22.1)</td>
</tr>
<tr>
<td>45–54</td>
<td>298 (14.9)</td>
</tr>
<tr>
<td>≥55</td>
<td>178 (8.9)</td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
</tr>
<tr>
<td>Primary or secondary</td>
<td>365 (18.3)</td>
</tr>
<tr>
<td>High school</td>
<td>869 (43.4)</td>
</tr>
<tr>
<td>University</td>
<td>766 (38.3)</td>
</tr>
</tbody>
</table>

a The number of participants surveyed was 2,000.

correct temperature or did not defrost meat correctly. It was also reported that food handling practices differed according to the socioeconomic group and the level of education of the consumers (13). Sanlier (20), who also studied the food safety knowledge and food preparation practices of young and adult consumers, reported significant behavioral differences between young and adult consumers ($P < 0.001$).

The aim of the present study was to describe the food safety perceptions and practices of consumers living in Çanakkale, Turkey, regarding food safety issues during food purchasing, preparation, and storage and to examine whether there were significant effects of gender, age, and educational status on consumer behavior.

MATERIALS AND METHODS

A quantitative survey was performed to assess the food safety perceptions and practice of consumers from May to July 2006 in Çanakkale, a province in the northwestern part of Turkey. According to the 2006 census, the total number of people living within the boundaries of Çanakkale was 476,128. The survey was taken by 2,000 randomly selected respondents older than 15 years living in Çanakkale. The survey contained 36 questions and included the following sections: (i) demographics, (ii) food shopping habits and behaviors, (iii) food handling and storage knowledge, and (iv) food safety knowledge and behaviors. In the demographic section, the gender, age, and education levels of the participants were determined.

Data were obtained by face-to-face interviews. Three districts were designated to set up interview stands to reflect the demographic structure of Çanakkale. Two stands were set up in front of different shopping centers so that volunteers would constitute food purchasing consumers. Interviews were conducted by eight university students of the Food Engineering Department of Çanakkale Onsekiz Mart University. They were familiarized with the questionnaire to be able to answer any possible questions regarding the survey. The objective of the survey was explained to the respondents by interviewers. Volunteers were selected randomly. To gain the attention of the residents, one chocolate bar was given to each respondent. Also, small gift packages including food and cleaning products were given to one person in every 20 respondents, using a lottery system to increase participation.

Statistical analysis. The SAS V8.2 (21) packet program was used for statistical analysis. Descriptive statistics, frequencies, cross-tabulations, and chi-square analysis were used to show the relationship between demographic characteristics and food shopping, food storage, and food safety behaviors and attitudes. The results were evaluated according to their statistical importance ($P < 0.05$).

RESULTS

Demographics. Over the survey period, a total of 2,000 analyzable questionnaires were obtained. The participants of the survey were residents of the city of Çanakkale, older than 15 years, and living in private households in Çanakkale. The age group with the greatest proportion of individuals was the 15- to 24-year bracket (32.9%), and many of the respondents had graduated from high school (43.4%). The numbers of female and male respondents were nearly equal. Detailed demographic data are provided in Table 1.

Purchasing behavior. In this part of the questionnaire, participants were asked about their shopping behavior while buying packaged foods (Table 2). The results show that most of the respondents (82.8%) always pay attention to expiration dates. Nearly one-half of the consumers were concerned about the additives used in products, and 41% of the consumers indicated that they could not understand anything from the ingredient list. Most of the participants (62.8%) also thought that food additives were harmful, while only 41% of them thought that they were not harmful when used at proper levels and 7.8% of participants said that they had no opinion about the harmfulness of food additives.

The results were analyzed with respect to gender, age, and educational levels. According to chi-square analyses, women were significantly more concerned about expiration dates.
dates and ingredient lists than men when buying packaged foods \((P < 0.001)\). Also, participants older than 24 years paid significantly more attention to ingredient lists and expiration dates than younger respondents \((P = 0.011; \ P < 0.001)\). However, no significant relationships were found among the educational status of consumers regarding the attention paid to expiration dates, ingredients, and food additives. Table 3 shows the responses with respect to gender.

In this study, the preferred shopping places for different food groups were also determined. Supermarkets were preferred for purchasing eggs, meat, and dairy products, while bazaars (open-air markets) were preferred for purchasing fruit and vegetables by a majority of consumers \((71.1\%)\). The preferred shopping places for different types of food and shopping preferences are presented in Table 4.

No significant differences were observed between gender and the preferred shopping locations for meat and meat products \((P = 0.346)\), and both genders were observed to prefer supermarkets when purchasing milk, dairy products, and eggs. In addition, women gave preference to bazaars more than men did for the purchase of fruits and vegetables \((P = 0.0027)\).

With regard to age groups, young people and people older than 55 years generally preferred supermarkets for meat and meat products, while middle-aged participants preferred butchers. All age groups preferred supermarkets for purchasing dairy products and eggs. Only 2\% of young people (aged 15 to 24 years) and 6\% of people aged 35 years and older preferred bazaars when purchasing these products.

A significant positive relationship was seen between shopping at supermarkets and educational status \((P < 0.05)\). People with lower educational levels were more willing to buy food from bazaars than were consumers with high school and higher educations \((P < 0.05)\).

Participants were also asked if they consume high-risk foods, such as raw meatballs (a dish made with raw minced meat and spices), lahmacun, stuffed mussels, and kokoreç (roasted sheep’s intestines) sold by street vendors. According to the survey results, 27\% of respondents admitted that they had bought meat products from street sellers and bazaars. A significant relationship was found between gender and participation in hawker food purchasing \((P < 0.05)\): men consumed street sellers’ food significantly more than did women \((81\% \text{ of men versus } 66\% \text{ of women})\). Furthermore, a negative significant relationship was found between age and the preference for these foods \((P < 0.05)\).

**Food handling and storage knowledge.** In this study, the questions provided in Table 5 were asked to determine the behaviors of consumers concerning food handling and storage. According to the given answers, most consumers said that they would either put a swollen can of food in the trash or return it to the place of purchase. Only 3.5\% of the participants indicated that they would consume a food product if the defects were not important.

Also, when questioned about what they would do when they saw a product in the refrigerator that had expired beyond its best-before date, nearly all consumers \((89\%)\)

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**Table 3. Proportions of male and female participants reporting attention to specific items during food purchasing, Canakkale, Turkey, May to July 2006**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Product expiration date</th>
<th>Safety certificate</th>
<th>Ingredient list</th>
<th>Food additives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Sometimes</td>
<td>No</td>
</tr>
<tr>
<td>Female</td>
<td>1,732 (86.6)</td>
<td>56 (2.8)</td>
<td>212 (10.6)</td>
<td>900 (45.0)</td>
</tr>
<tr>
<td>Male</td>
<td>1,582 (79.1)</td>
<td>108 (5.4)</td>
<td>310 (15.5)</td>
<td>828 (41.4)</td>
</tr>
</tbody>
</table>

*P* values were calculated by chi-square analysis with SAS V8.2.211.
Food safety knowledge and behaviors. In this part of the questionnaire, participants were asked about the safety and hygienic status of foods prepared in their homes and restaurants and sold by street sellers. Nearly all respondents (95%) believed that the foods they made in their own kitchens were hygienically prepared and safe. This rate decreased to 21% for foods prepared in restaurants and to 2% for food sold by street sellers.

In addition, consumers were questioned about which places they found safe for food shopping; most consumers chose supermarkets as the safest place. With respect to buying meat products, 43% of consumers found the butcher’s store safe. This result matched the ratio of consumers that shopped from butchers. Grocers were generally found unsafe for the purchase of eggs, dairy products, fruits, and vegetables by nearly 30% of the respondents. This rate increased to 60% for meat products. Approximately one-half (57%) of respondents believed that bazaars were safe for the purchase of fruits and vegetables, while most consumers found bazaars unsafe for the purchase of foods other than fruits and vegetables.

The results of a chi-square test showed that age and consumer perception about safer places for shopping were significantly related to each other. According to the results, young respondents aged between 15 and 24 years found supermarkets and markets safer than did the older respondents (P < 0.001).

Consumers were also asked about their perception of the risk of selected foods. The perceptions of respondents for the risk of selected foods are given in Table 6. Mushrooms were chosen as the highest-risk food, and fresh fruits and vegetables were chosen as the lowest-risk food from selected food products by most of the consumers.

The questions listed in Table 7 were also asked to consumers to determine their awareness of and interest in food safety issues. There were no significant relationships
between gender and knowledge of food safety ($P = 0.725$). Only one-half of the participants said that they had sufficient knowledge of food safety. A significant positive relationship was found between age and knowledge of food safety ($P < 0.001$). The results show that 30% of the young participants (15 to 24 years) said that they had sufficient knowledge of food safety issues. This ratio increased to 50% in the 25- to 34-year age group and 60% in the 35 and older age group. Nearly all consumers indicated that they were interested in food safety issues. They were informed about food safety mainly by television and newspapers. Only 33% of the respondents had obtained information from scientific publications.

Statistical analysis shows that women (92%) and participants older than 24 years (90 to 95%) were significantly more interested in food safety issues than men (85%) and younger consumers (80%) ($P < 0.001; P < 0.001$). No significant relationship was found between education level and food safety issues ($P = 0.074$).

**DISCUSSION**

The role of consumers in the prevention of foodborne illness is very important (6). Results of the present survey demonstrate that most of the participants lack knowledge of proper food purchasing and food safety issues. In this study, it was found that while customers usually observe the production and best-before dates, they do not pay the same attention to other written information on food packages. More than one-half of the participants stated that they checked the ingredients and the additives label before purchasing packaged food. According to the results of the questionnaire, most of the participants believed that the ingredients labels should be easier to read and understand. In addition, 95% of the participants thought that at least some of the additives were harmful to their health. In recent years, food safety issues have been frequently covered by the media, although people have been misinformed by some television programs that lack a scientific basis. This result is born of a subconscious fear about food additives and consumer belief that many food additives are harmful chemicals. The findings of this research reveal that the people in Çanakkale must be better informed about food additives.

Previous studies on food safety have demonstrated that knowledge of food safety increases with age and practice and women are more knowledgeable than men about issues regarding food safety. In addition, it has been determined that younger participants need more training on food safety than others do (20, 23). Similarly, the results of this study indicate that women were more careful than men in purchasing packaged foods and young individuals pay the least attention. In addition, it was determined that university graduates shopped more consciously than those who had lower academic backgrounds.

According to the results regarding the markets preferred by consumers, it was observed that most of the participants shopped at supermarkets. The reason why most consumers prefer supermarkets might be because supermarkets offer more choices of different brands and those consumers find comfort in the ability to examine a product more closely (15). It was also found that open-air markets (bazaars) were preferred to supermarkets for purchasing fruits and vegetables due to their provision of fresh products. In the present study, statistical analyses show that educational background and age are related to the preference for where to purchase food. It was found that university graduates preferred supermarkets more than others did and that primary and/or secondary school graduates were more likely to buy foods in bazaars. It was also observed that the rates of shopping in bazaars increased proportionally with age. The reason for this may be that middle-aged women maintained the shopping habits they possessed before large supermarkets appeared in Çanakkale. Other studies also indicate that supermarkets are the preferred places for purchasing foods (15, 23). In addition, Knight et al. (15) reported in their study that 86% of the participants pay substantial attention to the hygiene and cleanliness of the place where they shop.

In this study, it was determined that about 27% of the participants purchased meat products such as kokoreç and stuffed mussels from street vendors. In addition, it was observed that males and young people seemed more willing to eat food from street vendors. It was also determined that 35% of the participants ate street food, and nearly 25% of the respondents had consumed a meal from street vendors at least once a week. In addition, 95% of the participants said that they were interested in food safety issues. They were informed about food safety mainly by television and newspapers. Only 33% of the respondents had obtained information from scientific publications. Statistical analysis shows that women (92%) and participants older than 24 years (90 to 95%) were significantly more interested in food safety issues than men (85%) and younger consumers (80%) ($P < 0.001; P < 0.001$). No significant relationship was found between education level and food safety issues ($P = 0.074$).

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TABLE 7. Food safety–related questions and rate of answers, Čanakkale, Turkey, May to July 2006

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that you have sufficient knowledge about food safety issues? (n = 1,980)</td>
<td>982 (49.6)</td>
<td>998 (50.4)</td>
</tr>
<tr>
<td>Are you interested in food safety issues? (n = 1,992)</td>
<td>1,765 (88.6)</td>
<td>227 (11.4)</td>
</tr>
</tbody>
</table>

\[ \text{Note: } n \text{, number of participants who responded.} \]

to buy these products than females or middle-aged people did. In Turkey, there is a major interest in purchasing some products from street vendors. Along with these meat products, some milk products such as ice cream and milk and sweets are purchased from street vendors. In a research carried out in Van, Turkey, raw meatball samples sold in streets were analyzed, and the results showed that the microbiological qualities of the samples were very low (19). Moreover, in a study conducted in Istanbul, Izmir, and Čanakkale, Turkey, involving stuffed mussels, the number of mesophilic aerobic bacteria was found to be higher than 5 log CFU/g in most of the samples obtained from street vendors (14). These studies show that foods sold by street vendors carry the risk of food poisoning. However, in our questionnaire, a significant positive correlation was found between educational background and the habit of shopping from street vendors (P < 0.001). It was found that while 15% of primary or secondary school graduates shopped from street vendors, this rate reached as high as 30% in high school graduates and above. This shows that regardless of the educational backgrounds of the customers, their knowledge of food safety was inadequate, and they need to be better informed on this issue.

Along with goods sold by street vendors, nonpackaged goods sold in markets also carry risks related to contamination. In recent years, vendors in markets have started to use gloves while selling nonpackaged foods; however, because they are not adequately informed of proper handling, some of them touch several places with the same gloves and even touch banknotes without removing their gloves. Because customers are not well informed, they consider such situations to be normal. The results of our questionnaire reveal that at least 12% of the vendors located in places where the participants shopped did not wear gloves while handling nonpackaged foods. In addition, 4% of the participants stated that they did not pay attention to whether vendors wear gloves or not, while at least 20% of the participants stated that they continue to shop although the vendors that wear gloves touch other objects along with the goods they sell. This demonstrates the fact that vendors and customers do not have adequate information regarding the threat of contamination.

Food storage is an important step in preventing food poisoning that may occur at home. The participants of this study were asked what they would do if they noticed bulging on the cover or deformation on the package of the canned food they purchased. Almost all of the participants (93%) stated that they would give that food back or throw it away. The percentage of those who would ignore the deformation or would try to consume the product as soon as possible was approximately 7%. Another important issue is how long purchased foods should be stored. The participants were asked what they would do if they were to find in their refrigerator packaged foods that had exceeded their best-before date. About 90% of participants responded that they would throw them away, and 8% of them stated that they would decide whether to throw the food away or not depending on its taste and smell. In a study carried out in The Netherlands, it was observed that customers think that foods can be stored until their best-before dates even though their packages are opened. In addition, it was stated that participants decide whether to throw goods away or not by checking their taste and smell (22). In our study, most of the participants stated that they store opened UHT milk for a maximum of 2 to 3 days, while only 2% of them stated that they store it until its best-before date.

The internal temperature of the refrigerator should be maintained between 0 and 4°C for food safety, according to committees formed by international organizations (24). The results of our questionnaire indicate that almost one-half of the participants knew the required internal temperature of the refrigerator, while 27% of them stated that they did not know this temperature. Questionnaire studies carried out in England have demonstrated that 93% of consumers do not know the ideal temperature of refrigerators. This rate is around 46 to 60% in the United States (17). It is important for consumers to know the ideal temperature for their refrigerators and check the thermometers frequently to decrease the risk of poisoning. In conclusion, it was observed that most of the participants of this research were more informed on refrigerator temperature than consumers in other studies.

On the issue of food safety, while almost all of the participants thought that the foods they prepared at home are hygienic and healthy, the rate of participants who consider foods in restaurants to be hygienic and healthy was 21%. While 27% of the participants stated that they purchase foods from street vendors, the rate of participants who consider these foods to be safe was only 2%. These rates demonstrate that customers bought foods from street vendors even though they did not consider them to be hygienic. Even though the results indicate that the participants trusted the foods they prepared, studies carried out throughout the world have determined that customers are not aware of the sources of contamination and behave in ways that might cause contamination while preparing food (6, 10, 16, 17).

In a questionnaire study in Turkey, participants were asked to assess various food groups in terms of food safety, and the results showed that they consider eggs to be the most reliable foods (87%) and meat and meat products to be the least reliable foods (32%). The reliability rate was 62% for fish and shellfish products, 63% for chicken, 55% for milk and milk products, and 55% for fruit and vegetables (23). It was reported in another study that...
68% of the participants stated that they decided not to buy some food items due to food safety concerns; 61% of these participants stated that they decided not to buy meat and meat products, and 17% decided not to buy canned foods. Foods that cause the most concern are chicken, steak, pork, milk, yogurt, and ice cream (15). In our questionnaire, approximately one-half of the participants (51.1%) considered mushrooms to be very risky. Because cases of mushroom poisoning are encountered most frequently in Turkey, it is understood why the participants selected mushroom as the most risky food. A small percentage (7%) of participants stated that they had no opinion about possible risks of food groups. All food groups except fresh fruits and vegetables and frozen foods were considered to be highly risky. Most of the participants (79.7%) thought that fresh fruits and vegetables have low risk or no risk at all. This rate was approximately 40% for frozen foods. However, in recent years there has been an increase in the number of reported cases of foodborne illness linked to fresh fruits and vegetables. It is possible for any fruit or vegetable to become contaminated by pathogens such as *Escherichia coli* O157:H7, *Salmonella*, or hepatitis A virus (3).

In our study, it was observed that approximately one-half of the participants (49.6%) thought that they did not have adequate information regarding food safety, and 88.6% of participants stated that they were interested in the issue of food safety. It was observed that those who wanted to be informed about this issue primarily benefit from television and radio (74%) and newspapers and magazines (60%). The percentage of those who benefit from scientific resources is 33%. These findings reveal the necessity for education and training on food safety for consumers.

In conclusion, a comprehensive questionnaire that assessed the knowledge levels of the people of Çanakkale on purchasing and storing food and food safety was conducted, and the results demonstrate that consumers lack knowledge regarding these issues. Statistical analyses show that female and middle-aged participants were more careful in buying food and more interested in the issue of food safety than male and young participants. In addition, it was observed that as the educational background of consumers increased, health consciousness during shopping also increased. However, it was determined that almost all participants lacked information regarding some issues; and to remove these deficiencies, a brochure was prepared and printed to be distributed in various parts of the city. In this brochure, practical information on foodborne diseases, personal hygiene, proper food purchasing and preparation, and the prevention of cross-contamination was presented. In addition, public seminars were organized to provide the above information. However, to ensure that the acquired information was transferred to safer attitudes and behaviors, seminars should be repeated at specific intervals; moreover, educational procedures and processes should be controlled regularly. Sanlier (20) stated that such education should begin during childhood and reach the masses of people through formal and informal education and mass media. Additionally, this education should be incorporated into national policy to better equip the general population on the topic of food safety.

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**REFERENCES**


