

# The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey

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## Abstract

The purpose of this study was to evaluate knowledge, attitudes, and practices concerning food safety issues among food handlers in Turkey, conducting face to face interview and administrating questionnaire. Of the 764 food handlers who responded, 9.6% were involved in touching or distributing unwrapped foods routinely and use protective gloves during their working activity. A majority of participants (47.8%) had not taken a basic food safety training. The mean food safety knowledge scores was  $43.4 \pm 16.3$ . The study demonstrated that food handlers in Turkish food businesses often have lack of knowledge regarding the basic food hygiene (critical temperatures of hot or cold ready-to-eat foods, acceptable refrigerator temperature ranges, and cross-contamination etc.). There is a immediate need for education and increasing awareness among food handlers regarding safe food handling practices. © 2004 Elsevier Ltd. All rights reserved.

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## 1. Introduction

The increasing number of food poisoning outbreaks and food-related scares has led to calls for better hygiene and quality practices. Food poisoning outbreaks of salmonella, listeria, and *Escherichia coli* 0157 have made the public more sceptical of the food they consume. In recent months the debate surrounding The European Commission has recognized the importance of controlling food-poisoning outbreaks owing to the increasing number of meals consumed outside the home, in parallel with the everexpanding range of pre-prepared meals. This changing consumer lifestyle emphasizes the need for better, effective ways of controlling food hygiene. There is strong statistical evidence that the incidence of food poisoning caused by caterers is greater than in any other food sector, accounting for 70% of all bacte-

rial food poisoning outbreaks. Seventy per cent of these food poisoning outbreaks are due to the inadequate time and temperature control of food, while the remaining 30% are the result of cross-contamination (Wilson, Murray, Black, & McDowell, 1997).

The hands of food service employees can be vectors in the spread of foodborne diseases because of poor personal hygiene or cross-contamination. For example, an employee might contaminate his hands when using the toilet, or bacteria might be spread from raw meat to salad greens by food handler's hands, point out that data on risk factors for foodborne diseases imply that most outbreaks result from improper food handling practices (Ehiri & Morris, 1996). A study in the USA suggested that improper food handler practices contributed to approximately 97% of foodborne illnesses in food-service establishments and homes (Howes, McEwen, Griffiths, & Harris, 1996).

Food poisoning follows the ingestion of microorganisms that may have been present in already contaminated food, which may have resulted from inadequate

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food preservation techniques or unsafe handling practices or which may have arisen from cross-contamination from surfaces, equipment, or, less likely, from persons who carry enterotoxigenic staphylococci in their nares or on their skin (Barrie, 1996; Jay, Comar, & Govenlock, 1999). Similarly, infected food handlers are also a common source of foodborne viruses such as the Hepatitis A virus and the diarrhoea-causing, small round-structured viruses which are excreted in large numbers by infected individuals. Many cases of foodborne virus infection have been associated with catering (WHO, 1999). Poor sanitary practices in food storage, handling, and preparation can create an environment in which bacteria such as campylobacter, salmonella, and other infectious agents are more easily transmitted (Fielding, Aguirre, & Palaiologos, 2001; Gent, Telford, & Syed, 1999).

Food handlers may transmit pathogens passively from a contaminated source, for example, from raw poultry to a food such as cold cooked meat that is to be eaten without further heating. They may also, however, themselves be sources of organisms either during the course of gastrointestinal illness or during and after convalescence, when they no longer have symptoms. During the acute stages of gastroenteritis large number of organisms are excreted and by the nature of the disease are likely to be widely dispersed; clearly, food handlers who are symptomatically ill may present a real hazard and should be excluded from work. Good hygiene, both personal and in food handling practices, is the basis for preventing the transmission of pathogens from food handling personnel to consumer. (Bryan, 1988; Evans et al., 1998). The Food and Drug Administration (FDA), with support from enforcement agencies and the food industry has endorsed food service worker training since 1976; however, since that time, the retail food service industry, has intensified efforts to improve retail food safety through training of restaurant managers and employees (Lynch, Elledge, Griffith, & Boatright, 2003). When food poisoning outbreaks are investigated it has been established that small and medium sized businesses are often important locations in the transmission of foodborne illness (Walker, Pritchard, & Forsythe, 2003a).

In Turkey, there are many issues imposing risk on food safety due to industrialization and mass production, emergence of longer and more complex food chains, fast food consumption, street vendors and growing international trade and tourism. Besides, long-term inflation and other economical causes; advertisements, growing eating out habits (fast foods, restaurant meals etc.) are also the likely causes of food safety problems in Turkey. The purpose of this study was to evaluate knowledge, attitudes, and practices among food handlers with regard to food hygiene in food businesses in Ankara, the capital city of Turkey.

## 2. Material and methods

### 2.1. Participating businesses

This survey was conducted from November 2003 to May 2004 involving 764 food handlers in 109 food businesses in Ankara, Turkey. Assessments were comprised of hospital food services (31), catering establishments (14), school food services (4), hotels (11), kebab houses (27), takeaways (14) and restaurants (18). A written two questionnaires were prepared for this study. All questionnaires were followed by a face-to-face interview regarding the questions and responses to ensure the accuracy of the responses. Ten interviewers in research team were trained by the researchers to conduct assessments. The interviewers who were selected had educational backgrounds in nutrition and dietetics. The interview was conducted by the research team members who read each of the questions aloud during interview. Respondents were given adequate time to answer each query in writing.

### 2.2. Food safety knowledge questionnaire

The food safety knowledge questionnaire was designed to obtain information about food handlers knowledge of food poisoning, personal hygiene, cross-contamination, high-risk food groups, cleaning and, temperature control. The questionnaire for food handlers included 24 questions each with five possible answers. To reduce the response bias, the multiple choice answers included “not sure”. In addition, 9 questions were related with demographic characteristics of food-service staff (education level, age, gender, number of years staff in foodservice operations, food safety training). The score range was between 0 and 24. The scores were converted to 100 points. The score below 50% of food safety knowledge questionnaire is accepted as poor knowledge.

### 2.3. Food safety attitudes and practices questionnaire

The questionnaire was prepared based on the previous research conducted by Angelillo, Viggiani, Greco, and Rito (2001). Part I included 10 questions related to food handler attitudes toward food safety. Food handlers were asked to indicate their level of agreement to the statements using a three-point rating scale (3 = agree, 2 = uncertain and, 1 = disagree). The score range was between 0 and 30. The scores were converted to 100 points. Part II of the questionnaire consisted of a list of 10 practices that would indicated food handlers' practices toward foodborne disease prevention. A five-point rating scale (1 = never to 5 = always) was used for respondents to rate the level of impact of each practice.

The score range was between 0 and 50. The scores were converted to 100 points.

#### 2.4. Pilot test

The reliability of food safety knowledge questionnaire was also determined by pilot study on 50 food-service staff. The reliability coefficient of knowledge test was 0.74. As a result of the item analysis, several test questions were modified to improve clarity.

#### 2.5. Statistical analysis

All statistical analyses were conducted using SPSS for Windows (version 11.0, 2001, Chicago, IL). Statistical significance was set  $p < 0.05$ . The differences between training and untraining food handlers mean values was determined by a parametric (independent sample *t*-test) test.

### 3. Results

#### 3.1. Participants

Seven hundred and sixty-four of the 796 food service staff replied to the questionnaire from 109 food businesses, with a response rate of 95.9%. The majority (46.6%) of the food handlers had some primary education (year 5 of primary school) degree. Approximately half (51.3%) of the participants had been employed 10 or more years in some segment of the food businesses. The major group (46.7%) of the food handlers were between 31 and 50 years of age, and 22.5% were females.

#### 3.2. Food safety knowledge

The food safety knowledge of food handlers were poor (Fig. 1). A majority of participants (47.8%) had not taken a food safety training. The mean food safety knowledge scores was  $43.4 \pm 16.3$  (100 possible points). Mean scores and standard deviations for questionnaire sections were as follows: knowledge of temperature control ( $45.5 \pm 30.7$ ), knowledge of food poisoning ( $42.7 \pm 19.4$ ), knowledge of cross-contamination ( $53.4 \pm 19.2$ ) and, knowledge of personal hygiene ( $31.8 \pm 23.1$ ). Food safety knowledge questions that were most frequently answered incorrectly were related to time-temperature control and cooling and thawing and hand-washing practices. Total score of food safety knowledge questionnaire was higher in trained food handlers ( $45.8 \pm 17.6$ ) than untrained food handlers ( $40.8 \pm 14.3$ ) ( $p < 0.05$ ). In addition, results indicated that total food safety knowledge scores are higher in food handlers in the hospital food services ( $42.8 \pm 12.1$ ) and school food services ( $58.4 \pm 15.8$ ) than catering establishments

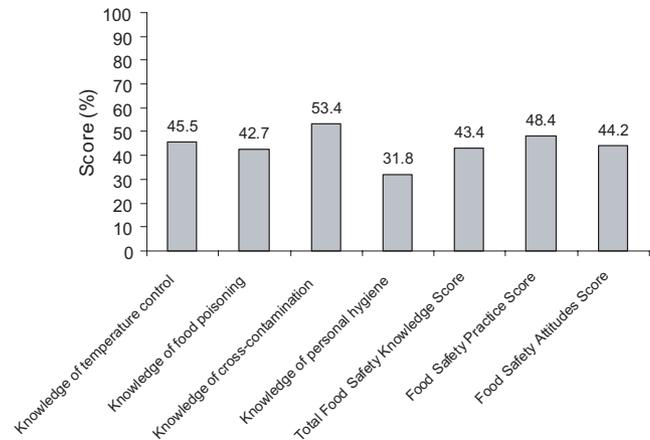


Fig. 1. Food safety knowledge scores, practices scores and attitudes scores of food handlers in food businesses

( $41.2 \pm 11.3$ ), restaurants ( $26.8 \pm 9.1$ ), hotels ( $38.2 \pm 12.1$ ), kebab houses ( $37.8 \pm 13.2$ ) and takeaways ( $37.5 \pm 15.9$ ) ( $p < 0.05$ ).

#### 3.3. Food safety attitudes

Table 1 shows the attitudes of food handlers toward the prevention and control of foodborne diseases. A positive attitude was reported by a great majority of food handlers, who agreed that using cap, masks, protective gloves and adequate clothing reduces the risk of food contamination (82.9%). Food handlers believe that how they handle food relates to food safety (81.7%), and improper storage of foods may be a hazardous to health (78.7%). Findings showed that personal with abrasions or cuts in fingers or hands should not touch unwrapped foods (do not cover cuts with easily detectable plasters) (45.8%), and that raw foods should be isolated from cooked foods (59.3%). In addition, the food safety attitudes scores of food handlers was  $44.2 \pm 13.2$  (100 possible points) (Fig. 1), and there is no difference in attitudes scores between training and untraining food handlers ( $p > 0.05$ ). The food safety attitudes scores was higher in food handlers in catering establishments ( $47.1 \pm 15.9$ ), school food services ( $40.8 \pm 9.4$ ) and hospital food services ( $46.2 \pm 14.3$ ) than restaurants ( $38.1 \pm 9.6$ ), hotels ( $37.9 \pm 5.2$ ), kebab houses ( $34.1 \pm 6.3$ ) and takeaways ( $39.6 \pm 5.4$ ) ( $p < 0.05$ ).

#### 3.4. Food safety practices

The self-reported hygienic practices showed that only 9.6% of those who involved in touching or distributing unwrapped foods routinely (always) use protective gloves during their working activity (Table 2). Of those food handlers who used gloves, most washed their hands before putting them on (8.1%) and after removing them (3.8%). Therefore, the practice score of food handlers

Table 1  
Food handlers' attitudes about food safety ( $n = 764$ )

Statements	Agree (%)	Uncertain (%)	Disagree (%)
Safe food handling is an important part of my job responsibilities	55.0	20.4	24.6
Learning more about food safety is important to me	65.4	21.4	13.2
I believe that how I handle food relates to food safety	81.7	10.9	7.5
Raw foods should be kept separately from cooked foods	59.3	33.1	7.6
Defrosted foods may be refrozen only once	62.2	30.2	7.6
Using cap, masks, protective gloves, and adequate clothing reduces the risk of food contamination	82.9	13.4	3.8
It is important to know the temperature of the refrigerator to reduce the risk of food safety	63.1	29.1	7.9
It is necessary to check thermometer settings of refrigerators and freezers once per day	63.5	32.5	4.1
Improper storage of foods may be hazardous to health	78.7	12.3	9.0
Food-services staff with abrasion or cuts on fingers or hands should not touch unwrapped foods (do not cover cuts with easily detectable plasters)	45.8	44.5	9.7

Table 2  
Food handlers' practices toward food-borne disease prevention ( $n = 764$ )

Statements	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)
Do you use gloves when you touch or distribute unwrapped foods?	25.1	28.8	15.4	21.1	9.6
Do you wash your hands before using gloves?	14.9	16.8	49.1	11.1	8.1
Do you wash your hands after using gloves?	6.8	67.9	11.6	9.8	3.8
Do you use protective clothing when you touch or distribute unwrapped foods?	8.4	21.7	56.5	2.7	10.6
Do you use a mask when you touch or distribute unwrapped foods?	16.5	22.0	21.7	31.8	8.0
Do you wear a cap when you touch or distribute unwrapped foods?	38.4	6.9	36.4	10.1	8.2
Do you wash your hands before touching unwrapped raw foods?	21.1	1.8	37.0	34.7	5.4
Do you wash your hands after touching unwrapped raw foods?	12.3	24.1	13.4	48.0	2.2
Do you wash your hands before touching unwrapped cooked foods?	41.9	29.8	8.9	14.4	5.0
Do you wash your hands after touching unwrapped cooked foods?	30.5	14.9	38.6	10.5	5.5

were  $48.4 \pm 8.8$  (100 possible points) (Fig. 1). In addition, there is a difference in food safety practices scores between trained and untrained food handlers ( $p < 0.05$ ). Results showed that food safety practice scores was higher food handlers in catering establishments ( $50.4 \pm 9.4$ ), school food services ( $52.5 \pm 9.2$ ) and hospital food services ( $50.9 \pm 9.2$ ) than restaurants ( $47.3 \pm 8.6$ ), hotels ( $47.4 \pm 8.3$ ), kebab houses ( $37.9 \pm 6.7$ ) and takeaways ( $44.1 \pm 2.5$ ) ( $p < 0.05$ ).

#### 4. Discussion

The limited research related to food safety knowledge, practices, and attitudes of food handlers in food businesses indicates food-handling problems need to be addressed. Ehiri and Morris (1996) pointed out that data on risk factors for foodborne diseases imply that most outbreaks result from improper food handling practices. A study in USA suggested that improper food handling practices contributed to approximately 97% of foodborne illnesses in food-service establishments and homes (Howes et al., 1996). Consequently, in order to reduce foodborne illnesses it is crucial to gain an understanding of the interaction of prevailing food safety

beliefs, knowledge and practices of food handlers (WHO, 2000). However, the efficacy of current food hygiene training is uncertain. A number of studies (Howes et al., 1996; Powell, Attwell, & Massey, 1997) have indicated that although training may bring about an increased knowledge of food safety this does not always result in a positive change in food handling behaviour. It has been suggested that this disparity between knowledge and practice occurs because much of the existing training, particularly formal certificated training, is designed using the KAP model (Rennie, 1995). This approach assumes that an individual's behaviour or practice (P) is dependent on their knowledge (K) and suggests that the mere provision of information will lead directly to a change in attitude (A) and consequently a change in behaviour. It has been suggested that this model is flawed in its assumption that knowledge is the main precursor to behavioural change (Ehiri, Morris, & McEwen, 1997).

Recently, Turkish Food Code changes mean that all Turkish food businesses must now provide food hygiene training commensurate with the work activities of their staff (Sağlam, 2000). However, the findings of this study indicated that 47.8% of basic food handlers have not received basic food hygiene training. In a study, 55% of

the 444 food handlers surveyed had undertaken formal food hygiene training, and 63% of managers had undertaken formal food hygiene training in UK food businesses (Walker, Pritchard, & Forsythe, 2003b).

The hands of food service staff can be vectors in the spread of foodborne diseases because of poor personal hygiene or cross-contamination. For example, a staff might contaminate his hands during using the toilet, or bacteria might be spread from raw meat to salad greens by food handler's hands (Fuerst, 1983). In our study, the food handlers always need to wash their hands, after touching unwrapped raw foods (2.2%), before touching unwrapped cooked foods (5.0%), and after touching unwrapped cooked foods (5.5%) (Table 2). In addition, knowledge of personal hygiene scores were poor ( $31.8 \pm 23.1$ ) (Fig. 1). The results indicate that food handlers in food businesses may have lack of knowledge about food safety. For example, only 21.2% of food handlers identified the need to wash their hands after going to the toilet, handling raw foods and before handling ready-to-eat food in our study (no data).

Attitudes, an important factor besides knowledge and enforcement, ensure a downward trend of foodborne illnesses. The necessary link of positive behaviour, attitudes and continued education of food handlers towards the sustainability of safe food handling practices has been highlighted (Howes et al., 1996). A generally negative attitude toward correct handling of food, safe storage practices, and cross-contamination control was to be found among food handlers. Therefore, the attitude scores toward foodborne diseases prevention and control was poor ( $44.2 \pm 13.2$ ). Similarly, the food safety practice scores of food handlers were very low ( $48.4 \pm 8.8$ ) (Fig. 1).

Foods vary in composition, so no single cooking temperature is going to give the culinary quality desired and the safety needed for all food; there are various combinations of time and temperatures needed to inactivate pathogenic vegetative bacteria (Schmidt & Rodrick, 2003). Since temperature treatment is frequently the critical control point a production process, the issue of poor temperature understanding could be a major hindrance of effective HACCP implementation (Walker et al., 2003b). In this study, there was lack of knowledge among the food handlers about the critical temperatures of hot or cold ready-to-eat foods, acceptable refrigerator temperature ranges, and cross-contamination. Only 42.0% of food handlers knew the correct temperature for holding hot food (63 °C) In addition, 18.3% of food handlers correctly answered cooked rice as a high risk food (no data). In a previous study (Walker et al., 2003b); less than half of 444 food handlers knew the correct temperature food holding hot food. Both studies showed lack of knowledge of critical temperature of food handlers.

As a conclusion, the findings of this study demonstrated that food handlers in food businesses have lack of food safety knowledge. Therefore substantive food safety training should be provided for all food-service staff before they begin to work continuous food safety training as well.

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