




Food Allergy Knowledge, Attitude and Practices of Restaurant Employees in İstanbul, Turkey

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ABSTRACT

With the significant increase in fatal cases of allergic reactions, the issue of food allergy has attracted the attention of authorities, particularly food allergy competence and practices among food handlers. The purpose of this study is to determine food allergy knowledge, attitude, and practices among restaurant employees in İstanbul, Turkey. This observational cross-sectional study was conducted among 490 restaurant employees included restaurant managers, cooks and service workers. The questionnaire used in this study was developed by researchers based on previous studies. The mean knowledge score for participants was 41.74 ± 20.27 , the attitude score was 69.42 ± 2.42 and the practice score was 75.26 ± 13.1 . According to these results, the level of food allergy knowledge and attitude of the restaurant employees were 'moderate' and the practice level was evaluated as 'low risk practice'. It was found that only 22.9% of the participants attended food allergy training and only 26.9% stated that they could provide appropriate service in order to prevent food allergy. The knowledge (47.45 ± 20.77) and practice (82.02 ± 10.06) scores of the participants receiving food allergy training were statistically higher than those not receiving food allergy training (39.99 ± 19.80 and 73.25 ± 13.23 , respectively; $p < 0.05$). A significant weak positive correlation was observed between knowledge with attitude ($r = 0.12$, $p < 0.05$), knowledge with practice ($r = 0.39$, $p < 0.05$) and attitude with practice ($r = 0.25$, $p < 0.05$). This study is very important since it is the first comprehensive study conducted to measure the level of food allergy knowledge, attitude, and practices of restaurant employees in Turkey. Understanding the knowledge, attitude, and practices of restaurant employees on food allergies may help managers to plan the most appropriate policies and training for their employees.

Keywords: Food allergy, Food safety, Restaurant employees, Knowledge, Attitude, Practice

İstanbul'daki Restoran Çalışanlarının Gıda Alerjisi Bilgi, Tutum ve Uygulamaları

ÖZ

Alerjik reaksiyonlardaki ölümcül vakaların sayısının artışıyla birlikte gıda alerjisi konusu, özellikle gıda çalışanlarının gıda alerjisi konusundaki yeterliliği ve uygulamaları, yetkililerin dikkatini çekmektedir. Bu çalışmanın amacı İstanbul'daki restoran çalışanlarının gıda alerjisi bilgi, tutum ve uygulamalarını belirlemektir. Bu gözlemsel kesitsel çalışma yönetici, aşçı ve servis personelinin içeren 490 restoran çalışanı arasında gerçekleştirilmiştir. Çalışmada kullanılan anket daha önce yapılmış çalışmalar esas alınarak araştırmacılar tarafından geliştirilmiştir. Yapılan analizler sonucunda katılımcıların ortalama bilgi puanı 41.74 ± 20.27 , tutum puanı 69.42 ± 2.41 ve uygulama puanı 75.26 ± 13.1 olarak tespit edilmiştir. Bu sonuçlara göre, restoran çalışanlarının gıda alerjisi bilgi ve tutum puanları "orta", uygulama puanı ise "düşük riskli uygulama" olarak değerlendirilmiştir. Katılımcıların sadece %22.9'u gıda alerjisi eğitimi aldığını ve sadece % 26.9'u gıda alerjisini önlemek için uygun hizmet sağlayabileceklerini belirtmişlerdir. Gıda alerjisi eğitimi alan katılımcıların bilgi (47.45 ± 20.77) ve uygulama (82.02 ± 10.06) puanlarının gıda alerjisi eğitimi almayanlara göre

(sırasıyla 39.99±19.80 ve 73.25±13.23) istatistiksel olarak daha yüksek ($p<0.05$) olduğu belirlenmiştir. Bilgi, tutum ve uygulama arasındaki ilişkiye bakıldığında; bilgi ve tutum ($r=0.12$, $p<0.05$), bilgi ve uygulama ($r=0.39$, $p<0.05$) ve uygulama ile tutum ($r=0.25$, $p<0.05$) arasında anlamlı ve pozitif zayıf korelasyon olduğu görülmüştür. Bu çalışma, Türkiye'deki restoran çalışanlarının gıda alerjisi bilgi, tutum ve uygulamalarını ölçen ilk kapsamlı çalışma olması nedeniyle oldukça önemlidir. Restoran çalışanlarının gıda alerjisi konusundaki bilgi, tutum ve uygulamalarını anlamak, yöneticilerin çalışanları için en uygun politika ve eğitimleri planlamasına yardımcı olabilecektir.

Anahtar Kelimeler: Gıda alerjisi, Gıda güvenliği, Restoran çalışanları, Bilgi, Tutum, Uygulama

INTRODUCTION

Food allergy is defined as an adverse reaction arising from the body's immune system on exposure to harmless food or food component [1, 2]. Clinical symptoms of allergic reactions typically occur in the skin, gastrointestinal tract, and respiratory system. Although food allergy symptoms are mostly minor, such as rashes, itching, and swelling; some allergic reactions could be much more severe and in some cases there can be generalized anaphylaxis and even death [3, 4]. Although nearly all food is capable of triggering an allergic reaction, there are some common foods that cause the majority of reactions. Eight foods included milk, eggs, fish, shellfish, wheat, tree nuts, peanuts, and soybeans cause approximately 90% of reported reactions [5].

In some countries, food allergy prevalence has been increasing and becoming an important public health problem. An estimated number of Americans up to 15 million including 5.9 million children under age 18 [6] and 17 million Europeans with 3.5 million of them under 25 years of age suffer from food allergies [7]. The number of children with allergies has doubled in the last 10 years. The prevalence of allergies in children varies from 1.7% in Greece to 4% in Italy and Spain, to over 5% in France, UK, Netherlands and Germany [7]. Each year in the US, 200,000 people require emergency medical care for allergic reactions to food [6]. In Turkey, the food allergy cases have become more frequent [8] and prevalence of food allergy has increased almost twice in the last 10 years [9]. Some studies of prevalence of food allergy have been conducted in Turkey [10-12]. One of these studies showed that prevalence of food allergy in the Turkish population seems to be low when compared with Northern and Western European countries [12]. Additionally it was reported that one of every 17 children had food allergy in Turkey [13]. Although food allergy is considered as a serious health problem, the data on the true prevalence of food allergy in the general population is inadequate [1] and many people, including food handlers are unaware that an allergic reaction to food could be life-threatening [14].

Each part of the society needs to be aware of such an important issue. Especially food handlers who are directly involved in preparing food, have a key role in the food safety [14]. In this context, restaurant employees are in an important position because they are in contact with food and they serve food to hundreds of people every day in restaurants. Many people prefer to eat in restaurants because of various factors such as,

increasing income level and life style changes, leisure time, socializing with new people, convenience, status and avoiding cooking at home [15]. Commercial restaurants are common areas that food allergic reactions can occur [16]. According to a study, 34% of the allergic food consumers had experienced at least one restaurant reaction and 36% of them had three or more reactions [17]. In restaurants, cross-contacts in food preparation areas, poor understanding of allergy by restaurant staff, miscommunication among not only restaurant employees, but also restaurant staff and customers with food allergies, unexpected or hidden food allergens, incomplete food labels, contact with food residues and ingredients not listed by restaurants on menus have been accepted as causes of food allergy reactions in restaurants [18-21]. When all these causes are considered, it seems that restaurant employees can play a critical role in reducing the risk of food allergy adverse effects and the role of restaurants in the management of allergies is particularly important [22]. The high risk of food allergy in restaurants means that the restaurant industry should be better prepared to avoid this life-threatening event [23]. Therefore it is important to determine the level of food allergy knowledge, attitude, and practices of restaurant employees.

Several studies have been conducted to determine the level of food allergy knowledge, attitude, and practices of restaurant employees [4, 14, 22-27]. Results of these studies have shown that many restaurant employees need food allergy training [16, 23, 24, 28]. However, we have not seen any comprehensive studies which determine the food allergy knowledge, attitude, and practices of restaurant employees in Turkey. This study was aimed to determine the food allergy knowledge, attitude, and practices of restaurant employees in the city of Istanbul, Turkey and whether demographic variables are effective on those. It is important to examine the similarities and differences between demographic variables since they can affect restaurant's operations planning, policies, and training programs. Especially the determination of the effect of food allergy training on food allergy knowledge, attitude, and practices is very important in terms of training activities planned to be carried out in the future. Our results will help to understand some gaps about food allergy management and to plan and implement policies as well as training. Revealing the situation of employees on the subject of food allergy is an accurate step that can be taken to form a protection against food allergy.

MATERIALS AND METHODS

Participants and Study Design

This observational cross-sectional study was conducted among 490 restaurant employees including restaurant managers, cooks and service staff working in chain and independent restaurants in Istanbul, Turkey. Since the universe size could not be calculated exactly, the sample size scale table [29] was used for determining the sample size. In cases where the universe is 1.000.000 and above, the sample size was considered as min 384 ($\alpha=0.05$). Therefore the total of 490 valid questionnaires that were filled in correctly were accepted for use in the study while the data collection process. The study was held between July and October 2018 between 2 pm and 4 pm which are off-peak hours. While individuals who were literate and worked as managers, cooks and service staff were included in this research, individuals who did not wish to enroll in the research voluntarily, were <18 years of age, had less than six months of work experience, and could not speak and understand Turkish were not included. The participants were informed about the purpose and contents of the study and the researchers obtained written consent forms from the participants. All procedures were in accordance with the 1964 Helsinki Declaration. The Ethics Committee of Human Studies in Social Sciences of Abant İzzet Baysal University approved the study (No: 2017/174).

The interview questionnaire was developed based on the literature review by Choi and Rajagopal [4], Shafie and Azman [14], Dupuis et al. [22], and Lee and Sozen [23] consisted of three sections. The first section contained 15 questions that evaluate the knowledge on food allergies. This section consisted of four categories including 'food allergy definition', 'food allergy symptoms and reaction', 'food allergy management', and 'knowledge on the top eight food allergens'. All participants were asked to choose among three options: 'yes', 'no' or 'unsure' in first three category and two options: 'yes' or 'no' in the last category. In this section, knowledge questions were recoded as 1 for correct answers and 0 for incorrect and unsure answers. The second section contained 13 expressions to assess the attitude of the participants. The five-point Likert scales ranging from one (1) 'strongly agree' to five (5) 'strongly disagree' was used in this section. The third section contained 11 items assessing the frequency of specific food allergy practices in restaurant using a three-point Likert scale including never (1), sometimes (2), and always (3).

Data Collection and Analysis

Multiple data collection methods were used in this study to reveal all demographic characteristics of the participants such as gender, age, education level, type of establishment, professional experience, position, receiving food allergy training, and self-confident in food allergies. These models provide for the collection of numerical data both from in-depth descriptions and from people related to the current situation.

The total scores of food allergy knowledge, attitude, and practices were calculated by summation of the correct answers of the questions for each section. The total score for each section was converted to a percentage by dividing the total score by the maximum score obtainable. An arbitrary scoring system was used to assess the level of knowledge, attitude, and practices based on the responses provided. According to an arbitrary scoring system the total knowledge, attitude, and practices scores were explained based on an interquartile, whereby the first quartile (≤ 25) would be explained as 'Poor knowledge/Negative Attitude/High-Risk Practice', the second and third quartiles ($>25-\leq 75$) would be explained as 'Moderate Knowledge/Moderate Attitude/Moderate Risk Practice' and the last quartile (≥ 75) as 'Excellent Knowledge/Positive Attitude/Low-Risk Practice' [14].

Statistical Analysis

All data obtained in the study were analyzed using the SPSS (Statistical Package for Social Sciences) for Windows, version 20.0, demo (IBM Corp., Armonk, NY, USA). The internal consistency of the questionnaire was calculated using Cronbach's alpha. Descriptive statistics including frequencies, percentage distributions, means, and standard deviations were used to evaluate demographic characteristics. Normality test was performed using skewness and kurtosis coefficients and accordingly one-way ANOVA and independent sample t-test (confidence interval 95%) were used to compare demographic characteristics such as age, gender, educational level and work experience etc. with data of knowledge, attitudes and practices. The Scheffe test was used as a complementary post-hoc analysis to determine the differences after the ANOVA test. Pearson correlation analysis was applied to the continuous variables of the study. Spearman's correlation coefficient was used to determine the association between food allergy knowledge, attitudes and practices scores of the participants. The findings were evaluated at 95% confidence interval and $p < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Demographic Characteristics

This study included a total of 490 participants, 46.1% of which were cooks, 40.8% were service workers, and 13.1% were managers (Table 1). The percentages of male and female participants were 76.3% and 23.7%, respectively. The majority of the participants (49.4%) had high school degree. Regarding professional experience, the majority of the participants (45.7%) had >7 years of work experience while very few (7.8%) had <1 year of work experience. 55.5% of the restaurants where the participants worked were independent and 44.5% were chain restaurants. It was found that 77.1% participants did not attend any training related to food allergy. Majority of the participants (73.1%) stated that they cannot provide appropriate service in order to prevent food allergy in their workplaces. This result showed that participants had lack of confidence in food

allergy management issue in their workplaces. The lack of confidence of participants in this situation may be related to not receiving any training on food allergy. In previous studies, it was reported that employees

receiving food safety training had more confidence in the implementation of food safety programs at the workplace than those untrained [30, 31].

Table 1. Demographic characteristics of the participants

Demographic Characteristics	Groups	n	%
Gender	Male	374	76.3
	Female	116	23.7
Age (years)	< 24	120	24.5
	25-29	120	24.5
	30-34	72	14.7
	35-39	68	13.9
	40-44	54	11.0
	> 45	56	11.4
Educational level	Primary education	108	22.0
	High school	242	49.4
	Associate degree	78	12.7
	Bachelor's degree	62	15.9
Type of establishment	Chain	218	44.5
	Independent	272	55.5
Position	Manager	64	13.1
	Cook	226	46.1
	Service worker	200	40.8
Professional experience	< 1 year	38	7.8
	1-3 year	100	20.4
	4-6 year	128	26.1
	> 7 year	224	45.7
Receiving food allergy training	Yes	112	22.9
	No	378	77.1
Self-confident in food allergies	Yes	132	26.9
	No	358	73.1
Total		490	100.0

Food Allergy Knowledge, Attitudes, Practices of Employees and Their Relationship with Demographic Characteristics

Overall scores and their relationship with demographic characteristics were shown in Table 2. The mean knowledge score for participants was 41.74 ± 20.27 , the attitude score was 69.42 ± 2.42 and the practice score was 75.26 ± 13.1 . According to these results, the level of food allergy knowledge and attitude of the restaurant employees was 'moderate' and the practice level was 'low risk practice'. We found significant ($p < 0.05$) associations between food handlers' knowledge, attitudes and practices and the variables such as gender, education level, type of establishment, position, professional experience and receiving food allergy training. It was determined that knowledge and attitude scores increased significantly as the level of education increased ($p < 0.05$). The knowledge (56.61 ± 20.95), attitude (75.86 ± 11.44) and practice (84.09 ± 9.33) scores of the participants in manager position were significantly higher than the other positions ($p < 0.05$). The knowledge (47.45 ± 20.77) and practice (82.02 ± 10.06) scores of the participants receiving food allergy training were statistically higher than those not receiving food allergy training (39.99 ± 19.80 and 73.25 ± 13.23 , respectively; $p < 0.05$).

It was determined that the knowledge, attitude, and practices scores of the participants with associate and bachelor's degree were the highest. This result showed that as the level of education increases, the level of knowledge, attitude, and practices about food allergy also increases. However no statistically significant difference was found in practice score on education levels ($p > 0.05$). According to the type of establishment variable, the difference between the knowledge and practice scores of the employees was not found statistically significant ($p > 0.05$). The attitude scores of the chain restaurants (70.44 ± 10.66) were found to be higher than the attitude scores of independent restaurants (68.62 ± 8.7) and this difference was statistically significant ($p < 0.05$). Shafie and Azman [14] reported that 59.8% of the restaurants considered were independent, 40.2% were chains, and the attitude and practice scores of the employees working in chain restaurants were higher than independent restaurants. Similarly, Mandabach et al. [28] showed that the knowledge of the managers in the chain restaurants were significantly higher than those in independent restaurants. The consistency of food and service quality in the restaurants is the most important issue in terms of customer expectation. Because of the necessity of ensuring the quality and consistency between the branches in chain enterprises [32], the knowledge,

attitude, and practices scores of the chain restaurants are expected to be higher. The scores of the participants were examined in terms of their position in the restaurant and it was determined that the knowledge (56.61±20.95), attitude (75.86±11.44) and practice (84.09±9.33) scores of the managers were higher than those in other positions ($p<0.05$). The fact that managers are conscious and knowledgeable in this regard can be an indication that their employees will be more knowledgeable in the future. It can be assumed that the managers will transfer their knowledge and experience to their employees as well. Unlike this finding, Lee and Sozen [23] informed that the managerial staff and restaurant employees have similar total knowledge scores. The participants with a professional experience ≥ 7 years had significantly ($p<0.05$) the highest knowledge (45.48±19.74) and practice (77.19±12.66) scores. It can be said that professional experience positively affects knowledge and practice. The knowledge and practice scores of the participants receiving food allergy training were higher than those not receiving food allergy training and this difference was statistically significant ($p<0.05$). However, no significant difference was found in attitude

scores. The knowledge (47.45±20.77) and practice (82.02±10.06) scores of those who received food allergy training were considered to be quite high compared to the overall scores of knowledge and practice (41.74±20.27 and 75.26±13.1, respectively). This result indicated that the level of knowledge and practice of food allergy would increase when restaurant employees are trained. Lee and Barker [16] stated that the employees' food allergy knowledge improved after receiving food allergy training. In order to reduce food allergy risk and prevent fatal reactions, food allergy training should be included in food safety training programs [14]. If employees lack food allergies knowledge, awareness and training, restaurants have difficulty in providing allergen-free products to their customers [20]. Despite the importance of food allergy knowledge, there were some barriers to food allergy training such as high training cost, high staff turnover, time constraints, language barriers and lack of interest by management and employees. Information about effective food allergy training for restaurant employees should be identified and disseminated to restaurateurs and hospitality management educators [20].

Table 2. The association between demographic characteristics, knowledge, attitudes and practices scores of participants

	Knowledge		Attitudes		Practices	
	Mean±SD	p	Mean±SD	p	Mean±SD	p
Overall scores	41.74±20.27		69.42±2.42		75.26±13.1	
Gender						
Male	40.89±20.75	0.096	68.4±11.5	0.016	75.23±13.76	0.890
Female	44.48±18.35		72.7±9.16		75.40±10.69	
Education level						
Primary education	34.65±16.45	0.002	67.1±8.98	0.013	75.85±12.83	0.656
High school	40.56±20.15		69.54±10.1		75.59±13.66	
Associate degree	47.26±14.40		71.66±8.22		75.69±11.76	
Bachelor's degree	50.54±24.78		70.54±9.72		76.59±12.66	
Type of establishment						
Chain	42.50±22.60	0.465	70.44±10.66	0.044	76.3±13.56	0.122
Independent	41.12±18.17		68.62±8.7		74.43±12.66	
Position						
Manager	56.61±20.95	0.002	75.86±11.44	0.009	84.09±9.33	0.009
Cook	44.32±18.78		66.78±8.68		73.69±11.19	
Service worker	33.94±18.17		70.36±8.98		74.19±14.93	
Professional experience						
< 1 year	33.99±16.80	0.019	64.3±6.62	0.006	76.85±13.39	0.006
1-3 year	35.29±20.22		69.18±9.86		72.35±13.36	
4-6 year	42.35±20.45		70.34±8.4		73.65±13.09	
> 7 year	45.48±19.74		69.9±10.44		77.19±12.66	
Receiving food allergy training						
Yes	47.45±20.77	0.001	69.02±11.12	0.642	82.02±10.06	0.011
No	39.99±19.80		69.54±9.2		73.25±13.23	

$p<0.05$, One-way ANOVA and independent sample t-test. SD: Standard deviation

Detailed Responses of Food Allergy Knowledge, Attitudes and Practices of Employees

Detailed responses by the participants for each statement are summarized in Table 3, Table 4, and Table 5. In this part of the study, knowledge statements are coded with K Code (K1, K2,...), attitude statements are coded with A code (A1, A2,...) and practices statements are coded with P code (P1, P2,...) for ease of expression. When these tables were examined in

detail, the deficiencies of the participants could be seen. Participants' responses to food allergy knowledge items were shown in Table 3 and the Cronbach's coefficient of reliability was found as 0.756. About half of the participants (50.6%) knew that the definition of food allergy (K1). The correct responses to the expressions about occurrence, symptoms and results of food allergy (K4, K5, K6, K7) were 45.7%, 38.8%, 42.0% and 41.6%, respectively. Food allergy is a very serious condition that can cause death and only 42% of participants could

respond to this statement correctly. Similarly, in a study conducted by Shafie and Azman in Malaysia [14], only 51.1% of the participants correctly responded to this statement. Only 46.1% of the participants knew that the difference between lactose intolerance and milk allergy (K2). Lactose intolerance and milk allergy may sound similar but they actually describe two different digestive problems, and milk allergy is more severe than the other. Since food allergy affects the immune system, it has serious consequences than food intolerance. While food intolerance is not life-threatening, food allergy can result in death [6]. Lactose intolerance, the more typical of the two issues, does not cause dangerous side effects, while milk allergy can. Milk allergy is a kind of food allergy resulting from an allergic reaction to the protein in milk. Lactose intolerance is caused by inadequate amount of enzyme lactase, which is needed to break down lactose found in milk and other dairy products [33]. Due to the severity of food allergic reaction consequences, it should be noted that food allergy is a condition distinct from food intolerance. Similarly 60.7% of restaurant employees in Malaysia were unsure of the difference between lactose intolerance and milk allergy [10]. The terms of cross contact and cross contamination are also confused with one another like confusion between food intolerance

and food allergy. Cross-contact results when an allergen is carelessly transferred from allergen-containing food to another food without an allergen. There is an ambiguity between the terms "cross-contact" and "cross-contamination" for restaurant employees. The term "cross-contact" is fairly new and restaurant employees may think this is the same thing as cross-contamination. When talking about bacterial transmission in cross contamination, there is protein transmission in cross contact and proteins may not lose their effect when cooked [6]. Many restaurant employees were not well informed about food allergy risks particularly caused by cross-contact [14]. In this study, the correct answers to the cross-contact expressions (K11, K12, K13, K15) were found as 58.0%, 38.4%, 41.2%, and 37.6%, respectively. This showed that participants had the lowest rating on food allergy knowledge related to cross-contact. Understanding this mechanism is important to reduce food allergy risks in the workplace [14]. Choi and Rajagopal [4] investigated that the participants trained on food allergy knew how to avoid cross-contact during food preparation and/or service. Shafie and Azman [14] demonstrated that 41% of the participants thought that cross-contact occurred when raw food interacted with cooked food.

Table 3. Food allergy knowledge of participants

Code	Knowledge Items ($\alpha = 0.756$)	True	
		n	%
K1	Food allergy is an abnormal response of the immune system to an ordinarily harmless food or food ingredient.	248	50.6
K2	Lactose intolerance and milk allergy are the same condition.*	226	46.1
K3	Food allergens are generally proteins.	178	36.3
K4	Small amount of food can cause food allergy.	224	45.7
K5	Food allergy reaction occurs twenty-four hours after the food is consumed.*	190	38.8
K6	Food allergy reaction can cause death.	206	42.0
K7	Abdominal cramping or pain, pain or tightness in the chest, diarrhea, difficulty in breathing, hives, itching and rash are the main symptoms caused by food allergy.	204	41.6
K8	According to Turkish food codex labelling regulation, allergen components are shown on food packages.	196	40.0
K9	Cooking (deep frying, boiling, etc.) at high temperature can destroy food allergens.*	228	46.5
K10	Drinking cold and plenty of water can relieve the allergic reaction.*	176	35.9
K11	When preparing products containing food allergen, different tools (tongs-scoops) should be used.	206	58.0
K12	When preparing food for a customer with food allergies, you can touch food both containing and not containing allergens with the same glove.	188	38.4
K13	A food allergen can be destroyed by cooking in high temperature or by keeping in deep freeze.*	202	41.2
K14	Allergic reactions may happen after touching the food that contains allergen.	212	43.3
K15	Removing an allergen, e.g. removing the walnuts from a prepared meal, may provide a safe meal for a food allergic customer.	184	37.6

* Incorrect statement

In addition to the knowledge test, Table 3a showed the distribution percentages of responses to the eight most common food allergies. Less than half of the participants were able to give the correct answer for the eight major food allergens. In contrast to our study, Radke et al. [34] suggested that almost 90% of participants (restaurant managers and employees) responded correctly to the expressions related to the most common allergens. On the other hand, 84.5% of the participants identified

tomato as one of the eight major food allergens although it is not. In the other studies conducted by Shafie and Azman [14], Ajala et al. [30], and Radke et al. [34], 78.3%, 98.4%, and 88% of restaurant employees knew that tomato is not among the most common food allergens, respectively. The results of the current study showed that there was a lack of knowledge about the most common eight major food allergens.

Table 3a. Top Eight Food Allergen Knowledge of Participants

Food Items	True	
	n	%
Peanuts*	230	46.9
Milk*	222	45.3
Tomato	76	15.5
Soy*	228	46.5
Fruits	228	46.5
Fish*	176	35.9
Crustacean*	158	32.2
Gluten	192	39.2
Monosodium glutamate	120	24.5
Sesame	130	26.5
Eggs*	234	47.8
Wheat*	160	32.7
Tree nuts*	224	45.7

* Top eight food allergens

Participants' attitudes towards food allergies were shown in Table 4 and the Cronbach's coefficient of reliability was found as 0.845. Attitudes toward 'possibility to prepare safe food for customers with food allergies' had the highest mean rating of 3.81 (A1) while attitudes toward 'the necessity of taking food allergies very seriously in the restaurant sector' has the lowest mean rating of 3.51 (A9). Similarly, a study conducted by Bailey et al. [26] in Great Britain, examining restaurant employees' knowledge on food allergies showed that almost all employees were confident in their ability to serve safe food for customers with food allergies. In contrast to these results, other studies showed that there was a deficiency in foodservice operation in terms of providing safe food for customers with food allergies [20, 35, 36]. Although food allergic reactions can occur in many places, commercial restaurants are common places for such reactions to occur. When food allergy-related deaths were determined, it was seen that nearly half of the cases were caused by food consumed in restaurants [20]. As food allergy is a serious condition that may cause a potentially life-threatening immunological reaction, restaurant employees should have a higher attitude towards this issue.

Table 4. Food allergy attitudes of participants

Code	Attitude Items ($\alpha = 0.845$)	n (%)					Mean	SD
		SD	D	N	A	SA		
A1	I think I can prepare and serve safe food for the people with food allergies.	18 (3.7)	84 (17.1)	66 (13.5)	128 (26.1)	194 (39.6)	3.81	1.23
A2	I think those who have food allergies should not eat at restaurants.	44 (9.0)	82 (16.7)	74 (15.1)	116 (23.7)	174 (35.5)	3.60	1.35
A3	If the right precautions are taken, cross-contact can be eliminated.	36 (7.3)	62 (12.7)	108 (22.0)	130 (26.5)	154 (31.4)	3.62	1.25
A4	I think it is the responsibility of the establishment to prevent food allergies in restaurants.	32 (6.5)	76 (15.5)	92 (18.8)	136 (27.8)	154 (31.4)	3.62	1.25
A5	I think that food workers (cooks, service staff, managers or cashiers) should have knowledge about food allergies.	18 (3.7)	86 (17.6)	78 (15.9)	126 (25.7)	182 (37.1)	3.75	1.23
A6	I think it's hard to serve people who have food allergies in a restaurant.	36 (7.3)	56 (11.4)	104 (21.2)	132 (26.9)	162 (33.1)	3.67	1.25
A7	I think people with food allergies have the right to eat in restaurants snugly.	18 (3.7)	72 (14.7)	132 (26.9)	116 (23.7)	152 (31.0)	3.64	1.18
A8	I think that restaurant staff should be kept informed about food allergies and should receive periodic training.	32 (6.5)	64 (13.1)	100 (20.4)	132 (26.9)	162 (33.1)	3.68	1.24
A9	I think that food allergies should be taken seriously in this establishment.	30 (6.1)	92 (18.8)	96 (19.6)	142 (29.0)	130 (26.5)	3.51	1.24
A10	Some alternatives should be provided to customers with food allergies according to their needs.	20 (4.1)	80 (16.3)	94 (19.2)	144 (29.4)	152 (31.0)	3.68	1.20
A11	I think, the customer requests about food allergy shouldn't be refused.	34 (6.9)	66 (13.5)	90 (18.4)	122 (24.9)	178 (36.3)	3.70	1.28
A12	I think preventing incidences of food allergies is an important part of my professional responsibilities at my workplace.	22 (4.5)	82 (16.7)	72 (14.7)	150 (30.6)	164 (33.5)	3.72	1.22
A13	I think employees, should be able to identify ingredients in the menu item upon consumer request.	24 (4.9)	80 (16.3)	98 (20.0)	110 (22.4)	178 (36.3)	3.70	1.25

Scale for statements: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. SD: Standard deviation.

^{3*} = Item was reversely coded

Table 5 shows the mean ratings of food allergy practices at workplace. The Cronbach's coefficient of reliability was 0.80. It was found that the statements on the cross-contact (P5, P6, P7) had high mean scores of 2.44, 2.46, and 2.42, respectively. On the other hand, the lowest mean ratio for another statement (P11) on cross

contact stating "When preparing fried food for employers with food allergy, I make sure that I change the oil in the deep fryer to prevent cross-contact" was 1.93. It is also very important to provide correct information to the customer as much as preparing a safe product for an allergic customer. It was seen that the participants gave

a low score to the statement (P9) on informing the customer correctly. Kwon and Lee [20] stated that the restaurant employees also have some barriers for providing safe food to their customers; such as lack of knowledge and awareness on food allergies, lack of concern among food handlers; lack of resources; and

lack of time in a fast-paced work environment. Communication between restaurant employees and customers with food allergies should be improved. Research is limited on the dining out attitudes and practices of the consumers with food allergies and these researches should be increased.

Table 5. Food allergy practices of participants

Code	Practices Items ($\alpha = 0.806$)	n (%)			Mean	SD
		Never	Sometimes	Always		
P1	If a mistake is made when preparing a meal for a food allergic customer, I remake the food.	110 (22.4)	106 (21.6)	274 (55.9)	2.33	0.82
P2	I wash my hands thoroughly with soap and water and wear a new pair of gloves before preparing an allergen-free meal.	82 (16.7)	266 (54.3)	142 (29.0)	2.12	0.67
P3	I try to listen carefully, understand and then answer customers' questions about allergens in the food.	98 (20.0)	130 (26.5)	262 (53.5)	2.33	0.80
P4	If one of my customers has a food allergy, I communicate the allergen information to the cook to ensure that the food is prepared safely and is allergen-free.	76 (15.5)	174 (35.5)	240 (49.0)	2.33	0.73
P5	I use clean and sanitized equipment and utensils at my workplace to prevent cross-contact between allergens.	68 (13.9)	136 (27.8)	286 (58.4)	2.44	0.73
P6	I use separate equipment (tongs, ladles) for handling allergen-containing foods.	84 (17.1)	102 (20.8)	304 (62.0)	2.45	0.77
P7	While serving food for a food allergic customer, I separately handle allergen-containing and allergen-free plates to prevent cross-contact.	72 (14.7)	142 (29.0)	276 (56.3)	2.42	0.73
P8	When a customer identifies himself as having a food allergy, I provide accurate information to them regarding ingredients and preparation method.	78 (15.9)	250 (51.0)	162 (33.1)	2.17	0.68
P9	Although I am not sure about the menu contents, I still assure the customer that the food does not contain any allergens.*	180 (36.7)	186 (38.0)	124 (25.3)	1.89	0.79
P10	When preparing food for a food allergic customer, I pay more attention about safe food production.	72 (14.7)	142 (29.0)	276 (56.3)	2.42	0.73
P11	When preparing fried food for a food allergic customer, I make sure that I change the oil in the deep fryer to prevent cross contact.	186 (38.0)	154 (31.4)	150 (30.6)	1.93	0.83

* Item was reversely coded

Association among Food Allergy Knowledge, Attitudes, Practices of Employees

Summary of correlation for the levels of knowledge, attitudes and practices was shown in Table 6. A significant positive correlation was observed between knowledge with attitudes ($r=0.12$, $p<0.05$), knowledge with practices ($r=0.39$, $p<0.05$), and attitudes with practices ($r=0.25$, $p<0.05$). These findings indicated that the level of food allergy knowledge of restaurant employees will influence their attitudes and practices in handling food safety. In this case, quality food allergy training will provide positive results at the level of attitudes and practice. However, many studies did not agree that food safety training did not have a positive effect on practice and attitude [37, 38]. In addition, there are studies showing that the high level of knowledge does not always reflect the practice positively [39]. The information given in some training courses does not change properly at the level of perception and application and remains the only theoretical knowledge. Therefore, it is important to consider that training is not enough by itself and the effectiveness, quality and applicability of the given training should also be ensured and controlled. In this regard, trainers, institutions and the government have great responsibilities in terms of controlling.

Table 6. Correlation among food allergy knowledge, attitudes and practices scores of participants

Level	Spearman's rho	Sig.
Knowledge - Attitudes	0.120*	0.008
Attitudes - Practices	0.245*	0.000
Practices - Knowledge	0.390*	0.000

*Correlation is significant at the 0.05 level

CONCLUSION

This study provided information about food allergy knowledge, attitudes, practices of restaurant employees including restaurant managers, cooks and service staff working in chain and independent restaurants in Turkey. It was found that restaurant employees had levels of 'moderate knowledge and attitude' and 'low risk practice' about food allergy. As a result of detailed examination of the questionnaire, it was revealed that the restaurant employees lack of knowledge about food allergy symptoms and reactions, food allergy management, the most common eight food allergens, and some terms such as cross contact and food intolerance. Additionally, it was found that majority of employees did not receive food allergies training. Good overall levels of knowledge on food safety among food handlers and effective use of such knowledge in food processing applications are also applicable to the production of safe food in restaurant operations. Considering the prevalence of increased food allergy and the potential risk of food allergic individuals, the restaurant sector needs to develop operational plans and policies for food allergy management. Development of policies should involve various stakeholders such as consumers with food allergies, food service managers and employees, food safety inspectors, and food allergy experts. In this respect, both the authorities and the competent government authorities should take the necessary measures. The most important measure is food allergy training; therefore food safety training programs must be included in the subject of food allergy. Similarly, the FDA [40] also recommended that allergy education should be a part of food safety training for foodservice employees. On the other hand, it was observed that knowledge, attitude, and practices positively affected each other. This study showed that with high quality food allergy training, when the level of knowledge of the employees

is increased, the level of attitude and practice will also increase. Future studies can provide training for food allergy, control of training effectiveness and the effect of this on perception and application level.

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