

## **A STUDY OF FOOD ALLERGY KNOWLEDGE, ATTITUDES, AND PRACTICES OF RESTAURANT EMPLOYEES**

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### **ABSTRACT**

*The objective of this research was to evaluate the knowledge, attitudes, and practices (KAP) of food allergy among restaurant employees in Alexandria, Egypt, using a cross-sectional study design. A convenient sample of 189 restaurant employees completed a self-reported questionnaire to collect data on their KAP towards food allergies. Analysis of the data and testing of hypotheses and relationships between KAP were conducted using descriptive statistics and structural equation modeling (SEM). The study results showed that most restaurant employees had moderate knowledge and positive attitudes towards food allergies, while most practices were low to moderate risk. The findings also revealed that knowledge positively influenced attitude and practices, while attitude positively influenced practices. The study concludes that providing more training for restaurant employees could reduce the risk of serving unsafe meals to customers with food allergies*

**KEYWORDS:** Food allergy, KAP, employees, Egypt, restaurants

### **1. INTRODUCTION**

When the immune system reacts to a particular food after consumption, it results in an allergic reaction to that food. Consuming foods that have caused allergies can lead to symptoms such as digestive problems, hives, and swelling of the airways, even when consumed in small amounts. In some cases, anaphylaxis can occur, which is a life-threatening condition for food- allergic persons (Turnbull et al., 2015).

According to Elghoudi and Narchi (2022), the estimated prevalence of food allergies is 8% among children under the age of 5 and 4% among adults. Although children may outgrow food allergies as they grow older, there is no cure for them. It is significant to note that food allergies are

often mistaken for food intolerance, which is a more frequent reaction that does not involve the immune system, even though it can be unpleasant.

Gargano et al. (2021) state that a variety of foods have been linked to allergies, including cow's milk, shellfish, eggs, tree nuts, peanuts, soy, and wheat. The prevalence of food allergies differs among countries. Risk factors for food allergies include a family history of allergies, vitamin D deficiency, obesity, and sanitation. Allergic reactions are caused by immunoglobulin E (IgE) in the immune system binding to food molecules, with proteins being the primary culprits. Inflammatory chemicals like histamine are then released. Diagnosis of food allergies usually involves a comprehensive medical history, elimination diets, skin prick tests, blood tests for IgE antibodies against food, and oral food challenges, among other factors.

According to Food Allergy Research and Education (FARE) (2019), the number of children developing food allergies in the U.S. has increased by nearly 50% since 1997. Despite multiple medical studies exploring potential treatments, it is unclear whether food allergies can be cured. The National Restaurant Association (NRA, 2019) reports that consumers today are dining out more frequently than ever before. However, this poses a challenge for people with food allergies or their parents who may find it difficult to navigate restaurant menus.

As Soon (2020) points out, food allergy reactions are one of the leading causes of death in restaurants. In order to comply with legal requirements while accommodating customers' needs, restaurateurs must understand the risks associated with food allergies. To support the food allergy community, several professional organizations have developed training programs for restaurant staff. This will help increase awareness of food allergies among employees and provide valuable resources and information for people with food allergies (Nasser Eldine et al., 2021)

Non-profit organizations like Food Allergy Research & Education (FARE) and AllergyEats have been instrumental in providing information about food allergies. AllergyEats is a consumer review website that was founded in the early 2000s and allows users to share and discover their dining experiences at restaurants that accommodate food allergies (Food Allergy Research and Education, 2019). According to FARE (2019), FoodallergyEats.com is the top guide for individuals with food allergies in the U.S. to locate restaurants that are food allergy-friendly

In a similar manner to cross-contamination of microorganisms, proper cooking could reduce or eliminate the risks of foodborne illnesses (Food Allergy Research and Education, 2019), another common misconception was that cooking has reduced or eliminated food allergens when cross-contact occurred. When employees served customers with food allergies, their knowledge level was inadequate even though they believed they could provide allergen-free meals (Wen & Kwon, 2016).

Although food service employees expressed confidence in their ability to provide allergen-free meals, research by Ahuja and Sicherer (2007) found that many lacked the necessary knowledge about food allergies to do so effectively. The study revealed that 58% of respondents had not received any training on food allergies, while 35% believed that high heat could destroy allergens, and 25% believed that allergens could be safely removed from finished meals. This lack of knowledge could prevent food service employees from accommodating customers or responding to their questions and special requests appropriately (Shafie & Azman, 2015; Dupuis et al., 2016; Radke et al., 2016; Elshahoryi et al., 2021; Nasserredine et al., 2021). Also, non-coordinated employees may not follow safe food handling procedures in the kitchen if they are unaware of the severity of allergies. This is noted by Dupuis et al. (2016).

Researchers have investigated the dining experience of customers with food allergies in light of the increasing number of individuals with food allergies (e.g., Leftwich et al., 2011; Kwon et al., 2013; Lee and Barker, 2017; Kwon and Lee, 2012). A focus group, an interview with an individual, and a survey were the most commonly used research methods in these studies. In addition, and in the case of food handlers and employees, there have been numerous studies that focused on food allergy KAP in different hospitality aspects worldwide (Radke et al., 2016; Dupuis et al., 2016; Eren et al., 2021; Abdelhakim, 2018). However, this is not the case of the Egyptian context.

Thus, due to the dearth of studies on food allergy in different hospitality sectors (El-Fattah & Saleh, 2017; Abdelhakim et al., 2020; Abdelhakim, 2022), Providing a complete picture of food allergies in the hospitality industry was the goal of this study. Therefore, the purpose of this study was to identify food allergy KAP among a sample of restaurant employees. The study also examined the relationship between the previous variables among restaurant employees.

## **1.1 RESEARCH PROBLEM STATEMENT**

Food allergies are becoming increasingly prevalent worldwide, and it is important to understand the KAP of staff in restaurants regarding food allergies. Despite the significant risk that food allergies pose to consumers, there is limited research on the KAP of food handlers in restaurants regarding food allergies in Egypt (Abdelhakim et al., 2019; El-Fattah & Saleh, 2017; Abdelhakim et al., 2020; Abdelhakim, 2022). This knowledge gap is particularly important to address as food handlers are responsible for ensuring that food is safe for consumers to eat, including those with food allergies. Therefore, the research problem is to investigate the KAP of food allergy among food handlers in restaurants and to identify the factors that influence their KAP towards food allergies in Alexandria.

## **2. REVIEW OF LITERATURE**

### **2.1 FOOD ALLERGY AND HOSPITALITY INDUSTRY**

For commercial food service establishments, several state and federal laws are in place to prevent allergic reactions (Abbot et al., 2007). However, some employees of restaurants were not aware of the existence of food allergens in menu items and the methods for preventing cross-contact between menu items and food allergens (Lee and Barker, 2017). Servers might overlook allergens or hidden ingredients if they were not aware of them (Mandabach et al., 2005). Even in peanut-free meals prepared immediately after peanut-containing meals in 62 British food service establishments, nearly 21% of the meals were contaminated with peanut or peanut proteins (Leith et al., 2006)

According to previous studies (Barnett et al., 2011; Kwon and Lee, 2012), miscommunications between restaurant staff and customers with food allergies have led to allergic reactions. Wen and Kwon (2016) conducted interviews with food service managers to investigate how restaurant staff could effectively communicate and fulfill customers' requests for allergen-free orders. Surprisingly, only five out of 16 managers reported that managers or chefs would visit customers' tables to confirm that their allergen-free orders had been received and prepared correctly (Wen & Kwon, 2016).

However, providing allergen-free meals to customers with special dietary restrictions might prove beneficial to restaurants that were willing to accommodate this group of customers (Tsai et al., 2014), even though it might be a challenge for restaurateurs (Ahuja & Sicherer, 2007; Lee & Xu,

2015). Restaurants that have accommodated allergen-free orders would benefit not only from increased profits, reputation, popularity, and customer loyalty, but also create a better customer experience and improve reputation (Wen et al., 2020). When food allergy customers have had a positive experience at a restaurant, they were more likely to return (Kwon et al., 2013). A positive reputation and increased profits were also benefits of allergen-free restaurants. In light of the fact that most people have dined out with family or friends, a "veto vote" could have a tremendous impact (Ferraro et al., 2019). In most cases, if one member of a party had food allergies, the entire party would go to a restaurant that could accommodate that request. As a result, allergic individuals "veto" restaurants that fail to accommodate their allergies (Antico, 2011). The possible profits brought by consumer groups such as food-allergic persons were significant due to the fact that there are nearly 15 million Americans with food allergies (Wen et al., 2020). Through allergen-friendly food, Chang's China Bistro, the largest casual dining Chinese restaurant chain in the U.S., increased its profit significantly with allergen-friendly gluten-free orders (Wen & Kwon, 2017).

The food allergy knowledge of hotel employees has not been studied extensively, unlike restaurant employees. Bordelon (2016) conducted one of the few studies in this area to examine the role of food allergies in airlines, hotels, and attractions. The research aimed to investigate the provision of food allergy information for travelers and the implementation of legislation across eight sectors, including seven hotels. The study revealed that only one hotel had limited website information about food allergies. As a result, hotels did not address food allergies adequately. Travelers with food allergies could more easily choose appropriate menus if airlines and attractions provided information about their food allergy policies and procedures on their websites

Keeping a food allergy under control is a very challenging task in everyday life. Especially when eating out, for instance in a restaurant, patients with limited dietary control have faced this challenge. Cross-contact (contamination) during food preparation or the inclusion of ingredients that consumers might not reasonably expect could cause allergen exposure under such circumstances. It is still the restaurant staff's knowledge, attitude, and subsequent practices that have determined whether suitable foods were provided, regardless of whether consumers appropriately have communicated their dietary needs. Thus, research on food allergy awareness among restaurant staff has attracted increasing interest; especially since previous studies have indicated profound knowledge gaps (Loerbroks et al., 2019).

Food handlers and restaurant staff should have knowledge and practices related to food allergies, given the increased awareness of food allergies among public health authorities. Raising awareness among food handlers and suppliers could potentially reduce the consequences of food allergies. Food service workers or caregivers play a crucial role in protecting vulnerable populations, such as the elderly, children, adolescents, and people with disabilities, who may not be able to recognize potentially risky foods (Din et al., 2018). Previous studies have shown that participants possessed moderate food allergy knowledge (Loerbroks et al., 2019; Ajala et al., 2010). However, research on food allergy knowledge among food handlers and restaurant employees in Egypt is limited (El-Fattah & Saleh, 2017; Abdelhakim et al., 2020)

## **2. 2 KAP MODEL OF FOOD ALLERGY AND HYPOTHESES**

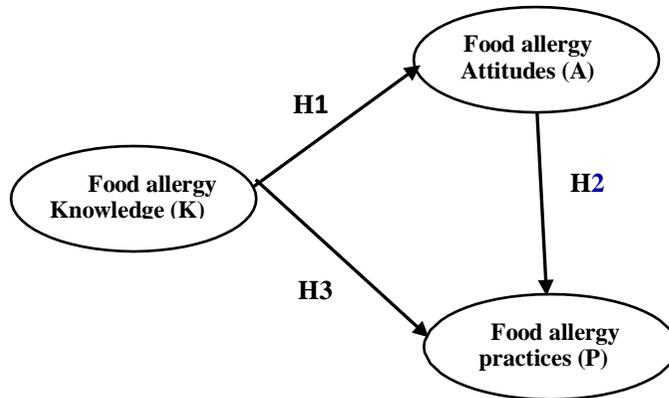
The KAP (Knowledge, Attitude, and Practice) model is a widely used framework to understand individual and community behavior in health-related issues. In the context of food allergies, the KAP model can help to identify knowledge gaps and misconceptions about food allergies, as well as attitudes and practices that may contribute to the risk of allergic reactions. The knowledge component of the model refers to the understanding of what food allergies are, their causes, symptoms, and appropriate management. Attitude encompasses personal beliefs, emotions, and values that influence how individuals perceive food allergies and their impact on daily life. Practice refers to the actual behaviors and actions taken to prevent and manage food allergies, including avoiding allergenic foods, reading food labels, and carrying emergency medication. The KAP model has been used in various studies to assess the level of knowledge, attitude, and practice of individuals and communities regarding food allergies, and to develop educational interventions that can improve awareness, reduce risk, and promote safe food handling practices

In light of the previous literature, three hypotheses were developed as shown in the conceptual model (Figure1):

*H1: Food allergy knowledge of restaurants' employees is positively affecting their attitudes toward food allergy.*

*H2: Attitudes toward food allergy of restaurants' employees are positively affecting their practices regarding food allergy.*

*H3: Food allergy knowledge of restaurants' employees is positively affecting of their practices toward food allergy.*



**Figure1: Food Allergy KAP of restaurants' employees**

### **3. RESEARCH METHODOLOGY**

#### **3.1 THE RESEARCH DESIGN**

A cross-sectional quantitative research was conducted. Predefined questions in a self-reported questionnaire were used in KAP surveys to collect quantitative data (Abdelhakim & Badr, 2021). KAP surveys revealed what has been said, but actual actions might differ considerably from what has been said or has been done (Abdelhakim, 2022).

#### **3.2 THE QUESTIONNAIRE DESIGN**

In Alexandria, Egypt, a developed self-administered questionnaire derived from previous related studies to assess food allergy KAP among restaurant employees (e.g. Ajala et al., 2010; Loerbroks et al., 2019; Elshahory et al., 2021). An independent translator with substantial experience in tourism and hospitality education developed the questionnaire in English and then translated it into Arabic. Based on the preliminary findings from the face-to-face pilot, the questionnaire was modified. There were four sections in the questionnaire. There were four questions about socio-demographic characteristics and restaurant-related data in the first section. The second section contained six knowledge questions about food allergies. Staff attitudes were addressed in the third section with four items. Eight questions were included in the final section about the correct practices to prevent cross-contamination and how employees should deal with mistakes that may impact the safety of food for allergy sufferers.

#### **3.3 SAMPLING**

A convenient sample of 200 employees working in dining restaurants was targeted. The research participants worked in restaurants in Alexandria and

completed 189 valid forms (response rate 94.5%) were collected. Data were collected from the first of October 2022 to the end of December 2022.

### **3.4 DATA ANALYSIS**

Responses to the survey were scored using a system in which a correct answer was awarded 51 points, an incorrect answer was given 50 points, and respondents who selected "I don't know" received 50 points to prevent guesswork from skewing the results. The survey used a five-point scale to quantify responses, ranging from "never" to "rarely" to "sometimes" to "often" to "always," with each response being scored from 0 to 5. Similarly, a five-point scale ranging from "strongly disagree" to "strongly agree" was used to quantify responses, with each response being scored from 1 to 5.

In order to test the proposed conceptual model and its hypotheses, PLS-SEM was employed in the study. According to Hair et al. (2016), PLS-SEM is a useful method for developing theories. The data was analyzed using WarpPLS 7.0 software. Fornell and Larcker (1981), Kock (2017), and Hair et al. (2016) were used to assess the reliability and validity of the measurement models.

## **4. RESULTS AND DISCUSSIONS**

### **4.1 PROFILE OF RESPONDENTS**

The respondents in table 1 have a diverse demographic profile. Most of respondents (86.6%) are aged between 30 and 40 years in this research. Male respondents made up the majority (87.3%), whereas female respondents made up the minority (12.6%). Nearly 70 percent of respondents (69.8%) had a university education. Last but not least, three-quarters of respondents worked in operational roles.

**Table 1: The profile of respondents**

Demographics		Respondents	
		N	(%)
Gender	Male	165	(87.3)
	Female	24	(12.6)
Age (years)	25- 30	25	(13.2)
	31-35	99	(52.3)
	36-40	33	(17.4)
	40 <	32	(16.9)

Educational level	High school	52	(27.5)
	University	132	(69.8)
	Postgraduate	5	(2.6)
Job level	Managerial level	46	(24.33)
	Operational level	143	(75.67)
<b>Total</b>		<b>189</b>	<b>100</b>

Additionally, Table 2 indicates that respondents know a good amount about food allergies (Grand Mean= 3.6) and positive attitudes (Grand Mean= 3.9), however, they have low practices related to handling food allergy related risks (2.47).

**Table (2) Mean statistics for KAP of food allergy**

Constructs	Mean Statistics
Food allergy Knowledge (K)	3.6
Food allergy Attitudes (A)	3.9
Food allergy Practices (P)	2.47

**4.2 MEASUREMENT MODEL**

When the average variance extracted (AVEs) of a construct exceed 0.5, it indicates convergent validity in the measurement model (Fornell and Larcker, 1981). Discriminant validity is established when the square roots of AVEs exceed inter-construct correlations (Table 3). The measurement is reliable if there is a positive correlation of greater than 0.7 between Cronbach's alpha (CA) and composite reliability (CR) (Field, 2009; Hair et al., 2016) (Kock, 2020). Furthermore, if the variance inflation factors (VIFs) are below 5, then there is no multicollinearity (Kock, 2020). Discriminant validity is supported by an HTMT ratio of less than .90 (Table 4) (Kock, 2020). Based on these findings, it can be inferred that the current measurement model is both valid and reliable.

**Table (3) Measurement model of food allergy KAP among restaurants' employees**

Constructs	Indicators	Loading	CA	CR	AVE	$\sqrt{AVE}$
Food allergy Knowledge (K)	K1	0.790	0.850	0.894	0.627	0.792
	K2	0.808				
	K3	0.863				
	K4	0.780				

	K5	0.816				
	K6	0.890				
<b>Food allergy Attitudes (K)</b>	A1	0.864	0.891	0.925	0.755	0.869
	A2	0.878				
	A3	0.832				
	A4	0.834				
<b>Food allergy Practices (P)</b>	P1	0.834	0.809	0.887	0.724	0.851
	P2	0.882				
	P3	0.836				
	P4	0.932				
	P5	0.871				
	P6	0.940				
	P7	0.933				
	P8	0.889				

*Note: CA: Cronbach's alpha, CR: Composite reliability, AVE: Average variance extracted*

**Table (4) Square root of AVEs and inter-constructs correlations**

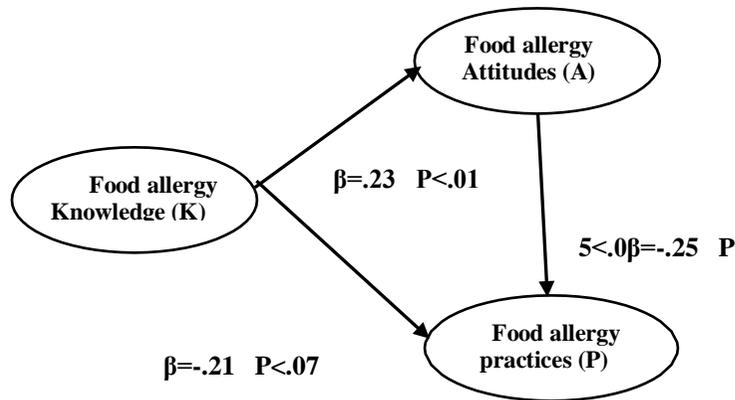
<b>Constructs</b>	<b>Knowledge (K)</b>	<b>Attitudes (A)</b>	<b>Slef-reported Practices (P)</b>
Knowledge (K)	<b>(0.792)</b>		
Attitudes (A)	0.641	<b>(0.906)</b>	
Practices (P)	0.577	0.720	<b>(0.957)</b>

**Table (5) HTMT ratios**

<b>Constructs</b>	<b>Knowledge (K)</b>	<b>Attitudes (A)</b>	<b>Slef-reported Practices (P)</b>
Knowledge (K)	0.734		
Attitudes (A)	0.623	0.759	
Practices (P)	0.830	0.840	0.780

### 4.3 STRUCTURAL MODEL

As shown in Figure (2), the findings have showed that the food allergy knowledge (K) acquired by restaurants' employees have positively affected their attitudes toward food allergy (A) ( $\beta=.23$ ,  $P<.01$ ) (H1 is supported). In addition, the employees' attitudes toward food allergy (A) have affected their Practices (P) ( $\beta=.25$ ,  $P<.01$ ) (H2 is supported). However, although knowledge (K) acquired by restaurants' employees have positively affected their Practices ( $\beta=.21$  and  $P<.07$ ) (H3 is rejected).



**Figure2. The structural model of the impact KAP of food allergy**

These two constructs (K and A) explain 43% of the variance in the practices of food allergy of restaurants' employees. Accordingly, the actual behaviors of restaurant employees are lower than those they report in their self-reported behavior.

### 5. CONCLUSION

The study successfully met its objective based on the findings. The majority of the restaurant staff had moderate to excellent knowledge and awareness of food allergies, with low to moderate risk behaviors. The level of knowledge among employees was influenced by their educational background, job position, work experience in the restaurant industry, and the possession of a food safety and management systems certificate

**Table (6) Hypothesis testing results**

No.	Hypotheses	B value	Result
H1	Food allergy Knowledge(K) $\rightarrow$ Attitudes (A)	0.22**	Accepted

H2	Food allergy Attitudes (A) → Food allergy Practices (P)	0.23**	Accepted
H3	Food allergy Knowledge(K) → Food allergy Practices (P)	0.17 <sup>NS</sup>	Rejected
<b>Note:</b> * Significant at 5%, ** Significant at 1%, <sup>NS</sup> Not Significant			

To create and develop effective interventions, it is also critical to understand the relationship between knowledge, attitudes, and practices. The managers must be role models for their colleagues, teach and train them in order to introduce safe meals to food allergic clients. Therefore, managers must acquire a good level of knowledge about attitudes, skills, and work habits. It is still very likely that restaurant staff, together with customers with food allergy, will not understand food allergen risks, will have poor knowledge of appropriate controls, and will have high-risk practices. As a result, the most significant problem is a lack of training. In spite of the fact that the survey indicated food handlers were somewhat familiar with food allergy, allergic individuals must stay vigilant, questioning where meals will be served in terms of what ingredients will be used, ensuring that the food is free of allergens, and always paying attention to the labels on food products.

## 6. IMPLICATIONS AND FURTHER RESEARCH

### 6.1 IMPLICATIONS

The findings of this study will be of interest to researchers and scholars in the hospitality industry as it contributes to the current theory and literature on managing food allergies. The study has also developed and tested a model that can be applied empirically in various hospitality contexts and sectors. The results of this study can guide future research on food allergies.

This study's practical and managerial implications are significant, as they provide valuable insights for managers in catering settings such as restaurants, airlines, and hospitals. By selecting and training employees who possess higher levels of knowledge and experience, managers may be able to reduce the risks associated with food allergies. Moreover, the findings can help identify areas that require improvement in food safety-related activities and increase the level of awareness among food handlers in the catering industry. This is especially relevant since the establishment of the National Food Safety Authority (NFSA) has required that food handlers possess a reasonable level of knowledge about food allergies. The

study's results may be beneficial to managers, supervisors, and auditors in understanding their employees' training needs and enhancing the quality of their services.

## **6.2 LIMITATIONS AND FUTURE RESEARCH**

Research directions for the future can be drawn from this research, as it has some limitations. First, future research should include a variety of catering establishments, such as fast-food restaurants, airline catering, and institutional catering, since the data were collected from restaurant workers in Alexandria, Egypt. For data collection, a self-reported survey was used; future studies may use direct observation and documents (e.g., reviews from customers and menu analyses) to examine potential food allergies and related risks in catering. In addition, this study was conducted in Alexandria, the second capital of Egypt; future studies could consider other countries or be cross-country or cross-cultural in nature.

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