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Dining out safely with food allergies: A comparative perspective from restaurant managers and servers in Malaysia

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Abstract

Food can motivate visiting a destination or coming together with family and friends, but food allergy concerns and reactions increasingly spoil the tourism and leisure experience. Incidents of food allergies in restaurants, and questions on how to handle food allergy communication and practices require attention from the hospitality industry. Based on a survey conducted at restaurants, we applied a five-level framework to examine and compare the multifaceted perspectives of restaurant managers and front-line employees regarding their understanding and practices on food allergies. Findings showed that managers' and servers' food allergy knowledge in Malaysia was low when compared with similar studies conducted in a 'Western' context. In addition, the results also indicated significant differences between food allergy practices and perceived training needs between the two tested groups. In general, managers were more aware of the practices and perceived training needs regarding food allergies than servers. Majority of servers did not receive training in food allergies. Accordingly, all relevant stakeholders must cooperate in developing appropriate educational tools to improve food allergy knowledge.

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Introduction

Food allergy is an adverse immune reaction to a food allergen that can trigger mild (*e.g.*, rash, itchy sensation) to severe (*e.g.*, anaphylaxis) reactions (Moore *et al.*, 2017). Past research showed that food allergies are common and on the rise in Asia (Pang *et al.*, 2017; Wai *et al.*, 2021). In developing countries such as Malaysia, food allergies were once considered rare. However, new epidemiological data from the last decade have proven otherwise, as food allergy prevalence continues to increase with economic growth (Leung *et al.*, 2018). Even though this disease is chronic, people tend to overlook its severity due to limited knowledge about it (Din *et al.*, 2019). Food avoidance is one of the many methods to prevent food allergies (Soon, 2018). Government regulations imposing accurate food allergen labelling on food products are crucial to indicate the presence of food allergens, and to protect consumers.

As highlighted by the Institute of Tropical Agriculture and Food Security, Universiti Putra Malaysia, food allergies among Malaysians are prevalent, and require further action (UPM, 2020). In Malaysia, food products that may cause hypersensitivity such as cereal containing gluten, nuts and nut products, fish and fish products, milk products, and lastly egg products should be reflected on food labels (MOH, 1985). However, the Precautionary Allergen Labelling (PAL) is done voluntarily, and most importantly, it is only imposed on the food manufacturing industry. Accordingly, allergen labelling usually does not take place at restaurants in Malaysia. This may be one reason why the awareness and knowledge level towards food allergies is low (Din *et al.*, 2015) and moderate (Soon, 2018). Loerbroks *et al.* (2019) indicated that there is much variation internationally regarding the knowledge of restaurant staff about food allergies, and that "attitudes towards food allergy remain under-researched".

Despite various preventions consumers may take to avoid food allergens, some have encountered difficulties when dining out. Food allergy incidents at restaurants are common, and may be attributed to various causes including complex food, cross-

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contact, miscommunication, or lack of knowledge about food allergies among employees (McAdams *et al.*, 2018). Food allergy incidents can have negative economic and legal consequences for foodservice businesses. Customers with food allergies may avoid a restaurant which does not accommodate concerned consumers. Allergic reactions of restaurant customers to food can lead to a negative reputation of a business, deteriorating customer relationships, and a decrease in their sales (Barnett *et al*., 2020). Businesses may face liability issues and lawsuits if they fail to adhere to health procedures (McAdams *et al*., 2018). Providing allergen-free food for customers with food allergies is challenging, and one of the major concerns for every foodservice establishment (Wen and Kwon, 2016). Food allergies thus constitute a prominent issue for restaurants, specifically their managers and servers, who play a crucial role in preventing and managing allergens (Lee and Sozen, 2018).

Previous research investigated knowledge, attitude, and practices of managing food allergies from the perspective of food establishment employees (Choi and Rajagopal, 2013; Loerbroks *et al*., 2019). Other studies focused on food allergy training and training needs (Soon, 2020). While most of these studies highlighted two to three measurements – mainly knowledge, attitude, and practices – the present work applied a more nuanced framework by integrating five measurements to compare managerial and employee perspectives towards food allergies. The five measurements were (1) food allergy knowledge, (2) attitude, (3) practices, (4) training received, and (5) perceived training needs. The two additional measurements of training are important since training contributes to increasing staff value (Bailey *et al*., 2014).

Unlike most of the existing research on food allergies in restaurants, the present work distinguished between the perspectives of restaurant managers and servers. The distinction between these groups is essential since their knowledge and experience may differ based on their positions (Lee and Sozen, 2018). Both groups are crucial to the functioning of the restaurant business, and the management of food allergies, but their roles differ significantly. Managers are usually responsible for tasks such as marketing, recruiting, training, developing menus, ordering supplies, overseeing food quality, and ensuring health and safety guidelines. Servers however typically present menus, take and serve food and drinks, keep tables clean, and communicate with customers (Gordon and Brezinski, 2016). Indeed, "a weakness in any staff member in food allergy can result in unsafe food being served" (Bailey *et al*., 2014).

Accordingly, the present work offered a comparison between managers and servers from a Malaysian perspective. The main objective was to compare the food allergies knowledge, attitude, food safety practices, training received, and perceived training needs among restaurant managers and servers. The present work asked what respondents know and think about food allergies as well as what they do about it in their workplace. In addition, training received and perceived training needs among managers and servers were examined to further understand the contents and perceptions of the training. An analysis of similarities and differences between managerial and employee perspectives can help restaurants and foodservice establishments to address potential gaps in knowledge, and to implement better policies, training, and strategies for food allergy risk management.

Literature review

Food allergies and foodservice establishments

Food allergy is the outcome of maladaptive immune responses to harmless food antigens. Restaurants represent "unique and challenging environments for accommodating food allergies", especially in countries where food and dining out represent popular leisure and tourism activities (McAdams *et al.*, 2018). In Malaysia, food is also portrayed as representative of its multicultural nature, thus highly promoted to domestic and international tourists.

However, dining out, including restaurant or takeout, accounts for a large number of allergic food reactions after consumption at home (Oriel *et al*., 2021), ranging from minor symptoms such as rashes, itches, or swelling to much more severe consequences including anaphylactic shock and death (Radke *et al*., 2016). Providing allergen-free food to customers who suffer from food allergies has become an increasing challenge for foodservice establishments (Loerbroks *et al*., 2019). Food selection has become a tedious task for individuals with food allergies as they need to read the list of ingredients conscientiously, and often require additional conversations with restaurant staff when the allergy information provided is unclear or incomplete (Barnett *et al*., 2020). Therefore, eating

away from home may be stressful for an individual suffering from food allergies (Lee and Xu, 2015; Newman *et al.,* 2022).

As such, managers and servers play distinct roles in foodservice establishments. Managers are responsible for developing plans for serving allergen-free food and providing food allergy training for staff. At the same time, servers should accurately describe ingredients on the menu to the customers, and alert kitchen staff and managers to any reported allergies (Bailey *et al*., 2014; Wen and Kwon, 2016).

Food allergy knowledge, attitude, practices, and training

To provide allergen-free meals for individuals with food allergies, foodservice employees should know about food allergens and allergies (Choi and Rajagopal, 2013; Lee and Liu, 2021). Henroid and Sneed (2004) discovered that foodservice employees did not consistently follow food safety practices although they have high food safety knowledge. Research conducted by Ahuja and Sicherer (2007) found that most foodservice employees were unaware that even the consumption of small amounts of allergens could cause allergic reactions; employees were unaware that heat does not destroy allergens. Research offers mixed findings on whether food allergy knowledge differs based on sociodemographic characteristics such as gender, age, and job position (McAdams *et al.,* 2018). However, most studies agree that restaurant managers are more knowledgeable than servers since managers are often designated to handle customers with food allergies, and provide training to other employees (Wen and Kwon, 2017). Hence, the first hypothesis proposed by the present work was:

H1: There is a significant difference in food allergy knowledge between managers and servers.

Knowledge about food safety is important as it influences behaviour and attitude towards handling food allergies (Coleman and Roberts, 2005). Positive attitude of foodservice employees towards accommodating and handling food allergy issues and requests can reduce food allergy outbreaks (Sani and Siow, 2014). While comparing attitude towards food allergies between managers and servers, Lee and Sozen (2018) identified similar responses between these two groups. However, research comparing the food allergy attitude between these two groups is scarce. Based on the different responsibilities, experience, and knowledge base of managers and servers, the second hypothesis proposed by the present work was:

H2: There is a significant difference in attitude towards food allergies between managers and servers.

Appropriate practices are necessary at foodservice and production workplaces to avoid food allergy incidents (Choi and Rajagopal, 2013). To improve food safety practices at commercial establishments, continuous and frequent training or educational programmes are needed (Da Cunha *et al*., 2014). Toh and Birchenough (2000) show a strong correlation between knowledge and food handling practices. As managers were generally more knowledgeable, they would be committed to ensuring that the food safety practices are fully implemented so that the customers' special dietary requirement is met. However, prior research suggested a profound gap between managers' and servers' practices. Many restaurant employees perceive certain practices such as initiating a conversation about food allergies and avoiding food allergy reactions as the responsibilities of customers rather than restaurant staff (Wen and Kwon, 2017). Therefore, the third hypothesis proposed by the present work was:

H3: There is a significant difference in food allergy practices between managers and servers.

Continuous training should be prioritised in foodservice establishments (Soon, 2020). Previous studies agreed that training is crucial for every foodservice employee as the number of customers with food allergies has increased (Radke *et al*., 2016). As most managers are involved in planning and implementing training programs, they also require proper training programmes (such as “train the trainer” course) to carry out tasks effectively. Further challenges in achieving sufficient training include high costs, staff turnover in many restaurants, and limited time dedicated to such training (Soon, 2020). Therefore, the fourth hypothesis proposed by the present work was:

H4: There is a significant difference in food allergy training received between managers and servers.

Food allergy training is crucial for foodservice employees to ensure the safety of concerned customers (Lee and Sozen, 2016). Studies found that foodservice employees believe in their capability to produce allergen-free meals for allergic customers even though they have not received proper training (Ahuja and Sicherer, 2007). Recent research suggested that more research is needed to assess food allergy training needs so that workshops, training, and other educational programmes can be designed and implemented more effectively (Soon, 2020). As suggested by Lee and Sozen (2018), needs assessment for restaurant managers who design training programmes can be beneficial. However, there is lack of evidence on the differences between perceived training needs among managers and servers. Therefore, the fifth hypothesis proposed by the present work was:

H5: There is a significant difference in perceived training needs on food allergies between managers and servers.

Materials and methods

A comparative study was conducted to analyse the different levels of understanding and practices between managers and servers in Malaysia's restaurants using the following five measurements: knowledge, attitude, practices, training received, and perceived training needs.

The state of Penang, which is located at the northwest coast of Peninsular Malaysia, was chosen as the research site of the present work. It constitutes a well-known United Nations Educational, Scientific and Cultural Organization (UNESCO) cultural tourist destination, and a food heaven for both local visitors and tourists, featuring a wide variety of restaurants, street foods, and local delicacies (Khoo and Badaruzalam, 2014).

Data sampling involved convenience and quota sampling. In stage one, restaurants located at Georgetown were identified. Georgetown was selected as it is the capital city of Penang, and well known for its culinary traditions. With the growth of Penang tourism, Georgetown has emerged as a popular location for cafés and restaurants (Moorthy *et al*., 2017). Convenience sampling was applied in the sense that restaurants were selected based on their willingness to participate in the present work; no incentives were given for participation. The restaurants were approached face-to-face by the researchers, and there were 76 restaurants that agreed to participate. In stage two, a prior power analysis was conducted using G*Power version 3.1.9.7 to determine the minimum sample size required to test the study hypothesis. Results indicated that the size of the sample needed to achieve 80% power for detecting a medium effect (0.5), at a significance criterion of $\alpha = 0.05$, was $N = 102$ [*t*-test = means: difference between two independent means (two groups)]. Therefore, the targeted sample size of 200 was adequate to test the study hypothesis. A quota sampling was employed in which 100 managers and 100 servers from the participating restaurants were recruited. Self-administered questionnaires were distributed to the managers and servers from the restaurants through a face-to-face approach. However, only 176 questionnaires were duly filled and returned by respondents, achieving a response rate of 85%.

The questionnaire was adapted from Choi and Rajagopal (2013), and contained five main sections. Section one examined the respondents' socio-demographics. In section two, respondents were asked about their knowledge of food allergies using 11 multiple-choice questions. Section three aimed to examine the respondent's attitude towards food allergies. This section contained 14 items in which the respondents must indicate the extent to which they agree with the items by using a 5-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Section four contained 11 items about food allergy practices of servers at their workplace. The frequency of specific food allergy practices was examined with 1 = never, 2 = sometimes, and 3 = always. The last section divided the questionnaire into two sections with a screening question. The screening question aimed to identify those servers who had received food allergies and allergen handling training either on-the-job or during orientation. Respondents who had received training specific to food allergies and allergen handling were required to proceed to Section 5a (consisting of five items to examine types of food allergy training received with the option 'yes' or 'no') and 5b (consisting of five items to test their perception of the need for food allergy training using a 5-point Likert scale which ranged from 1 = very unnecessary to 5 = very necessary). In contrast, respondents who had never received food allergy training were required to skip section 5a, and only answer section 5b.

Two food research experts conducted an expert judge review to assess the content validity of the questionnaire. The questionnaire was piloted for clarity, length, and general consistency with 30 respondents, which was 10% of the sample projected for the larger parent study as suggested by Connelly (2008). Minor amendments were made for section two, question number 7 relating to the best treatment for controlling a severe food allergic reaction as most of the respondents could not answer, leading to high missing values during the pilot test. An additional option, 'E. I do not know', was added as suggested by Din *et al.* (2015). Some questions inquired food allergy specific knowledge which some respondents might not be knowledgeable about.

Statistical Package for the Social Sciences (SPSS) version 25.0 was used to analyse the collected data. The instrument's validity and reliability were checked with Exploratory Factor Analysis (EFA) and Cronbach's Alpha, respectively. Descriptive analysis was conducted in which frequency, percentage, mean, and standard deviation of the tested items were calculated. Mann-Whitney U test was conducted to examine the significant difference in food allergy knowledge, attitude, food safety practices, and perceived training needs among managers and servers as the data normality was not met, with skewness and kurtosis falling beyond the range of +1 to -1 (Hair *et al*., 2016).

Results

Respondents' profile

Of 176 valid responses, 51.1% of respondents were managers, and 48.9% were servers. 52.3% of them were females and 47.7% were males. The number of females was slightly higher in both positions. Age distribution was skewed towards younger respondents. However, this varied significantly between positions, with 81.4% servers, and 17.8% managers. Malaysians made up the majority of respondents (88.6%), with servers (93%) outnumbering managers (84.4%). Most of the respondents (78.4%) had graduated from college, and had higher educational levels. Surprisingly, the results showed that the percentage of servers who graduated from college and higher levels (75.6%) was higher than that of managers (55.6%). However, from the 55.6% who reported, 18.9% of the managers had completed their postgraduate studies.

Validity and reliability analyses

During pilot testing, questionnaires were distributed to 30 foodservice employees working in restaurants to examine the instrument's face validity. Exploratory Factor Analysis (EFA) was employed to support the instrument's dimensionality, convergence, and discriminant validity. Principal Component Analysis with Varimax Rotation was used to determine the construct validity of the questionnaire. The analysis did not include knowledge and training as both of them are not reflective constructs. The Kaiser-Meyer-Olkin measure of sampling adequacy is acceptable at 0.711 (Cerny and Kaiser, 1977). The Bartlett's test of sphericity was significant at $p < 0.05$. The results showed that the data set was adequately sampled, and that factor analysis of the data was appropriate. The results showed that the majority of the factor loadings met the minimum cut-off value of 0.3 as proposed by Field (2013), while five items were removed as their factor loadings were less than 0.3. The lowest Eigenvalue was 'perceived training needs (2.43)' and significant at above 1.00. Cronbach's Alpha was conducted to assess the reliability of the scale. The overall Cronbach's Alpha of the 25 items (0.67) was within the acceptable range of 0.6 - 0.7 (Cronbach, 1951). Among the three tested variables, 'perceived training needs' recorded the highest Cronbach's Alpha value (0.85), followed by practices (0.69), and attitude (0.63).

Food allergy knowledge, attitude, practices, and training of managers and servers

Table 1 summarises the results of food allergy knowledge of the respondents. The mean rating for knowledge was 5.71 (SD = 1.54) (out of 11 points), with the managers (mean = 5.80) scoring slightly higher than servers (mean = 5.61). Respondents were knowledgeable about how soon the food allergy reaction occurs after the food is consumed (89.8%). Managers (91.1%) scored higher in this question as compared to servers (88.4%). Additionally, 87.5% of the respondents stated that it is the service staff's responsibility to prevent food allergy reactions, with managers (91.1%) scoring slightly higher than servers (83.7%). However, most of the respondents were unaware of the best treatment to control a severe food allergy reaction (only 4.5% were aware); especially among servers, with only 2.3% responding correctly. Additionally, when the respondents were asked to

Table 1. Knowledge on food allergies of managers and servers.

Knowledge item	Total (*n* = 176)	Manager (*n* = 90)	Server (*n* = 86)
1. How soon does a food allergy reaction occur after the food is consumed?			
Immediately or within a few hours after the food is consumed	**158 (89.8)**	**82 (91.1)**	**76 (88.4)**
Twenty-four hours after the food is consumed	15 (8.5)	5 (5.6)	10 (11.6)
Thirty-six hours after the food is consumed	2 (1.1)	2 (2.2)	0 (0.0)
Forty-eight hours after the food is consumed	1(0.6)	1 (1.1)	0 (0.0)
2. Which body system can be affected by a food allergy reaction?			
Gastrointestinal tract	29 (16.5)	12 (13.3)	17 (19.8)
Respiratory system	23 (13.1)	14 (15.6)	9 (10.5)
Skin	51 (29.0)	26 (28.9)	25 (29.1)
All of the above	**73 (41.5)**	**38 (42.2)**	**35 (40.7)**
3. Food allergies are caused by the body's negative reaction to which of the following?			
Fats	36 (20.5)	16 (17.8)	20 (23.3)
Proteins	**35 (19.9)**	**17 (18.9)**	**18 (20.9)**
Carbohydrates	3 (1.7)	3 (3.3)	0 (0.0)
Trans-fatty acids	102 (58.0)	54 (60.0)	48 (55.8)
4. Which of the following does not belong in the top eight food allergens?			
Potato	**31 (17.6)**	**13 (14.4)**	**18 (20.9)**
Wheat	62 (35.2)	30 (33.3)	32 (37.2)
Shrimp	48 (27.3)	29 (32.2)	19 (22.1)
Tofu	35 (19.9)	18 (20.0)	17 (19.8)
5. Which of the following items are risky for guests who have food allergies?			
Fried foods	1 (0.6)	0 (0.0)	1 (1.2)
Desserts	2 (1.1)	0 (0.0)	2 (2.3)
Complex dishes with many ingredients	78 (44.3)	49 (54.4)	29 (33.7)
All of the above	**95 (54.0)**	**41 (45.6)**	**54 (62.8)**
6. Which of the following should service staff do in order to prevent an allergic reaction?			
Cook food to the right internal temperature	11(6.3)	4 (4.4)	7 (8.1)
Be able to identify ingredients in the menu item upon customer request	**154 (87.5)**	**82 (91.1)**	**72 (83.7)**
Use dishwasher for washing dishes	1 (0.6)	0 (0.0)	1 (1.2)
Keep foods safe from microbial growth	10 (5.7)	4 (4.4)	6 (7.0)
7. Which of the following is the best treatment for controlling a severe food allergic reaction?			
Benadryl™	3 (1.7)	1 (1.1)	2 (2.3)
Pseudoephedrine	6 (3.4)	1 (1.1)	5 (5.8)
Sudafed™	2 (1.1)	1 (1.1)	1 (1.2)
8. If a guest is experiencing an allergic reaction, what is the first thing you should do?			
Determine which food the guest is allergic to	44 (25.0)	25 (27.8)	19 (22.1)
Investigate how the allergic reaction could have happened	2 (1.1)	1 (1.1)	1 (1.2)
Defend the food allergy policies of your establishment	0 (0.0)	0 (0.0)	0 (0.0)
Get medical help immediately	**130 (73.9)**	**64 (71.1)**	**66 (76.7)**
9. Why can fried foods be dangerous for individuals with food allergies?			
The high fat content in fried foods makes allergic reactions worse	10 (5.7)	3 (3.3)	7 (8.1)
Frying change the chemical structure of foods	18 (10.2)	7 (7.8)	11 (12.8)
Cross-contact with other food proteins can occur if the oil was used to cook other foods	**148 (84.1)**	**80 (88.9)**	**68 (79.1)**
The high starch content makes allergic reactions worse	0 (0.0)	0 (0.0)	0 (0.0)
10. Which of the following is the definition of allergen cross-contact?			
Contact between raw and cooked foods	41 (23.3)	18 (20.0)	23 (26.7)
Contact between allergen-containing foods and non-allergen containing foods	**127 (72.2)**	**69 (76.7)**	**58 (67.4)**
Contact between allergen-containing foods and raw meat	8 (4.5)	3 (3.3)	5 (5.8)

Bold values indicate correct responses.

identify food that does not belong to the top eight food allergens from the list, only 17.6% were able to identify them; surprisingly, the managers (14.45) recorded a lower percentage than servers (20.9%).

The total mean score of respondents' attitude towards food allergies was 4.20 (SD = 0.26) based on a 5-point Likert Scale. Servers' attitude towards providing customers with food allergies with accurate information relating to food ingredients had the highest mean rating (M = 4.73, SD = 0.63), whilst managers scored slightly higher than servers (mean difference = 0.3). In contrast, willingness to attend food allergy courses or workshops achieved the lowest mean rating (M = 3.90, SD = 0.81), especially among servers (M = 3.79, SD = 0.78) as compared to managers (M = 4.01, SD = 0.81). The summary of the results is presented in Table 2.

Table 2. Attitude on food allergies of managers and servers.

Attitude item	Total (*n* = 176)		Manager (*n* = 90)		Server (*n* = 86)	
	Mean	SD[a]	Mean	SD[a]	Mean	SD[a]
It is important to me that accurate information about food ingredients is provided to customers with a food allergy.	4.73	0.63	4.74	0.63	4.71	0.63
I think preventing incidences of food allergies is an important part of my job responsibilities at my workplace.	4.73	0.57	4.72	0.60	4.74	0.54
I believe appropriate precautions can be taken to avoid cross-contact between foods at my workplace.	4.48	0.58	4.52	0.57	4.43	0.59
I believe that the disclosure of accurate allergen information to customers with a food allergy will decrease the likelihood of a food allergic reaction.	4.32	0.74	4.32	0.72	4.33	0.76
I think all foodservice employees should be knowledgeable about food allergies.	4.60	0.57	4.63	0.57	4.57	0.56
I am willing to change my food handling behaviours related to handling food allergens.	4.36	0.58	4.33	0.62	4.40	0.54
I believe that knowledge about food allergies would make me more confident about handling food at my workplace.	4.30	0.63	4.31	0.65	4.28	0.61
I think understanding the basics of food allergies will be useful to me in my workplace.	4.34	0.60	4.39	0.58	4.29	0.61
I think the manager in my workplace should educate me about food allergies and allergen handling.	4.09	0.60	4.10	0.58	4.07	0.61
Learning more about food allergies is important to me, personally.	4.03	0.64	4.12	0.68	3.93	0.57
I think individuals involved in food preparation should be more knowledgeable about food allergies than servers or cashiers.	4.02	0.78	4.00	0.79	4.05	0.77
I am willing to attend food allergy training courses/workshops to learn more about food allergies	3.90	0.81	4.01	0.81	3.79	0.78

[a]Standard deviation. Scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; and 5 = strongly agree.

Table 3 presents the mean rating of food allergy practices among restaurant employees in their workplace. The overall mean score for food allergy practices was 2.71 ± 0.25 based on 3-point Likert scale. Most of the servers mentioned that they always listen and answer attentively to customer inquiries relating to food allergies or allergens in the food, with a mean rating of 2.89 (SD = 0.34). This was especially true among managers achieving a mean rating of 2.92 ± 0.27 as compared to servers (M = 2.85, SD = 0.39).

However, separate equipment for handling food containing allergen was not commonly practiced in the workplace, with a total mean rating of 2.40 (SD = 0.73), with both managers (M = 2.41, SD = 0.75) and servers (M = 2.40, SD = 0.72) scoring equally low in this item.

Table 3. Practices on food allergies of managers and servers.

Practices item	Total (*n* = 176)		Manager (*n* = 90)		Server (*n* = 86)	
	Mean	SD[a]	Mean	SD[a]	Mean	SD[a]
When preparing food for a customer with food allergies, I pay more attention to safe food handling practices than when preparing food for a customer without food allergies.	2.81	0.42	2.82	0.38	2.79	0.46
I use clean and sanitised equipment and utensils at my workplace to prevent cross-contact between allergens.	2.70	0.53	2.78	0.42	2.62	0.62
I wash my hands thoroughly with soap and water, and wear a fresh pair of gloves before preparing an allergen-free meal.	2.79	0.50	2.82	0.44	2.76	0.55
If a mistake is made when preparing a meal for a food allergic customer, I remake the food.	2.79	0.50	2.81	0.45	2.77	0.55
I try to listen carefully, understand, and then answer customers' questions about food allergies or allergens in the food.	2.89	0.34	2.92	0.27	2.85	0.39
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.	2.85	0.42	2.91	0.27	2.79	0.51
When preparing fried food for patrons with a food allergy, I make sure that I change the oil in the deep fryer to prevent cross-contact.	2.56	0.67	2.71	0.57	2.41	0.71
I use separate equipment (tongs, ladles) for handling allergen-containing foods.	2.40	0.73	2.41	0.75	2.40	0.72

[a]Standard deviation. Scale: 1 = never; 2 = sometime; and 3 = always.

Fewer than half of the respondents (47.7%, *n* = 84) mentioned that they received training related to food allergy at the workplace (Tables 4a and 4b). Of the respondents who received training, 95.24% mentioned that they participated in training on avoiding cross-contact between food during food preparation or services. This training seemed to be the most common one received by managers, with 100% indicating that they had gone through training on the prevention of cross-contact during the food handling process. In comparison, training in communicating allergen information effectively to customers seemed less common in Malaysia, as only half of the respondents (59.92%) mentioned that they had received such training. The results showed that allergen communication training was more common among managers (72.09%) than servers (46.34%).

Concerning the perception of food allergy training needs, most respondents agreed that training is necessary with a total mean rating of (M = 4.33, SD = 0.71) based on a 5-point Likert Scale, especially on how to communicate allergen information to customers (M = 4.40, SD = 0.84). However, the perception of the types of training needs was slightly different between managers and servers. As most managers perceived training in allergen communication to be most important in the restaurant (M = 4.57, SD = 0.75), servers mentioned that identifying the top eight food allergens is the most needed training for their level of work (M = 4.35, SD = 0.93).

Table 4a. Food allergy training received by managers and servers.

Training item	Total (*n* = 84)		Manager (*n* = 43)		Server (*n* = 41)	
	Yes *n* (%)	No *n* (%)	Yes *n* (%)	No *n* (%)	Yes *n* (%)	No *n* (%)
I have received training about food allergies (serious nature of food allergies, including allergic reactions, anaphylaxis, and death).	69 (82.14)	15 (17.86)	36 (83.72)	7 (16.28)	33 (80.49)	8 (19.51)
I have received training to identify the top eight food allergens.	56 (66.67)	28 (33.33)	33 (76.74)	10 (23.26)	23 (56.10)	18 (43.90)
I have received training on how to read food allergen labels.	62 (73.81)	22 (26.19)	32 (74.42)	11 (25.58)	30 (73.17)	11 (26.83)
I have received training on how to avoid cross-contact between foods during food preparation/service.	80 (95.24)	4 (4.76)	43 (100.00)	0 (0.00)	37 (90.24)	4 (9.76)
I have received training on how to communicate allergen information to customers.	50 (59.52)	34 (40.48)	31 (72.09)	12 (27.91)	19 (46.34)	22 (53.66)

Table 4b. Perceived food allergy training needs of managers and servers.

Training item	Total (*n* = 176)		Manager (*n* = 90)		Server (*n* = 86)	
	Mean	SD[a]	Mean	SD[a]	Mean	SD[a]
Training on food allergies (serious nature of food allergies, including allergic reactions, anaphylaxis, and death).	4.34	0.88	4.43	0.89	4.23	0.86
Training on how to identify the top eight food allergens.	4.30	0.96	4.24	0.99	4.35	0.93
Training on how to read food allergen labels.	4.27	0.92	4.40	0.91	4.14	0.91
Training on how to avoid cross-contact between foods during food preparation/service.	4.35	0.90	4.37	0.97	4.34	0.84
Training on how to communicate allergen information to customers.	4.40	0.84	4.57	0.75	4.22	0.90

[a]Standard deviation. Scale: 1 = very unnecessary; 2 = somewhat unnecessary; 3 = neither necessary nor unnecessary; 4 = necessary; 5 = very necessary.

Comparison of food allergy knowledge, attitude, practices, and training of managers and servers

A Mann-Whitney U test was conducted to examine food allergy knowledge, attitude, practices, training received, and perceived training needs between managers and servers. The distribution of all the five tested variables was not similar, as assessed by visual inspection. Table 5 shows that attitude and perceived training needs were significantly different between managers and servers. Therefore, H2 and H5 were accepted. The attitude scores for managers (mean rank = 94.91) were found to be significantly higher as compared to servers (mean rank = 81.79), U = 3293 z = -1.72, $p < 0.1$ using an exact sampling distribution for U (Dineen and Blakesley, 1973). The same results were shown for perceived training needs as managers' needs (mean rank = 96.93) were found to be significantly higher than servers (mean rank = 79.68), U = 3111.5, z = -2.27, $p < 0.05$ using an exact sampling distribution for U (Dineen and Blakesley, 1973). Therefore, H1, H3, and H4 were rejected with $p > 0.05$.

Table 5. Comparison of knowledge, attitude, practices, training received, and perceived training needs on food allergies between managers and servers.

Variable	Mean rank		*U* score	*z* score	*p* value
	Manager	Server			
Knowledge	**91.19**	85.68	3627.50	- 0.73	0.46
Attitude	**94.91**	81.79	3293.00	-1.72	.086*
Practices	**94.38**	82.35	3341.00	-1.60	0.11
Training received	**92.11**	84.73	3545.50	-1.04	0.28
Perceived training needs	**96.93**	79.68	3111.50	-2.27	0.02**

*significant at $p < 0.1$, and **significant at $p < 0.05$; bold values = higher mean rank.

Discussion

While the hospitality industry has suffered under the current pandemic, food safety and hygiene precautions are expected to be paramount for the recovery and post-COVID phases of gastronomic tourism. Restaurant employees need to be primed to accommodate diverse customers with special requests, including food allergies. The present work provided valuable insights into the quantitative differences between food allergy knowledge, food safety practices, training received, and perceived training needs among restaurant managers and front-line servers at Georgetown, Penang, one of Malaysia's popular tourist destinations. Food allergy management is crucial during COVID-19 as food allergy patients might be susceptible to severe allergic reactions which may conflict with the virus infection (Anaphylaxis UK, 2020; Zhang *et al.*, 2022).

Overall, the present work revealed that the food allergy knowledge of food handlers in Penang was moderate (mean = 5.71), with managers scoring slightly higher than servers (mean difference = 0.19). There was no significant difference in food allergy knowledge between managers and servers which was aligned with similar studies conducted in the United States and Canada (Lee and Sozen, 2018), or respondents of different job positions within a restaurant (McAdams *et al.*, 2018). As compared to a study conducted by Choi and Rajagopal (2013) in the United States, where the average mean score for university foodservice employees was 8.62, the knowledge of food allergies among food handlers in Malaysia was relatively poor.

Respondents of the present work were knowledgeable about how food allergy reactions occur after consuming food allergens, and the service staff's responsibility to prevent an allergic reaction in foodservice establishments. However, most of them were unaware that injectable epinephrine is the best treatment in cases of severe food allergic reactions, and most of them failed to identify the top eight food allergens from a given list of allergens. The result is of great concern, as a lack of knowledge in identifying the top eight food allergens poses some risk to customers with food allergies (Bailey *et al.*, 2014). For example, 32.3% of managers identified that shrimp does not belong to the top eight food allergens, which is 10% higher than servers. This result is worrying as shrimp is one of the top food allergens in Asia (Lee *et al.*, 2008). Therefore, if the managers or servers did not realise that the ingredients may include a major food allergen, it will likely increase the risk of food allergy to customers when eating out. Customers are dependent on information provided either in written or oral form by the restaurant (Barnett *et al.*, 2020). Therefore, education on the big eight allergens, which account for 90% of food allergy reactions, should be provided to both managers and servers.

Additionally, the results showed a significant difference in attitude between manager and servers. Most servers had positive attitude towards handling food allergies in their workplace (mean = 4.2), which corresponded with existing research (McAdams *et al.*, 2018). Managers and servers had positive attitude towards providing accurate information about food ingredients to customers, and were committed to preventing food allergies in their workplace. However, managers scored slightly higher than servers. This is not surprising as managers are the designated persons responsible for handling food allergy requests and questions. Therefore, they are more committed to meeting customer's special dietary requests than servers. Radke *et al.* (2016) also found a positive correlation between managers' attitude /

knowledge and experience of serving food to allergic customers. However, this relationship was not found to be of special significance among servers. In other words, even though all levels of staff are involved in serving meals to customers with food allergies, managers, as compared to servers, are more committed to ensuring that the food served is allergen-free.

Surprisingly, although respondents in the present work had only moderate knowledge, they had positive food allergy practices. This finding differed from previous research conducted by Radke *et al.* (2016), who showed that some allergy-specific practices consistently relate to knowledge and attitude of foodservice employees. In the present work, the respondents, especially managers, scored the highest in relation to attentiveness in answering customers' questions about food allergens. This result is not surprising as most customers sought to communicate their special dietary needs directly with managers rather than servers. Customers often felt that the servers were not very knowledgeable about food allergy reactions, and that the servers' answers about food allergies were unsatisfactory (Barnett *et al*., 2020). Moreover, customers worried that the requested special dietary needs were not effectively conveyed to the kitchen staff (Barnett *et al*., 2020). The findings of the present work further showed that respondents were not aware of the need to use separate equipment while handling allergen-free food. This may increase the probability of cross-contact with allergen-containing food in the food handling process. However, there was no significant difference between the food allergy practices of managers and servers.

Comparing food allergy training needs, managers generally received more food allergy training than servers. However, the difference between both job positions was not significant. The present work showed that the education of food allergies among foodservice employees in Penang was insufficient. Fewer than half the servers interviewed mentioned that proper training regarding food allergy was provided at the workplace. Several barriers such as lack of interest and commitment (Lee and Xu, 2015), lack of resources, and high turnover rates might be why training is not provided at the workplace (Soon, 2020).

Furthermore, the results showed that the training provided was incomplete as most respondents mentioned that training in the communication of food allergen information to the customers was not provided. Respondents perceived it as an essential training element that must be incorporated into their workplace training. This result was not surprising as past studies have shown similar findings (Wen and Kwon, 2016; 2017). Even though food allergy training was provided in some of the restaurants concerning identifying food allergens and preventing cross-contact, few of them have provided training about proper communication between the front- and back-of-house employees, or between restaurant employees and customers (Lee and Xu, 2015). Even though training and certification may be crucial in improving knowledge and attitude (Soon, 2020), findings showed that there was significant difference between managers and servers on perceived training needs, and lack of interest among servers in participating in such training. Servers may feel that the duty of communicating issues related to allergens to concerned customers is part of the manager's responsibility. The managers will instruct most servers to pass allergen-free requests to them instead of empowering them to make proactive decisions (Wen and Kwon, 2016). As such, servers may not be prepared to handle these situations, thus potentially leading to high customer dissatisfaction.

Theoretical implications

As a theoretical contribution, the present work integrated the following five dimensions of food allergy understanding, (1) food allergy knowledge, (2) attitude, (3) practices, (4) training received, and (5) perceived training needs to examine the differences between restaurant managers and servers within a Malaysian context. This way, a more nuanced understanding of managing food allergies in restaurant contexts has been established, and gaps between preconceived ideas and actual behaviour, identified. Comparative studies between the perspectives of restaurant managers and servers are scarce, and can assist restaurants in better planning their food allergy-related policies and practices.

The present work highlighted critical issues for managing food allergies in Malaysia's restaurants. The present work thus contributed to the emerging literature on accommodating consumers with food allergies in the hospitality industry (Choi and Rajagopal, 2013; Barnett *et al.*, 2020; Lee and Liu, 2021; Zhang *et al.*, 2022). Our findings showed significant difference in attitude and perceived training needs among managers and servers. Most

foodservice employees had moderate food allergy knowledge but had positive attitude, practices, and perceived training needs. However, such positive scores in attitude would not necessarily translate into practical behaviour in real-life situations. Past studies have shown that numerous factors, including pressure to complete daily tasks on time, lack of managerial and resource support, lack of understanding of the need to comply with guidelines, lack of motivation and rewards, and lastly, insufficient reminders from the managers, represent barriers to the implementation of knowledge in everyday operations (Howells *et al*., 2008). In addition, more than 50% of foodservice employees do not receive training in food allergies. This is also relevant for gastronomic tourism in Malaysia as Penang is a popular destination for domestic and international tourists. With the increase in food allergy incidents in Malaysia, food allergy awareness among foodservice employees, as well as their preparedness to meet consumers' needs, is paramount.

Practical implications

Regarding practical implications, the present work showed that food allergy cases may lessen when the awareness level of food allergy increases (Behemann, 2010). Education in food safety in general and food allergens enhances knowledge and awareness. Therefore, the restaurant industry – including staff members in the managerial and employee roles, public sector policymakers, and educators can cooperate in developing appropriate educational tools to improve food allergy knowledge of foodservice employees (Rai and Bai, 2017). This will help improve the image of Penang's tourism industry and gain re-growth in the number of visitors to Penang, especially in the tourism recovery process post-COVID-19. Another practical implication relates to effective communication and employee-guest interaction. Therefore, employees' training should also focus on communication skills since servers must communicate directly with customers. Such a strategy may be further supported by a written document which outlines the procedures for communicating and serving guests with dietary restrictions (Lee and Liu, 2021).

Limitations and future research

The present work had several limitations and future research directions that need to be acknowledged. The present work only focused on managers and servers. To obtain a more holistic perspective on managing and communicating food allergies, future researchers may include food handlers and chefs (also see Eren *et al.*, 2021) in their study who also play significant roles in food safety. Furthermore, future research may use qualitative methods such as semi-structured interviews and observations to obtain in-depth information about actual food allergy attitude and practices among foodservice employees.

Conclusion

Food and dining out at restaurants are important parts of the leisure experience at many destinations. However, the risks of exposure to food allergens in restaurants have increased over the last few decades, prompting the restaurant industry to be better prepared for such events.

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