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Food Allergy Knowledge and Attitudes of Owners and Managers of Independently Owned Restaurants in Metro Orlando, Florida

ABSTRACT

Owners and managers (n = 102) of independently owned restaurants in Metro Orlando, FL, completed a web-based questionnaire that assessed food allergy knowledge and attitudes. Participants were confident in their knowledge of food allergens (4.28 ± 0.63). The attitude item with the lowest mean score was "not all restaurants needed to comply with food allergy policies" (2.70 ± 1.26), suggesting participants believed compliance with food allergy policies was critical in all restaurants. Eighty (78.4%) participants correctly answered all 10 knowledge questions. The mean knowledge score was 7.7 of 10 possible points. Florida requires foodservice workers to be knowledgeable about food allergies but does not mandate food allergy training or certification. It is in the best interest of foodservice establishments to train workers on food allergies to safeguard customer health.

INTRODUCTION

Commercial restaurants serve roughly 70 billion meals and snacks annually in the United States, substantially contributing to the economy *(22, 29)*. According to the U.S. Department of Agriculture *(43)*, the restaurant and foodservice industry accounts for more than 50% of dollars spent by Americans away from home. As consumer expenditure in foodservice operations continues to increase, providing safe food to consumers is essential to prevent illness or death, lawsuits, business loss or closure, and loss of reputation.

Studies have indicated an increase in individuals with food allergies and how food allergies affect many Americans *(16, 17, 25, 26, 36, 45)*. More than 32 million Americans are affected by food allergies annually, costing consumers US$24.8 billion in medical costs, including doctor visits, emergency room treatment, and hospitalizations *(12, 15)*. Families spend US$20.5 billion annually in labor productivity due to time away from work for doctor appointments and other related medical expenses *(14)*. Americans spend more than US $5.5 billion annually out of pocket on allergen-free foods *(14, 15)*.

A food allergy reaction results from an immune response to proteins in certain foods. The top nine food allergens are milk, eggs, peanuts, tree nuts, fish, crustacean shellfish, wheat, soy, and sesame *(12)*. Allergic reactions can cause

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short-term symptoms, such as hives and shortness of breath, and death may occur in some cases. Food allergy incidents can happen anywhere, but these incidents commonly occur at restaurants *(1, 3, 5)*. Because of the complexities of preparing allergen-free meals, foodservice establishments encounter challenges in accommodating consumers with food allergies *(31)*. According to Lee and Sozen *(24)*, consumers with food allergies have also increased, with more consumers eating away from home. Kwon and Lee *(22)* suggested that with the intensifying prevalence of food allergies, it is vital that clear and precise communication among consumers and foodservice employees and between employees occurs. Moreover, consumers with food allergies have become more cautious and communicate food allergy needs with foodservice employees when dining out *(22, 27)*. The Americans with Diasbilities Act (ADA) and Section 504 includes food allergy as a disability and entities that receive federal money should accommodate individuals with food allergies *(4)*.

Communication of food allergies

Lack of communication among front of house and back of house foodservice employees, hidden food allergens in menu items, and cross contact (an allergen-free food becoming contaminated with an allergen-containing food) have been implicated in food allergy incidents in restaurants *(21, 26)*. Clear communication between foodservice employees and customers with food allergies is critical for safeguarding customers. Wen and Kwon *(45)* suggested that training foodservice employees on proper communication with customers with food allergies can influence employees to reduce risky food handling behaviors *(45)*.

A comprehensive training and communication plan will provide employees with the necessary knowledge to provide a safe dining experience *(41)*. A study by Abbot et al. *(1)* found that foodservice employees lacked knowledge of food allergens in menu items and how to avoid cross contact during food preparation and service. Another study conducted with foodservice employees in take-out restaurants found a lack of understanding of food allergy versus food intolerance and ways to prevent cross contact *(35)*.

Food allergy accommodations

Gupta et al. suggested training managers and employees could prevent food allergy incidents at restaurants *(15)*. Another study suggested foodservice operations willingly modify menu times, use alternative allergen-free ingredients, and use separate equipment to prepare and serve customers with food allergies *(34)*. In a study of 110 restaurant managers in the southern United States, 77.3% were willing to modify recipes to accommodate consumers with food allergies *(26)*. However, providing allergen-free meals remains challenging for foodservice operations *(23, 32, 43, 45)* due to the complexities of menu items, cost, time needed for purchasing alternative ingredients, lack of experience in preparing allergen-free meals, and cost of preparing and training the employees to accommodate customers with food allergies.

Food allergy attitudes, knowledge, and training of owners and managers in restaurants

There is little research on food allergy knowledge, attitudes, and training of owners and managers in independently owned restaurants *(26)*. Past research has documented the impact of employee food safety knowledge and attitudes on food handling practices *(2, 6, 7, 10, 21, 28, 37)*. Training can increase food allergy knowledge, which influences attitudes, thereby improving food handling practices and preventing incidences of food allergy reactions. Lee and Xu *(26)* in the United States surveyed 110 restaurant managers in the United States on food allergy knowledge, attitudes, and preparedness for handling a food allergy emergency. Forty percent of participants could not identify that fish and soy belonged to the "big eight" food allergens. Eighty percent of participants lacked an understanding of listing the common eight food allergens on menu items, and 54.5% of participants believed that food intolerance and food allergy were the same condition. Participants perceived that customers should be responsible for communicating food allergy accommodations to foodservice staff. Forty-one participants disagreed or strongly disagreed that the foodservice staff must ask customers if they need food allergy accommodations. A food allergy training intervention evaluated the effect of food allergy training on foodservice employees' (n = 11) knowledge and skills needed to safely serve customers with food allergies in the United Kingdom *(5)*. Before training, 82% of participants were able to answer food allergy knowledge questions correctly, and this increased to 91% post-training.

However, increased knowledge alone does not always result in safe food handling practices *(21, 24, 26, 46)*. The food safety culture of foodservice establishments also influences employee food handling practices *(10)*. Foodservice establishments that support employees by providing the equipment, tools, training, and rewards for safe food handling practices create intrinsic and extrinsic motivation for employees to handle food safely. The current study aimed to assess food allergy attitudes and knowledge of owners and managers in independently owned restaurants in Metro Orlando, FL.

MATERIALS AND METHODS

A web-based questionnaire was developed and emailed to owners and managers of independently owned restaurants in Metro Orlando, FL. The institutional human subjects review board approved the data collection procedures and instruments. According to the Florida Department of Business & Professional Regulation guidelines, form HR

5030-039, all restaurant managers and employees must be familiar with the definition of a food allergy, the top eight food allergens, and describe common symptoms of an allergic reaction *(11)*.

Sample

The restaurants identified for this project were obtained from an initial listing of 1,123 independently owned establishments in Metro Orlando, FL, from the Florida Department of Business & Professional Regulation, Division of Hotels and Restaurants. The COVID-19 pandemic resulted in 78 permanent and 88 temporary restaurant closures in Metro Orlando *(30, 47)*, resulting in 957 independently owned restaurants. The list was reviewed and revised by restaurant type and cuisine. The principal investigator called the restaurants and talked to an owner or manager, explaining the reason for the phone call, purpose of study, data collection procedures, and eligibility criteria. Owners and managers that agreed to participate in the study provided email addresses to receive the questionnaire. Two hundred fifty-five restaurants did not answer or return telephone calls, and 41 restaurants refused to participate in the study. Six hundred and sixty-one email addresses remained, with 60 undeliverable email addresses, for a final restaurant listing of 601 that participated in the study.

Survey instrument

The questionnaires developed by Rajagopal and Strohbehn *(33)* and Choi and Rajagopal *(8)* were adapted for this study based on guidelines by Dillman et al *(14)*. The questionnaire consisted of 10 food allergy knowledge questions, 19 food allergy attitude items (1 = strongly disagree; 5 = strongly agree), and 10 demographic questions. Correct answers to knowledge questions earned one point, with zero points for incorrect answers. According to the U.S. Census Bureau of Labor Statistics *(41, 42)* 25.6% of Metro Orlando, FL, residents are native Spanish speakers, and Spanish is the most common non-English language in the region. The questionnaire was translated into Spanish and translated back into English to ensure the accuracy of the translation. Experts in food safety, foodservice, and research design reviewed the questionnaire before the pilot test.

Pilot study

The questionnaire was sent to 20 owners and managers of independently owned restaurants in Metro Orlando, FL. Four participants ($n = 4$) completed and returned study. Participants received two reminder emails at 1-week intervals prompting them to complete the questionnaire.

Data analysis

Data were analyzed by using IBM SPSS software (version 27.0, IBM Corporation, Armonk, NY). Descriptive statistics (frequency, percentage, mean [M], and standard deviation [SD]) were computed. Cronbach's alpha coefficient was measured to assess the reliability of the questionnaire *(17)*. Chi-square tests examined the differences between independent variables and the relationship between two nominal variables *(29)*. Analysis of variance (ANOVA) examined the relationship between food allergy attitudes and knowledge and participant demographic variables *(39)*.

RESULTS

Demographic characteristics

One hundred eleven questionnaires were received; 9 were incomplete, resulting in 102 valid questionnaires *(Table 1)*. More than half of the participants were male ($n = 65$, 63.7%). The average participant age was 26 to 33 years ($n = 33$, 32.4%). English was the most spoken language ($n = 63$, 61.8%), followed by Spanish ($n = 35$, 34.3%). Less than half of the participants ($n = 42$, 41.2%) were Hispanic or Latino, followed by Caucasian or White ($n = 39$, 38.2%). Forty-three (42.2%) participants had 1 to 5 years of work experience in foodservice. Fifty-nine (57.8%) participants had 1 to 5 years of experience as the owner or manager at the current restaurant. Participants reported an average of 41 to 50 hours worked per week ($n = 56$, 54.9%). The most common cuisines represented were American cuisine ($n = 41$, 40.2%), followed by Latino cuisine ($n = 31$, 30.4%). Participants worked at casual full-service ($n = 40$, 39.2%) and quick-service restaurants ($n = 35$, 34.3%). Sixty (58.8%) participants had received formal food safety training. Fifty-three (52.0%) participants had not received any food allergy training. Eighty (78.4%) participants did not have food allergy training certification.

Food allergy knowledge of owners and managers

The average food allergy knowledge score was 7.68 ± 2.11 of 10 possible points *(Table 2)*. Eighty (78.4%) participants correctly identified eggs as a food allergen. Over half of the participants ($n = 59$, 57.8%) recognized that proteins in some foods trigger food allergies. Seventy-three (71.6%) participants recognized the symptoms of food allergic reactions, and 85.3% ($n = 87$) knew that identifying food allergens in menu items can prevent an allergic reaction. Most participants ($n = 89$, 87.3%) knew they should wash their hands before preparing allergen-free foods and after wiping surfaces on which allergen-containing foods were prepared or consumed. Over 91.2% ($n = 93$) of participants recognized cross-contact practices that can transfer an allergen from one food to another. In contrast, over three-quarters ($n = 85$, 83.3%) identified practices to prevent an allergic reaction and avoid cross contact. More than half of the participants ($n = 59$, 57.8%) were familiar with the state of Florida rule requiring all foodservice employees to know the most common food allergens. Sixty (58.8%) participants knew restaurants in Florida were not required to provide allergen-free menu options for customers with food allergies.

TABLE 1. Demographic characteristics of restaurant owners and managers (n = 102)[a]

Demographic characteristics	*n*	%
Gender		
Man	65	63.7
Woman	36	35.3
Prefer not to answer	1	0.98
Age (year)		
18–25	10	9.8
26–33	33	32.4
34–41	30	29.4
42–49	13	12.7
50 and older	16	15.7
Race		
Hispanic or Latino	42	41.2
Caucasian or White	39	38.2
Black or African American	11	10.8
Asian	8	7.8
American Indian or Alaskan Native	1	0.9
Prefer not to answer	1	0.9
Highest level of education		
High school/GED	15	14.7
Some college	24	23.5
Associate degree	20	19.6
Bachelor's degree	34	33.3
Master's degree	8	7.8
Doctoral degree	1	0.9
First language		
English	63	61.8
Spanish	35	34.3
Other	2	1.1
Chinese	1	0.9
Haitian Creole	1	0.9
Years owned or managed current restaurant		
Less than 1 year	12	11.8
1–5 years	59	57.8
6–10 years	15	14.7
11–15 years	5	4.9
16 or more	11	10.8

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TABLE 1. Demographic characteristics of restaurant owners and managers (*n* = 102)[a] (cont.)

Demographic characteristics	*n*	%
Years of foodservice experience		
Less than 1 year	1	1.0
1–5 years	43	42.2
6–10 years	24	23.5
11–15 years	14	13.7
16 years or more	20	19.6
Restaurant type		
Casual full service	40	2
Quick service	35	34.3
Fine dining full service	13	12.7
Takeout and delivery	10	9.8
Other	4	3.9
Type of cuisine		
American	42	41.2
Latino (e.g., Mexican, Puerto Rican, Venezuelan)	31	30.4
Italian	10	9.8
Chinese	5	4.9
Indian	1	1.0
Japanese	1	1.0
Vietnamese	1	1.0
Other	11	10.8
Have food allergy certification		
Yes	53	52.0
No	49	48.0

[a]Total response is less than 102 due to unanswered questions.

Demographic differences in knowledge

ANOVA assessed differences in knowledge by race, education, and food allergy training. ANOVA is an appropriate statistical analysis when testing for differences between groups in a continuous dependent variable *(38)*. The ANOVA for knowledge by race was statistically significant, $F(3, 98) = 4.42$, $P = 0.006$, partial $\eta^2 = 0.12$, indicating significant differences in knowledge between races. Tukey post hoc tests showed knowledge scores of Caucasian or White (M = 0.85, SD = 0.14) was higher than Hispanic or Latino participants (M = 0.69, SD = 0.23).

The ANOVA for knowledge by education was statistically significant, $F(4, 97) = 5.60$, $P < 0.001$, partial $\eta^2 = 0.19$, indicating significant differences in knowledge between education levels. Tukey post hoc analyses indicated knowledge scores for those with a high school degree (M = 0.63, SD = 0.23) and some college (M = 0.67, SD = 0.85) were significantly lower than those with an associate degree (M = 0.85, SD = 0.15), bachelor's degree (M = 0.82, SD = 0.19), and postgraduate degree (M = 0.87, SD = 0.15). The ANOVA findings for knowledge by food allergy training were statistically significant, $F(1, 100) = 17.32$, $P < 0.001$, partial $\eta^2 = 0.15$, indicating significant differences in knowledge on the basis of food allergy training. The findings indicate that knowledge scores for those with food allergy training (M = 0.85, SD = 0.14) were significantly greater than those without food allergy training (M = 0.68, SD = 0.24).

Attitudes of owners and managers toward food allergies

Participants indicated agreement or disagreement with 19 attitude statements toward food allergy policies and procedures related to foodservice establishments *(Table 3)*.

TABLE 2. Food allergy knowledge of owners and managers (*n* = 102)

Questions	*n*	%
Which of the following is among the top eight food allergens?		
Chicken	15	14.7
Marshmallows	3	2.9
Eggs[a]	80	78.4
Spinach	4	3.9
Which of the following is not among the top eight food allergens?		
Milk, shellfish	0	0.2
Peanuts, tree nuts	2	1.9
Eggs, soy	2	1.9
Yeast, sugar[a]	98	96.1
A food allergy is triggered by which of the following in food?		
Carbohydrates	27	26.5
Proteins[a]	59	57.8
Fats	14	13.7
Vitamins	0	0.0
Which of the following is not a symptom of a food allergic reaction?		
Hives	21	20.6
Itching	3	2.9
Trouble breathing	5	4.9
Nosebleed[a]	73	71.6
When should hands be washed?		
After preparing food containing food	2	1.9
After preparing allergen-free allergen	7	6.9
After wiping tables containing an allergen	4	3.9
All of the above[a]	89	873
Which of the following can a foodservice employee do to prevent an allergic reaction?		
Cook food to the right internal temperature	4	3.9
Be able to identify ingredients in menu items containing allergens[a]	87	85.3
Use the dishwasher for washing dishes	10	9.8
Store food in the refrigerator	1	0.97
Which of the following is an example of cross contact?		
Utensils that are cleaned and sanitized before preparing allergen-free food	1	0.97
Chopping boards that are cleaned and sanitized before preparing an allergen-free food	6	5.9
Allergen-free products are stored away from allergen-containing foods	2	2.0
A knife used for peanut butter is also used to prepare a nut-free sandwich[a]	93	91.2

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TABLE 2. Food allergy knowledge of owners and managers (*n* = 102) (cont.)

Questions	*n*	%
Which of the following should you do to avoid cross contact?		
Cook the allergy-free foods first	1	0.97
Use separate utensils and dishes for making and serving safe foods	5	4.9
Wash your hands with soap and water before preparing allergen-free food	10	9.8
All of the above[a]	85	83.3
In Florida, restaurants are required to have allergen-free menu options for customers with food allergies.		
Yes	10	9.8
No[a]	60	58.9
Don't know	32	31.4
In Florida, all restaurant employees are required to know the most common food allergens.		
Yes[a]	59	57.8
No	29	28.4
Don't know	14	13.7

[a]Correct answers to knowledge questions

Cronbach's alpha coefficient for attitude items was 0.72. The M food allergy attitudes score was 3.55 (SD = 0.45). Attitude items that had a M score of 4.0 or higher on a 5.0 scale were "I am confident in my knowledge of food allergens" (4.28 ± 0.63); "It is important to me that all employees working in my restaurant receive food allergy training" (4.05 ± 0.83); "Employee compliance with the restaurants' food allergy policies and procedures are important for public health" (4.00 ± 1.25); and "I would be interested in receiving the latest information about food allergies" (4.00 ± 0.98).

The lowest scoring attitude items were "it is not the responsibility of my restaurant if a food allergic reaction occurs in the restaurant" (2.91 ± 1.21); "my restaurant does not have food allergy policies and procedures for employees because no food allergy incidents have ever occurred in my restaurant" (2.84 ± 1.41); and "not all restaurants need to comply with food allergy policies and procedures" (2.70 ± 1.41).

Demographic differences in attitudes

Chi-square test results were significant $\chi^2(4) = 23.09$, $P < 0.001$, suggesting that the type of restaurant and allergen-free menu items identified in restaurants are related. Chi-square results were not significant for the type of cuisine and allergen-free menu items in restaurants $\chi^2(1) = 1.31$, $P = 0.252$, suggesting observed frequencies were not significantly different than the expected frequencies.

The chi-square test results were significant on the basis of an alpha value of 0.05, $\chi^2(4) = 14.72$, $P = 0.005$, suggesting that type of restaurant and written food allergen policies and procedures are related to one another. The type of cuisine and written food allergen policies and procedures in restaurants were independent. The chi-square results were not significant $\chi^2(1) = 0.89$, $P = 0.345$, suggesting that the type of cuisine and written food allergen policies and procedures in restaurants were unrelated.

The ANOVA for attitudes by race were not statistically significant, $F(3, 99) = 0.42$, $P = 0.739$, partial $\eta^2 = 0.01$, indicating no significant differences in attitudes between races. The ANOVA findings for attitudes by education were statistically significant, $F(4, 97) = 4.23$, $P = 0.003$, partial $\eta^2 = 0.15$, indicating significant differences in attitudes between education levels. Post hoc Tukey analyses indicated that attitudes scores for those with a high school degree (M = 3.22, SD = 0.97) were significantly less than those with an associate degree (M = 3.72, SD = 0.34), bachelor's degree (M = 3.61, SD = 0.40), and postgraduate degree (M = 3.78, SD = 0.50). The ANOVA for attitudes and food allergy training was not statistically significant, $F(1, 100) = 2.80$, $P = 0.097$, partial $\eta^2 = 0.03$, indicating receiving food allergy training does not impact attitudes toward food allergies.

DISCUSSION

This study aimed to examine the food allergy knowledge and attitudes of owners and managers in Metro Orlando, FL. Females constitute 49% of managers and 56% of supervisors

TABLE 3. Food allergy attitudes of owners and managers (n = 102)

Attitudes	M	SD
I am confident in my knowledge of food allergens.[b]	4.28	0.64
It is important to me that all employees working in my restaurant receive food allergy training.[b]	4.05	0.84
Employee compliance with the restaurant's food allergy policies and procedures is vital for public health.	4.00	1.25
I would be interested in receiving the latest information about food allergies.	4.00	0.98
My restaurant should regularly provide the latest food allergy information to employees.	3.81	1.01
Employee food allergy training is essential to avoid food allergic reactions.	3.78	0.97
My restaurant should provide food allergy training to employees handling food (servers).	3.73	1.09
Employees that receive food allergy training always follow food allergy policies and procedures.	3.63	0.97
My restaurant should provide food allergen information to consumers with food allergies.	3.63	1.12
It is not the responsibility of my restaurant if a food allergic reaction occurs outside the restaurant from food purchased at my restaurant.	3.62	1.16
All my staff members know what to do in case of a suspected food allergic reaction.	3.58	1.02
All members of my staff are knowledgeable about my restaurant's food allergy policies and procedures.	3.57	1.08
It is important to provide food allergy training in multiple languages.	3.56	1.09
All members of my staff are knowledgeable about food allergens.	3.48	1.04
When food is ordered for delivery (UberEats, etc.), the restaurant is not responsible if a food allergic reaction occurs.	3.17	1.26
There is a need to develop food allergy policies and procedures in my restaurant.	3.17	1.15
It is not the responsibility of my restaurant if a food allergic reaction occurs in the restaurant[b]	2.91	1.21
My restaurant does not have food allergy policies and procedures for employees because no food allergy incidents have ever occurred in my restaurant[b]	2.84	1.41
Not all restaurants need to comply with food allergy policies and procedures[b]	2.70	1.26

[a]Rating scale: 1, strongly disagree; 5, strongly agree.
[b]Reverse coded items

in the U.S. foodservice industry *(30)*, but in this study, 67.3% were male. The average participant age was 26 to 33 years (n = 33, 32.4%), which is above the national average age for U.S. restaurant owners and managers (27.1%) *(30)*. More than three-quarters of U.S. foodservice workers (77.9%) have some sort of food safety training certification (i.e., ServSafe, National Environmental Health Association) *(18)* but not specifically food allergy training. Massachusetts, Maryland, Michigan, Rhode Island, and Virginia have laws for food allergy management in restaurants *(12)*. Illinois requires at least one person on staff in the restaurant at all times when the restaurant is operating that has received food allergy training and allergen awareness *(12)*. New York, NY, and St. Paul, MN, require food allergy posters to be posted in restaurants *(12)*. In our study, only 52% of participants had food allergy certification. This finding is not surprising because Florida does not require foodservice workers to undergo food allergy training. A disconnect exists because Florida requires all foodservice employees to know about food allergies, the top eight food allergens, and describe common symptoms of an allergic reaction *(11)*, but providing food allergy training is not required.

Participants demonstrated food allergy knowledge, as evidenced by the average knowledge (7.68 ± 2.11 from 10 possible points). In a study of restaurant managers (n = 278) by Radke et al., more than 80% of managers were able to identify major food allergens, allergy symptoms, and severity of food allergy reactions, and managers had significantly higher food allergy knowledge than those that prepared food *(32)*. Only 57.8% of participants in our study correctly identified that proteins in foods cause a food allergy reaction, suggesting participants were aware of food allergens and allergy symptoms, but not all could identify what food component causes an allergic reaction. Food allergy edu-

cators could address this need when providing food allergy training to owners and managers and food preparers. However, Lee and Xu found that 40% of foodservice managers (n = 110) could not identify soy and fish among the top allergens *(26)*.

The onus of educating foodservice workers on food allergies rests on the restaurant owners and managers. Foodservice establishments would benefit from developing a comprehensive training and communication plan to provide customers with a safe dining experience and employees with the knowledge and procedures to provide exemplary guest service *(41)*. Jackson-Davis et al. *(18)* described how contextualized information communicated to food handlers had helped change the food safety behaviors of employees. The authors concluded that communicating food safety risks by targeting a specific audience and cultivating a personal connection from those at risk to the food handlers have proven to produce change.

Participants rated three attitude statements with low scores: "it is not the responsibility of my restaurant if a food allergic reaction occurs in the restaurant"; "my restaurant does not have food allergy policies and procedures for employees because no food allergy incidents have ever occurred in my restaurant"; and "not all restaurants need to comply with food allergy policies and procedures." The U.S. Food and Drug Administration does not require commercial foodservice establishments to accommodate customers with food allergies *(44)*; however, it might be a requirement at the state and local level. Foodservice establishments could face legal consequences along with loss of business and reputation if customer safety is compromised *(3)*.

Our study found areas with potential for improvement. Most participants demonstrated basic food allergy knowledge, but some gaps in food allergy knowledge existed. Foodservice operations can address this gap by providing food allergy training (formal and informal) to employees by using handouts, posters, and information booklets that are available at no cost from the Food Allergy Research and Education organization *(10)*. Owners and managers can use this knowledge to train foodservice workers in restaurants. Foodservice workers receiving food allergy training are more likely to have an action plan in place and implement this action plan to accommodate customers with food allergies *(46)*. Foodservice operations can also encourage safe food handling practices by providing incentives to employees, such as a raise, promotion, or recognition as an employee of the month.

The mean score for owners' and managers' attitudes toward food allergy policies and procedures was 3.55 ± 0.45. Participants' attitude scores suggested they perceived safe food allergen handling practices were essential. However, participants did not feel food allergy policies and procedures were necessary for the restaurant because no food allergy incidents occurred or they felt not all restaurants need to have food allergy policies and procedures. Foodservice workers may perceive that the food safety locus of control lies with the customers and that customers will be responsible and communicate food allergy needs to the foodservice workers. However, consumers perceive foodservice establishments to be diligent about food safety owing to "optimistic bias," which refers to individuals believing they are at less risk of negative experiences than their peers, thus, diminished perception of risk *(34)*.

CONCLUSIONS

Findings from this study provided insight into food allergy knowledge and attitudes of owners and managers from Metro Orlando restaurants. Training about food allergies and the restaurant's food allergy policies and procedures could improve the food allergy attitudes and knowledge of owners and managers. Knowledge and attitudes do not always result in safe food handling practices *(2, 6, 10, 21, 26, 40, 46)*. Restaurant owners and managers and employees can create a food safety culture and work as a team to develop and implement food allergy policies and procedures.

Future studies could also investigate factors influencing the development and implementation of food allergy training independently owned restaurants, including available training in multiple languages. Future research could assess if differences exist between the attitudes and knowledge of foodservice employees and owners and managers, which might influence the development and implementation of food allergy policies and procedures. Qualitative research methods such as observations, focus groups, and interviews can enable researchers and foodservice establishment stakeholders to delve deeper into food allergy attitudes, knowledge, and practices of foodservice workers and managers. Most studies have assessed the knowledge, attitudes, and self-reported practices, which do not reflect actual food handling practices.

This study has some limitations. Many restaurants were closed or operating with limited hours because of the COVID-19 pandemic, making it challenging to contact participants. Broyles et al. *(7)* suggested that a lack of face-to-face and personal recruitment strategies may impact participants' response rates. Temporary and permanent restaurant closures, incorrect email addresses of owners and managers, and incorrect or nonfunctional restaurant phone numbers compounded the challenges faced with data collection.

The COVID-19 pandemic may have also influenced participants' willingness to partake in the study because, since the pandemic started in March 2020, restaurants have struggled to operate due to COVID guidelines, supply chain issues, and employee turnover. Language barriers may have influenced the willingness to participate, but only 34.2% of participants listed Spanish as the first language spoken at home. Social desirability bias might have affected participant responses. An assessment of the socioeconomic background and its influence on foodservice workers' food allergy attitudes and knowledge is warranted holistically to look at food allergy attitudes, knowledge, and practices.

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