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Restaurant takeout practices of food-allergic individuals and associated allergic reactions in the COVID-19 era

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Clinical Implications

Allergic reactions from restaurant takeout food were reported by 16.8% of survey respondents, and about 25% avoided takeout altogether, with no differences before or during coronavirus-19. Allergists should counsel patients regarding obtaining safe restaurant takeout.

Individuals with food allergies face challenges when ingesting food prepared in restaurants. Allergic reactions can be severe or even fatal. In a US national registry study, 19% of food-associated fatalities occurred in restaurants.^{1,2} Although restaurant staff may feel comfortable providing allergen-safe meals, deficits exist in staff training and knowledge of food allergies.^{3,4} A recent analysis of national survey data showed that the home accounts for 51% of food-allergic reactions in children.⁵ Some of these reactions could result from restaurant takeout, but takeout was not specifically assessed. Dining out accounted for 13% of reactions.⁵ Allergic reactions to restaurant takeout has not been previously evaluated.

With social distancing implemented during the coronavirus-19 (COVID-19) pandemic, takeout has become more common. We sought to characterize takeout preferences among US families with a food-allergic child before and during the COVID-19 pandemic. As a secondary objective, we characterized any associated allergic reactions. We created a survey of parents ordering takeout with data before and during the pandemic, allergic reactions, and demographics. The study was approved by the institutional review board. From November to December 2020, a Research Electronic Data Capture online survey was distributed via the Mount Sinai Jaffe Food Allergy Institute listserv and social media. Listserv subscribers include food-allergic individuals, their parents, and individuals interested in food allergy. Individuals aged 18 years or older with at least one child with a physician-diagnosed food allergy were sent the survey after we obtained informed consent. Deidentified, parental-reported data were collected. Descriptive statistics, McNemar, Wilcoxon signed rank sum, chi-square, Fisher exact, and Cochran-Armitage trend tests were used for analyses, all performed using SAS software (version 9.4, (SAS Institute, Cary, NC). Statistical significance was set at P less than .05.

A total of 206 individuals participated. Children with food allergy were mostly male (56.3%), White (87.9%), non-Hispanic (83.5%), and from the northeast (New York, 60.7%; New Jersey, 21.4%; and Connecticut, 6.8%). [Table E1](#) (in this article's Online Repository at www.jaci-inpractice.org) lists demographics. Before the pandemic, defined as before March 2020, most families reported ordering takeout in varying frequencies (77.7%). [Table E2](#) (in this article's Online Repository

at www.jaci-inpractice.org) lists takeout preferences and practices. Overall, there were no differences in takeout practices among food-allergic individuals before and during the COVID-19 pandemic.

[Figure 1](#) shows pre-COVID precautions taken by food allergic individuals who order takeout and reasons why respondents avoided takeout. Other mitigation efforts (11.2%) included only ordering from restaurants previously visited or that do not cook with avoided ingredients. There were no differences in these responses pre-/during COVID-19; however, during COVID-19, 11.2% indicated that the pandemic was a reason to avoid takeout.

Allergic reactions from restaurant takeout were reported by 16.8% ($n = 29$) of 173 respondents. Thirty-three participants did not answer. Most children who had an allergic reaction were school-aged children or adolescents: 6 to 12 years (37.9%), 13 to 17 years (37.9%), and 18 years or older (13.8%). Allergic reactions varied from one (44.8%) to two (34.5%) and three or more (20.7%). One allergic reaction was excluded from analyses owing to delayed symptom onset; all other reported reactions occurred within 2 hours. Symptoms typically occurred within 30 minutes (69.0%), or from 31 minutes to 2 hours (27.6%); 28.6% reported emergency room evaluation. Treatment included oral antihistamines (86.2%), epinephrine autoinjector use (27.6%), steroids (20.7%), bronchodilators (6.9%), none (6.9%), and antacids (3.4%). The source of allergic reaction was often unknown. When identified, milk (24.1%), peanut (20.7%), and wheat (6.9%) were most common. Restaurant cuisines most often implicated in allergic reactions included Chinese (25.0%), American (14.3%), and Indian, Korean, Thai, Italian, vegan, or hotel restaurants (each 7.1%). There were no significant differences in takeout precautions or methods for ordering among those who had reactions. A statistically higher risk for reaction was noted for those ordering Mexican, Chinese, or Asian cuisine not specified by the survey participant ([Table I](#)).

Here, to the best of our knowledge, we report the first study evaluating restaurant takeout practices among food-allergic individuals and any associated allergic reactions. Allergic reactions to takeout food occur despite precautions taken by food-allergic individuals: 16.8% in this survey. Severe allergic reactions occurred mostly to food from Asian restaurants. These results were consistent with research citing Asian restaurants as high-risk for food-allergic reactions (up to 19%), and suggest that risk may vary by cuisine, which should be considered by restaurant patrons.⁶ Our study highlights specific precautions taken by food-allergic individuals ordering takeout ([Figure 1](#)). Although there was no difference in the types of precautions exercised among individuals who reacted and did not react, future studies understanding the efficacy of individual precautionary strategies are suggested to identify best practices. Most individuals who had an allergic reaction took steps to prevent one from occurring. Interestingly, only one individual experienced an allergic reaction when no precaution was taken. We hypothesize that miscommunication of allergy status from families to restaurants may explain why individuals experienced allergic reactions even when precautionary steps were taken. Moreover, certain precautionary strategies may have different levels of effectiveness compared with others. We would not encourage a dependence on the visual

Practices of Food Allergic Individuals

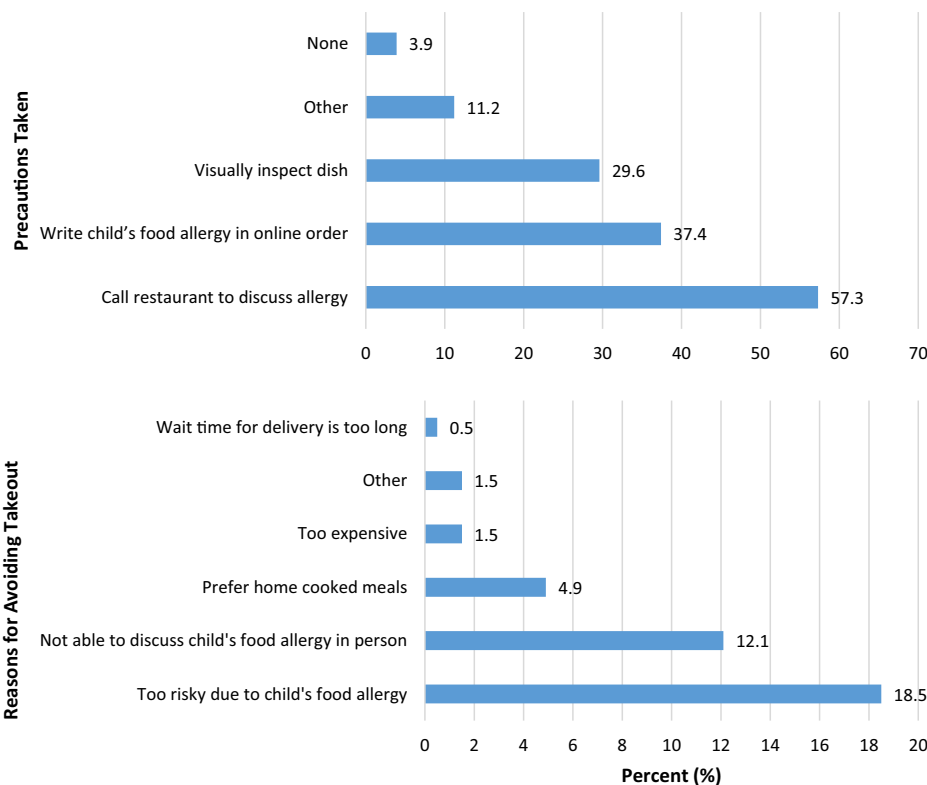


FIGURE 1. Precautions taken when ordering and reasons cited for avoiding takeout in food-allergic individuals.

inspection of food (there was a trend toward risk with this strategy). Restaurant staff lack of knowledge is also likely.³ A high percentage of restaurants had no menu allergen labeling (35.8%), and there was a borderline difference in this category between those who did and did not react ($P = .06$), which suggests that this could be a focus area and may reflect increased allergen awareness and protocols in those establishments (ie, better communication and knowledge). Identifying potential barriers to menu allergen labeling that may exist for restaurants is recommended, so that widespread menu labeling can occur in collaboration with restaurants. Families made no major changes to takeout routines during the COVID-19 pandemic, and allergic reactions occurred in patterns seen before the pandemic. Data presented here support the need for improved communication between restaurant workers and patrons and the expansion of food allergy knowledge among restaurant staff.

Allergic reactions from takeout were high, but this should be interpreted with caution owing to study limitations, including the survey-based nature of this study, which was potentially biased by respondent experience and recall. Recall bias may exist with pre-pandemic data, because this study was conducted more than 6 months after the start of the COVID-19 pandemic. The nature of the survey did not allow us to determine whether persons with specific allergies (eg, milk vs peanut) had increased risks for reactions, nor could we determine whether restaurants that did not usually provide takeout before the pandemic were riskier than those that did. The study was based on a convenience sample, and thus it

was geographically limited. However, additional analysis excluding the approximately 11% of survey participants outside New York, New Jersey, and Connecticut did not yield meaningful differences in study conclusions.

Future studies are needed examining effective ways to prevent allergic reactions from takeout food, to advance advocacy efforts. Allergists should carefully discuss risks with patients, promoting clear communication and asking and educating about cross-contact and hidden ingredients.^{7,8} Mandating the declaration of allergenic ingredients on menus, encouraging free text options for food allergies to be declared by individuals ordering takeout, and regular and effective restaurant staff training may be helpful in reducing risk.⁸ Prior studies from the hospitality industry also indicate interest from restaurants in obtaining additional food allergy training.⁹ Together, these efforts may improve takeout experiences among food-allergic individuals, so that food can be enjoyed safely.

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TABLE I. Pre-pandemic characteristics of allergic reactions to takeout food

Takeout characteristics	Reacted, n (%) (n = 28)	No reaction, n (%) (n = 144)	P†
Ordered takeout	27 (96.4)	131 (91.0)	.47
Takeout precautions			
Write child's food allergy in online order	11 (39.3)	66 (45.8)	.52
Call restaurant to discuss allergy	23 (82.1)	94 (65.3)	.08
Visually inspect dish	12 (42.9)	49 (34.0)	.37
Other	3 (10.7)	20 (13.9)	1.00
None	1 (3.6)	7 (4.9)	1.00
Takeout mode			
Online application	7 (25.0)	59 (41.0)	.11
Restaurant website	7 (25.0)	56 (38.9)	.16
Telephone order	24 (85.7)	105 (72.9)	.15
Menu allergies declared*			
Yes, all of the time	1 (3.7)	15 (11.5)	
Yes, most of the time	3 (11.1)	18 (13.7)	
Yes, half of the time	1 (3.7)	5 (3.8)	
Yes, some of the time	7 (25.9)	51 (38.9)	
No	15 (55.6)	42 (32.1)	.06
Restaurants for orders			
American	17 (60.7)	82 (56.9)	.7119
Bakery	1 (3.7)	10 (6.9)	1.0000
Deli	8 (28.6)	31 (21.5)	.42
Chinese	15 (53.6)	33 (22.9)	.0009
Indian	4 (14.3)	14 (9.7)	.50
Japanese	9 (32.1)	40 (27.8)	.64
Thai	2 (7.1)	13 (9.0)	1.0000
Asian	10 (35.7)	21 (14.6)	.008
Italian	16 (57.1)	66 (45.8)	.27
Mediterranean	8 (28.6)	25 (17.4)	.17
Mexican	17 (60.7)	48 (33.3)	.006
Spanish	4 (14.3)	11 (7.6)	.27
Fine dining	2 (7.1)	11 (7.6)	1.0000
Fast food	12 (42.9)	48 (33.3)	.33
Ice cream parlor	2 (7.1)	14 (9.7)	1.0000
Pizza	18 (64.3)	98 (68.1)	.83
Steakhouse	0	15 (10.4)	—

Bolded *P* values indicate statistical significance.

*A total of 47 responses were missing.

†Chi-square test for association and Cochran-Armitage trend tests were used to determine whether there was an association between individuals who had a reaction compared with those who did not before the pandemic among factors presented in the table.

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ONLINE REPOSITORY

TABLE E1. Characteristics of food-allergic children (n = 206)

Characteristics	n (%)
Sex	
Male	116 (56.3)
Female	90 (43.7)
Race	
White	181 (87.9)
Asian	26 (12.6)
Black	7 (3.4)
Prefer not to answer	5 (2.4)
Not listed	4 (1.9)
American Indian or Alaska Native	1 (0.5)
Native Hawaiian or Pacific Islander	0
Ethnicity	
Not Hispanic or Latino	172 (83.5)
Not listed	17 (8.3)
Hispanic or Latino	9 (4.4)
Prefer not to answer	8 (3.9)
Avoided foods	
Peanut	146 (70.9)
Tree nuts	124 (60.2)
Sesame	82 (39.8)
Egg	57 (27.7)
Milk	56 (27.2)
Shellfish	36 (17.5)
Fish	26 (12.6)
Wheat	16 (7.8)
Soy	10 (4.9)
Other (legumes, seeds, grains, or avocado)	42 (20.4)

TABLE E2. Takeout preferences before and during the COVID-19 pandemic

Takeout characteristics	Before COVID, n (%)	During COVID, n (%)	P†
Ordered takeout			.3035
Yes	160 (77.7)	154 (74.8)	
No	46 (22.3)	52 (25.2)	
Takeout frequency*			.2550
Less than once/mo	26 (16.4)	27 (17.7)	
1-3 times/mo	62 (39.0)	61 (39.9)	
Once/wk	43 (27.0)	39 (25.5)	
1-3 times/wk	27 (17.0)	23 (15.0)	
≥4 times/wk	1 (0.6)	3 (2.0)	
Takeout mode			
Online application	66 (32.0)	73 (35.4)	.1779
Restaurant website	63 (30.6)	73 (35.4)	.0588
Telephone order	130 (63.1)	116 (56.3)	.0196
Menu allergies declared*			.3764
Yes, all of the time	16 (10.1)	14 (9.2)	
Yes, most of the time	21 (13.2)	23 (15.1)	
Yes, half of the time	6 (3.8)	4 (2.6)	
Yes, some of the time	59 (37.1)	55 (36.2)	
No	57 (35.8)	56 (36.8)	
Restaurants for orders			
American	99 (48.1)	86 (41.8)	.0526
Deli	39 (18.9)	29 (14.1)	.0330
Chinese	49 (23.8)	33 (16.0)	.0002
Japanese	49 (23.8)	41 (19.9)	.0455
Asian	31 (15.1)	25 (12.1)	.2008
Italian	82 (39.8)	69 (33.5)	.0124
Mediterranean	33 (16.0)	28 (13.6)	.2253
Mexican	65 (31.6)	51 (24.8)	.0082
Fast food	60 (29.1)	48 (23.3)	.029
Pizza	116 (56.3)	103 (50.0)	.024
Other‡	<10%	<10%	—

Bolded *P* values indicate statistical significance.

*A total of 47 responses before COVID were missing. Also, 53 responses were missing for takeout frequency and 54 were missing for menu allergies declared during COVID.

†McNemar and Wilcoxon signed rank sum tests were used to determine whether there was an association between time of delivery (before or during COVID) and the factors presented in the table.

‡Other (<10%) includes bakery, bar, Cambodian, Indian, Korean, Taiwanese, Thai, Vietnamese, African, Caribbean, French, German, Polish, Spanish, fine dining, ice cream parlor, seafood, smoothie or juice, steakhouse, vegan, vegetarian, and other food establishments (hotel restaurants), each of which was individually less than 10%.