

Trends in anaphylaxis management during COVID-19



Walaa Hamadi, MD,^a and Thomas B. Casale, MD^b *St George, Utah, and Tampa, Fla*

Background: Anaphylaxis is an acute, potentially life-threatening systemic hypersensitivity reaction that commonly occurs in the community setting and is best managed with epinephrine.

Objective: The purpose of this study was to examine the effects of the coronavirus 2019 disease (COVID-19) pandemic on trends in acute at-home anaphylactic events, including emergency room (ER) visits and treatment for anaphylaxis.

Methods: We used data from 2 sources: survey data from the Food Allergy Research and Education Patient Registry and the electronic medical records of patients who presented to the Tampa General Hospital ER with a diagnosis of anaphylaxis. We collected data from events during the COVID-19 epidemic as well as before and after availability of the COVID-19 vaccine. The data were analyzed using descriptive statistics.

Results: A total of 190 Food Allergy Research and Education survey responses were completed. Of the 190 respondents, 63 reported that the COVID-19 pandemic changed how they responded to an allergic reaction. Of the 63 patients, 71% avoided seeking medical care outside the home, 30% used self-medication more quickly than usual, and 14% delayed their use of medication. Only 87 events (46%) were treated with epinephrine. From April 1, 2018, to March 31, 2022, a total of 4358 individuals presented to the Tampa General Hospital ER with an *International Classification of Diseases, 10th Revision*, diagnosis code of anaphylaxis or allergic reaction. Only 718 individuals received epinephrine in the ER. In all, 867 patients presented 1 year before March 1, 2020 (before availability of the COVID-19 vaccine), and 1833 patients presented 1 year after April 1, 2021 (after availability of the vaccine).

Conclusions: According to the survey and ER data capture, only 16% of patients received epinephrine. After COVID-19 vaccine availability there were more ER visits for anaphylaxis among patients seen in a tertiary care teaching hospital. (*J Allergy Clin Immunol Global* 2024;3:100284.)

Key words: Anaphylaxis, ER, epinephrine, COVID-19

INTRODUCTION

Anaphylaxis is an acute, potentially life-threatening systemic hypersensitivity reaction that commonly occurs in the community setting. Foods and stinging insect venom are the leading causes of anaphylaxis in children and adolescents, whereas drugs and insect stings are the most common triggers of anaphylaxis in adults.^{1,2} There has been a global increase in rates of all-cause anaphylaxis, especially in the first 2 decades of life. However, the fatality rate had remained stable at approximately 0.5 to 1 death per million person years. Risk factors associated with severe or fatal anaphylaxis include older age, mast cell disorder, asthma, cardiovascular disease, β -blocker or angiotensin-converting enzyme inhibitor use, and delayed epinephrine use.^{3,4} Epinephrine should be administered at the onset of anaphylaxis, as its delayed use increases the risk of morbidity and mortality, as well as the risk of biphasic reactions.⁵⁻⁸ A meta-analysis of 27 studies that together included 4144 patients with anaphylaxis and 192 biphasic reactions, reported a biphasic reaction rate of 4.6% and a median time of onset of 11 hours (range 0.2-72 hours). No fatal reactions in biphasic reactions have been reported.⁹

Evaluating epidemiologic data related to anaphylaxis is important to help highlight disease burden, implicated allergens, and risk factors, all of which can help clinical practice and prevent future severe reactions and fatalities.

The purpose of this study was to examine the effects of the coronavirus disease 2019 (COVID-19) pandemic on trends in acute at home anaphylactic events, including emergency room (ER) visits and treatment for anaphylaxis. We used data from 2 sources: the Food Allergy Research and Education (FARE) Patient Registry and the electronic medical records (EMRs) of patients who presented to Tampa General Hospital (TGH) ER with a diagnosis of anaphylaxis.

RESULTS AND DISCUSSION

We captured survey data from the FARE Patient Registry, a national online repository of data collected from participants with food allergies. Data collection was completed through the Invitae survey platform. Deidentified self- and parent-reported data were collected from an institutional review board (Advara)-approved FARE survey. The survey responses of patients who had an acute allergic reaction to food during the COVID-19 pandemic from March 1, 2020, to January 31, 2022, were collected. The surveyed information included location of the allergic reaction, triggering allergen, information as to whether the response to the event was different on account of the COVID-19 pandemic, and treatment

From ^athe Department of Allergy and Immunology, Intermountain Healthcare, St George, Utah, and ^bthe Division of Allergy and Immunology, Morsani College of Medicine, University of South Florida, Tampa.

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Corresponding author: Thomas B. Casale, MD, Division of Allergy and Immunology, Morsani College of Medicine, University of South Florida, Tampa, FL 33612. E-mail: tbcasale@usf.edu.

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Abbreviations used

COVID-19: Coronavirus 2019
 ER: Emergency room
 TGH: Tampa General Hospital
 EMRs: Electronic medical records
 FARE: Food Allergy Research & Education

TABLE I. Top 5 ICD-10 codes from the TGH ER

ICD codes	No. of patients
Top 5 ICD-10 codes for those who received epinephrine in the TGH ER	
Z91.018 – Allergy to other foods	144
Z91.030 – Bee allergy status	74
Z91.013 – Allergy to seafood	66
T78.40XA – Allergy, unspecified, initial encounter	52
Z91.010 – Allergy to peanut	45
Top 5 ICD-10 Codes used with all patients of the TGH ER	
Z91.09 – Other types of allergy status besides allergy to drugs and biologic substances	1907
T78.40XA – Allergy, unspecified, initial encounter	589
Z91.018 – Allergy to other foods	540
T78.40XD – Allergy, unspecified, subsequent encounter	225
Z88.9 – Allergy status to unspecified drugs, medications, and biologic substances	204

received. The data collected were analyzed by using descriptive statistics.

We also collected data from a retrospective review of the EMRs of patients who presented to the TGH ER from April 1, 2018, to March 31, 2022, for anaphylaxis based on discharge codes (*International Classification of Diseases, 10th Revision* [ICD-10] codes) and whether epinephrine treatment was received (see [Table I](#)). The data collected included demographics, medical history, allergies, medications list, treatment received in ER (epinephrine), and ICD-10 codes. The data were analyzed by using descriptive statistics. The study protocol and waiver of the patient's informed consent were approved by the local ethics committee. All age groups and sexes were included. A list of the ICD-10 codes included are available in the Online Repository (at www.jaci-global.org).

A total of 190 FARE survey responses were completed. The top 5 triggering allergens were tree nuts (18%), peanuts (14%), egg (10%), seafood (10%), and milk (8%). Less than 2% of the reactions occurred at a doctor's office. In all, 63 patients reported that the COVID-19 pandemic changed how they responded to an allergic reaction. Of these patients 71% avoided seeking medical care outside the home, 30% used self-medication more quickly than usual, and 14% delayed the use of medication. Only 87 events (46%) were treated with epinephrine. A total of 30 patients (16%) reported not using epinephrine because it was not available; however, 72 patients (38%) reported not using epinephrine despite it being available.

A total of 4358 patients presented to the TGH ER from April 1, 2018, to March 31, 2022, with a diagnosis of an acute allergic

4,358 patients presented to TGH ER with a diagnosis of anaphylaxis or acute allergic reaction

Only 718 (16%) received epinephrine in the ER

The most frequently used ICD-10 code for those who received epinephrine was “allergy to other food”

Females presented twice as often as males

876 patients presented 1 year prior to March 1, 2020 (pre-COVID vaccine)

1,833 patients presented 1 year after April 1, 2021 (post-COVID vaccine availability)

FIG 1. Disposition of patients seen in the TGH ER for anaphylaxis.

reaction (see the ICD-10 codes in Online Repository). Only 718 (16%) received epinephrine in the ER. The most frequently used ICD-10 code for those who received epinephrine was “allergy to other food” ([Table I](#)). Females presented twice as often as males (2967 vs 1391). In all, 867 patients presented 1 year before March 1, 2020 (before the COVID-19 vaccine was available), and 1833

TABLE II. Number of patients presenting to TGH ER before and after COVID-19 vaccine availability

Time in relation to the COVID-19 pandemic	Dates	Total No. of patients of the TGH ER (n = 4358)	Patients of the TGH ER who received epinephrine (n = 718)
2 y before the pandemic	April 1, 2018, to March 31, 2019	654	106
1 y before the pandemic	April 1, 2019, to March 31, 2020	867	104
1 y into the COVID-19 pandemic	April 1, 2020, to March 31, 2021	1004	184
1 year after availability of the COVID-19 vaccine	April 1, 2021, to March 31, 2022	1833	324

patients presented 1 year after April 1, 2021 (after availability of the COVID-19 vaccine) (Fig 1). For further context, see Table II.

There are limitations to these data. The FARE survey data were voluntary and consisted of self-reported data that were subject to recall bias. The TGH ER data were from a retrospective EMR review that was also subject to bias. The data from FARE cannot be reconciled with ICD-10 code data, as the source of input varies. The term *anaphylaxis* may not apply to all reactions; in addition, no parameters of reaction severity were identified, as we were unable to further qualify these reactions. We were unable to assess the outcome of patients who did and did not receive epinephrine. An additional limitation arises from the potential for coding errors among ER physicians, underscoring the need for increased education regarding the accurate coding and management of allergic reactions.

Food remains the major trigger for anaphylaxis. COVID-19 appeared to have influenced whether patients visited an ER for anaphylaxis. FARE responders were hesitant to seek medical care outside the home during the COVID-19 pandemic. After the COVID vaccine became available, there were more ER visits for anaphylaxis among patients seen in a tertiary care teaching hospital (TGH). Most importantly, there continues to be hesitancy to use epinephrine by both the patient (survey data) and in the ER (TGH), which can lead to greater adverse consequences.

The recently published anaphylaxis practice parameter update emphasizes the importance of prescribing and using epinephrine both at home and in the ER.¹⁰ The parameter emphasizes the need for specific counseling and training of patients and caregivers, including when and how to administer the epinephrine autoinjector and whether and when to call 911. The parameter states that if epinephrine is used promptly, immediate activation of emergency medical services or a visit to the ER may not be required provided the patient experiences a prompt, complete, and durable response. Our data emphasize that there is a need for more patient and ER

staff education on the appropriate use of epinephrine to manage an acute allergic reaction and how the COVID-19 pandemic influenced patient self-management.

DISCLOSURE STATEMENT

Disclosure of potential conflict of interest: The authors declare that they have no relevant conflicts of interest.

Clinical implications: During the COVID-19 pandemic, patients experiencing an acute allergic reaction were less likely to seek care outside the home. Treatment with epinephrine at home or in the ER occurred in only a minority of patients.

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