

Hospitalizations of Children and Young Adults from Peanut-Induced Anaphylaxis in Texas

Zuber D. Mulla, PhD

Objective: Population-based studies of peanut anaphylaxis in Texas children and young adults are lacking. The objective of this investigation was to report the clinical and demographic features of children discharged throughout Texas with a diagnosis of anaphylaxis triggered by peanut consumption and calculate the peanut anaphylaxis hospitalization rate by age group.

Methods: Public-use statewide Texas hospital discharge data for the years 2004 through 2007 were analyzed. Patients under the age of 25 years who were Texas residents were included in the study if their principal or secondary diagnosis was anaphylactic shock due to peanut, ICD-9-CM code 995.61. Clinical and demographic features were summarized. Peanut anaphylaxis hospitalization rates were calculated by dividing the number of hospitalizations in a particular age group by the appropriate Texas resident population estimate.

Results: Thirty-four patients were identified, 23 of whom (67.7%) were male. The majority (91%) of the patients were emergency or urgent admissions. After controlling for patient sex and whether or not the patient was self-pay, asthmatics were more likely than non-asthmatics to have received mechanical ventilation (adjusted exact odds ratio = 15.98, $P = 0.01$). The highest risk of peanut anaphylaxis hospitalization was in the youngest age group, children under five years 1.9/1 million.

Conclusion: Epidemiologic analysis of a statewide hospital discharge database revealed that the highest risk of peanut anaphylaxis hospitalization in Texas children and young adults was in children under five years.

Asthmatics were significantly more likely than non-asthmatics to receive mechanical ventilation during their hospitalization.

Key Words: anaphylaxis, asthma, epidemiology, food allergy, peanut

Food allergies decrease quality of life and may be increasing in prevalence.¹ It is estimated that the prevalence of adverse immune responses to foods is approximately 5% in young children in westernized countries.¹ Sicherer and colleagues recently reported that the prevalence of self-reported peanut allergy in children under 18 years of age in the United States was 0.4% in 1997, 0.8% in 2002, and 1.4% in 2008.²

In certain individuals peanut consumption may lead to anaphylaxis which is a potentially fatal systemic allergic reaction that is rapid in onset and involves the activation of mast cells and/or basophils.³ A PubMed search using the terms “peanut anaphylaxis Texas” did not reveal any publications. The objective of this study was to examine the clinical, demographic, and epidemiologic features of children and young adults who were hospitalized throughout Texas and discharged with a diagnosis of peanut anaphylaxis during a four-year period. Texas is located on the United States-Mexico border and is large in both area (261,797 square miles)⁴ and population (estimated population in 2009: 24,782,302).⁴

Materials and Methods

This study was approved by the Institutional Review Board of the Texas Tech University Health Sciences Center,

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Key Points

- A total of 34 children and adolescents under the age of 25 years were discharged throughout Texas between 2004 and 2007 with a principal or secondary discharge diagnosis of peanut anaphylaxis.
- The highest risk of peanut anaphylaxis hospitalization in Texas children and adolescents was in the youngest age group, children under five years (1.9/1 million).
- Among the 34 cases of peanut anaphylaxis, asthmatics were more likely than non-asthmatics to have received mechanical ventilation (adjusted exact odds ratio = 15.98, $P = 0.01$) during their hospital stay.

El Paso, Texas. Data were analyzed using SAS 9.2 software (SAS Institute, Inc., Cary, North Carolina). Epidemiologic analyses were performed using the Public Use Data File, a hospital inpatient discharge database that was obtained from the Texas Department of State Health Services (Austin, Texas). This dataset contains clinical and demographic information of several million patients who were discharged in calendar years 2004 through 2007. The principal discharge diagnosis up to and including 24 secondary discharge diagnoses had been coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Similarly, up to 25 procedures (one principal plus 24 secondary procedures) performed during the hospital stay were coded using ICD-9-CM.

Patients under the age of 25 years who were Texas residents were included in the study if their principal discharge diagnosis or one of their secondary diagnoses was anaphylactic shock due to peanut, code 995.61, and there was sufficient information to assign the record to one of the following age groups: 0–4, 5–9, 10–14, 15–19, and 20–24 years. Mechanical ventilation was defined as the presence of ICD-9-CM codes 96.70, 96.71, or 96.72 in any of the 25 procedure fields. Asthma was defined as ICD-9-CM code 493 in any of the 25 discharge diagnosis fields. Children living with the risk of anaphylaxis may develop anxiety.^{5,6} In order to explore this possibility diagnosis codes 300 and 308 were used to identify patients with anxiety and related conditions. Diabetes was defined as ICD-9-CM code 250. Tobacco users were identified using ICD-9-CM code 305.1. The length of stay and total charges variables were also analyzed.

Peanut anaphylaxis hospitalization rates were calculated by dividing the number of hospitalizations in a particular age group by the appropriate Texas resident population estimate.⁷ For example, the rate in the 0- to 4-year group was calculated by totaling the number of peanut anaphylaxis hospitalizations between 2004 and 2007 in this age range and dividing this figure by the sum of the annual population of Texans aged 0 to 4 years for the years 2004 through 2007. The association between asthma status and the outcome of mechanical ventilation was explored using a two-sided Fisher's exact test and exact conditional logistic regression.⁸

Results

Thirty-four patients were identified, 23 of whom (67.7%) were male. While the Public Use Data File does not contain a unique patient identifier, the research portion of this statewide inpatient discharge database does contain such a variable. A review of this unique identifier and accompanying patient demographic data revealed that it is unlikely that any of the 34 records represented repeat admissions for any patient. To clarify, each patient was only included once in this analysis. Several racial and ethnic groups were represented in the case series, including 20 individuals who were white non-Hispanics, five who were black (one of whom was of Hispanic ethnicity), and two who were Asian or Pacific Islanders. One

of the teenage boys in the 15- to 17-year age group was a diabetic. Another male in the 15- to 17-year age range was the only individual identified as a smoker in the case series using the appropriate ICD-9-CM code.

The dataset did not contain a continuous age variable. The Table reports the age distribution of the cases and the peanut anaphylaxis hospitalization rate per 1 million population by age group. The highest risk of peanut anaphylaxis hospitalization was in the youngest age group, children under five years (1.9/1 million). A second peak occurred in teenagers 15 to 19 years.

The Public Use Data File contains a variable summarizing the type of admission (e.g., was the admission an emergent or an elective hospitalization?). However, the data dictionary does not offer definitions of the possible values for this variable. A total of 21 patients were emergent admissions (61.8%), 10 were urgent admissions (29.4%), and three were elective admissions. The admitting diagnosis in 18 of the 34 patients (52.9%) was peanut anaphylaxis. Four patients had an admitting diagnosis of swelling, mass, or lump in the head and neck while two patients had respiratory distress as their admitting diagnosis. The admitting diagnosis was dermatitis due to the ingestion of food for two patients.

None of the patients had code 308 (acute reaction to stress) listed as a discharge diagnosis. However, four patients (11.8%) had a diagnosis code beginning with 300. The records of three of these patients had code 300.00 (anxiety state, unspecified) while the remaining patient record contained code 300.4 (dysthymic disorder, a category that included several diagnoses including anxiety depression and depression reaction).

The average length of stay was 1.8 days (median = 1 day, range: 1 to 11 days). Total charges were recorded in dollars (\$) and ranged from \$1739 to \$110,525 with a mean of \$10,353.50 and a median of \$5880.53. None of the patients expired in the hospital, although approximately 18% (n = 6) of the 34 patients received mechanical ventilation. Twelve

Table. Number of peanut anaphylaxis (PA) hospitalizations and PA hospitalization rate in children and young adults residing in Texas, USA, by age group, 2004–2007

Age Group, y	No. PA Hospitalizations	4-y Texas Resident Population Estimate	PA Hospitalization Rate per 1 million Residents
0–4	14	7,417,036	1.9
5–9	3	6,619,564	0.5
10–14	4	6,912,321	0.6
15–19	8	7,133,890	1.1
20–24	5	7,117,377	0.7
0–24	34	35,200,188	1.0

(35.3%) of the 34 patients were asthmatics. The prevalence of mechanical ventilation was 41.7% in asthmatics and 4.6% in non-asthmatics (Fisher exact test $P = 0.01$). The unadjusted exact prevalence odds ratio comparing asthmatics to non-asthmatics for the outcome of mechanical ventilation was 13.65 ($P = 0.03$). After controlling for patient sex and whether or the not patient was self-pay, asthmatics continued to be more likely than non-asthmatics to have received mechanical ventilation (adjusted exact odds ratio = 15.98, $P = 0.01$).

Discussion

Hospitalization for anaphylaxis triggered by peanut consumption in Texas children and young adults is rare (overall rate = 1.0/1 million); nonetheless, its emotional and economic toll is not insignificant. The Texas Public Use Data File does not contain information on patient encounters that occurred in the emergency department and hence the case series presented here was mainly composed of severe episodes of peanut anaphylaxis (91% of the patients were emergency or urgent admissions).

Conclusion

Epidemiologic analysis of a statewide hospital discharge database revealed that the highest risk of peanut anaphylaxis hospitalization in Texas children and young adults was in children younger than five years old. A second peak in the risk (the hospital rate) occurred in teenagers 15 to 19 years, perhaps reflecting an increase in risk-taking behavior, unavailability/loss of an adult to monitor food sources, and/or inconsistency in the carrying of an epinephrine autoinjector. Future epidemiologic investigations of peanut anaphylaxis in Texas should strive to capture multicenter/statewide data on patients with anaphylaxis who were managed in an outpatient setting.^{9,10}

Patients with severe peanut allergy should be evaluated by an allergist and have immediate access to self-injectable epinephrine, especially those with concomitant asthma. This latter group of patients appears to be at a higher risk of fatal and near-fatal anaphylactic reactions to food compared to non-asthmatics.^{11,12} Bock and colleagues reported on 32 fatal cases

of anaphylaxis triggered by foods.¹² Among the 25 patients for whom data were available, 24 were known to have asthma, and the majority of the decedents did not have epinephrine available at the time of their fatal reaction (29/32 or 91%).¹²

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