EPIPEN4SCHOOLS® Survey: Characteristics of Anaphylaxis and Common Triggers

MV White,[1] D Goss,[2] K Hollis,[2] K Millar,[2] S Silvia,[2] P Siegel,[2] ME Bennett,[3] RA Wolf,[4] M Wooddell,[4] S Hogue[2]

[1]Institute for Asthma and Allergy, Wheaton, MD; [2]RTI International, Research Triangle Park, NC; [3]Clarity Consulting, LLC, Raleigh, NC; [4]Mylan Specialty L.P., Canonsburg, PA

Mylan® Seeing is believing™

ABSTRACT

Rationale: The purpose of this study was to describe the characteristics of anaphylactic events and epinephrine auto-injector (EAI) use in children and adults in US schools.

Methods: This exploratory, cross-sectional, web-based survey of schools participating in the EPIPEN4SCHOOLS® program (Mylan Specialty L.P., Canonsburg, PA) captured characteristics of anaphylactic events and EAI use during the 2013-2014 school year.

Results: A total of 5683 schools responded to questions on the occurrence of anaphylactic events. A total of 919 anaphylactic events were reported by 11% of schools (607/5683). Most schools (89%, 5076/5683) reported no anaphylactic events, and 10% (543/5683) reported 1 to 2 anaphylactic events. Most anaphylactic events occurred in students, 89% (757/852), 22% (187/852) of which occurred in those with no known allergies. In 9% (75/852), allergy status was unknown. Of the 919 events, triggers were reported for 847 events (92%); most triggers, 62% (n=529), were listed as food, 10% (n=81) were listed as insect stings, 7% (n=56) as environmental/medication/health-related factors, and 1% (n=9) as latex. Approximately 20% of events (172/847) had an unknown trigger. Although food allergy triggers were predominant throughout the year, prevalence of certain triggers varied seasonally. Insect stings were relatively less frequent during winter, 4% (5/143), vs fall, 13% (31/243), and spring, 10% (26/268), months, whereas unknown triggers reached a high of 27% (71/268) during spring.

Conclusions: More than 1 in 10 schools reported an anaphylactic event in a single school year, many of which were associated with unknown triggers. These data indicate the unpredictable nature of anaphylaxis and the importance of anaphylaxis training for staff and caregivers.

INTRODUCTION

- Anaphylaxis is a serious, acute, and potentially life-threatening allergic reaction.[1]
- In the United States, between 1.2% and 16.8% of the population may experience an anaphylactic event in their lifetime.[2]
- Anaphylaxis can be induced by various triggers including foods, drugs, biologics, insect stings, latex, and exercise.[1]
- Risk of anaphylaxis among boys and girls can be affected by age, as food allergy rates are estimated to be between 1% and 8% in children.[2]
  - Moreover, the prevalence of food allergy may be increasing among school-aged children.[4]
- As children ≥5 years of age in the United States spend much of their day in school, there is a need for school staff to be prepared to manage life-threatening reactions to food and other triggers of anaphylaxis that could be encountered in this setting.

OBJECTIVE

- The purpose of this study was to describe the characteristics of anaphylactic events and epinephrine auto-injector (EAI) use in children and adults in US schools.

METHODS

- This exploratory cross-sectional survey of schools participating in the EPIPEN4SCHOOLS® program (Mylan Specialty L.P.) assessed anaphylactic events and treatment(s) administered at each responding school during the 2013-2014 school year.

Data source

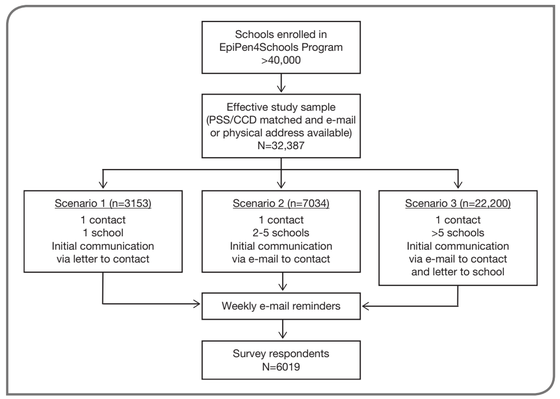
- Survey of schools participating in EpiPen4Schools, a program launched in 2012 that provides EpiPen® Auto-Injectors* to qualifying public and private kindergarten, elementary, middle, and high schools in the United States
  - Composed of 15 web-based questions, 8 of which were repeated for each anaphylactic event reported per school
  - Answered by an individual at each school with knowledge of occurrences of anaphylactic reactions and treatment(s) administered during the 2013-2014 school year (eg, school nurse)
  - Study duration: May 21, 2014, to July 9, 2014

*The EpiPen4Schools program provided 2 EpiPen Auto-Injector 2-packs, 2 EpiPen Jr® Auto-Injector 2-packs, or 1 of each 2-pack free of charge.

Sample contact and notification

- US schools registered with the EpiPen4Schools program (>40,000) were matched to Common Core of Data (CCD; US Department of Education, Washington, DC) or to the Private School Universe Survey (PSS; US Department of Education, Washington, DC) databases to obtain demographic and school contact information to request participation in the survey (Figure 1).
  - A total of 32,387 schools had available contact information (Figure 1).
  - 3 possible scenarios occurred for contacting and notifying the respondents, based on the number of schools per contact (Figure 1).
  - A total of 6019 surveys were completed (Figure 1); most questions included a count of missing data, as respondents were not required to answer every question.

Figure 1. Preparation of samples and notification procedures.



CCD, Common Core of Data; PSS, Private School Universe Survey.

Data analysis

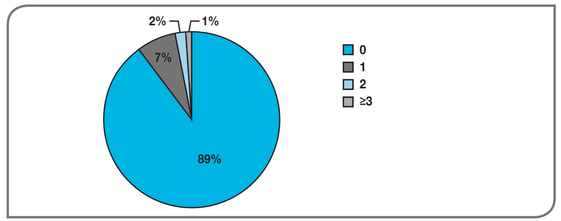
- Characteristics of participating schools (eg, census region, grade levels of responding schools, type and source of EAIs stocked) and of anaphylactic events (eg, individual who experienced the anaphylactic event, previously known allergies, the trigger that initiated the anaphylactic event, treatment administered) were reported using descriptive statistics.
  - Relative frequency of each characteristic was calculated by dividing the total number for each response category of the relevant variable across all schools by the combined number of responses across all schools.
  - Missing responses were excluded.

RESULTS

Events

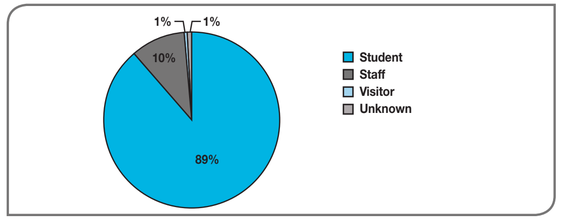
- Data on the occurrence of anaphylactic events were available for 5683 schools.
- A total of 919 anaphylactic events were reported in 607 schools (11%, n=5683).
  - The majority of schools (89%, 5076/5683) reported no anaphylactic events, ~10% (543/5683) reported 1 to 2 anaphylactic events, and 1% (64/5683) reported ≥3 events (Figure 2).

Figure 2. Distribution of schools by number of anaphylactic events reported (n=5683).



- Of the 852 anaphylactic events with available data on those who experienced the event, the majority (89%, n=757) occurred in students, 84 (10%) occurred in school staff, and 5 (1%) occurred in visitors (3 adults and 2 minors) (Figure 3).
  - 22% of these events (187/852) occurred in individuals who had no known allergies.

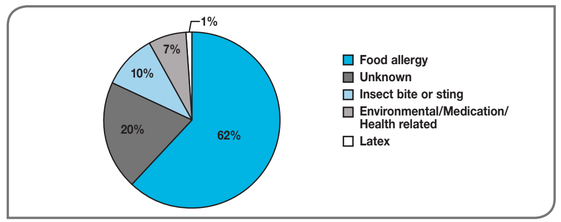
Figure 3. Individuals who experienced a reported anaphylactic event (n=852).



Anaphylactic triggers

- Of the 919 anaphylactic events, data on types of triggers were reported for 847 events (92%).
- Most triggers, 62% (529/847), were reported as food, 10% (81/847) were reported as insect bites or stings, 7% (56/847) were reported as environmental or medication/health-related factors, and 1% (9/847) were reported as latex (Figure 4).
  - Approximately 20% of events (172/847) had an unknown trigger (Figure 4).

Figure 4. Types of triggers reported for anaphylactic events (n=847).



- Data were available on the seasonality of allergens that triggered 654 anaphylactic events experienced by students (40 anaphylactic events that occurred during the summer were excluded, as not all participating schools were open).
  - A greater number of anaphylactic events occurred in spring (n=268) relative to fall (n=243) and winter (n=143; Table).
  - Food allergy triggers remained predominant throughout the school year, while the prevalence of other triggers varied by season (Table).
  - Fewer events triggered by insect stings or bites occurred in the winter compared with spring or fall (Table).

Table. Seasonal Distribution of Anaphylactic Events in Students by Reported Triggers[a]

Trigger, n (%)	Fall (n=243)	Winter (n=143)	Spring (n=268)
Food	163 (67)	109 (76)	158 (59)
Insect bite or sting	31 (13)	5 (4)	26 (10)
Environmental/Medication/Health related	16 (7)	9 (6)	13 (5)
Unknown	33 (14)	20 (14)	71 (27)

[a]Anaphylactic events that occurred during the summer were excluded as not all participating schools were open. The seasons were defined as follows: fall = September, October, November; winter = December, January, February; spring = March, April, May.

STRENGTHS AND STUDY LIMITATIONS

- This is the first comprehensive analysis of anaphylactic events and use of EAIs in US schools, providing details of >900 events.
- This exploratory survey was subject to limitations such as response bias and potential measurement errors, including systematic and random variance resulting from the respondents (eg, failing to carefully read a question or misreporting an event).
- Responses were limited by the level of detailed information retained at the schools related to anaphylaxis and were subject to respondent recollection of the events.
- Survey response rate was 19%, likely due to factors such as the timing of the survey at the end of the school year, and the lack of direct and verifiable contact information for some respondents.

SUMMARY AND CONCLUSIONS

- More than 10% of schools participating in the EpiPen4Schools survey reported an anaphylactic event, suggesting that anaphylaxis is not uncommon in US schools.
- Most anaphylactic events (89%) were experienced by students; of these, many (20%) were associated with unknown triggers.
- Food was the predominant trigger of anaphylactic events in students throughout the school year.
- These results highlight the unpredictability of anaphylaxis and the need for continued anaphylaxis training for protection of all students, staff, and visitors.

Acknowledgments: Support for this study and preparation of this poster was provided by Mylan Specialty L.P., Canonsburg, PA. BioRidge Pharma maintains the database of schools registered for the EpiPen4Schools program and worked with RTI to provide mailing databases and logistical mailing services to contact schools to participate in the EpiPen4Schools survey. RTI collaborated with Mylan Specialty L.P. on the design and implementation of the survey. Editorial assistance was provided by MedThink SciCom.

References: 1. Simons FE, Sheikh A. Anaphylaxis: the acute episode and beyond. *BMJ*. 2013;346:f602. **2.** Neugut AI, Ghatak AT, Miller RL. Anaphylaxis in the United States: an investigation into its epidemiology. *Arch Intern Med*. 2001;161(1):15-21. **3.** Wood RA. The natural history of food allergy. *Pediatrics*. 2003;111(6, pt 3):1631-1637. **4.** Branum AM, Lukacs SL. Food allergy among children in the United States. *Pediatrics*. 2009;124(6):1549-1555.