Food allergy prevalence, knowledge, and behavioral trends among college students — A 6-year comparison

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Clinical Implications

- Food allergy awareness among students identifying as food-allergic has modestly improved compared with 6 years earlier. However, notable risk-taking behavior is still problematic. Non–food-allergic peers have good food allergy awareness regarding the need for strict allergen avoidance.

TO THE EDITOR:

Food allergy is a public health concern affecting nearly 8% of children, and may have doubled in prevalence between 1997 and 2011.[1-4] We published the index study pertaining to food allergy in college students at the University of Michigan in 2009, highlighting poor rates of self-injectable epinephrine (SIE) carriage, student-reported allergen avoidance, and on-campus food allergy awareness.[5] Since that publication, this university created a program for comprehensive food allergy dietary/nutritional support and dining hall labeling.[6] We therefore sought to reassess trends in reported student food allergen awareness and preparation, to compare 6-year outcomes within the same university, as well as assess awareness among non–food-allergic students and compare trends at 2 other large Midwestern universities without a food allergy diet/labeling program.

In the spring of 2014, a 39-question electronic survey was randomly distributed using Survey Monkey (Portland, Ore) to approximately 26,500 undergraduate e-mail accounts of students older than 18 years at the University of Michigan, 24,000 accounts at the Ohio State University, and 18,000 accounts at the University of Pittsburgh. No data were available on the final number of accounts that received the message or messages that were actually opened to verify the response rate. Electronic informed consent was obtained, and the University of Michigan Medical School Institutional Review Board approved this study. The full methods are detailed in the Appendix of this article's Online Repository at www.jaci-inpractice.org.

A total of 1772 students responded to the survey, with 748 (42.2%) reporting that they had a food allergy, 52.6% (n = 394) of which reported past reaction symptoms consistent with the National Institutes of Allergy and Infectious Diseases/Food Allergy and Anaphylaxis Network anaphylaxis criteria.[7] Details of the sample are described in Table I.

In 2014, less than 50% of the 414 Michigan food-allergic students reported maintaining any emergency medication (n = 173 [41.7%]), including 36.7% (n = 152) indicating they maintain SIE. Approximately 82.6% (n = 342) reported that at least 1 close campus contact was aware of their food allergy. Only 50.5% (n = 209) reported always practicing strict allergen avoidance, 28.5% (n = 118) reported that campus dining hall foods were always labeled for allergen content, and 33% (n = 138) reported that allergen-free alternative foods were available in the dining halls. Figure 1 details the comparison of trends in food allergy awareness and self-management preparation between Michigan students in 2009 and 2014. Although multiple key trends were significant, the total numbers within these trends did not eclipse more than 50% of students reporting adherence for these measures in 2014. A similar significant trend was noted for reported reasons why a food-allergic student would not always practice strict allergen avoidance (see Figure E1 in this article's Online Repository at www.jaci-inpractice.org).

In exploring 2014 trends across the 3 universities surveyed, there were relatively few significant proportional differences between the populations, further detailed in this article's Online Repository at www.jaci-inpractice.org and in Figures E2 and E3 in this article's Online Repository at www.jaci-inpractice.org. A logistic regression model predictive of factors associated with reported student compliance with both strict avoidance and epinephrine carriage (at all 3 universities) was created, noting significant positive associations with health behavior adherence based on food allergen type, a reported history of being bullied, and a reported history of prior anaphylaxis (see Table E1 in this article's Online Repository at www.jaci-inpractice.org).

A total of 1024 non–food-allergic students at the 3 universities also responded to this survey. Reported awareness of food allergy and associated health behaviors among the non–food-allergic students was high—81.8% (n = 838) reported knowing someone with a food allergy, 44.6% (n = 457) reported knowledge of how to use an SIE device, and 59.7% (n = 611) reported that allergen content was clearly labeled for dining hall food. A higher proportion of the nonallergic students than food-allergic students reported that practicing strict avoidance is always necessary (70.2% vs 50.4%; $P < .001$), and significantly fewer non–food-allergic students reported strict avoidance would not be necessary than food-allergic students (see Table E2 in this article's Online Repository at www.jaci-inpractice.org).

Despite significant interval improvement from 2009 on the Michigan campus across multiple trends, awareness and adherence with commonly recognized food allergy self-management among students remain disconcerting. Rates of maintaining any emergency medication, always carrying epinephrine, practicing strict allergen avoidance, and food preparer awareness were well under 50%. The proportion of risk-taking behavior among Michigan students worsened over time, though present-day risk-taking trends were similar across all 3 universities surveyed. Moreover, the non–food-allergic students demonstrated more awareness of practicing strict avoidance than the allergic students across all campuses. These trends suggest a potential lack of progress in adherence to and awareness of optimal food allergy self-management behavior, which hopefully is not representative of a "plus ça change, plus c'est la même chose" situation in an era of progressively intensive food allergy education.

The impact that Michigan's awareness and labeling program has had is difficult to assess, though the study was not specifically designed to assess this. It is disconcerting that just slightly more

TABLE I. Population characteristics

Trend (n = 1772 unless stated)	% (n)
Male	24.7 (439)
Class (n = 1772)	
Freshman	22.4 (398)
Sophomore	23.1 (409)
Junior	23.3 (412)
Senior/graduate	28.9 (503)
Report having a food allergy	42.2 (748)
Tree nut	216 (28.9)
Peanut	175 (23.4)
Milk	138 (18.5)
Wheat	114 (15.2)
Shellfish	85 (11.4)
Soy	36 (5.8)
Seed	43 (5.7)
Egg	39 (5.2)
Fish	30 (4)
Campus	
University of Michigan	414 (55.3)
The Ohio State University	129 (17.2)
University of Pittsburgh	205
History of symptoms of anaphylaxis (n = 748)	52.7 (394)
Age of initial reaction (y) (n = 666)	
0-6	41 (273)
6-12	21 (140)
>12	38 (254)
Age of most recent reaction (y) (n = 656)	
0-6	7.3 (48)
6-12	5.9 (39)
>12	86.7 (569)
Maintains emergency medication (n = 748)	44.2 (330)
Epinephrine autoinjector	35.6 (266)
Always carry epinephrine autoinjector (n = 266)	51.2 (138)
Reported past bullying (n = 748)	
Any school level	40.5 (303)
College	27 (202)
Non–food-allergic student awareness (n = 922)	
Can use SIE	48.7 (457)
Allergen content labeled for dining hall food	66.3 (611)
Knows someone with food allergy (n = 1024)	81.2 (838)

than 25% of food-allergic students clearly identify and report that foods are always labeled for allergen content in the dining hall, and that fewer than one-third of students reported availability of an allergen-free alternative meal, but particularly interesting that a higher number of the non–food-allergic students did report foods were labeled. It is unclear whether this labeling and awareness program fails to reach the at-risk students, or has difficulty influencing behavioral change. High level of reported awareness of labeling of meals by the nonallergic students may suggest the latter explanation. In fact, we observed encouraging levels of awareness among non–food-allergic students in terms of knowledge in how to use an SIE device, awareness of allergen content labeling in the dining hall, as well as reporting better understanding of the need for comprehensive allergen avoidance compared with their allergic counterparts. These trends suggest that a somewhat strong baseline level of food allergy awareness may exist among non–food-allergic students.

This study is limited by a low response rate of approximately 1% to 4%. Emails were sent out to the student body with no way to monitor how many were unread or ignored, though the response rate was similar to that in 2009, using consistent methodology. Approximately less than 5% of students aged 18 to 22 years have food allergy, and the study would appeal mostly to the food-allergic population, so the response rate may be appropriate. Other limitations include the use of self-reported data, which are subject to both recall bias and possible challenges to the validity of any student's reported diagnosis. It is possible that some students misperceived the fact that they have a food allergy (eg, oral allergy syndrome or food intolerances) or are simply misdiagnosed or misclassified (eg, positive sensitization only, baked milk/egg tolerant, or have oral allergy syndrome), which could influence poor reported adherence with anticipated health behaviors. To counter some of these pitfalls, questions were used to enrich the sample for respondents most likely to have a "valid" diagnosis, similar to other self-reported food allergy surveys.[4,8]

Although reported awareness among food-allergic students, SIE maintenance/carriage, and perpetual avoidance of one's food allergen have somewhat improved relative to 6 years ago, risk-taking behaviors and poor adherence with health behavior recommendations remain problematic among food-allergic undergraduates. Despite statistically significant improvement in multiple parameters reflecting allergic students' adherence with positive health behaviors regarding food allergy self-management, the clinical significance of these changes remains questionable when fewer than 50% of students responded in a way that would reasonably reflect understanding of appropriate self-management. These data indicate a continuing need for increased support of food-allergic students on campus, and ongoing need to study the impact of programs to help guide food-allergic students on campus for gaps and areas of suboptimal implementation given the difficulties of chronic disease management in young adults.

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This study was supported in part by the National Center for Advancing Translational Sciences (grant nos. 2KL2TR000434 and 2UL1TR000433). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Conflicts of interest: T. D. Green is director of the Food Allergy Research & Education Clinical Network Web site. M. Greenhawt has received research support from Agency for Healthcare Research and Quality (1K08HS024599-01, Career Development Award); has received travel support from National Institute of Allergy and Infectious Diseases, Joint Taskforce on Allergy Practice Parameters; is an unpaid member of the National Peanut Board scientific advisory council; has received consultancy fees from the Canadian Transportation Agency, Nutricia, Nestle, Aimmune, Kaleo Pharmaceutical, Monsanto, Intrommune Pharmaceutical; is associate editor for the Annals of Allergy, Asthma, and Immunology; and has received lecture fees from American College of Allergy, Asthma, and Immunology, Reach MD, Thermo Fisher Scientific, New York Allergy and Asthma