

Letter to the Editor

Possession of epinephrine auto-injectors by Canadians with food allergies*To the Editor:*

Although there is unanimous agreement that epinephrine is the first-line treatment for anaphylaxis,¹ many with food allergy have not been prescribed an epinephrine auto-injector (EAI).

As part of our nationwide Canadian study on the prevalence of food allergy,² households from the 10 Canadian provinces were randomly selected from the electronic white pages and were telephoned between May 2008 and March 2009. Households self-reporting an allergy to peanut, tree nut, fish, shellfish, and/or sesame were recontacted within 4 months of the telephone survey and asked whether the individual(s) with allergy currently had an EAI. There was no differentiation between EAI formulations currently available in Canada (EpiPen; King Pharmaceuticals Canada, Mississauga, Ontario, Canada, and Twinject; Paladin Labs Inc, St-Laurent, Quebec, Canada).

Two categories of respondents with allergy were defined: (1) those reporting a convincing history of an IgE-mediated allergic reaction* and/or a physician diagnosis of an allergy to peanut, tree nut, fish, shellfish, or sesame, termed the probable group,² and (2) those reporting a physician diagnosis of an allergy to peanut, tree nut, fish, shellfish, or sesame, termed the diagnosed group.

Multivariate logistic regression models were performed for each group of respondents to identify factors associated with having an EAI; multiple imputation techniques were used to adjust for missing data for the low-income variable. Both models were hierarchical using the following household-level variables: postsecondary education of household respondent (attained college/university degree), low-income household,[†] marital status of household respondent (married/living with partner), urban location of household,[‡] and birthplace of household respondent (not born in Canada). The following individual-level data of the allergic participants were also included: age (<18 years), sex, type of allergy (peanut, tree nut, or sesame), multiple allergies (allergy to >1 of peanut, tree nut, sesame, fish, or shellfish), age at most severe reaction, treatment with epinephrine during most severe reaction, multiple allergic reactions, and self-report of diagnostic allergy testing.

Of 10,596 households contacted, 3,666 responded (35% participation rate), of which 3,613 completed the entire interview, representing 9,667 individuals. Of these 9,667 individuals, 310 (3.2%) were considered to have a probable food allergy to at least one of the following: peanut, tree nut, fish shellfish, and/or sesame. Of those with probable food allergies, 261 (84%) could be recontacted and queried on the EAI (convincing history only, n = 63; diagnosis only, n = 38; convincing history and diagnosis,

n = 160). These were similar to the 49 with a probable allergy who could not be contacted (Table I).

Of the 261 with probable allergy, 45% (95% CI, 39% to 51%) had an EAI. One hundred ninety-eight of the 261 with probable allergy (76%) formed the diagnosed group (diagnosis only, n = 38; convincing history and diagnosis, n = 160), and 55% (95% CI, 48% to 62%) of these reported having an EAI.

In a multivariate model for the probable group, individuals with allergy residing in a household where the respondent was married/living with a partner were more likely to have an EAI (Table II). Furthermore, children, females, those with multiple allergies, those who experienced their most severe reaction at a younger age, those who had been treated with epinephrine during the most severe reaction, and those who reported having had confirmatory testing were more likely to have an EAI. The same factors were associated with having an EAI in the diagnosed group.

While it is recommended that because of the potential for anaphylaxis, all individuals with food allergy have an EAI, our results show that only 45% to 55% report having the device. On the basis of previous research by our group in school-age children reporting that less than 50% owning an EAI actually have it available at all times,¹ we suspect that many of the 45% to 55% of respondents in SCAALAR (Surveying Canadians to Assess the prevalence of common food Allergies and Attitudes towards food LABelling and Risk) who own an EAI do not have it readily accessible.

Individuals with food allergy who resided in a household where the primary respondent was married or living with a partner were more likely to own an EAI potentially because such households have higher health literacy and are more likely to seek appropriate medical attention and be more compliant with suggested management. It has been shown that single people are less likely to have a family doctor,³ making them less likely to consult a physician for a suspected food allergy and hence less likely to be prescribed an EAI. Furthermore, such households may be less able to afford the EAI.

It was not surprising that children, individuals experiencing their most severe reaction at a younger age, and females were more likely to have an EAI. Parents are usually very diligent with their children's health and would therefore ensure that they are properly assessed and managed for food allergy.⁴ As it is already known that males are less vigilant regarding their health, are less likely to have a family doctor,³ and are more likely to engage in risk-taking behaviors, it would be expected that they were less likely to have an EAI.

Characteristics of the food allergy itself were also associated with greater likelihood of having an EAI; those with multiple allergies, those treated with epinephrine during their most severe reaction, and those reporting diagnostic allergy testing were more likely to own an EAI. These characteristics may be associated with a greater likelihood of seeing an allergist and hence obtaining a prescription for an EAI.^{5,6} These results are consistent with those of previous studies showing that physicians are more likely to prescribe an EAI to individuals with more than one food allergy⁷ possibly because of the increased risk of accidental exposure associated with having multiple allergies. We have also shown in a previous study that those who self-carry the EAI are more likely to have had a previous allergic reaction requiring epinephrine.¹

*A convincing history of an allergic reaction was defined as a minimum of 2 mild signs/symptoms or 1 moderate or 1 severe sign/symptom that was likely mediated by IgE and occurred within 2 hours of ingestion or contact (or inhalation for fish and shellfish). Mild symptoms include pruritus, urticaria, flushing, or rhinoconjunctivitis; moderate includes angioedema, throat tightness, gastrointestinal complaints, or breathing difficulties (other than wheeze); and severe includes wheeze, cyanosis, or circulatory collapse.

†Low-income cutoff is defined as an income level at which families or unattached individuals spend at least 70% of before-tax income on food, shelter, and clothing and is determined according to family size and geographic location.

‡Residing in a Canadian metropolitan area with a population of 100,000 or more.

TABLE I. Sociodemographic characteristics of responders with allergy and nonresponders

| Characteristic | % (95% CI) | |
|--|-------------------------|---------------------------|
| | Responders (n = 261) | Nonresponders (n = 49) |
| Household characteristics | | |
| Postsecondary education | 66 (60-72) | 69 (52-83) |
| Low-income household* | 5.1 (2.4-9.5) | 8.3 (1.0-27) |
| Married/living with partner | 83 (78-88) | 82 (66-92) |
| Urban location of household† | 68 (62-74) | 54 (39-69) |
| Not born in Canada | 9.2 (5.9-14) | 9.8 (2.7-23) |
| Individual characteristics | | |
| Child (<18 y) | 22 (17-28) | 16 (7.3-30) |
| Female | 58 (52-65) | 54 (37-71) |
| Allergy to peanut, tree nut, and/or sesame | 57 (51-63) | 45 (31-60) |
| Multiple allergies | 24 (19-29) | 10 (3.4-22) |
| Mean age at most severe reaction (y) | 24 (22-27) | 29 (23-34) |
| Treated with epinephrine during most severe reaction | 26 (21-32) | 16 (7.3-30) |
| Multiple allergic reactions | 73 (67-79) | 61 (46-75) |
| Self-report of diagnostic testing | 69 (63-75) | 69 (55-82) |

*Low-income cutoff is defined as an income level at which families or unattached individuals spend at least 70% of before-tax income on food, shelter, and clothing and is determined according to family size and geographic location.

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TABLE II. Multivariate logistic regression model examining the association between owning an epinephrine auto-injector and household and individual characteristics

| Characteristic | Odds ratio (95% CI) | |
|--|---------------------|-------------------|
| | Probable group | Diagnosed group |
| Household characteristics | | |
| Married/living with partner | 3.8 (1.4-9.1) | 3.6 (1.1-9.4) |
| Individual characteristics | | |
| Child (<18 y) | 5.1 (1.5-13) | 5.1 (1.4-15) |
| Female | 2.8 (1.3-5.6) | 4.0 (1.5-8.7) |
| Multiple allergies | 2.6 (1.1-5.3) | 2.9 (1.2-6.4) |
| Age at most severe reaction | 0.96* (0.93-0.98) | 0.95* (0.91-0.98) |
| Treated with epinephrine during most severe reaction | 5.2 (2.1-11) | 5.1 (1.9-12) |
| Self-report of diagnostic allergy testing | 6.5 (2.4-16) | 13 (1.7-64) |

*For every 1-y increase in age of most severe reaction, the likelihood of having the epinephrine auto-injector decreases by 4% (probable group) and 5% (diagnosed group).

Our study is limited by our relatively small sample size and moderate response rate. Consequently, our sample was not fully representative of the Canadian population in that it consisted of a higher percentage of households having a postsecondary education and income exceeding the low-income cutoff,² potentially resulting in an overestimation of the percentage owning an EAI. Furthermore, we did not ask detailed questions regarding the accessibility of the EAI. For those without an EAI, we do not know whether it was not prescribed or whether they failed to fill or renew their initial prescription.

It is a matter of concern that only 55% of Canadians who were diagnosed by a physician as having a food allergy have an EAI. Hence, based on known knowledge gaps,⁸ we anticipate that it is not only individuals with food allergy and their families who

require more effective education on the recognition and management of anaphylaxis but likely health care providers as well. Certain individuals with food allergy are particularly unlikely to own an EAI (those residing in households where the household respondent is single, adult, and male) and merit additional attention. The recently published guidelines regarding the diagnosis and management of food allergy⁹ should be disseminated among all health care providers, and the essentials should be distilled and made accessible to food allergy advocacy organizations and the public. Furthermore, education campaigns and action plans regarding the management of food allergy should be implemented not only in schools but also in the workplace and should target groups who are particularly unlikely to have an EAI—that is, those who are single, adult, or male. Such strategies should reduce the number of individuals with allergy without EAIs and minimize the number of potentially fatal anaphylactic reactions in Canada.

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