

Allergic reactions in the community: a questionnaire survey of members of the anaphylaxis campaign

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Summary

Background Allergic reactions to food are well recognized in both children and adults, but because of their relative infrequency their typical features may not be readily recognized by patients and their medical care givers who are not allergists.

Objective We sought to investigate the circumstances and clinical characteristics of food allergies in adults and children in the community.

Methods Self-completed questionnaire responses over a 6-month period from 109 members of the Anaphylaxis Campaign, the major British patient resource group for people who have suffered severe allergic reactions.

Results One hundred and nine respondents reported 126 reactions during the study period. Seventy-five were children (under 16 years, median age 6 years at the time of reaction). Predictably more boys than girls were reported to have had reactions but more women reported reactions than men ($P < 0.05$). Although the groups were equally aware of their food allergies the children had undergone diagnostic tests more often ($P < 0.001$). Foods were implicated in 112 (89%) of reports. Restaurants were implicated less often (14%) than in other series, probably reflecting British eating habits. Children with asthma reported more severe reactions than those without asthma ($P = 0.008$), although frequency or severity of recent asthma symptoms was not associated with severity of allergic reaction reported. When available, self-injectable adrenaline was used in 35% of severe reactions and 13% of non-severe reactions ($P = 0.01$). A quarter of adults who received one dose of adrenaline also received a second dose.

Conclusion The allergens implicated in this report reflect previous data from similar patient groups in North America. Asthmatic children suffer more severe reactions than non-asthmatic children. It appears that British adults need better access to expert care of their allergies. Even when it is prescribed and available self-injectable adrenaline appears under-used in severe reactions. The incidence of severe but non-fatal allergic reactions in the UK may have been underestimated in the past.

Keywords allergy, anaphylaxis, food, service provision

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Introduction

Allergic reactions to food affect 4–6% of children and 1.5% of adults [1]. Personalized care plans appear to be effective in preventing severe allergic reactions in children and adults in the community [2, 3] but their provision is not standardized. Schools and other day care facilities may have established action plans but do not adhere to them consistently [4–6].

The currently available data suggest there are differences in the clinical presentation of allergic reactions between adults

and children [7, 8]. Retrospective and prospective review of deaths show that adolescents and young adults are the groups most at risk of death. Children rarely die of food-related allergic reactions [8, 9] although many allergists believe such deaths may be under-reported because of lack of appreciation of a possibly allergic aetiology in fatal asthma attacks [10].

Reports from the US Food Allergy and Anaphylaxis Network and others show that complex foods prepared by caterers and restaurants constitute a bigger risk than unadulterated allergens to allergic consumers, young and old [7, 8, 11, 12].

The purpose of this study was to prospectively evaluate the circumstances and clinical characteristics of allergic reactions in adults and children, as reported by members of the UK-based Anaphylaxis Campaign, a charity originally set up to provide information and support to people with food allergies.

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Methods

The majority of Anaphylaxis Campaign members (>90%) report allergic reactions to foods. The Anaphylaxis Campaign asked its 6000 members, via its quarterly newsletter, to report any reactions experienced during the 6-month period October 2000–April 2001. Sixty percent of index members under 18 are male, but this ratio is reversed in the adult membership, where 67% of the members are female.

The Medical Advisory Committee of the Campaign (authors G. L., R. P., P. E., J. W., J. H.) approved the final version of the questionnaire (developed by S. C., D. R. and G. L.) of 41 questions which was included in the newsletter. Details were sought regarding demographic information, prior history of other allergies, information about the food suspected and the reaction reported. Other specific questions focussed on personal or medical responses to the allergic reaction including hospital attendance or admission. Specific instructions were given to only record reactions that occurred during the study period, with the date recorded on the form.

Symptoms were considered as typical and significant if members reported 'swelling of throat or mouth, wheezing and difficulty breathing, collapse, loss of consciousness, severe abdominal pain, nausea-vomiting, diarrhoea, hives, rhinitis and conjunctivitis, flushing'. Participants were divided into two subgroups: children (under 16 years) and adults (older than 16 years).

Data were manually entered and checked in an SPSS spreadsheet (Version 10.1.1, SPSS, IL, USA) and some data were reanalyzed using SAS v9.0. To investigate the factors associated with the severity of an allergic reaction, a logistic regression was conducted using generalized estimating equations. A *P*-value of less than 0.05 was considered significant.

Results

One hundred and thirteen members responded, representing one in 44 members of the Anaphylaxis Campaign. Four patients were excluded because of unclassifiable responses. Ten of the 109 responders (75 children and 34 adults) reported more than one allergic reaction, giving a total of 126 valid reports (88 from children and 38 from adults). Six children and four adults reported recurrent reactions.

The median age of registrants at time of reaction was 6 years (range 1–15.9) for children and 29.5 years (range 16–72) for adults. There was a significant preponderance of females in the adult group: 44% of children and 74% of adults were female ($P < 0.05$). Eighty-eight percent of children and 74% of adults had at least one other atopic disorder including eczema, rhinitis and asthma (Table 1).

Foods were implicated in 112 reactions (89%) (Fig. 1). There was a similar distribution of reactions to the common allergenic foods in each age group but adults reported reactions to relatively unusual foods more often than children ($P = 0.004$). Forty percent of reactions in adults were because of more unusual but internationally well-recognized allergenic foods including citrus fruits, peas, banana, kiwi, sesame, mustard and food additives. Fourteen reactions (11%) were to unidentified substances, related to meals in all cases, (12 in

Table 1. Description of the registrants

	Children	Adults
Median age at time of reaction (years)	6	29.5
Sex		
Male (%)	57*	26
Female (%)	43	74
Other atopic disorders (%)	85	73
Eczema (%)	72†	38
Rhinitis (%)	19	6
Hayfever (%)	34	35
Asthma (%)	58	56

Numbers indicate percentage values.

* $P < 0.05$; † $P < 0.01$.

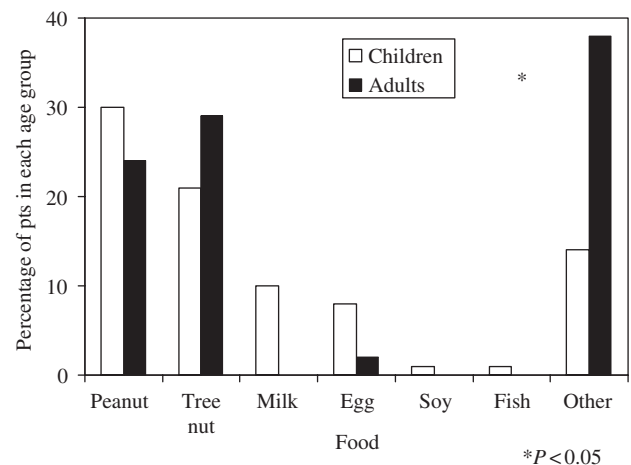


Fig. 1. Foods responsible for acute allergic reactions.

children, two in adults, $P = 0.16$), but further details did not allow confident identification of the allergen (Table 2).

Table 3 shows the details of the reactions to food. One fifth of children reported a reaction in school or day care. Although both groups were reported as equally aware of their food allergies, the children had undergone diagnostic tests more often ($P < 0.01$).

Reactions were reported after smelling, touching, eating and drinking foodstuffs. Eighty-two percent of reactions started within 30 min of contact with allergen. Mouth and throat swelling was the most common symptom in both groups although they were reported more by adults than children (68% vs. 44%, $P < 0.05$). Adults reported severe symptoms more often than children ($P = 0.04$), particularly cardiovascular collapse ($P = 0.02$). However severe abdominal pain, local and general hives, rhinitis–conjunctivitis and flushing were reported more often in children.

Some factors were considered by respondents to have worsened the reactions to food, compared with previous reactions suffered. These were exercise, alcohol, infection, menstruation [3]. Twenty-six of the 30 severe reactions (86%) in children were in asthmatic children ($P = 0.008$). Asthma did not affect reaction severity in adults, although this may be accounted for by the smaller sample size in the adult age group. Indices of severity of asthma did not appear to affect clinical severity of allergic reactions reported for adults or

Table 2. Features of 14 reactions in which allergen could not be positively identified

Reaction number	Patient number	Age (years)	Known allergies	Circumstances/location	Reaction	Treatment	Comment
1	5	5	Milk, Egg, Peanut	Party	Urticaria, Wheeze	Antihists, β_2 inh	Two other reactions to dairy reported
2	5			Party at school	Facial swelling	Antihists Adr	
3	25	6	Egg, Peanut, Tree nuts	Icecream at theatre	Lip swelling, Collapse	Adr	Same icecream previously tolerated
4	27	3	Milk, Egg, Peanut	Party	Throat Swelling Urticaria, Angioedema, Rhinitis, Abdominal pain	Antihists β_2 inh pred	
5	31	31	Peanut	Take away meal at home	Throat swelling, Vomit	None	? lupin
6	38	15	Peanut, Tree nuts	Supermarket icecream at home,	Throat and lip swelling	Antihists	
7	39	2	Milk, Egg	Chocolate at home	Urticaria, Lip swelling	Antihists	
8	50	13	Milk, Egg, Peanut	Restaurant meal	Urticaria, Eczema, Vomit	None	
9	65	9	Milk, Egg, Peanut, Kiwi, Latex	Youth club	Abdominal pain, Itch, Dizzy	Antihists Adr	
10	65			Fast food restaurant	Wheeze, Urticaria, Dizzy	Antihists IV at hospital	
11	88	15	Peanut, Tree nuts	Shop-made fruit drink and chocolate at home	Mouth swelling	Antihists, β_2 . Inh given by G. P.	
12	93	6	Peanut, Tree nuts	In car from school	Conjunctivitis, Lip swelling	Adr β_2 inh	
13	97	9	Peanut	Indian food at home	Conjunctivitis, Abdominal pain	Antihists	
14	113	44	Tree nut, Cats, Pollen	Red wine at home	Mouth swelling, Urticaria, Shivering	Adr Antihists	

Adr, Adrenaline; β_2 Inh., β_2 agonist inhaler; Antihist, Antihistamines given p.o. unless stated; Pred, prednisolone.

children. Adults showed a trend for recent use of reliever medication (β_2 agonists) ($P = 0.06$) and nocturnal symptoms ($P = 0.09$), but no trend was evident for these parameters in children or for exertional asthma in either group.

Table 4 summarizes the characteristics of treatments. Most patients had been prescribed rescue medication (92% of children and 95% of adults). Antihistamines were the most commonly used drugs in both groups, and their use was higher in children than adults ($P < 0.05$). Although each group had injectable adrenaline available at the time of reaction, adults used it more often than children. Both groups appeared to under-use adrenaline. Approximately half of each group reported severe symptoms but only 11% of severe reactions in children and 32% in adults were treated with injected adrenaline. For those who had self-injectable adrenaline available at the time of a reaction (98 episodes), 13/37 severe reactions and 8/61 non-severe reactions were treated with adrenaline ($\chi^2 = 6.63$, $P = 0.01$). Adults also used a second injection of adrenaline more often than children. (Table 4). The ratios of hospital treatment and admission were significantly higher in adults than in children.

Discussion

Anaphylaxis is an uncommon clinical event in the United Kingdom [13], although reports based on hospital discharges may not take account of people who present at emergency

departments but do not require admission to hospital. However the risk of anaphylaxis represents a considerable additional psychological and social burden on sufferers and their families [14].

We have confirmed that most people who have allergic reactions already know they are at risk of an allergic reaction if exposed to that food [8]. However it is notable that about a third of reactions happen after exposure to unidentified allergens or to foods not previously identified as a risk. Reactions occur in more domestic situations in the UK than reported in US series [11, 15], either reflecting British eating habits in general or a reluctance of British allergic subjects to risk allergen exposure in restaurants. School reactions occurred in nearly a fifth of children, despite the group studied being a well-motivated population with a high awareness of food allergy.

The children reacted to more 'typical' foods than adults, and even when we conservatively considered the allergen unidentifiable (Table 2), the range of foods and circumstances were very similar to those reported previously [8, 15]. Because the adults experienced their reactions mostly in restaurants and other locations, they probably are faced with more unusual foods and compound meals than children, whose parents reported their reactions generally occurred in familiar locations such as home or school where the repertoire of allergenic foods may be more limited.

Adults reported collapse more often than children and therefore they required injections of adrenaline, hospital

Table 3. Details of 126 reactions in 75 children (88 reactions) and 34 adults (38 reactions)

	Children (%)	Adult (%)
Location where symptoms began		
Home	31 (35)	9 (27)
Relative's home	8 (9)	2 (5)
Friends home	7 (8)	5 (13)
Restaurant	5 (6)	6 (16)
School	16 (18)	2 (5)
Other	21 (24)	14 (37)
Patient known to be allergic to the implicated food	57 (66)	25 (66)
Food product implicated		
Unadulterated allergen	13 (19)	3 (12)
Food known to contain allergen	12 (18)	3 (12)
Food not known to contain allergen	37 (55)	17 (68)
Uncertain	5 (7)	2 (8)
Allergy previously verified by tests	65 (74)†	18 (65.8)
Skin prick test	43 (66)*	6 (33.3)
Specific IgE	37 (56)	13 (72.2)
Challenge	13 (20)	1 (5.6)
Allergen contact		
Smell	10 (12)	5 (13)
Touch	17 (20)	7 (18.4)
Eat	52 (63)	24 (63)
Drink	3 (4)	1 (3)
Symptoms		
Throat-mouth swelling	39 (44)*	26 (68)
Wheezing and breathing difficulties	29 (33)	18 (47)
Collapse	6 (7)*	8 (21)
Severe abdominal pain	19 (22)	4 (10)
Local hives	36 (41)	11 (29)
General hives	27 (31)	7 (18)
Rhinitis-conjunctivitis	13 (15)*	1 (2)
Nausea-vomiting	9 (10)	4 (10)
Flushing	12 (14)	4 (10)
Severe	30 (34)	20 (53)
Other	22 (25)	6 (16)
Factors thought to worsen the reaction		
Exercise	2 (2.5)	0 (0)
Alcohol	0 (0)†	5 (15.2)
Infection	2 (2.5)	2 (6.1)
Menstruation	2 (2.5)	1 (3.0)
Other	6 (7.8)	3 (9.1)

Data are given as the number (percentage).

* $P < 0.05$; † $P < 0.01$.

attendance or admission more often. It is important to note that 3/12 adults (25%) who received one dose of adrenaline also received a second dose of adrenaline. This has important implications for the provision of adrenaline kits to people at risk of severe reactions [16] and especially for those for whom estimation of future risk is difficult [17].

Reaction severity was significantly associated with asthma, but only in children; this may be accounted for by the smaller sample size in the adult age group. This is the first prospective study to show such an association of reaction severity with asthma, although asthma severity itself was not a key feature of the association. Asthma care should be a critical target for the outpatient supervision of children with food allergy.

Table 4. Characteristics of the treatment responses to 126 allergic reactions (88 in 75 children and 38 in 34 adults)

	Children	Adult
Patient had received a medical prescription before the allergic reaction	81 (92.0)	36 (94.7)
Adrenaline kit available at time of reaction	70 (79.5)	28 (75.7)
Adrenaline administered at time of reaction	10 (11.4)†	12 (32.4)
Who injected adrenaline?		
Self	0 (0)	8 (21.6)
Parent	9 (10.2)	0 (0)
Other	1 (1.1)	4 (10.8)
Second adrenaline injection given	1 (1.1)*	3 (8.3)
Other medication given		
Antihistamine	59 (70.2)*	15 (45.5)
Steroid	2 (2.4)	0 (0)
Bronchodilator	10 (11.9)*	4 (12.1)
Patient treated at hospital	21 (24.1)†	18 (48.6)
Patient admitted to hospital	5 (5.8)*	7 (18.9)

Data are given as the number (percentage).

* $P < 0.05$; † $P < 0.01$.

Although both groups were equally aware of their food allergies, the children had undergone diagnostic tests more often. This finding suggests that the parents of allergic children access medical care for their children's food allergies better than allergic adults do. It may also mean that adults with allergies that are stable over time are not under regular follow up by adult physicians, unlike children where regular review is more common [3, 18].

Interpretation of our findings has several limitations, reflecting, as they do, the highly motivated population studied, with heightened awareness of allergy risks, particularly of food allergy risks. The comparisons of reports by adults and children was not a primary outcome but we feel our subgroup analysis was justified by the differences found, particularly the positive findings related to severity of reaction and the lack of specialist review reported by adults. The data were self-reported and were not validated by either physician review, which it was not possible to include in the nationwide design of the study, or by the gold standard test in food allergy, a double-blind, placebo-controlled food challenge. Our findings may not be applicable to the wider allergic community but they do suggest that recent studies regarding the incidence of severe allergic reactions, with very strict inclusion criteria [9], may have considerably underestimated the frequency of significant and severe, if not fatal, allergic reactions in the British population. The recently identified under-provision of allergy services in the UK [19] constitutes a significant and potentially dangerous burden of anxiety and stress for allergic patients.

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drafts of the manuscript. J. H. designed the study, supervised the analysis and writing of first draft and undertook revisions of the manuscript. J. D. and D. B. performed statistical analysis and contributed to drafts of the manuscript. D. R. supervised data collection. All authors have seen and approved the submitted version. J. H. is the guarantor of the paper.

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