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Perceived prevalence of peanut allergy in Great Britain and its association with other atopic conditions and with peanut allergy in other household members

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Background: Despite increasing awareness of peanut allergy, little is known of its prevalence. We report on a two-stage interview survey conducted in Great Britain.

Methods: A total of 16 434 adults (aged 15+ years) reported their own allergies and atopies and named cohabitants with peanut allergy (stage 1). Follow-up interviews were conducted with identified sufferers from peanut allergy (stage 2).

Results: At stage 1, peanut allergy was reported in 58 respondents and 205 other household members. When we accounted for cases where peanut allergy was unconfirmed or newly reported at stage 2, the prevalence, based on 124 confirmed sufferers, was estimated as 0.48% (95% confidence interval 0.40%–0.55%). The prevalence in children (0.61%, 0.41%–0.82%) was slightly higher than in adults; age-of-onset was strikingly earlier. Prevalence was strongly associated with other atopies, particularly tree-nut allergy. Cases tended significantly to cluster in households. Half of cases had never consulted a doctor. Exactly 7.4% reported being hospitalized after a reaction.

Conclusions: Peanut allergy is reported by 1 in 200 of the population and is commoner in those reporting other atopies. The fact of similar rates in children and adults argues against a recent marked rise in prevalence. The frequency and potential lethality of this disorder emphasize the need for sufferers to

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Deaths from peanut allergy were first described in 1982 (1). Some are avoidable if correct medical advice is given (2). To help doctors advise their patients, the prevalence of affected individuals must be known, but few data are currently known. We aimed to determine the perceived prevalence of peanut allergy in Great Britain and its association with

demographic factors, other food allergies, atopic conditions, and allergy in family/household members. Our study comprised a screening survey and detailed interviews with sufferers identified.

Material and methods

Stage 1

In an “omnibus” survey, at-home interviews were conducted weekly in a sample of 2000 households, nationally representative in terms of the respondent’s age, sex, social class, and household size. Between November 1995 and January 1996, respondents aged 15+ years were asked to identify from a defined list of atopic conditions, including food allergies, those they suffered from and which other cohabitants, including children, suffered from peanut allergy.

Stage 2

We tried to conduct in-depth interviews with all reported sufferers from peanut allergy (or, for children, with their

parents). Provided that subjects confirmed the presence of the allergy, questions were asked on source of diagnosis, doctor consultation, number of reactions, age at first reaction, type of contact with peanuts causing the reactions, amount of peanuts taken, symptoms occurring, medication taken, and hospitalization necessary. We also asked subjects about asthma, eczema, and hay fever, and other food allergies. The questionnaire was based on a validated questionnaire used in a large nationwide cohort of peanut-allergic subjects (3).

Prevalences in different groups were compared by chi-square tests stratified for age and/or sex (4). Ranked variables were compared by a stratified Kruskal-Wallis test (5).

Results

A total of 16 434 men and women were interviewed at stage 1. Atopic conditions and food allergies were commoner in women (Table 1). Asthma, eczema, and hay fever were about 10 times more prevalent than the commoner food allergies. Asthma, eczema, hay fever, and tree-nut allergy (but not

Table 1. Prevalence of reported allergy/atopy in 16420* British men and women aged 15+

Allergy/atopy	Unweighted prevalence				Weighted prevalence	
	Cases	Males	Females	P†	Total	±95% CI*
Asthma	1341	6.9	9.2	<0.001	8.2	7.9 (7.5–8.3)
Eczema	838	3.3	6.6	<0.001	5.1	4.9 (4.6–5.3)
Hay fever	1756	10.1	11.2	<0.05	10.7	10.9 (10.3–11.4)
Eggs	113	0.35	0.98	<0.001	0.69	0.68 (0.55–0.82)
Fish	84	0.33	0.66	<0.01	0.51	0.50 (0.39–0.61)
Fruit	86	0.25	0.75	<0.001	0.52	0.54 (0.42–0.66)
Milk	112	0.45	0.88	<0.01	0.68	0.71 (0.57–0.84)
Tree nuts	63	0.35	0.42	NS	0.38	0.40 (0.30–0.51)
Peanuts	58	0.24	0.45	<0.05	0.35	0.39 (0.28–0.49)
Pulses	6				0.04	0.04 (0.01–0.07)
Sesame	8				0.05	0.04 (0.01–0.06)
Soy	8				0.05	0.04 (0.01–0.08)
Wheat/flour/gluten	61	0.21	0.51	<0.01	0.37	0.36 (0.26–0.45)
Cheese	34	0.15	0.26	NS	0.21	0.19 (0.13–0.26)
Chocolate	32	0.21	0.18	NS	0.21	0.21 (0.13–0.28)
Any food allergy	681	3.8	5.1	<0.001	4.1	4.2 (3.9–4.5)
Any allergy/atopy	4130	21.8	28.0	<0.001	25.2	25.0 (24.3–25.8)

*Fourteen of 16 434 subjects refused to answer; 7515 men and 8905 women answered.

†Weighted by sex, age, social grade, and employment status; CI: confidence interval.

†For comparison of prevalence by sex, NS: not significant.

Table 2. Prevalence of confirmed* peanut allergy by sex and age

		Age group (years of age)						All ages
		0–4	5–9	10–14	0–14	15–44	45+	
Male	Numbers with allergy	5	7	9	21	17	7	45
	Prevalence	0.47	0.77	0.91	0.71	0.28	0.17	0.35
	(95% confidence interval)				(0.40–1.02)	(0.15–0.42)	(0.04–0.30)	(0.25–0.44)
Female	Numbers with allergy	3	5	6	14	47	18	79
	Prevalence	0.34	0.55	0.63	0.51	0.79	0.41	0.60
	(95% confidence interval)				(0.24–0.78)	(0.56–1.01)	(0.22–0.61)	(0.48–0.73)
Combined numbers with allergy	Numbers with allergy				35	64	25	124
	Prevalence				0.61	0.53	0.30	0.48
	(95% confidence interval)				(0.41–0.82)	(0.41–0.66)	(0.18–0.41)	(0.40–0.55)

*Confirmed at stage 2 interviews, not by allergy testing.

other food allergies) were commoner in younger people (data not shown).

At stage 1, 253 households were identified with member(s) reported to have peanut allergy. In 48, it was the respondent; in 195, a cohabitant; and in 10, both. Stage 2 interviews were not conducted in 139 of the households, due mainly to refusal ($n=63$), being unobtainable ($n=35$), or not confirming the allergy when contacted ($n=29$). The likelihood of success was greater ($P<0.01$) if, at stage 1, respondents reported having the allergy themselves (91.7%) than if they reported it only in a cohabitant (64.8%), but was not significantly related to age, sex, social class, or ethnicity. Overall, 124 stage 2 interviews were conducted in 114 households.

At stage 2, two stage 1 respondents and 27 cohabitants of stage 1 respondents failed to confirm the peanut allergy originally reported. Peanut allergy was confirmed in other interviews and also in one subject who died from it shortly after stage 1. In 16 of the 81 households (19.7%) where the stage 1 respondents reported peanut allergy only in a cohabitant, they claimed (later confirmed by telephone) to have it themselves at stage 2. (The stage 1 interviews could not have failed to detect peanut allergy in 19.7% of all respondents. Presumably, some respondents with peanut allergy did not mention it when selecting from the show card those allergies they suffered from, but did mention it in reply to the more specific question about other household sufferers, although this was not intended to relate to the respondent.)

If we assume that reinterview probability is unrelated to confirmation of peanut allergy, the unweighted prevalence can be estimated (see Appendix), correcting for false-positive and false-negative stage 1 reports, as 0.48% (95% confidence interval 0.40–0.55) (Table 2). The prevalence was similar for

stage 1 respondents (0.49%) and other cohabitants (0.47%). Weighting by age, sex, social class, and employment slightly increased the estimated overall prevalence, but only to 0.53%.

If we assume also that rates of reinterview and confirmation of allergy were independent of age and sex, corrected age and sex-specific prevalence estimates can be calculated (Table 2). The sex-specific rates by broad age groups varied significantly ($P<0.001$) due to higher rates in males aged 0–14 years and females aged 15–44 years and lower rates in males aged 15–44 and 45+. Risk varied markedly ($P<0.001$) by age in males, but less so in females ($P<0.05$). The overall rate in females was higher ($P<0.01$) than in males, but this was evident only in adults. The prevalence was somewhat higher at age 15–44 than at age 45+ ($P<0.05$ for sexes combined).

Confirmed prevalence did not vary significantly by social grade (ABC1 0.43%, C2DE 0.51%). Only three confirmed sufferers from peanut allergy were non-White, for whom prevalence (0.21%) was nonsignificantly less than for Whites.

In adults, peanut allergy was strikingly associated with other food allergies and atopy. In those with confirmed peanut allergy, asthma, eczema, and hay fever rates were 3–5 times higher than in the overall population, with most food allergies about 10 times higher, allergy to fruit over 20 times higher, and allergy to tree nuts almost 100 times higher ($P<0.001$). Atopy and other food allergies were also common in children with peanut allergy. Many other conditions, e.g., asthma with eczema, went together (results not shown).

Peanut allergy clustered in households and in families. Given one case in a household, the probability of another was estimated as 3.2%, six times that in the UK population ($P<0.001$). Nine of the 10 second cases in the same household were in first-degree relatives.

Table 3. Diagnosis, doctor consultation, and treatment for peanut allergy

Factor	Level	Males (age in years)		Females		Total
		0–14 %(n=21)	15+ %(n=24)	0–14 %(n=14)	15+ %(n=65)	
Source of diagnosis	No one/self/parent	60	67	50	72	67
	General practitioner	20	24	29	20	22
	Hospital allergy clinic	20	10	14	6	10
	Homoeopathy clinic	0	0	0	2	1
	Other	0	0	7	0	1
Diagnosis/consultation	Doctor diagnosed	38	29	43	26	31
	Consulted, not diagnosed	19	17	36	20	21
	Not consulted	43	54	21	54	48
Treatment for latest reaction	None	40	47	45	55	40
	Antihistamine tablets	13	12	9	15	14
	Injected adrenaline	0	0	9	2	2
	Inhaled adrenaline	0	0	0	2	1
	Inhaled steroids	7	6	0	8	7
	Steroid tablets	0	6	9	0	2
	Other	40	41	27	23	29

Numbers of respondents are less than indicated for some questions due to failure to answer.

Table 3 summarizes data on diagnosis and treatment. Only 31% of cases were doctor-diagnosed. A doctor was consulted in a further 21%, but, presumably, only regarding treatment. Frequency of diagnosis or consultation did not vary significantly between children and adults. Only half of sufferers reported taking any treatment, antihistamine tablets being most commonly reported.

Adults and children differed strikingly ($P < 0.001$) in reported age of first reaction. In children, 18% reacted by age 1 year and 56% by age 2. In adults, comparable percentages were 0% and 5%, 78% first reacting after age 10. This difference was not explained by the children's younger ages – 0.29% of 5–14-year-old children reacted by age 2, 15 times more than for adults.

For both first and latest reactions, many symptoms were reported, with rash, itching, vomiting, abdominal pain/cramp, facial swelling, and breathing difficulty each reported by 20–30% of sufferers. Sufferers reporting a specific symptom in their first reaction were much likelier than other sufferers to report it in their latest reaction (data not shown).

Of sufferers, 11% reported only one reaction; 31% reported more than 10 reactions; and 49% reported reacting in the year before interview. Symptoms peaked in 5 min in 24% and in 30 min in 53% of the sufferers, starting to improve by 1 h after contact in about 25%, and by 3 h in about 50%. Reaction to a smell, touch, or taste

was much commoner in children than adults (43% vs 9%).

Discussion

The prevalence of peanut allergy was based on respondents' self-report. Self-reporting may overestimate the prevalence of food allergy, but all methods used to diagnose food allergy have their limitations. For example, blood tests for specific serum IgE antibodies are of limited value because some people have a positive test and not symptoms (6), and a small minority of self-reported subjects have a negative skin test (1, 3). The double-blind, placebo-controlled food challenge is considered to be the best tool for confirming food intolerance, but food challenges are not advisable when the patient is at risk of anaphylaxis.

We interviewed 16 420 British adults (stage 1) and found that 0.4% of respondents reported peanut allergy when asked which of a list of allergies they suffered from. Respondents also identified other cohabitants (including children) with peanut allergy. We tried to conduct further interviews (stage 2) in all households with sufferers. Some identified individuals failed to confirm their allergy at stage 2, and some reporting peanut allergy only in another cohabitant at stage 1 reported at stage 2 that they themselves had it. On the basis of all 124 subjects with peanut allergy

confirmed at stage 2, we estimated the prevalence as 0.5%, assuming reinterview probability to be unrelated to confirmation of peanut allergy. Although this assumption cannot be directly tested and the rate of failure to re-interview was high, any error in estimating prevalence is probably small.

In adults, peanut allergy was significantly commoner in females (Table 2). In children (aged 0–14 years), it was nonsignificantly commoner in males (0.7%) than in females (0.5%). Prevalence in children was similar to that (0.5%) reported in a recent cohort study in the Isle of Wight (UK) (6).

As others have reported, peanut allergy is strongly associated with asthma, eczema, and hay fever and is strongly associated with tree-nut allergy (6–8). It is strongly related to all the common food allergies.

Our results confirm a report that peanut allergy clusters in households/families (3). We cannot tell from our data whether this is due to genetic or environmental causes.

We wished to estimate prevalence by severity. As anaphylactic shock is the severest consequence of peanut allergy, one definition of severe allergy includes the symptoms (breathing difficulty, wheezing, blue round lips, and fainting/loss of consciousness) associated with it. These were reported by 43 (34.7%) of the 124 confirmed sufferers, or about 0.2% of the overall population. Another definition involves hospitalization after a reaction. Of 122 sufferers who remembered, nine (7.4%) reported going to hospital, and four (3.3%) were admitted overnight; i.e., respectively, about 0.04% and 0.02% of the population.

In about half of confirmed cases, a doctor was never consulted. This lack of proper diagnosis or advice on management is of concern, particularly given the considerable recent news media attention, as is the small proportion of sufferers who reported using adrenaline, contrary to a UK Department of Health recommendation to general practitioners (9) that “patients with established peanut allergy and/or their close relatives should be trained to administer intramuscular adrenaline injections if required in an emergency and provided with the necessary equipment.”

As the prevalence of peanut allergy in grandparents, parents, and siblings of sufferers shows a clearly increasing trend (3), and as age of onset of peanut allergy is strongly related to age (3, 10), it has been suggested that prevalence is increasing and an epidemic may exist (3). Although we also found younger sufferers reported to react much earlier to peanuts, prevalence can hardly be rising dramatically when reported prevalence in children only modestly exceeds that in adults. While some aspect of exposure or sensitivity to peanuts may have changed over time, affecting recently born children more, other

explanations may underlie the association of age of onset with age. Adults may be unaware when they first had peanut allergy and may report only when they first remember having it. In contrast, parents may easily remember early-life incidents in their children. Moreover, early-onset allergy may resolve with time (3), existing follow-up studies being only of relatively short duration (6, 11). Our study identified only subjects with current peanut allergy – future studies might usefully ask whether subjects have ever had it.

More detailed tabulations of results can be obtained from the authors.

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Appendix

Frequency of peanut allergy among all original household members

Of 253 households identified with at least one sufferer at stage 1, peanut allergy in the household was confirmed in one subject who died from it and in 114 out of 143 households followed up. These 114 households yielded 124 cases. The total number of original household members with peanut allergy could then be estimated (assuming that confirmation of allergy is unrelated to probability of reinterview) as

$$\frac{124}{114} \left(1 + \frac{252 \times 114}{143} \right) = 219.605$$

Based on the estimated at-risk population of 46 252, this formula gave a rate of 0.475% (95% confidence interval 0.399–0.551).

Frequency among original respondents (aged 15+) and other cohabitants

Of 58 respondents originally reporting peanut allergy, 35 were successfully recontacted, with 33 cases confirmed at stage 2. Of 195 respondents who claimed that some other cohabitant had peanut allergy, 143 were recontacted and in 19 the original respondent was identified as having peanut

allergy. The true number of original respondents with peanut allergy could then be estimated as $(58 \times 33/35) + (195 \times 19/143) = 80.595$. By subtraction, the estimated number

of other household members was 139.01. Based on the at-risk populations of 16 420 and 29 832, these represent similar rates of 0.491% and 0.466%.

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