ARTICLE

Epidemiology of IgE-mediated food allergy

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Despite the large number of foods that may cause immunoglobulin E (IgE)-mediated reactions, most prevalence studies have focused on the most common allergenic foods, i.e. cow's milk, hen's egg, peanut, tree nut, wheat, soya, fish and shellfish.

Food allergy peaks during the first two years of life, and then diminishes towards late childhood as tolerance to several foods develops. Based on meta-analyses and large population-based studies, the true prevalence of food allergy varies from 1% to >10%, depending on the geographical area and age of the patient.

The prevalence of food allergy in South Africa (SA) is currently being studied. The prevalence of IgE-mediated food allergy in SA children with moderate-to-severe atopic dermatitis is 40%; however, this represents a high-risk population for food allergy. Preliminary data from the South African Food Sensitisation and Food Allergy (SAFFA) study, which is investigating food allergy in an unselected cohort of 1 - 3-year olds, show a prevalence of 11.6% sensitisation to common foods. Food allergy was most common to egg (1.4%) and peanut (1.1%).

Food allergy appears to be the most common trigger of anaphylactic reactions in the community, especially in children, in whom food is responsible for ≥85% of such reactions. In adults, shellfish and nut, and in children, peanut, tree nut, milk and egg, are the most common triggers of food-induced anaphylaxis.

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True food allergy is less prevalent than commonly perceived. Up to 34% of individuals or parents think that they or a family member has a food allergy and 22% avoid particular foods because the food may possibly contain an allergen. However, only 1 - 6% of persons test positive on full evaluation, which may include double-blind placebo-controlled food challenges.[1-4]

Epidemiology of IgE-mediated food allergy

The prevalence of food allergy varies significantly based on geographical region, allergens tested, diagnostic criteria, population age and concurrent atopic conditions.[5] Variations in food allergy definitions and inconsistencies in study design make studies on food allergy prevalence difficult to compare. Self-reporting significantly overestimates food allergy prevalence up to 10-fold;[4] hence, objective measurements are necessary to establish a true food allergy diagnosis. Similarly, sensitisation to foods is much higher than clinically relevant allergies; therefore, sensitisation should always be combined with more objective information to prove allergies. Food challenge testing is the optimal way of proving food allergy, albeit labour and cost intensive. Recent large population-based studies, such as the EuroPrevall study in Europe[6] and HealthNuts study in Australia,[7] have used food challenge testing and can be considered flagship studies of food allergy prevalence.

Prevalence of food allergy

Despite the large number of foods that can cause immunoglobulin E (IgE)-mediated reactions, most prevalence studies have focused on the most common allergenic foods, i.e. cow's milk, hen's egg, peanut, tree nut, wheat, soya, fish and shellfish.[8]

Food allergy peaks during the first two years of life, and then diminishes towards late childhood as tolerance to several foods develops over time. Based on meta-analyses and large population-based studies, the true prevalence of food allergy varies from 1% to >10%, depending on the geographical area and age of the patient.[9-19] Allergy prevalence to the most common allergenic foods is summarised in Table 1.

The prevalence of food allergy in South Africa (SA) is currently being studied. An unselected population of 211 Xhosa high-school students showed an overall sensitisation to foods of 5%.[20,21] Preliminary data from the South African Food Sensitisation and Food Allergy (SAFFA) study,[22] which is investigating food allergy in an unselected cohort of 1 - 3-year-olds, show a prevalence of skin-prick tests of ≥1 mm (11.6%), ≥3 mm (9.9%) and ≥7 mm (4.2%) to all foods tested. Challenge-proven food allergy to any food is 1.8% after the preliminary analysis; recruitment is ongoing.

Table 1. Summary of prevalence of allergy to individual food allergens

Allergen	Prevalence in young children, %	Prognosis
Cow's milk	0.3 - 3.5 (<0.5 in adults)	>80% outgrown by 16 y
Hen's eggs	0.5 - 8.0 (<0.5 in adults)	>80% outgrown by 16 y
Wheat	<1	Majority outgrow – 65% by 12 y
Fish	<0.2 (children) and <0.5 (adults)	Usually allergic for life
Shellfish	<0.5 (children) and <2.5 (adults)	Usually allergic for life
Peanut	0.06 - 5.90	20% outgrown
Tree nut	0.2 - 1.4	10% outgrown
Plant food	0.1 - 4.3	

Increase in food allergy

Many studies have suggested a true rise in the prevalence of true food allergies over the past 10 - 20 years,[23-25] but further confirmation is required. This probable increase in food allergy requires urgent further investigation as it may be due to modifiable environmental factors.[26,27] Not only genetic factors, but also several environmental factors, have been proposed as influencing the risk for food allergy,[28] such as timing of allergen exposure, microbial exposure, and dietary antioxidant consumption.[29-31]

Allergies to specific foods

Cow's milk

Cow's milk protein allergy (CMPA) peaks in the first year of life. Based on several studies, its documented prevalence is 0.3 - 3.5% in young children (<5 years of age),[22,32-36] <1% in older children, and <0.5% in adults.[22,37,38]

Studies have indicated a generally good prognosis for CMPA, with 45 - 56% outgrowing the allergy by the age of 1 year, 60 - 76% by age 2, 85 - 90% by age 3, and 97% by age 15.[38,39]Acquisition of tolerance is faster in those with:

- initial specific IgE <2 kU/L
- delayed v. IgE-mediated reactions
- absence of asthma or allergic rhinitis.[40,41]

Egg

Egg allergy is more prevalent in children than in adults, and is usually IgE mediated. The estimated prevalence is 0.5 - 5.0% in early childhood,[42,43] decreasing significantly to <0.5% in older children and adults.[43,44] The prevalence of egg allergy in the preliminary data on 1 - 3-year-old SA children is 1.4%.[22]

Previous studies have demonstrated a good prognosis for egg allergy, with around 50% of egg allergic children outgrowing the condition by the age of 3 years, and 66% by the age of 5 years.[44,45]

Factors associated with persistence of egg allergy include:

- high initial egg specific IgE
- multiple food allergies
- multiple atopic conditions
- ovomucoid sensitivity
- slow decrease in specific IgE to egg white over time.[45]

Wheat

Wheat allergy is self-reported in about 4.5% of the population,[46] but confirmed in <1%.[42,43,46,47] It can manifest in both IgE-mediated and non-IgE-mediated symptoms. The natural history of wheat allergy is less well studied, but the majority of patients tend to become tolerant by adolescence.[47] A study from the USA showed the development of tolerance in 29% by 4 years, 56% by 8 years, and 65% by 12 years.[48]

Fish and shellfish

Fish allergy is one of the few allergies that may be more common in adults than in children. A wide variety of fish and shellfish species have been implicated, depending on availability and consumption patterns. Large USA-based studies have shown a prevalence of fish allergy in ≤0.2% of children and ≤0.5% of adults,[49,50] and shellfish allergy in ≤0.5% of children and ≤2.5% of adults.[49,50] Seafood allergy is lifelong in the majority of cases.

Peanut

The prevalence of peanut allergy varies significantly between geographical regions: in the EuroPrevall study, the overall prevalence of peanut allergy was 2.6%,[51,52] with wide variation between countries from 0.06% to 5.9%.[53] Prevalence of peanut allergy is about 0.8% in the population in the USA.[54] In an SA study of Xhosa high-school students, 1.9% were sensitised to peanut but none reported allergic symptoms.[55] Experience from our food allergy clinics in SA, and figures on peanut allergy in eczema patients, suggests that peanut allergy in SA may now be higher than previously anticipated.[56] The prevalence of peanut allergy in the preliminary data on 1 - 3-year-old SA children is 1.1%.[22]

Peanut allergy usually starts in early childhood and only a small proportion (20%) of patients outgrow it.[57,58] Negative skin-prick tests or a low level of peanut specific IgE makes outgrowing the allergy more likely.

The prevalence of tree nut allergy in the USA is approximately 0.5%.[54] The prevalence among European children in the EuroPrevall study varied from 0.2% to 1.4%.[59,60] The prevalence may be higher in adolescents and adults, as allergy to tree nuts may occur for the first time in adult life.

Allergy to tree nuts is outgrown in only about 10% of children, predominantly in those with low specific IgE <5 kU/L.[61]

Plant food

Allergic symptoms to various fruits and vegetables may be true allergies or caused by cross-reactivity (pollen fruit syndrome). In a recent systemic review (EuroPrevall study), the prevalence of perceived allergy to any fruits varied between 0.4% and 11.5%, and challenge-proven food allergy to fruits was 0.1 - 4.3%.[62]

Food-related anaphylaxis and fatalities

Food allergy appears to be the most common trigger of anaphylaxis in the community. One-third to half of anaphylactic episodes can be attributed to food;[63,64] this proportion seems to be higher in children, in whom food is responsible for ≥85% of anaphylactic reactions.[65] In adults, shellfish and nut are the most common triggers of food-induced anaphylaxis, and in children, peanut, tree nut, milk and egg.[66] The prevalence of food-induced anaphylaxis is difficult to estimate owing to methodological differences in acquiring data; however, there is evidence that food-induced anaphylaxis is increasing.[67]

Food allergy and comorbid conditions

Food allergic patients are significantly more likely than non-allergic patients to have concomitant atopic conditions. In patients with food allergy, studies have shown that:[68]

- 35 - 71% have evidence of atopic dermatitis
- 33 - 40% have evidence of allergic rhinitis
- 34 - 49% have evidence of asthma.

The prevalence of IgE-mediated food allergy in patients with moderate-to-severe atopic dermatitis is 30 - 40%, based on studies in Europe, the USA,[69-72] and, more recently, SA.[56]

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