

REGULAR ARTICLE

Parent-reported food allergy requiring an avoidance diet in children starting elementary school

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ABSTRACT

Aim: To evaluate the prevalence of parent-reported food allergies requiring avoidance diet at early school age.

Methods: The school health nurses interviewed, by using a structured questionnaire on the required diet at school, the parents of all the 1542 children starting elementary school in a Finnish town with 210 000 inhabitants.

Results: An allergy to basic foods was found in 41 (2.7%) children: 1.5% to milk, 1.1% to eggs and 1.0% to grains. An allergy to nuts was present in 3.1% and to fruits and vegetables in 5.8%, both with known cross-sensitization to pollens. In all, 9.2% of the children reported some allergy. Milk, egg and grain allergies were associated with soy, nut and spice allergies.

Conclusion: Over 2% of the 1542 Finnish first-graders reported allergies to basic foods (milk, eggs or grains) requiring special avoidance diets at school. The figure suggests that avoidance diets started in the first years of life still unnecessarily continued.

INTRODUCTION

Five to 10% per cent of children and 3–4% of adults have food allergies (1–3). The rates of food allergies vary by age, local diets and diagnostic practices. The peak prevalence of allergies to basic foods takes place in infancy: 2–3% are allergic to milk, 1–2% to eggs, <1.5% to nuts and <0.5% to grains (1–4). Based on Finnish register data, 2% of children aged <2 years were on an avoidance diet because of milk allergy in 2006 (4). Milk, egg and grain allergies resolve by age: in 75–90% by age 7 and in >90% by age 16 years (3,5). However, avoidance diets often continue even though the former food allergy patients actually can tolerate the foods in question. Birch and timothy grass pollens are the most common seasonal allergens in Finnish children (6), and the patients allergic to seasonal pollens are often co-allergized to certain fruits, vegetables, legumes, spices and nuts (7,8).

Early school age is a reasonable time to evaluate the transience or permanence of food allergies in children. Transient early-life food allergies have mainly resolved (5,9–11), and sensitization to birch and other pollens with cross-reactivity to plant food allergens have usually taken place (12). Finnish children begin elementary school between 6.5 and 7.5 years of age. All children and parents visit first the school health nurses and thereafter the school doctors. If the parents report food allergies or other diseases requiring special diets, school nurses interview the parents and children, and in collaboration with school doctors decide, whether any special diet is warranted. In the case of food

allergy, the disease is presumed to be doctor-diagnosed, preferably by a paediatrician, and still symptomatic.

The aim of the present study was to evaluate the prevalence of parent-reported food allergies requiring avoidance diets in the children starting elementary school.

SUBJECTS AND METHODS

In September 2009, 1542 children (777 boys and 765 girls) born in 2002 started elementary school in Tampere, the third largest town of Finland with 211 633 inhabitants. There are 40 schools in the town, the number of first-graders varied between 13 and 90 per school, and 29 school health nurses were responsible for the pupils. The school health nurses performed an examination of all of the first graders between September and December 2009. As a part of this examination, the need of avoidance diets as result

Key notes

- Over 2% of the 1542 children starting Finnish elementary school reported allergies to basic foods like milk, eggs or grains requiring avoidance diets, which means that unnecessary avoidance diets continued until school age. Fruit and vegetable allergies were present in 5.8% and nut allergies in 3.1%, reflecting the high frequency of seasonal pollen allergy.

of food allergies, celiac disease and lactose intolerance were charted by using a structured questionnaire. The parents had filled in a routine health questionnaire in advance. The school health nurses checked this information, interviewed the parents and children, and filled in the study questionnaire. Thus, the data of the present study were collected before the examinations made by the school doctors.

The study questionnaire contained questions on the belonging of milk, eggs, soy, fish and grains and cereals (wheat, rye, oat, barley) to the diet of the child. Milk, eggs and grains are considered basic children's foods in Finland. The use of milk, low-lactose milk and lactose-free milk was inquired about separately. If the child was able to use low-lactose or lactose-free milk or milk products, the case was classified as lactose intolerance. Only when the child was unable to use any milk products at all, milk allergy was considered. If grains and cereals were avoided, the presence of celiac disease diagnosis was checked, and the suitability of wheat, rye, oat and barley was asked for separately. The children who could not tolerate one or more grains and did not have celiac disease were determined to have allergy. If the child did not eat eggs but could tolerate egg protein in the food, the child was deemed not to have an egg allergy. Multi-allergy was defined as allergy to milk, wheat and any other grain. Additionally, a list of 32 fruits, vegetables, legumes, nuts and spices, which may cross-react with pollens, was incorporated in the questionnaire, and the school health nurses were asked to underline the foods that the child could not consume.

Statistics

The data were analysed using SPSS Statistics 17.0 software (IBM Corp., NY, USA). The results are expressed as percentage contributions and odds ratios (OR) with 95% confidence intervals (95% CI). Pearson's chi-square test and Fisher's exact test were used in the statistical analysis of the data.

Ethics

Because the personal data of the children were not registered, the study was conducted by the permission of the Chief Doctor and the Executive Board of the Tampere Health Centre. Oral consent was obtained from the parents before interviewed by school health nurses.

RESULTS

Cow milk allergy was present in 23 (1.5%), egg allergy in 17 (1.1%) and grain allergy in 15 (1.0%) children, with no significant differences between boys and girls (Table 1). Allergies to basic foods were present in 2.7% (95% CI 1.9–3.5%) and multi-allergy in 0.3% (0.04–0.6%) of the children (Table 1). In total, 142 (9.2%) children reported allergy to at least one food.

Ninety children (5.8%, 95% CI 4.7–7.0%) reported allergies to raw fruits or vegetables, 48 (3.1%, 95% CI 2.2–4.0%) to nuts, 23 (1.5%) to legumes and 13 (0.8%) to spices, with no significant differences between the genders (Table 1).

Table 1 Food allergies by gender in the 1542 children starting elementary school

Allergen /allergies	Boys, N = 777 (%)	Girls, N = 765 (%)	All (N = 1542)
Cow milk	14 (1.8)	9 (1.2)	23 (1.5) [0.9–2.1]**
Eggs	7 (0.9)	10 (1.3)	17 (1.1) [0.6–1.6]
Grains	7 (0.9)	8 (1.0)	15 (1.0) [0.5–1.5]
Wheat [†]	6 (0.8)	5 (0.7)	11 (0.7) [0.3–1.1]
Rye [†]	7 (0.9)	6 (0.8)	13 (0.8) [0.4–1.3]
Barley [†]	5 (0.6)	7 (0.9)	12 (0.8) [0.3–1.2]
Oat [†]	4 (0.5)	3 (0.4)	7 (0.5) [0.1–0.8]
Multi-allergy [‡]	3 (0.4)	2 (0.3)	5 (0.3) [0.04–0.6]
Basic food allergies [§]	18 (2.3)	23 (3.0)	41 (2.7) [1.9–3.5]
Soy	5 (0.6)	4 (0.5)	9 (0.6) [0.2–1.0]
Fish	8 (1.0)	5 (0.7)	13 (0.8) [0.4–1.3]
Legumes	12 (1.5)	11 (1.4)	23 (1.5) [0.9–2.1]
Nuts	20 (2.6)	28 (3.7)	48 (3.1) [2.2–4.0]
Spices [¶]	3 (0.4)	10 (1.3)*	13 (0.8) [0.4–1.3]
Fruits and vegetables [§]	49 (6.3)	41 (5.4)	90 (5.8) [4.7–7.0]

*p = 0.048; no other significant differences between boys and girls.

[†]Included in the group of allergy to grains.

[‡]Allergy to milk, wheat and one other grain.

[§]Allergy to milk, eggs or one of the four grains.

[¶]Capacity to cross-react with birch pollens; in addition, legumes and nuts may cross-react with seasonal pollens.

**95% confidence interval.

Celiac disease had been diagnosed in 11 (0.7%) children: in one boy and 10 girls (p = 0.006). In all, 114 (7.4%) children reported partial or total lactose intolerance: 48 boys and 66 girls (p = 0.066). The presence of total lactose intolerance was 2.1% (13 boys and 20 girls, p = 0.202).

An allergy to basic foods (milk, eggs or grains) increased significantly the risk of nut and spice allergies, and also the risk of soy allergy, but for soy allergy, the 95% CI was extremely wide (Table 2).

The numbers of food-allergic children varied from 0 to 14 and the numbers of milk-allergic children from 0 to 4 between the 29 school health nurses. These figures are too

Table 2 Other food allergies in the 41 children with basic food allergy, compared with 208 children with no such allergy

Allergen	Children with basic food allergy* (%) [95% CI]	OR (95% CI)
Soy (N = 9)	7 (17) [6–29]	21.2 (4.2–106.4)
Fish (N = 13)	4 (10) [1–19]	2.4 (0.7–8.2)
Legumes (N = 23)	5 (12) [2–22]	1.5 (0.5–4.2)
Nuts (N = 48)	13 (32) [17–46]	2.3 (1.1–4.9)
Spices (N = 13)	6 (15) [4–25]	4.9 (1.6–15.5)
Fruits and vegetables (N = 90)	17 (41) [26–57]	1.3 (0.7–2.6)

*An allergy to milk, eggs or one of the four grains.

OR, odds ratio; CI, confidence interval.

negligible for any analyses on the interviewer's influence to the results of the study.

DISCUSSION

More than 2% of the 1542 children starting elementary school reported allergies to basic foods requiring special avoidance diets at school. About 1.5% were allergic to milk, 1.1% to eggs and 1.0% to grains, and 0.3% were multi-allergic to milk, wheat and another grain. The figures are similar to those reported by Finnish toddlers, which means that unnecessary avoidance diets still continued. Allergies to fruits and vegetables (5.8%) and nuts (3.1%) were common. It is likely due to cross-sensitization with seasonal pollens. Allergy to basic foods was associated significantly with soy, nut and spice allergies.

In a systematic review of parent-reported food allergies, the prevalence of milk allergy at school age varied from 1.2% to 5% in seven included studies, and the prevalence of egg allergy varied from 0.2% to 2% in four included studies (1). Grain allergy was not reported separately. In over 350 Finnish food-allergic children, grain allergy was present in 11%, which means a population prevalence of <0.5% (11). The prevalence of allergy to any food (nuts included, but fruits, vegetables and legumes not included) varied from 3% to 12% (1). When the diagnoses were based on food challenges, skin prick tests or allergen-specific IgE measurements, the figures were substantially lower (1). The allergies in the present study are parent-reported and checked by school health nurses as a part of health examination. We consider that our data are reliable in terms of the used diets, because the parents were advised to report only allergies which they considered to require special avoidance diets at school.

Our figures on basic food allergies, 2.7% overall, and 1.5% to milk and 1.0–1.1% to eggs and grains, are within the limits presented in the systematic review (1), but are still higher than expected, because over 75% of basic food allergies in early childhood should resolve by school age (3–5,9–11). Our figures at early school age were not substantially lower than those reported for Finnish toddlers (4), e.g. the national prevalence of cow milk allergy was 2.0% in children aged <2 years based on register data on reimbursements for special formulas (4). Thus, unnecessary avoidance diets have continued until school age in children who actually had tolerated previously allergy causing foods if actively checked and tried to add in the diet. On the other hand, recent evidence suggests that food allergies, in line with other allergies, are increasing in prevalence (2,3), and in addition, the recovery by age may take place more slowly than previously. In two studies, only 12% of the children with food allergy resolved egg allergy by age 6 and less than half, 42%, resolved milk allergy by age 8 years (9,10).

Allergy to nuts, fruits and vegetables was common, evidently because of cross-sensitization with seasonal pollens. Timothy grass and birch pollens are the most common seasonal allergens in Finland (6), and cross-allergies with nuts and certain fruits and vegetables are common (7). In

previous paediatric studies on parent-reported food allergies, the prevalence of peanut allergy has varied from 0% to 2% in school-aged children (1). When the diagnoses were based on challenge, the prevalence was 0.2% in Danish school children (7). As many as 1.4% of over 6000 British 7-year-old children reacted to peanut and 1.0% to tree nuts in skin prick tests (13), but <25% of sensitized children had clinical peanut allergy in another study (14). In a recent systematic review, allergies to fruits varied from 2.2% to 11.5% and allergies to vegetables from 0.7% to 3.3% in under 6-year-old children (15). No age-specific data were presented for 6–18 years-old children, but the figures were lower in adults than in children: 6.6% or less for fruits and 2.2% or less for vegetables (15). These figures mean that our results obviously overestimated the prevalence of nut allergy, but were in line with available prevalence data on allergies to fruits and vegetables cross-reactive with birch and other seasonal pollens.

In a recent study in over 9000 Dutch children, the sensitization assessed by skin prick tests to food allergens decreased and the sensitization to inhaled allergens increased by age (16). Over half of the children with food allergies reacted to inhaled allergens, and over 25% of the children with allergies to inhaled allergens reacted to milk, eggs, peanut, wheat or soy (16). In the present study, self-reported allergy to basic foods like milk, eggs and grains beyond the preschool age increased significantly the risk of an allergy to soy, nuts and spices, but not to legumes, fruits and vegetables.

There are three main strengths in the present study. First, an early school age is a reasonable time to evaluate the transience versus persistence of food allergies. Transient cases of early-life food allergies have recovered, and in addition, pollen allergies associated with allergies to fruits, vegetables, nuts and legumes, have become symptomatic. Despite an optimal age, the study was cross-sectional with no longitudinal data available required to demonstrate true transience versus persistence of allergic symptoms. Second, we were able to recruit all the 1542 children starting elementary school in Tampere, Finland, into the study by scheduling the survey as part of the routine health examination. Despite this, the number of children with food allergies was too small for any stratified school-based or interviewer-based analyses. And third, lactose intolerance and celiac disease were carefully evaluated and excluded from the milk and grain allergy groups. In particular, self-reported lactose intolerance is so common that the separation of lactose intolerance from milk allergy is necessary in questionnaire-based studies.

The main shortcoming of the study was that the data consisted only of parent-reported information with no deeper objective investigations. This bias was lessened, but not totally eliminated, by the fact that school health nurses checked the information by interviewing the parents and children. Additionally, only allergies the parents considered to require special avoidance diets at school were recorded. Another shortcoming is that only children from one town were recruited. On the other hand, the child population is

rather homogenous in Finland, and there are both rural and urban areas (but no truly metropolitan area) in the town included. Therefore, there is no reason to expect significant differences between different regions within the town or even within the country.

In conclusion, parent-reported nurse-confirmed food allergies were common, in total 9.2%, in the 1542 children starting elementary school. The prevalence of allergy to basic foods (milk, eggs and grains) was 2.7%, which is higher than expected at early school age and suggests that avoidance diets started during the first years of life still unnecessarily continued. Allergies to fruits or vegetables (5.8%) and to nuts (3.1%) were common, evidently because of cross-allergy with seasonal pollens.

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