Prevalence and cumulative incidence of food hypersensitivity in the first ten years of life

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Running Title: Food allergy in older children

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**Abstract**

**Background**
Prevalence, incidence and natural history of food hypersensitivity (FHS) and its trends in an unselected cohort of older children is unclear.

**Methods**
A birth cohort born on the Isle of Wight (UK) between 2001-2002 was followed up prospectively. Children were clinically examined and skin prick tested at set times and invited for food challenges when indicated. At 10 years of age, children were also invited for a blood test.

**Results**
969 children were recruited at 12 weeks pregnancy and 92.9%, 88.5%, 91.6% and 85.3% were assessed at one, two, three and ten years.

Prevalence of sensitisation to any allergen over 10 years was 186/969 (19.2%; 95% CI: 16.84-21.8) and 108/969 (11.2%; 95% CI: 9.31-13.29) children were sensitised to at least one predefined food allergen. Excluding wheat (due to cross reactivity with pollen), 40/969 (4.1%; 95% CI: 3.19 - 5.32) children were sensitised to a predefined food allergen. Using food challenges and/or a good clinical history, the cumulative incidence of food hypersensitivity (FHS) in the first decade of life was 64/947 (6.8%, 95% CI: 5.2-8.4), while the prevalence of FHS at 10 years was 30/827 (3.6%, 95% CI: 2.54-5.15). The vast majority, 25/827 (3.0%, 95% CI: 1.8 – 4.2) suffered from IgE mediated food allergy, while 5/827 (0.6%, 95% CI: 0.07 – 1.3) had non-IgE mediate food allergy/food intolerance.
Conclusions

By the age of ten years 6.8% of children suffered from FHS based on food challenges and a good clinical history. There was a large discrepancy between reported and diagnosed FHS.

Keywords: Food allergy, Food hypersensitivity, Food intolerance, Incidence, Prevalence

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Introduction

Food Hypersensitivity (FHS) is the umbrella term for food allergies (FA) [IgE and non-IgE mediated] and non-allergic food hypersensitivity as currently defined by the European Academy of Allergy and Clinical Immunology (EAACI) and the World Allergy Organization.\(^{1}\)

Very few studies are available with the majority of these focusing on IgE mediated food allergies only. An EAACI systematic review reported food allergy rates based on a clinical history/food challenge of 1.1 – 1.2% in 6 year olds and 1.4 – 2.3% in 11 – 17 year olds. Based on food challenge only, these figures were 0.4 - 4.2% in 6-10 year olds and 0.1 – 5.7% in 11 – 17 year olds.\(^{2}\)

We have previously reported FHS in 6, 11 and 15 year old cohorts on the Isle of Wight (IOW). At six years of age,\(^{3}\) the prevalence of FHS based mainly on open food challenge (OFC) outcomes and positive skin prick test (SPT) responses plus a history of adverse reactions was 20/798 (2.5%) (95% CI 1.5 to 3.8). In the older children we found that the prevalence of FHS was 18/775 (2.3%) in the 11-year-old cohort and 17/757 (2.3%) in the 15-year-old cohort.\(^{4}\)

The aim of the present study is to address key knowledge gaps with respect to FHS in older children, namely: the prevalence, cumulative incidence and natural history of FHS in the first ten years of life (including both FA and non-allergic FHS), and how clinically defined FHS relates to reported symptoms of FHS. In this paper we will continue to use the term FHS in order to compare our data with previous studies from the IOW, using the same methodology. However, our focus is primarily on IgE mediated food allergies.
Methods

A whole population birth cohort was established on the Isle of Wight to study the prevalence and cumulative incidence of FHS. At one, two and three years, cohort children were invited to attend the clinic for a medical examination guided by a detailed questionnaire. At 10 years, visits to the schools were performed for SPT upon consent. Information regarding any adverse reactions to food was obtained using a standardised questionnaire. SPT was performed using ALK Abello diagnostic extracts. Lupin flour (only performed at 10 years) and sesame allergens were obtained from Stallergens. SPT reactions with a mean wheal diameter of 3 mm or greater than the negative control were regarded as positive. Based on their history and SPT results at ten years of age the following children were invited for food challenges.

- Those with a positive SPT to a food that they had not knowingly eaten previously.
- Those who indicated a previous adverse reaction to foods (regardless of their skin prick test data).
- Those with a previous diagnosis of a food allergy, without any recent exposure with a clear reaction.

The following children were excluded:

- Those with a previous diagnosis of food allergy based on a food challenge where the SPT size increased significantly
- Those with a previous diagnosis of a food allergy, where consultation with the allergist indicated that a food challenge would be too risky
- Those with a SPT size above the 95% predictive values with a history of a clinical reaction.

Food challenges were performed using the PRACTALL guidelines for IgE mediated food allergy. To diagnose non-IgE mediated food allergy, a normal daily amount was given to the individual, based on the information of the National Diet and Nutrition Survey (UK) until the child showed a reaction or a maximum period of 7 days. In order to minimise any bias, food challenges were performed blinded where possible, but always when looking for delayed/subjective symptoms.

Symptoms for IgE and non-IgE mediated FHS was classified according to the NICE guidelines i.e. we diagnosed immediate type symptoms based on the symptoms listed by the NICE guidelines occurring within 2 hours of ingestion of the foods.
Delayed symptoms were diagnosed based on the symptoms listed by the NICE guidelines occurring 2 hours up to 7 days after ingestion of the food.

**Ethics permission**

Ethical approval for the study was obtained from the NRES South Central - Southampton B Research Ethics Committee (REF 10/H0504/11).

**Analysis of data**

Data were double entered by different operators on SPSS versions 20 and 21 and were compared and verified (SPSS Inc, Chicago, USA). Frequency tables were produced at each time point from which prevalence rates were computed for each allergen together with 95% confidence intervals. Numbers indicating loss of follow-up were clearly stated. Missing data were handled by showing the relevant denominator in each instance. Reasons for loss of follow-up or missing data were: family declined any further involvement in the study, children declined to provide a blood sample or undergo skin prick tests, families/children declined food challenges due to previous reactions (defined as assessment by a paediatric allergist and symptoms in agreement with the UK NICE guidelines)⁹ or positive oral challenges, and families moved out of area. Confidence intervals were calculated using the Clopper-Pearson test. In order to rule out selection bias at 10 years we used the following methodology: A family history of allergic disease was defined as a first degree relative (mother, father or sibling) with a “yes” answer to any of the validated ISAAC questions¹⁰. We compared (using a 2x2 table and Fisher’s exact test) those who completed the FAIR recruitment questionnaire with a positive answer to a family history of allergic disease vs. those who completed the 10 year questionnaire with a positive answer to a family history of allergic disease. We then compared those who consented to SPT at one years who reported a family history of allergy to those who consented to SPT at ten years with a reported family history of allergy. We measured education level by comparing the mothers in the consenting families at one and 10 years with higher (college/university) and high school/less.
Results

The study population consisted of 969 (91% of the target population of 1063) children. 827/969 (85%) children were seen at 10 years. Over the course of the 10 years, 725/969 (74.8%) children were seen at one, two, three and 10/11 years of age and 947/969 (97.7%) children were seen at any time point. We have therefore used 947 as our denominator for FHS over 10 years.

To rule out selection bias at 10 years, we compared reported family history of allergy at recruitment vs those seen at 1 year 752/900 (83.6%) and those seen at 10 years (691/827 (83.4%) and there was no difference between the two groups (p=0.99). The same applied to those consenting to SPT at one year (637/736 [86.5%]) and ten years (490/588 [83.6%]); p=0.64). We also compared maternal education between those seen at 1 year (558/900 [62%]) and 10 years (527/827 [63.6%]); p=0.75 with no difference.

Sensitisation rates

Sensitisation rates at three and ten years are summarised in table 1. Cumulatively over the period of 10 years, 40/969 (4.1%; 95% CI: 3.19 - 5.32) children were sensitised to a predefined food allergen.

Where history indicated, children were skin prick tested to other allergens. At the age of ten years, five children who were not sensitised to any of the predefined food allergens were sensitised to hazel nut (3), brazil nut (4), cashew nut (3), pistachio (3), walnut (1), almond (1) and tomato (1).

Reported symptoms of allergic disease in the first ten years of life

Over the 10 year period, 203/947 (21.4%) children or parents reported a food related problem. 77/827 (9.3%) children reported a food related problem to 107 foods, to the question “do you have any food related problems”. On further questioning of the 77/827 (9.3%) participants, it was noted that a number of children/parents interpreted this question as food related aversion/dislike and 23 children were excluded for these reasons. Of the 54 remaining participants followed with further phone-calls and history taking by the study clinical and specialist allergy dietitian:

- 1 child showed no improvement on the elimination diet (wheat) and was therefore not indicated to undergo a food challenge;
• 2 further children declined the intervention (reported GI symptoms but did not want to trial an elimination diet);
• 8 children reported that the problem resolved naturally on further questioning
• in 3 children the physician advised no challenges as they were diagnosed with coeliac disease;
• 2 children outgrew their egg allergy;

Of the 38 children eligible for food challenges
• 23 underwent food challenges;
• 5 children moved to the mainland and did not come for further follow-up but were included in prevalence data if they were considered to be still allergic based on skin/serum testing and recent history
• 10 children declined food challenges but were included in prevalence data if they were considered to be still allergic based on skin/serum testing and recent history

162 children who were avoiding a food for reasons such as aversion, fear of allergic reaction or avoidance without giving any reason, a further 15 children were invited to be further investigated based on reported symptoms suggestive of FHS: 9 underwent food challenges, 2 children declined intervention/challenges, another 2 children reported that the problem resolved naturally and 2 children showed no improvement on an exclusion diet (figure 1).

Diagnosis of Food Hypersensitivity based on food challenges at 10 years
Overall, 37 food challenges were performed in 32 children (23 in those reporting food allergy and 9 in those reporting food avoidance). These challenges were: 11 one day OFC, 10 one day DBPCFC, 5 one week OFC and 11 one week DBPCFC. Of these, 6 one day OFC, 3 one week OFC and 2 one week DBPCFC were positive.

We invited all children for food challenges, but some declined. We have therefore concluded that the following children were suffering from a FHS at 10 years of age, based on the following criteria:
• 6 positive OFC 1 day: 2 peanut, 2 brazil nut, 1 sesame and 1 egg
• 3 positive OFC 1 week: 2 wheat and 1 milk
• 2 positive DBPCFC 1 week: 1 wheat and 1 egg
• 6 positive SPT plus clear history: 3 peanut (SPT 5 mm, 6 mm and 8 mm), 2
sesame (SPT 5 mm and 6 mm) and 1 hazelnut (SPT 6 mm)

- 6 SPT above the 95% predicted values (> 8 mm): 5 peanut and 1 brazil nut
- 2 still avoiding the food and report reactions on recent accidental ingestion: 2 egg (refused SPT but 5 mm and 5 mm at last follow-up)
- 2 positive food challenges for delayed type symptoms in the past who refused further food challenges: 2 milk
- 3 children diagnosed with coeliac disease

(two of these children, one with a peanut allergy and one with an egg allergy did not initially report a problem but were picked up from further questioning and challenges and were diagnosed with a food allergy)

Of these 30 children, 9 had more than one food allergy, leading to 30 children allergic to 50 foods.

Based on those with a positive food challenge and/or clear history (i.e. objective symptoms on consumption of the allergen), the prevalence of FHS at ten years is 30/827 (3.6%, 95% CI: 2.54 to 5.15). Of the 77/827 (9.3%) children who initially reported adverse reactions to foods, only 23/77 (29.9%) could be verified by means of a food challenge and/or a clear history.

Dividing the children into those with IgE mediated and non-IgE mediated food allergy:

25 children suffered from IgE mediated food allergy: 25/827 (3.0%, 95% CI: 1.8 – 4.2) and 5 children suffered from non-IgE mediated food allergy: 5/827 (0.6%, 95% CI: 0.07 – 1.3). We did not rule out that these children might have suffered from food intolerances.

The cumulative incidence of FHS by ten years of age

The cumulative incidence of food hypersensitivity over 10 years was 64/947 (6.7%, 95% CI: 5.2 to 8.4). Between 3 and 10 years of age, 9/947 children (0.95%, 95% CI: 0.3 to 1.6) outgrew their food hypersensitivity (egg 4, milk 3, sesame 1, peanut 1) and 12/947 (1.3%, 95% CI: 0.60 to 2.0) children developed new food hypersensitivities (peanut 2, egg 1, wheat 2, sesame 2, gluten 2, milk 1, tree nuts 2).

Foods implicated in FHS
Milk and egg were the most common food hypersensitivities encountered in the first ten years of life, although peanut was the most prevalent allergen at 10 years. (table 2)

**Discussion**

To our knowledge, this is currently the only cohort in the world providing this kind of information. The prevalence of FHS at ten years was 30/827 (3.6%, 95% CI: 2.54 to 5.15), while the cumulative incidence of food hypersensitivity over a 10 year period was 64/947 (6.7%, 95% CI: 5.20 to 8.4). 25/827 (3.0%, 95% CI: 1.8 – 4.2%) suffered from IgE mediated food allergy, 5/827 (0.6%, 95% CI: 0.07 – 1.3%) from non-IgE mediated food allergy/food intolerance.

**Sensitisation to food allergens**

Sensitisation rates to milk were relatively low. No child was sensitised to milk using the SPT solution, but one child showed a positive prick-prick to milk and was clinically milk allergic. Mustafayev et al.\(^{11}\) reported a sensitisation rate of 1.1% in 10-11 year olds in Turkey and Ronchetti et al.\(^{12}\) reported sensitisation rates of 0.5% in 9 year olds and 2% in 13 year olds in Italy.

In this cohort, sensitisation to egg was 2/588 (0.34%). Ronchetti et al.\(^{12}\) reported egg sensitisation of 0% in 6-9 year olds in Italy and 1% in 13 year olds.

In our cohort, 14/588 (2.4%) children were sensitised to peanut at 10 years of age. Sensitisation rates to peanuts in the previous two cohorts were 3.7% (11 year) and 2.7% (15 year).\(^{4}\) Mustafayev et al.\(^{11}\) reported a 0.7% prevalence of SPT positive peanut sensitisation in 10-11 year old Turkish children, while Nicolau et al.\(^{13}\) reported 5.1% sensitisation in 8 year olds from the UK.

**Clinical Allergy**

We have diagnosed 3/827 (0.36%) children with a clinical reaction to cow’s milk but only one child was sensitised and showed signs of IgE mediated CMA (0.12%). Other studies in this age group have reported IgE mediated CMA varying from 0.1% (Mustafayev et al.\(^{11}\) and Orhan et al.\(^{14}\)) up to 13.3% (Wan et al.\(^{15}\)).
At 10 years of age 6/827 (0.73%) were egg allergic; all IgE mediated. Based on OFC and a good clinical history, Mustafayev et al.\(^{(11)}\) reported 0.1% egg allergy in 10-11 year olds and Orhan et al.\(^{(14)}\) reported 0.9% egg allergy in Turkish children.

Over the course of the 10 years, 13/947 (1.4%) children were diagnosed with peanut allergy, and 12/827 (1.5%) children were allergic at 10 years, similar to Nicolau et al.\(^{(13)}\) who diagnosed 1.9% of 8 year olds in the UK with a peanut allergy. In our earlier cohorts, we have found that 7/775 (0.9%) at 11 years and 6/757 (0.8%) at 15 years were peanut allergic.

In our ten year old follow up, 6/827 (0.73%) children were clinically allergic to sesame. In our other cohorts we have found that 0/775 11 year olds and 1/757 (0.013%) 15 year olds was sesame allergic.

We have found 4/827 (0.48%) children with wheat allergy at the age of 10 years. We could not find any other studies reporting wheat allergy at 10 years of age.

**Reported vs Diagnosed food allergy**

It is well known that there is a discrepancy between reported and diagnosed FHS. At ten years 77/827 (9.3%) parents reported a food related problem and of these, 23/77 29.9% were diagnosed with FHS. The EAACI systematic review reported self-reported rates of food allergy at 6-17 years of age of 1.6 – 24.2%.\(^{(2)}\) Brugman et al.\(^{(16)}\) reported self-reported food allergy in children in the Netherlands aged 4-15 years of 7.2%.

**Foods implicated**

In a German study by Roehr et al.\(^{(17)}\) the authors identified that the children mainly reacted to apple, kiwi, soy, hazelnut, and wheat. The foods identified in our study were cows’ milk, hens’ eggs, wheat, peanut, sesame, and tree nuts.

One possible limitation of the study is the low uptake of food challenges. We do however feel that all those children considered to be food allergic at ten years of age were questioned by an experienced allergy dietitian/allergist, have been seen over the years at the David Hide Asthma and Allergy Centre and have clear histories of reactions plus positive SPT results in the case of IgE mediated food allergies. The findings of our study do not represent food allergy data across the world, but according to the UK census data, is representative of the South of England and our
data confirms with the recently published cow’s milk allergy data from Southampton/Winchester.(18)

To conclude, in this study we have found that 64/947 (6.8%) of children suffer from FHS over the first decade of life. There was a large discrepancy between reported and diagnosed FHS. The main foods implicated were cows’ milk, hens’ eggs and peanut. A large number of children seem to outgrow their allergies to milk and egg by 10 years, with smaller numbers for peanut and sesame. New onset food allergies at 10 years of age were found for most foods studied.
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References


Table 1: Sensitisation rates in the first ten years of life

<table>
<thead>
<tr>
<th>Sensitisation</th>
<th>3 years (n=642)</th>
<th>10 years (n=588)</th>
<th>Positive at 3 and 10 years (persistent allergy)</th>
<th>Positive at 10 years but negative at 3 years (new onset)</th>
<th>Positive at 3 years but not at 10 years (outgrown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any of the predefined allergens</td>
<td>n (%) (95% CI)</td>
<td>n (%)</td>
<td>These figures include only those that were SPT at 3 and 10 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>76 (11.8) (9.3-14.3)</td>
<td>145 (24.7) (21.2 - 28.1)</td>
<td>51/60 (85.0)</td>
<td>76/424 (17.9)</td>
<td>9/60 (15.0)</td>
</tr>
<tr>
<td>Any of the predefined food allergens</td>
<td>29** (4.5) (2.9 - 6.1)</td>
<td>87** (14.6) (11.9 - 17.7)</td>
<td>15/21 (71.4)</td>
<td>64/463 (13.8)</td>
<td>6/21 (28.6)</td>
</tr>
<tr>
<td></td>
<td>23 (3.6) (2.2 - 5.0)</td>
<td>16 (2.7%) (1.4 - 4.0)</td>
<td>9/18 (50.0)</td>
<td>6/466 (1.3)</td>
<td>9/18 (50.0)</td>
</tr>
<tr>
<td>Any of the predefined aero-allergens</td>
<td>70 (10.9) (8.5 - 13.3)</td>
<td>141 (24.1) (20.5 - 27.4)</td>
<td>47/55 (85.5)</td>
<td>77/429 (18.0)</td>
<td>8/55 (14.5)</td>
</tr>
<tr>
<td>Milk</td>
<td>3 (0.5) (-0.1 - 1.1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3/3 (100)</td>
</tr>
<tr>
<td>Egg</td>
<td>9 (1.4) (2.0.34)</td>
<td>2 (28.6)</td>
<td>0</td>
<td>5/7 (71.4)</td>
<td></td>
</tr>
<tr>
<td>Allergen</td>
<td>Mean (SD)</td>
<td>Range</td>
<td>Sensitivity</td>
<td>Specificity</td>
<td>Sensitivity/Specificity</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------</td>
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<td>-------------</td>
<td>-------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Wheat</strong></td>
<td>8 (1.3)*</td>
<td>0.4 - 2.2</td>
<td>79 (13.4)</td>
<td>4/5 (80.0)</td>
<td>66/478 (13.8)</td>
</tr>
<tr>
<td>Fish (Cod)</td>
<td>3 (0.5)</td>
<td>-0.1 - 1.1</td>
<td>1 (0.17)</td>
<td>1/3 (33.3)</td>
<td>0</td>
</tr>
<tr>
<td>Peanut</td>
<td>13 (2.0)</td>
<td>0.9 - 3.1</td>
<td>14 (2.4)</td>
<td>7/10 (70.0)</td>
<td>6/476 (1.3)</td>
</tr>
<tr>
<td>Sesame</td>
<td>9 (1.4)</td>
<td>0.5 - 2.3</td>
<td>1 (0.17)</td>
<td>1/5 (20.0)</td>
<td>0</td>
</tr>
<tr>
<td>Lupin (10 years only)</td>
<td>4 (0.68)</td>
<td>0 - 1.3</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>House dust mite</td>
<td>43 (6.7)</td>
<td>4.8 - 8.6</td>
<td>80 (13.6)</td>
<td>25/34 (73.5)</td>
<td>46/451 (10.2)</td>
</tr>
<tr>
<td>Grass</td>
<td>21 (3.3)</td>
<td>1.9 - 4.7</td>
<td>96 (16.7)</td>
<td>15/17 (88.2)</td>
<td>70/465 (15.1)</td>
</tr>
<tr>
<td>Cat</td>
<td>26 (4.1)</td>
<td>2.6 - 5.6</td>
<td>45 (7.7)</td>
<td>13/21 (61.9)</td>
<td>24/463 (5.2)</td>
</tr>
</tbody>
</table>

* All children with a positive SPT to wheat also had a positive SPT to grass and consumed wheat without any problems.

** including those sensitised to wheat
Table 2: FHS to single foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Number of children with FHS over 10 years (no of IgE mediated cases)</th>
<th>FHS at three years (n)</th>
<th>FHS at ten years (n)</th>
<th>IgE vs.non-IgE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>26 (2)</td>
<td>4</td>
<td>3 (0.36%) (1 outgrew)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1*:2 (both with diarrhoea and bloatedness; also to cheese)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>* had negative SPT using solution but positive SPT using pasteurised milk</td>
<td></td>
</tr>
<tr>
<td>Egg</td>
<td>19 (13)</td>
<td>9</td>
<td>6** (0.73%) (4 outgrew and 1 newly diagnosed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>** only two children consented to SPT at 10 years had positive results. Three children had positive SPTs during the first 10 years of life but refused SPT on the day. One child became sensitised after egg avoidance.</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>6 (1)</td>
<td>2</td>
<td>4 (0.48%) (2 newly diagnosed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1:3 (main symptoms included constipation/diarrhoea; coeliac disease ruled out)</td>
<td></td>
</tr>
<tr>
<td>Gluten</td>
<td>3 (0)</td>
<td>1</td>
<td>3 (0.36%) (2 newly diagnosed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0:3</td>
<td></td>
</tr>
<tr>
<td>Peanut</td>
<td>13 (13)</td>
<td>11</td>
<td>12 (1.5%) (1 outgrew peanut allergy and 2 new onset)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12:0</td>
<td></td>
</tr>
<tr>
<td>Sesame</td>
<td>7 (7)</td>
<td>5</td>
<td>6 (0.73%) (1 outgrew sesame allergy and 2 new onset)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6:0</td>
<td></td>
</tr>
<tr>
<td>Brazil nut</td>
<td>4 (4)</td>
<td>2</td>
<td>4 (0.48%) (2 new onset)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4:0</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>Count</td>
<td>Positive SPT</td>
<td>Reaction</td>
<td>Notes</td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
<td>--------------</td>
<td>----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Corn</td>
<td>1 (1)</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>1 (1)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>1 (0)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Salicylate</td>
<td>1 (0)</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Pineapple</td>
<td>1 (0)</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Almond</td>
<td>2 (1)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hazelnut</td>
<td>3 (3)</td>
<td>1</td>
<td>3 (0.36%) (2 new onset)</td>
<td>3:0</td>
</tr>
<tr>
<td>Cashew nut</td>
<td>3 (3)</td>
<td>1</td>
<td>3 (0.36%) (2 new onset)</td>
<td>3:0</td>
</tr>
<tr>
<td>Pistachio</td>
<td>3 (3)</td>
<td></td>
<td>3 (0.36%)</td>
<td>3:0</td>
</tr>
<tr>
<td>Walnut</td>
<td>1 (1)</td>
<td></td>
<td>1 (0.12%)</td>
<td>3:0</td>
</tr>
</tbody>
</table>

* In table 1 only one child showed a positive SPT to sesame. The six children with sesame allergy had SPT of 4.5 mm, 2.5 mm, 1.5 mm and 3 refused SPT at 10 years of age, but were still clinically allergic.