

REGULAR ARTICLE

# Special diets are common among preschool children aged one to five years in south-east Sweden according to a population-based cross-sectional survey

Caroline Servin (caroline.servin@ltblekinge.se)<sup>1</sup>, Sofia Hellerfelt<sup>1</sup>, Christina Botvid<sup>1</sup>, Magnus Ekström<sup>2,3</sup>

1.Department of Pediatrics, Blekinge Hospital, Karlskrona, Sweden

2.Department of Clinical Sciences, Division of Respiratory Medicine & Allergology, Lund University, Lund, Sweden

3.Department of Medicine, Blekinge Hospital, Karlskrona, Sweden

## Keywords

Avoidance diet, Elimination diet, Medical diet, Preschool child, Special diet

## Correspondence

C Servin, MD, Department of Pediatrics, Blekinge Hospital, SE-37185 Karlskrona, Sweden.

Tel: +46768-782580 |

Fax: +46455734232 |

Email: caroline.servin@ltblekinge.se

## Received

2 September 2016; revised 12 January 2017; accepted 20 January 2017.

DOI:10.1111/apa.13753

## ABSTRACT

**Aim:** Information about the prevalence of special diets in preschool children is limited. The aim of this study was to measure the prevalence of all special diets among preschool children in a Swedish municipality.

**Methods:** This was a population-based cross-sectional survey of all 3276 preschool children aged one to five years in the municipality of Karlskrona, Sweden. The questionnaire assessed the number of children at each preschool, how many were on special diets, their dietary requirements, age, sex, whether they had a medical certificate and whether the special diet had a perceived medical cause.

**Results:** We obtained data for 3221 (98%) of the children, and 19% had special diets, including 12% on nonmedical diets and 6.3% on medical diets. The five most common diets were avoiding pork (7.8%), a vegetarian diet (4.8%), and avoiding cows' milk (3.5%), hens' eggs (1.2%) and lactose (1.1%). Gluten avoidance was more common in girls than boys (0.8% versus 0.2%,  $p = 0.032$ ). Half (47%) of the children on special medical diets lacked a medical certificate.

**Conclusion:** Special diets were common in preschool children in south-east Sweden, and the causes were mainly nonmedical. Mandatory medical certificates for medically based special diets might reduce unnecessary dietary restrictions.

## INTRODUCTION

Special diets are common in children, and reasons can be nonmedical or medical, including food hypersensitivity (1,2), a general term for adverse reactions to food that has been reported by 21% of eight-year-old school children in Sweden (1). Food hypersensitivity includes food allergies, which are reactions of immunological origin, and nonimmunological intolerances such as lactose intolerance (3). Food allergy is a common and serious health problem in childhood (4,5). In developed countries, the estimated prevalence of true food allergy diagnosed by oral food challenge is approximately 3–8% in children (4–10). Adult-type lactose intolerance is thought to be uncommon in Sweden, at 2–3%, and symptoms do not typically develop before the age of four to five years (11,12). Coeliac disease is underdiagnosed, and the overall prevalence in Western populations is close to 1% and even higher in northern Europe (13–15).

There are large discrepancies between parent-reported and physician-diagnosed food hypersensitivity, which might lead to unnecessary diet restrictions with potential negative effects on nutrition during an important period of growth and development (2,4–9,16–19). Unnecessary special diets

can also result in additional costs and efforts for families and the preschools and schools their children attend (20).

Knowledge on the prevalence and the types of special diets in preschool children is limited. The prevalence of medically based special diets could reflect the present burden of potential food hypersensitivity at a societal level. There may be unexpected frequencies in certain special diets, as well as differences between sexes and age groups, the type of preschool, namely public or private, and the frequency of medical certificates that could prove

## Key notes

- This cross-sectional survey explored the prevalence of special diets among preschool children aged one to five years in a Swedish municipality.
- Data on special diets were available for 3221 (98%) of the preschool children, and this demonstrated that special diets were common (19%) and that the causes were mainly nonmedical (12%).
- Half of the children on special medical diets had not been issued with a medical certificate for their diet.

interesting from a medical perspective. The aim of this study was to measure the prevalence of special diets among preschool children aged one to five years in relation to these factors.

## MATERIAL AND METHODS

### Study design and setting

This was a population-based cross-sectional survey conducted in the municipality of Karlskrona, south-east Sweden, which has 65 000 inhabitants. There were a total of 62 preschools at the time of the study: 13 (21%) private and 49 (79%) public. The municipalities are responsible for providing children resident in Sweden with educational care at a preschool from the month they turn one year of age, so that their parents can work or study. Parents can choose which preschool their child attends, although admission to that specific preschool is not guaranteed. The Swedish Government finances most childcare via the municipalities, and the parental cost for childcare is the same for public and private preschools that receive financial support from the municipalities. Preschools provide meals for all children in their care, including children with special dietary requirements, and the educators and preschool children eat together.

### Study population

The study population comprised all 3276 children aged one to five years in educational care in the municipality, but excluded 41 who went to childminders. The number of children in educational care, and the total number of children aged one to five years in the municipality ( $n = 3783$ ), was obtained from the municipality and the Swedish Central Statistics Office.

### Data collection and assessments

The municipality has no formal requirement for medical certificates when preschool children need special diets for medical reasons, but it is recommended. The preschools use a special diet certificate, which is filled in and signed by a guardian and includes details of any food hypersensitivity and, or, special diets for other reasons.

The study data were collected between October and December 2015. All private and public preschools in the municipality were invited to participate in the study. A questionnaire was emailed to all directors, which assessed the number of children at each preschool, the number of children on special diets, their dietary requirements, age, sex, whether they had a medical certificate for their diet and whether their special diet had a medical and, or, nonmedical cause as perceived by the preschool staff or parents. The questionnaires also asked for the title of the person who completed the questionnaire and the number of special diet certificates that they used when they answered the questions. We specified that the questionnaire should be completed by the director, educator or chef responsible for special diets at each preschool and based on the special diet certificates that were signed by the guardians. A

reminder was emailed to all nonresponders, and if there was still no response, the directors were contacted and asked to answer the questionnaire by phone.

### Definitions

Special diets were defined as diets that required adjustments to the food that was normally served. Special medical diets were defined as special diets for medical reasons as perceived by the preschool staff or parents. Medical reasons were defined as food hypersensitivity, namely adverse reactions to specific foods, or other medical condition requiring a special diet as a part of the child's treatment. No medical certificate was needed to validate medical reasons. Special nonmedical diets were defined as special diets for nonmedical reasons, for example religious or ethical, as perceived by the preschool staff or parents.

### Categorisation of special diets

Special diets were categorised according to the cause, namely medical or nonmedical, and the type of diet based on the reports from the preschools. Some children were on special diets for both medical and nonmedical reasons, for example because they were allergic to hens' eggs (medical) and their religion called for them to avoid pork (nonmedical). When details of the cause of the special diet were missing or did not make sense, the directors were contacted by email for additional information. When no response was given, a probability assessment was performed as follows: a vegetarian diet and avoiding pork were considered as special nonmedical diets, and avoiding gluten, citrus, hens' eggs, lactose, cows' milk or specific food additives were considered as special medical diets.

### Ethical considerations

The study was approved by the Ethical Advisory Board in south-east Sweden (DNr: EPK 228-2014). As all the data that were requested were depersonalised, individual consent from the parents was not required. Parents were informed of the study by a poster displayed at each preschool.

### Statistical analyses

Baseline participant characteristics were summarised using means with SD. Estimates of primary interest were the prevalence of special diets among all preschool children. Prevalences were compared between boys and girls, private and public preschools and age categories using chi-square tests. The associations between the number of special diets and sex were analysed using linear regression adjusted for age. Statistical significance was defined as a two-sided  $p$  value  $<0.05$ . Statistical analyses were conducted using Stata version 14.1 (StataCorp LP, College Station, TX, USA).

The data on age and sex were not registered for 18 (0.6%) of the children in public preschools who for some reason had protected identities. For these children, the sex and age distribution was assumed to be the same as for the other children in public preschools. In the private preschools, the sex and age distribution was known for all the children,

but not all the children were included in the study, as two private preschools did not take part. However, we assumed the same sex and age distribution for all children in private preschools.

## RESULTS

Almost all ( $n = 3221$ , 98%) of the preschool children were included in the study, corresponding to 85% of all children aged one to five years in the municipality. Of the 62 preschools that were invited to take part, 60 agreed, and all of the children in those schools were included. The two that did not take part were private schools. Most of the included children ( $n = 2860$ , 89%) went to public preschools, and 361 (11%) went to private preschools. In a few cases, the data on the cause of the children's special diets were either missing ( $n = 5$ ) or did not make sense ( $n = 11$ ).

The overall prevalence of special diets was 19%, and the characteristics of the children on these diets are shown in Table 1. Special nonmedical diets (12%) were more common than medical diets (6.3%) or combined special medical and nonmedical diets (0.3%). Most children on special diets had one type of special diet ( $n = 526$ , 86%), but some had two ( $n = 51$ , 8.3%) or three or more ( $n = 37$ , 6.0%). The number of special diets was similar between boys and girls, also when they were adjusted for age ( $p = 0.42$ ).

The prevalence of all the reported special diets is shown in Table 2. The five most common diets were avoiding pork (7.8%), vegetarian diet (4.8%) and avoiding cows' milk (3.5%), hens' eggs (1.2%) and lactose (1.1%). Avoiding gluten was more common in girls than in boys (0.8% versus 0.2%,  $p = 0.032$ ), but there were no other significant differences between the sexes.

Figure 1 illustrates the prevalence of preschool children who avoided gluten, lactose, cows' milk and hens' eggs stratified by age. The prevalence of lactose avoidance was significantly higher among children aged 4–5 ( $n = 20$ , 1.5%) than those aged 1–3 ( $n = 14$ , 0.8%) ( $p = 0.049$ ). There were no significant differences in prevalence regarding avoidance of gluten, cows' milk or hens' eggs between these two age groups.

The prevalence of special diets was higher in public than private preschools (20% versus 13%,  $p = 0.003$ ). With regard to the special diets, medical reasons were more common in private than in public preschools (65% versus 31%,  $p = 0.01$ ). However, there was no statistically significant difference in the prevalence of special medical diets

**Table 1** Baseline characteristics of 614 preschool children on special diets

Characteristic	Boys n = 310	Girls n = 304	All n = 614
Age (years), mean $\pm$ SD	3.2 $\pm$ 1.3	3.3 $\pm$ 1.3	3.3 $\pm$ 1.3
Public preschools, n (%)	285 (92)	281 (92)	566 (92)
Private preschools, n (%)	25 (8)	23 (8)	48 (8)

SD, standard deviation.

**Table 2** Prevalence of special diets by categories and sex in 3221 preschool children

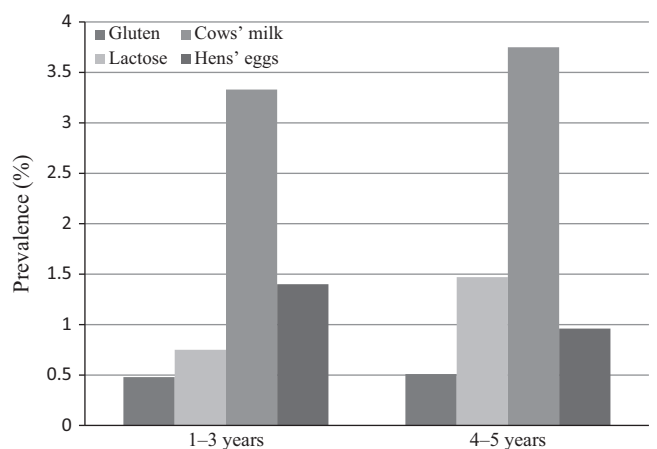
Special diet	Boys n = 1667 (%)	Girls n = 1554 (%)	p Value	All n = 3221 (%)
Any special diet	310 (18.6)	304 (19.6)	0.49	614 (19.1)
Nonmedical diets	194 (11.6)	207 (13.3)	0.15	401 (12.4)
Vegetarian	72 (4.3)	83 (5.3)	0.18	155 (4.8)
No pork	125 (7.4)	126 (8.1)	0.52	251 (7.8)
No beef	11 (0.7)	15 (1.0)	0.33	26 (0.8)
No poultry	8 (0.5)	10 (0.6)	0.53	18 (0.6)
Other nonmedical diets <sup>†</sup>	8 (0.5)	3 (0.2)	0.16	11 (0.3)
Medical diets	111 (6.7)	93 (6.0)	0.43	204 (6.3)
No lactose	23 (1.4)	11 (0.7)	0.06	34 (1.1)
No gluten	4 (0.2)	12 (0.8)	0.03*	16 (0.5)
No cows' milk	63 (3.8)	50 (3.2)	0.39	113 (3.5)
No hens' eggs	25 (1.5)	14 (1.0)	0.12	39 (1.2)
No fish	5 (0.3)	6 (0.4)	0.68	11 (0.3)
No shellfish	5 (0.3)	6 (0.4)	0.68	11 (0.3)
No wheat	4 (0.2)	1 (0.1)	0.21	5 (0.2)
No soy	3 (0.2)	4 (0.3)	0.64	7 (0.2)
No nuts	5 (0.3)	1 (0.1)	0.12	6 (0.2)
No legumes	1 (0.1)	1 (0.1)	0.96	2 (0.1)
No specific fruits and/or vegetables <sup>‡</sup>	9 (0.5)	15 (1.0)	0.16	24 (0.7)
Other medical diets <sup>§</sup>	10 (0.6)	6 (0.4)	0.39	16 (0.5)
Both medical and nonmedical diets	5 (0.3)	4 (0.3)	0.82	9 (0.3)

\*Statistical significant ( $p < 0.05$ ).

<sup>†</sup>Organic products ( $n = 1$ ), no blood products ( $n = 6$ ), no lamb ( $n = 1$ ), halal ( $n = 2$ ), no cheese ( $n = 1$ ).

<sup>‡</sup>No citrus ( $n = 4$ ), no pip fruit ( $n = 1$ ), no kiwi ( $n = 3$ ), no coconut ( $n = 1$ ), no pear ( $n = 1$ ), no strawberry ( $n = 2$ ), no banana ( $n = 4$ ), no blueberry ( $n = 3$ ), no pineapple ( $n = 1$ ), no tomato ( $n = 8$ ), no carrot ( $n = 2$ ), no pepper ( $n = 1$ ), no onion ( $n = 1$ ), no broccoli ( $n = 1$ ), no potato ( $n = 1$ ).

<sup>§</sup>Energy-enriched diet ( $n = 2$ ), no red food colouring ( $n = 3$ ), no spicy food ( $n = 2$ ), no specific food additives ( $n = 1$ ), ketogenic diet ( $n = 1$ ), puree diet ( $n = 3$ ), diabetic diet ( $n = 2$ ), protein-reduced diet ( $n = 1$ ), extremely restricted diet ( $n = 1$ ), diet according to own preference ( $n = 1$ ).



**Figure 1** Prevalence (%) of preschool children avoiding gluten, lactose, cows' milk and hens' eggs at the age of 1–3 ( $n = 1860$ ) and 4–5 ( $n = 1361$ ).

between private and public preschools (8.6% versus 6.0%,  $p = 0.062$ ).

Of all the 614 children on special diets, only 110 (18%) had a medical certificate, and only 53% of the 204 children on special medical diets had a medical certificate that entitled them to their diet. Of the children on one type of special diet, 15% had a medical certificate compared to 35% of the children on two or three or more different types of special diets. Fewer children on special medical diets who attended private preschools had a medical certificate than those attending public preschools (23% versus 58%,  $p = 0.001$ ).

## DISCUSSION

Special diets were prevalent in this study and affected almost one in five preschool children. The reasons for the diets were mainly nonmedical. The five most common special diets were avoiding pork, a vegetarian diet and avoiding cows' milk, hens' eggs and lactose in descending order. Gluten avoidance was more common in girls than boys. Almost half of the children on special medical diets lacked medical certificates that entitled them to their diet.

The main strength of this study was the high response rate of 98% of the preschool children, representing 85% of all children aged 1–5 in the municipality. Detailed data were obtained on all special diets for both medical and nonmedical reasons. The main limitation was the lack of detailed information on why the special diets were needed. For practical and financial reasons, we did not evaluate the children with special medical diets, to identify, confirm or rule out underlying diagnoses. This would have provided information on the prevalence of the different types of food hypersensitivities that requires foods to be eliminated from the children's diets (6–9,21–24). Another limitation is the assumptions made concerning age and sex distribution described in methods. The present findings pertain to self-reported special diets in preschools and may be applicable to other municipalities in Sweden or Scandinavia with a similar demography.

This study provides a comprehensive picture of all special diets in a Swedish preschool population. As the prevalence of special diets for medical reasons was 6.3%, it is probable that a smaller proportion of the preschool children were affected by food hypersensitivities, which is of interest at a societal level. The fact that almost half of the children on special medical diets lacked medical certificates that entitled them to their diet raises questions about whether some of these children had underlying undiagnosed medical conditions and whether fewer special medical diets would have been followed if having a medical certificate was mandatory.

The prevalence of special medical diets in this study was similar to the reported prevalence of food allergies in children (4–10). However, factors such as allergy definitions, methodologies and geographic variations influence the estimates, which make it difficult to accurately determine the prevalence of food allergies and to compare the rates between studies (23). In general, food allergies to

cows' milk and hens' eggs resolve during childhood (23). Our results did not show any significant differences in the avoidance of cows' milk or hens' eggs between age categories. Some of children aged 4–5 who avoided those foods in this study might have outgrown those allergies, but that fact had not yet been recognised. This still needs to be investigated.

Lactose avoidance affected 1% of the preschool children in this study. As children with adult-type lactose intolerance do not develop symptoms before four to five years of age (11,12), children aged 1–3 either avoid lactose unnecessarily or suffer from secondary lactose deficiency resulting from an underlying medical condition. It is important not to miss this.

The prevalence of gluten avoidance among preschool children in south-east Sweden was similar to the prevalence of coeliac disease in screening studies (13,14). The fact that the disease is more common in females is reflected in our results (13). According to the National Swedish Childhood Celiac Disease Register in March 2016, only eight children aged 1–5 living in the municipality had a registered diagnosis of coeliac disease (14). This indicates that eight of the 16 children in our study who avoided gluten might have undiagnosed coeliac disease or they avoid gluten unnecessarily. The fact that eight of the children who avoided gluten lacked a medical certificate further strengthens this suspicion.

Special diets for medical reasons were more common in private than in public preschools. Possible explanations could be differences in ethnicity, religious perceptions or socio-economic factors.

It is reassuring that the prevalence of special medical diets in this study was similar to the reported prevalence of diagnosed food allergies. However, considering the previously shown large discrepancies between parent-reported and diagnosed food allergies (2,4–9,16,17), and the fact that many children on special medical diets lack medical certificates, some children may have been subjected to unnecessarily restricted diets. A potential way to avoid this may be the requirement for mandatory medical certificates for special diets for medical reasons, preferably with an appropriate time limit, for example for cows' milk and hens' egg allergies. Another measure could be increased educational actions in both health care and childcare.

## CONCLUSION

Special diets were common in preschool children in south-east Sweden, and the causes were mainly nonmedical. Half of these children on special medical diets lacked medical certificates. Mandatory medical certificates for medically based special diets could be a way of reducing unnecessary diet restrictions.

## ACKNOWLEDGEMENTS

The authors thank all the preschool directors, chefs and educators in the municipality of Karlskrona who took part in the study.

**COMPETING INTEREST**

The authors have no conflict of interests to declare.

**FUNDING**

No external funding was provided for this study.

## References

- Winberg A, Strinnholm Å, Hedman L, West CE, Perzanowski MS, Rönmark E. High incidence and remission of reported food hypersensitivity in Swedish children followed from 8–12 years of age – a population based cohort study. *Clin Transl Allergy* 2014; 4: 32.
- Pyrhönen K, Näyhä S, Kaila M, Hiltunen L, Läärä E. Occurrence of parent-reported food hypersensitivities and food allergies among children aged 1–4 yr. *Pediatr Allergy Immunol* 2009; 20: 328–38.
- Johansson SG, Hourihane JO, Bousquet J, Brujinzeel-Koomen C, Dreborg S, Haahtela T, et al. A revised nomenclature for allergy. An EAACI position statement from the EAACI nomenclature task force. *Allergy* 2001; 56: 813–24.
- Longo G, Berti I, Burks AW, Krauss B, Barbi E. IgE-mediated food allergy in children. *Lancet* 2013; 382: 1656–64.
- Nwaru BI, Hickstein L, Panesar SS, Roberts G, Muraro A, Sheikh A. Prevalence of common food allergies in Europe: a systematic review and meta-analysis. *Allergy* 2014; 69: 992–1007.
- Rona RJ, Keil T, Summers C, Gislason D, Zuidmeer L, Sodergren E, et al. The prevalence of food allergy: a meta-analysis. *J Allergy Clin Immunol* 2007; 120: 638–46.
- Osterballe M, Hansen TK, Mortz CG, Host A, Bindslev-Jensen C. The prevalence of food hypersensitivity in an unselected population of children and adults. *Pediatr Allergy Immunol* 2005; 16: 567–73.
- Venter C, Pereira B, Voigt K, Grundy J, Clayton CB, Higgins B, et al. Prevalence and cumulative incidence of food hypersensitivity in the first 5 years of life. *Allergy* 2008; 63: 354–9.
- Venter C, Pereira B, Grundy J, Clayton CB, Roberts G, Higgins B, et al. Incidence of parentally reported and clinically diagnosed food hypersensitivity in the first year of life. *J Allergy Clin Immunol* 2006; 117: 1118–24.
- Venter C, Pereira B, Grundy J, Clayton CB, Arshad SH, Dean T. Prevalence of sensitisation reported and objectively assessed food hypersensitivity amongst six-year-old children: a population-based study. *Pediatr Allergy Immunol* 2006; 17: 356–63.
- Heyman MB. Lactose intolerance in infants, children and adolescents. *Pediatrics* 2006; 118: 1279–86.
- Grimheden P, Anderlid B-M, Gåfväls M, Svahn J, Grahnquist L. Laktosintolerans hos barn är ett överdiagnostiserat tillstånd. *Läkartidningen* 2012; 109: 218–21.
- Mearin ML. Celiac disease among children and adolescents. *Curr Probl Pediatr Adolesc Health Care* 2007; 37: 86–105.
- Namatovu F, Sandstrom O, Olsson C, Lindkvist M, Ivarsson A. Celiac disease risk varies between birth cohorts, generating hypotheses about causality: evidence from 36 years of population-based follow-up. *BMC Gastroenterol* 2014; 14: 59. Available at: <http://bmcgastroenterol.biomedcentral.com/articles/10.1186/1471-230X-14-59>.
- Gujral N, Freeman HJ, Thomson AB. Celiac disease; Prevalence, diagnosis, pathogenesis and treatment. *World J Gastroenterol* 2012; 18: 6036–59.
- Winberg A, West CE, Strinnholm Å, Nordström L, Hedman L, Rönmark E. Milk allergy is a minor cause of milk avoidance due to perceived hypersensitivity among schoolchildren in Northern Sweden. *Acta Paediatr* 2016; 105: 206–14.
- Winberg A, West CE, Strinnholm Å, Nordström L, Hedman L, Rönmark E. Assessment of allergy to milk, egg, cod, and wheat in Swedish schoolchildren: a population based cohort study. *PLoS One* 2015; 10: e0131804.
- Beery MJ, Adams J, Voutilainen H, Jarvinen-Seppo K. Impact of elimination diets on growth and nutritional status in children with multiple food allergies. *Pediatr Allergy Immunol* 2015; 26: 133–8.
- Meyer R, De Koker C, Dziubak R, Venter C, Dominguez-Ortega G, Cutts R, et al. Malnutrition in children with food allergies in the UK. *J Hum Nutr Diet* 2014; 27: 227–35.
- Protudjer JLP, Jansson S-A, Heibert MH, Bengtsson U, Kallström-Bengtsson I, Marklund B, et al. Household costs associated with objectively diagnosed allergy to staple foods in children and adolescents. *J Allergy Clin Immunol Pract* 2015; 3: 68–75.
- Steinke M, Fiocchi A, Kirchlechner V, Ballmer-Weber B, Brockow K, Hischenhuber C, et al. Perceived food allergy in children in 10 European nations. *Int Arch Allergy Immunol* 2007; 143: 290–5.
- Järvenpää J, Paassilta M, Salmivesi S, Sannisto T, Niitty S, Korppi M. Stability of parent-reported food allergy in six and 7-year-old children: the first 5 years of the Finnish allergy programme. *Acta Paediatr* 2014; 103: 1297–300.
- Sicherer SH, Sampson HA. Food allergy: epidemiology, pathogenesis, diagnosis and treatment. *J Allergy Clin Immunol* 2014; 133: 291–307.
- Kallio P, Salmivesi S, Kainulainen H, Paassilta M, Korppi M. Parent-reported food allergy requiring an avoidance diet in children starting elementary school. *Acta Paediatr* 2011; 100: 1350–3.