

ANALYSIS OF IgE-DEPENDENT FOOD ALLERGY CLINICAL MANIFESTATION IN INFANTS AND SMALL CHILDREN*

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Authors provided a retrospective analysis of IgE-dependent food allergy clinical symptoms in 339 children aged from 0 to 36 months of life. Among them 246 patients (72.6%) had food allergy, 93 patients (27.4%) had inhalatory and food allergy. The analysis was based on medical documentation.

The results demonstrated that 244 children (71.9%) manifested symptoms concerning the respiratory tract, while 168 (49.5%) had skin lesions. They showed that 71.9% of children had respiratory tract symptoms. Simultaneous manifestation of the allergic process in at least two systems was confirmed in 153 children (45.2%). It was observed that clinical manifestation of allergy changed with the age of the examined: the percentage of children manifesting symptoms related to the respiratory tract showed an upward tendency with age and a downward tendency in the case of digestive tract symptoms. The results of the study revealed also that cow's milk protein is an allergen most often responsible for the occurrence of food allergy symptoms in infants and small children.

INTRODUCTION

Food allergy, that is abnormal reaction to food consumption caused by immunologic mechanisms, is an important clinical problem in infants and small children. In medical literature, a number of authors have indicated an upward trend of its frequency over the last years [Kaczmarek, 1990; Ortolani *et al.*, 1995]. This fact is related to environment pollution and more frequent artificial feeding based on "humanised" cow's milk-based formula since birth. Etiopathogenesis of food allergy is not entirely known. It can be either IgE-dependent, which occurs mainly in atopic children, or IgE-independent [Heine, 2004; Ortolani *et al.*, 1995, 1999; Papageorgiou, 2002].

The complexity of food hypersensitivity mechanisms causes different location of symptoms and can refer to one or several systems [Burks, 2003; James, 2003; Kamer *et al.*, 1995; Kaczmarek, 1990; Mari *et al.*, 2005; Piotrowska-Jastrzębska, 1998]. Age of clinical symptoms disclosure is also important and depends on time of new products introduction into a diet. Infancy period favours allergy symptoms occurrence, because during this period of time a child systematically contacts with new food ingredients. Additionally, allergic reactions in infants are facilitated by immaturity of the immunological system and gut mucosal barrier [Kaczmarek, 1990; Kamer, 2001; Moneret-Vautrin, 1994]. This explains a gradual decrease of food allergy frequency during the first years of life. This tendency is confirmed by results of multiple studies which showed food allergy occurrence in 9–19% of infants and about 8% of children above the age of three [Hill *et al.*,

1995; Kaczmarek *et al.*, 1999; Kamer *et al.*, 1999; Kamer, 2001; Moneret-Vautrin, 1994].

Also the type of allergen has a substantial effect on food allergy history. Although many food ingredients can become potential allergens, it refers mostly to proteins, whereas in the case of infants – especially to proteins of cow's milk, soya, egg and meat [Kaczmarek, 1990; Kamer, 2001; Martelli *et al.*, 2005].

The aim of this study was a retrospective analysis of food allergy clinical symptoms in infants and children up to 36 months of age.

MATERIAL AND METHODS

A total of 339 children were provided with examinations, aged from 0 to 36 months of life, treated in 2nd Department of Paediatrics and Allergology of Polish Mother's Memorial Hospital Research Institute in 1990–2003. Of the children examined, 172 patients (50.7%) were in the first year of life, 104 (30.7%) were in the second year of life, and 63 (18.6%) were in the third year of life. Among the analysed group, 246 patients (72.6%) had food allergy, 93 patients (27.4%) had inhalatory and food allergy.

Each patient had clinical symptoms of allergy confirmed by increased serum concentrations of allergen-specific IgE antibodies against selected food and inhalant allergens (as IgE \geq to the second class of four-degree atopy classification) [Kjellman *et al.*, 1976]. Allergen-specific antibodies were evaluated with the immunoenzymatic method using an IgE Fast Plus test kit purchased from the 3M Diagnostic System.

In each case, the examination of allergy clinical manifestations was based on medical documentations. The results obtained were analysed statistically with the χ^2 test and Fisher's exact test.

RESULTS

Most children were allergic to cow's milk proteins (66.4%) and subsequently: white or yolk of an egg (37.2%), meat proteins: fowls, pork (28.0%), soya (6.5%) and carrot (2.1%). House dust mite (42 children) and animal hair (29 children) dominated among inhalant allergens. The other allergens stated rarely were: grasses, trees and weeds pollens.

Clinical symptoms of food allergy in the examined children are compiled in Table 1.

The analysis of clinical manifestations revealed that 244 children (71.9%) manifested symptoms concerning the respiratory tract, while 168 (49.5%) had skin lesions. Digestive tract symptoms were observed in 113 children (33.3%). Among the examined patients, 153 children (45.2%) manifested clinical symptoms concerning at least two systems. Simultaneous manifestation of the allergic process in all three systems: respiratory tract, digestive tract and skin was confirmed

in 30 children (8.8%) mostly in the first year of age. Among patients with isolated type of allergy, in all age groups there prevailed symptoms concerning the respiratory tract.

Prevalence of allergy manifestations according to age is presented in Figure 1.

It was observed that clinical manifestation of allergy changed with the age of the examined: the percentage of children manifesting symptoms related to the respiratory tract showed an upward tendency with age and a downward tendency in the case of digestive tract symptoms. Such a correlation was not confirmed in children manifesting skin symptoms. A statistically significant difference ($p < 0.05$) was confirmed only between children in the first and second year of life with symptoms concerned with skin. The other differences were not statistically significant.

In the next stage of the study, the type of symptoms related to each system was analysed in detail. Among symptoms concerning the respiratory tract the authors observed coryza, rhinitis, pharyngitis, otitis, recurrent obturative bronchitis and/or pneumonia (Figure 2). Most often occurring symptoms concerning the digestive tract were chronic diarrhoea and constipations (Figure 3), whereas among skin lesions - atopic dermatitis (Figure 4).

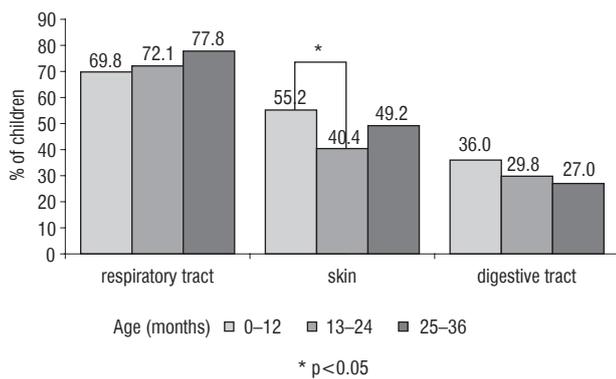


FIGURE 1. Clinical manifestation of IgE-dependent food allergy in the examined children.

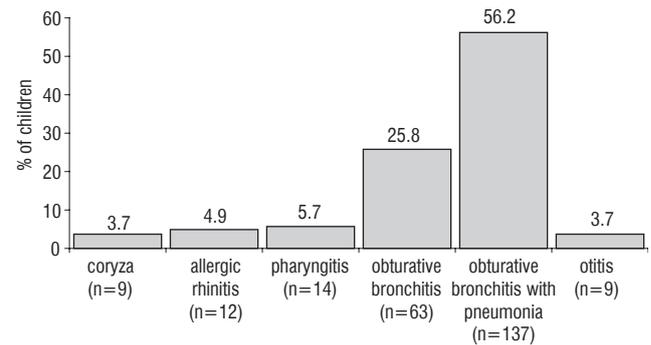


FIGURE 2. Allergic symptoms related to the respiratory tract.

TABLE 1. Clinical manifestation of IgE-dependent food allergy in the examined children.

Clinical manifestation	Age (months)							
	0-12		13-24		25-36		Total	
	n	%	n	%	n	%	n	%
ISOLATED	90	52.3	61*	58.6	35	55.6	186	54.8
Concerning:								
- respiratory tract	50	29.0	38	36.5	24	38.1	112	33.0
- skin	27	15.7	11	10.6	7	11.1	45	13.3
- digestive tract	13	7.6	12	11.5	4	6.3	29	8.6
ASSOCIATED	82	47.7	43*	41.4	28	44.4	153	45.2
System:								
- respiratory + skin	33	19.2	24	23.1	15	23.8	72	21.3
- respiratory + digestive	14	8.1	12	11.5	4	6.3	30	8.8
- skin + digestive	12	7.0	6	5.8	3	4.8	21	6.2
-respiratory + skin + digestive	23	13.4	1	1.0	6	9.5	30	8.8

n - number of children, *statistical significance at $p < 0.05$

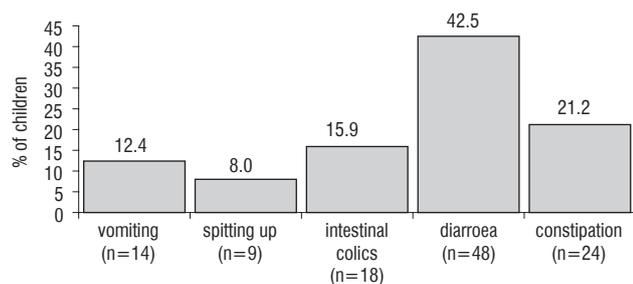


FIGURE 3. Allergic symptoms related to the digestive tract.

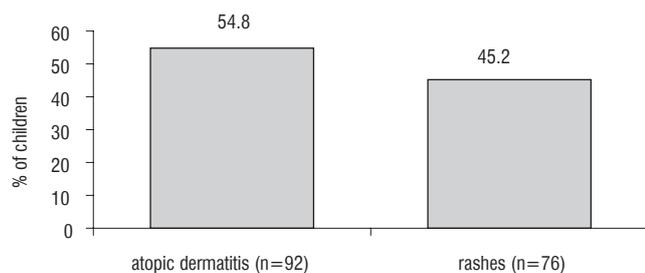


FIGURE 4. Allergic symptoms related to skin.

DISCUSSION

The complexity of pathogenesis and factors which predispose to allergy cause different location of symptoms and potential engagement of several systems [Bahna, 2003; Burks, 2003; James, 2003; Kamer, 2001; Kamer *et al.*, 1995].

The analysis of allergy clinical manifestation in the examined children showed that 156 children (46.0%) had associated type of allergy. Symptoms affected systems: respiratory, digestive and skin. These results are compatible to other authors' observations. Host *et al.* [1990] found out that 72% of patients with food allergy had clinical symptoms concerning at least two systems. The other authors' observations were very similar [Kaczmarek, 1990; Kamer *et al.*, 1995; Piotrowska-Jastrzębska, 1998]. Most often multiorgan manifestation of allergic disease was observed in infants, which is conformable to our earlier study [Kamer *et al.*, 1995] and research of other authors [Kaczmarek, 1990; Piotrowska-Jastrzębska, 1998]. In all age groups there prevailed symptoms related to the respiratory tract. This type of symptoms was observed in 17% of patients by Clein [1958], and in 30% by Kaczmarek [1990]. We observed the symptoms concerning the digestive tract in 33% of patients, while Kaczmarek – in 38% [1990].

The observed correlation between food allergy symptoms and age of patients was consistent with observations of many authors [Kaczmarek, 1990; Kaczmarek *et al.*, 1999; Kamer *et al.*, 1995], who showed that according to age, the percentage of children manifesting symptoms concerning the respiratory tract increases whereas that of children with digestive tract manifestation decreases.

CONCLUSIONS

1. It was confirmed that protein of cow's milk was the most common allergen (66.4%) inducing food allergy clinical symptoms in the examined infants and small children.

2. An upward tendency of clinical symptoms frequency

concerning the respiratory tract and a downward tendency concerning the digestive tract were observed with age.

3. It was demonstrated that in the youngest children IgE-dependent allergy symptoms often concern several systems.

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REFERENCES

- Bahna S.L., Clinical expressions of food allergy. *Ann. Allergy Asthma Immunol.*, 2003, 90, 41–44.
- Burks W., Skin manifestations of food allergy. *Pediatrics*, 2003, 111, 1617–1624.
- Clein N.W., Cow's milk allergy in infants and children. *Int. Arch. Allergy*, 1958, 13, 245–256.
- Heine R.G., Pathophysiology, diagnostic and treatment of food protein-induced gastrointestinal diseases. *Curr. Opin Allergy Clin. Immunol.*, 2004, 4, 221–229.
- Hill D.J., Hosking C.S., The cow milk allergy complex: overlapping disease profiles in infancy. *Eur. J. Clin. Nutr.*, 1995, 49, 1–12.
- Host A., Halken S., A prospective study of cow milk allergy in Danish infants during the first 3 years of life. *Allergy*, 1990, 45, 586–596.
- James J.M., Respiratory manifestations of food allergy. *Pediatrics*, 2003, 111, 625–630.
- Kaczmarek M., Allergy and civilization (*Alergia i cywilizacja*). 1990, KAW, Białystok, pp. 66–79 (in Polish).
- Kaczmarek M., Cudowska B., Bandzul K., Witkowska T., Parfieniuk W., Prevalence of food intolerance in infants in North-Eastern region of Poland. *Nowa Pediatria*, 1999, 14, 26–28 (in Polish).
- Kamer B., Multiorgan form of allergy in infants and small children. *Klin. Ped.*, 2001, 5, 29–32 (in Polish).
- Kamer B., Zwaigzne-Raczyńska J., Kaczmarek J., Lukomowicz J., Pasowska R., Analysis of food allergy clinical manifestation in infants and small children. Materials of a Nation-wide Symposium of a Working Group "Food Allergies and Intolerances", Bydgoszcz, 1995, 22 (abstract) (in Polish).
- Kamer B., Zielińska W., Raczyńska J., Sobczyńska K., Prevalence of allergic diseases in infants and small children of the Łódź population. *Ped. Pol.*, 1999, 74, 665–668 (in Polish).
- Kjellman N.-I.M., Johansson S.G.O., Roth A., Serum IgE levels in healthy children quantified by a sandwich technique (PRIST). *Clin. Allergy*, 1976, 6, 51–56.
- Mari A., Ballmer-Weber B.K., Vieths S., The oral allergy syndrome: improved diagnostic and treatment methods. *Curr. Opin. Allergy Clin. Immunol.*, 2005, 5, 267–273.
- Martelli A., Bouygue G.R., Isoardi P., Marelli O., Saratud T., Fiocchi A., Oral food challenges in children in Italy. *Allergy*, 2005, 60, 907–911.
- Moneret-Vautrin D.A., Guide du praticien en immunologie allergologique. 1994 (ed. D.A. Moneret-Vautrin). Masson, Paris, 1994, 6–7, 79–84.

17. Ortolani C., Vihgi G., Definition of adverse reaction to food. *Eur. J. Allergy Clin. Immunol.*, 1995, 50, (supl. 50), 8–13.
 18. Ortolani C., Bruijnzeel-Koomen C., Bengtsson U., Bind-slev-Jensen C., Bjorksten B., Host A., Ispano M., Jar-ish R., Madsen C., Nekam K., Paganelli R., Poulsen R., Wuthrich B., Controversial aspects of adverse reactions to food. *European Academy of Allergology and Clinical Immunology (EAACI) Reactions to Food Subcommittee. Allergy*, 1999, 54, 27–45.
 19. Papageorgiou P.S., Clinical aspect of food allergy. *Bio-chem. Soc. Trans.* 2002, 30, 901–906.
 20. Piotrowska-Jastrzębska J.D., Auxologic and densitomet-ric examinations in children with food allergy treated by elimination diet. Postdoctoral thesis. AM Białystok, 1998, pp. 53–54 (in Polish).
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MANIFESTACJA KLINICZNA ALERGII POKARMOWEJ IgE-ZALEŻNEJ U NIEMOWLĄT I MAŁYCH DZIECI

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Autorzy w oparciu o dokumentację szpitalną przeanalizowali retrospektywnie kliniczne objawy alergii pokarmowej IgE-zależnej u 339 dzieci w pierwszych trzech latach życia. Wśród nich 246 (72.6%) miało alergię pokarmową, a 93 dzieci (27.4%) pokarmowo-wziewną.

Stwierdzono, że najczęściej, bo 244 dzieci (71.9%) miało objawy z układu oddechowego, następnie 168 (49.5%) zmiany skórne. Objawy z przewodu pokarmowego obserwowano u 113 badanych (33.3%). Postać skojarzoną, w której występowały objawy z co najmniej dwóch układów miało 153 dzieci (45.2%).

Zaobserwowano również, że manifestacja kliniczna alergii zmieniała się wraz z wiekiem badanych tj.: odsetek dzieci z obja-wami z układu oddechowego wykazywał tendencję wzrostową, a malejącą w przypadku objawów z układu pokarmowego. Ponadto wyniki badań potwierdzają, że najczęstszym alergenem odpowiedzialnym za wystąpienie objawów alergii pokarmo-wej u niemowląt i małych dzieci jest białko mleka krowiego.