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Frequency of clinical manifestations of nutritional allergies in preschool children

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children have changes on the lips, and four children have problems with the digestive tract, i.e. diarrhea. Three children who are allergic to wheat flour only have digestive tract symptoms, i.e. diarrhea. Early detection of nutritional allergies and preventive measures that are applied to reduce exposure to allergens by implementing an elimination diet and avoiding allergens from the environment can mitigate the consequences of nutritional allergies.

Keywords: food allergies; anaphylactic reaction; preschool children.

Abstract

The aim of the study is to assess the frequency of clinical manifestations of nutritional allergies. This research was designed as a cross-sectional study conducted in the preschool institution "Dr Sima Milosevic". A specially created questionnaire for parents was used for the research. The questionnaire collected data that may have a direct or indirect significance on the occurrence of nutritional allergies. Descriptive and analytical statistical methods were used in statistical data processing. Of the total number of children, 41 children, or 1% of children, have nutritional allergies. The most common symptoms are related to skin changes (53.7%), changes on the lips (22%) and diarrhea (17.1%). Most children, 92.7%, do not have an anaphylactic manifestation of allergy, while 7.3% have an anaphylactic manifestation of allergy. Two children are allergic to eggs and have an anaphylactic manifestation of allergy, and one child is allergic to peanuts. Most children (11) who are allergic to milk have skin changes, i.e. atopic dermatitis, four

INTRODUCTION

In the last few decades, there has been an increase in the incidence of food allergy, which is constantly increasing. It is most often detected in the first years of life, most often by the age of three [1]. It is estimated that 6-8% of children develop food allergies in the first 3 years, which is especially important given the vulnerability of this period in life [2].

It is estimated that proteins from cow's milk, eggs, peanuts, and tree nuts are the allergens most responsible for clinical manifestations [2,3]. Radlovic and Lekovic suggested that nutritional allergies are associated with malnutrition in children [4]. Clinical manifestations of allergic intolerance to food antigens can be different. Knowledge of the natural course of food allergies is important because it can help diagnose nu-

tritional allergies. Data from Europe showed the prevalence of nutritional allergies was 5.9%, with the risk of nutritional allergies increased by 40% in children with one immediate family member with any nutritional allergy or allergy at all, and by 80% in children with two immediate family members with any allergy, compared to children with no family history of allergies [5]. They can have an impact on quality of life and even economic stability [6].

There are many risk factors associated with the development of food allergies, including atopic family history, gender, atopic dermatitis, and related genetic polymorphisms. The occurrence of nutritional allergies can be influenced by genetic factors, as well as environmental factors [6].

Clinical manifestations can be early and late [7]. Clinical manifestations depend on many factors, the

most important of which are age and the amount of allergen ingested [5].

Symptoms of nutritional allergic reactions are divided into gastrointestinal, skin, and respiratory manifestations [7].

The aim of this study was to evaluate the frequency of clinical manifestations of nutritional allergies.

METHODS

This research was designed as a cross-sectional study that was conducted at the PU “Dr Sima Milosevic”. In this study, we used comparative descriptive analysis of medical records and the number of children with nutritional allergies, and the type of nutritional allergies was determined in relation to 4123 children aged 2-6 years.

A specially created survey questionnaire for parents was used as a research instrument. The survey questionnaire collected data that may have a direct or indirect impact on the occurrence of nutritional allergies.

STATISTICAL ANALYSIS

Statistical data processing was done in the SPSS Windows version 25 software package. Descriptive and analytical statistics methods were used in statistical data processing. Descriptive statistical methods included absolute and relative numbers, measures of central tendency (arithmetic mean), and measures of dispersion (SD). The results are presented tabularly and graphically.

RESULTS

A total of 4,123 children staying in preschool were analyzed, of which 41 children or 1% of children have nutritional allergies. In the largest percentage of children, 48.8%, nutritional allergy was diagnosed at the age of one year and 31.7% at the age of two. At the age of three, a smaller percentage of children was recorded, namely 7.3%, and at the age of four and five, one child was reported each, that is, 2.4% of the total number of allergic children. In three children, i.e. in 7.3% of children, allergy was diagnosed before the first year of life and they were classified under other (**Table 1**).

Table 2 shows data on the manifestation of nutritional allergies through symptoms. Most of the symptoms are related to changes in the skin 53.7%, changes in the lips 22% and diarrhea 17.1%.

Table 1. Age of children when food allergy was diagnosed.

Age	Frequency (N)	Valid percent %	Cumulative percent %
from the age of one year	20	48.8	48.8
at two years old	13	31.7	80.5
at three years old	3	7.3	87.8
at four years old	1	2.4	90.2
at five years old	1	2.4	92.7
other	3	7.3	100.0
Total	41	100.0	

Table 2. Manifestation of clinical symptoms of nutritional allergies.

Simptomi	Frequency (N)	Valid percent %	Cumulative percent %
lips	9	22.0	22.0
skin	22	53.7	75.6
diarrhea	7	17.1	92.7
respiratory symptoms	3	7.3	100.0
Total	41	100.0	

The majority of children, i.e. 92.7%, do not have an anaphylactic manifestation of allergy, and 7.3% do (**Table 3**).

Table 3. Anaphylactic manifestation of allergy.

Anaphylactic manifestation of allergy	Frequency (N)	Valid percent %	Cumulative percent %
yes	3	7.3	7.3
no	38	92.7	100.0
Total	41	100.0	

Two children are slightly allergic to eggs and have an anaphylactic manifestation of the allergy, and one child is allergic to peanuts (**Table 4**).

Table 4. Anaphylactic manifestation of allergies in correlation with the types of foods that cause it.

Food	anaphylaxis		Total
	yes	no	
milk	0	26	26
egg	2	3	5
peanut	1	3	4
nut fruit	0	3	3
Total	0	3	3
Total	3	38	41

There is a positive correlation between the manifestation of symptoms and the type of food to which the child is allergic, $p < 0.5$. Most of the children (11) who are allergic to milk have skin changes, i.e. atopic dermatitis, then (4) children have changes on their lips and (4) children have problems with the digestive tract, i.e. diarrhea. Children (3) who are allergic to wheat flour only have symptoms of the digestive tract, i.e. diarrhea (**Table 5**).

Non-IgE-mediated reactions are usually caused by reactions of cells in the immune system and are usually characterized by delayed and non-acute reactions [11]. Allergy to food proteins occurs as a result of insufficiency of T-cell suppression and initiation of hypersensitive immune reactions that occur in response to antigenic stimulation [6].

Symptoms or clinical manifestations are divided according to respiratory symptoms, contact allergies, allergies on the skin, and lips, and gastrointestinal, diarrhea. In our research, there were the most children with changes in the skin (53.7%), followed by changes in the lips (22%) and diarrhea (17.1%). The skin problems that occur are angioedema swelling, similar to hives, except that the swelling is under the skin rather than on the surface [11].

Atopic eczema most often develops on the joints of the elbows or behind the knees and is characterized by itching and a red rash; the word ‘atopic’ in the term atopic eczema is indicative of the frequent association with atopy and the need to separate the clinical phenotype from ten or more other forms of eczema such as irritant, allergic contact, discoid, venous, seborrheic and photosensitive eczema [11].

Table 5. Correlation of manifestation of allergy and type of allergenic foods.

Manifestation of allergy	food								Total
	milk	egg	fish and seafood	peanut	nut fruit	wheat flour	other	honey	
lips	4	1	0	1	2	0	0	1	9
skin	11	3	1	3	1	0	1	2	22
diarrhea	4	0	0	0	0	3	0	0	7
respiratory symptoms	2	0	0	0	1	0	0	0	3
Total	21	4	1	4	4	3	1	3	41

DISCUSSION

Nutritional allergies are clinical reactions to food proteins that manifest on the skin, digestive, and respiratory systems [8]. The combination of atopic heredity and elevated IgE in cord blood is positively correlated with genetic predisposition to the development of nutritional allergies [9]. In the last ten years, the number of children with allergic reactions has been constantly increasing [9]. According to our law "Regulations on declaration, labeling, and advertising of food" mandatory allergens that must be declared on food products are defined [10].

In patients with contact dermatitis, food allergens may be responsible for uncontrollable or persistent symptoms that remain even after the removal of allergenic foods from use [12].

The environment in which children live during the period of growth and development is very important because they are exposed to various substances, some of which may be potential allergens. The "patch" test has proven to be very good for diagnosing dermatitis in children. The Food and Drug Administration has approved the use of patch testing in children aged 6-18

years, but a patch testing strategy for young preschool children (between 2 and 6 years) has yet to be defined [13].

Nutritional allergies are most often caused by ingestion, and clinical symptoms vary from local changes in the oral mucosa to systemic anaphylactic reactions. For people with a confirmed anaphylactic reaction to food allergens, accidental contact with a very small amount of allergens can be very risky. Contact with a small amount of allergen through skin contact, kissing or inhalation can lead to fatal systemic reactions. Urticaria on the face and angioedema in children with a confirmed anaphylactic reaction appear a few minutes after contact with allergens such as proteins from cow's milk and fish, i.e. after being kissed by their parents and people around them who have consumed milk, and fish. Very fast contact reactions through kissing or touching have also been recorded in children who are allergic to peanuts, fruits, and vegetables [14].

Asthma and allergic diseases have become one of the epidemics of the 21st century in developed countries. There is a hypothesis of an increased prevalence of allergy and asthma during the last 50 years, especially in developed countries. Given that the prevalence of asthma is on the rise, it appears that environmental influences rather than genetic factors are crucial. Hypotheses include the direct effects of 'fast food', increased prevalence of disease (associated with increased energy intake and decreased physical activity), altered immune exposure in early development, and effects of air pollution. An analysis was made of the influence of fast food (including deep frying) and asthma, symptoms of asthma, eczema, and allergies, and the consumption of so-called "fast food".

It is possible that consumption of fast food could influence the non-specific hyper-reaction of diarrhea and allergic sensitivity. Fast food consumption has a pro-inflammatory effect and may affect airway respiration by increasing airway inflammation. Therefore, increased consumption of fast food may contribute to any mechanism by a broad pro-inflammatory effect, a change in the response to all present allergens, or food allergen exposure [15].

The protective effect of foods rich in unsaturated fatty acids for protection against asthma in childhood has been proven. Early fish consumption was associated with a reduced risk of asthma.

Anaphylaxis is a medical emergency that requires immediate medical attention because it can lead to an acute, fatal respiratory spasm. It is an IgE-mediated process and the most severe form of allergic reaction, where mast cells suddenly release a large amount of histamine and later leukotrienes. In severe cases, intense bronchospasm, laryngeal edema, cyanosis, hypotension, and shock are present. Allergic bronchial asthma is an atopic disease characterized by bronchospasm.

Anaphylactic manifestation of allergy is the most dangerous form of manifestation of allergy, so it is very important to know whether children have this type of systemic reaction of the body to food allergens.

Two children in this study were allergic to eggs, and they have an anaphylactic manifestation of the allergy, and one child is allergic to peanuts. In such cases, there is an exact procedure for treating a child with an anaphylactic reaction. There is a procedure for ensuring the nutrition of children in a preschool institution for children with nutritional allergies. It is very important that all actors in providing children's nutrition are familiar with the type of food allergies that cause, with the child's name prominently displayed in the room where the child is staying in the distribution kitchen and the central kitchen. Staff training in food handling and meal preparation and serving is essential.

Allergy to cow's milk proteins occurs in early childhood and is found in 2-3% of children [10].

Eggs are very often the cause of nutritional allergies, due to numerous proteins (ovalbumin, ovomucoid, ovotransferrin, and lysozyme) [19]. Egg allergy is one of the most common food allergies, affecting 1.8% to 2% of children under 5 years of age, and is often associated with more severe clinical manifestations, including anaphylaxis [16].

Food allergies can cause various symptoms, and in some rare cases, pancreatitis can occur [17].

Peanut allergy occurs in about 0.5% of the children to 1% of the adult population [9]. Very often, peanut allergy is associated with stone fruit allergies. It is explained that the proteins of these two types of fruit are very similar [9].

The most common symptoms of allergies are manifested through the respiratory organs, and the most common are anaphylactic reactions. The onset of allergy manifests itself after ingestion, however, skin changes can also occur after inhalation of aerosolized proteins created during cooking or processing. Unlike most other food allergies, seafood allergies are lifelong in 90% of patients [16].

In the treatment of nutritional allergies, avoidance of allergenic foods and administration of emergency medications after accidental exposure to the allergen are most often used [18].

An elimination diet is a medical nutritional therapy where the intake and amount of liquids, food, and drugs are controlled, and the composition of food and drink components is monitored. It is very important to monitor the time and types of foods that are consumed, as well as the symptoms that occur, their duration, as well as whether insomnia occurs [19].

Elimination diets are used in the diagnosis and treatment of food allergies and other disease processes in which a systemic reaction to a specific food is suspected or proven. There are many elimination diets, but almost all are based on the concept of removing

food or foods from the diet for a period of time and then reintroducing the food while monitoring symptoms [20].

STUDY LIMITATIONS

The study had certain limitations, primarily related to the study design as well as the number of examined children.

CONCLUSION

The obtained results show that eczema is the most common clinical manifestation of nutritional allergies, and topical dermatitis in children who are allergic to milk, and the systemic reaction of the organism anaphylaxis is present in (7.3%) of children who are allergic to peanuts, eggs, and tree nuts. Early detection of nutritional allergies and preventive measures applied to reduce exposure to allergens by implementing an elimination diet and avoiding allergens from the external environment can mitigate the consequences of nutritional allergies.

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Učestalost kliničkih manifestacija nutritivnih alergija kod dece predškolskog uzrasta

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Kratak sadržaj

Cilj rada bio je da se proceni učestalost kliničkih manifestacija nutritivnih alergija. Ovo istraživanje je dizajnirano kao studija preseka koja se obavila u Predškolskoj ustanovi „Dr Sima Milošević“. Za potrebe istraživanja korišćen je posebno kreiran anketni upitnik za roditelje. Anketnim upitnikom prikupljeni su podaci koji mogu da imaju direktan ili indirektan značaj na pojavu nutritivnih alergija. U statističkoj obradi podataka bile su korišćene metode deskriptivne i analitičke statistike. Od ukupnog broja dece, 41 dete, od-

nosno 1% dece ima nutritivne alergije. Najviše ima simptoma koji su vezani za promene na koži (53,7%), promene na usnama (22%) i dijareje (17,1%). Većina dece, odnosno 92,7% nema anafilaktičku manifestaciju alergije, dok je kod 7,3% zabeležena anafilaktička manifestacija alergije. Dvoje dece koja su imala alergiju na jaje imaju anafilaktičku manifestaciju alergije, kao i jedno dete koje je alergično na kikiriki. Najviše dece (11) koje je alergično na mleko ima promene na koži, odnosno atopijski dermatitis, četvoro dece ima promene na usnama i četvoro dece ima probleme sa digestivnim traktom, odnosno pojavu dijareje. Troje dece koja su alergična na pšenično brašno jedino imaju manifestaciju simptoma digestivnog trakta, odnosno dijareju. Ranim okrivanjem nutritivnih alergija i preventivnim merama koje se primenjuju za smanjenje izloženosti alergenima primenom eliminacione dijeta i izbegavanjem alergena iz spoljne sredine mogu se ublažiti posledice nutritivnih alergija.

Ključne reči: alergije na hranu; anafilaktička reakcija; predškolska deca.