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FOOD ALLERGIES AMONG CHILDREN AS A SOCIAL AND MEDICAL PROBLEM

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ABSTRACT

Background: In recent years, food allergy has been diagnosed more frequently in children and adolescents. The environment is more toxic and chemical substances that are additives to food dominate the diet. Also, a changing lifestyle, exposure to stress, and a poorly balanced diet may have an impact on the occurrence of allergies. In society, more children suffer from food allergies than adults, and food allergies are becoming an increasingly serious social and medical problem.

Aim of the study: The aim of this study is to review the subject of food allergies in children, with a focus on the social and medical problems associated with this condition.

Material and methods: 31 studies, published in the last 10 years, were found in databases such as the Polish Medical Bibliography, PubMed Medline, and Google Scholar, using the following keywords: "food allergy", "risk factors", "diet", "psychology", "social aspects".

Conclusions: Given the potentially serious medical and social consequences resulting from allergic diseases, the increasing incidence of allergies among children and young people should motivate medical personnel and educators to receive additional training and to conduct further research in this area.

KEYWORDS: food allergy, risk factors, diet, psychology, social aspects

Background

Allergic diseases are currently a very serious medical and social problem. While these conditions are caused by many different allergens, most are food-borne. Environmental factors, including exposure to chemicals, foods, and changes in eating habits, also play a significant role in shaping the predisposition to allergies [1].

Food allergy, one of the adverse reactions to food products, is a clinical condition associated with activation of the immune system in response to a specific food component. Food allergens are harmless to the greater part of the population, but are recognized as harmful to individuals with specific predispositions [1].

Based on epidemiological studies, it has been estimated that the prevalence of allergies in children is 5–10% in Western countries and 7% in China, while in adults it is 4% in developing countries [2]. In a European questionnaire study on food allergy symptoms in children, conducted with over 40,000 parents, Wąsik et al. report that the incidence of food hypersensitivity is 4.7%. Among the surveyed populations, the lowest incidence rates were observed in Austria (1.7%), while Finland showed the highest rate (11.7%). The most common cause of allergy symptoms identified in this study was milk [3]. In Western countries, includ-

ing the USA, Great Britain and Canada, the incidence of food allergy to peanuts has increased significantly in children over the last two decades – from 1% to 4%. This effect is likely a consequence of the increasing popularity of peanut butter [2].

Allergy is a very demanding disease. Food allergy in children and adults is an ongoing area of research for many doctors and scientists, and the field is constantly being updated. This publication reviews the subject of food allergies in children, with a focus on the medical and social aspects of this condition.

Materials and methods

This paper is a critical literature review based on scientific publications from selected databases such as the Polish Medical Bibliography, PubMed Medline, and Google Scholar. The selection criteria for the included papers were clinical and review papers published in the last 10 years that contained keywords such as "food allergy", "risk factors", "diet", "psychology", "social aspects" and "education," and were focused on allergies and treatment in children, mainly in Poland.

In total, 31 articles, both in English and Polish, which met the search criteria, were selected for further analysis.

Results and discussion

Food allergies

Food allergy is the immune system's response to foreign substances (otherwise known as allergens) that, in this case, are dietary components [4]. Food allergies are categorized as atopic allergies, which also include hay fever, atopic dermatitis (AD), asthma, and insect venom allergies [4]. According to the EAACI classification developed in 2001, food allergy, also known as allergic hypersensitivity, is an abnormal, immune-mediated reaction of the body to ingredients contained in food. In this group of diseases, reactions with the presence of IgE-dependent and IgE-independent mechanisms are distinguished. In the case of an IgE-dependent reaction, clinical symptoms appear immediately after exposure to a given food, while IgE-independent reactions are delayed. Other types of food-induced reactions that are not dependent on immunological mechanisms are referred to as non-allergic food hypersensitivities [5-7].

As outlined above, immunological reactions include both IgE-dependent (type 1 according to Gell-Coombs) and IgE-independent reactions (types 2–4 according to Gell-Coombs). However, the development of immunohistochemical methods resulted in the discovery that some reactions are mixed, and that clinical symptoms can result from both IgE-dependent and IgE-independent mechanisms [8].

The prevalence of food allergy varies across the world, and is the result of different eating habits and age. In 1995, a group of experts from the Food and Agriculture Organization in the United States specified 8 foods as the main sources of allergens. This list includes cow's milk, eggs, wheat, soybeans, fish, shellfish, nuts, and peanuts. In 1999, this list was approved by the Codex Alimentarius Commission, and the included foods have subsequently been referred to as the "big eight". However, other products, including fruits and vegetables, are also an important source of allergens, and it is estimated that over 160 food products and food additives may be causally related to the development of food allergy [9].

Diagnostic management in the case of suspected food allergy should include a thorough interview with the patient, physical examination, skin tests, as well as other necessary laboratory tests [1].

Food allergy in children

Allergies are being diagnosed more often and in increasingly younger children. Among the environmental factors that contribute to the development of allergies are industrial pollution, exposure to tobacco smoke, type of childbirth, breastfeeding time, mother's age and diet, as well as the time of the child's birth. It has been shown, for example, that children born in spring or summer suffer less from food allergies than their peers born in autumn and winter. This phenomenon may be explained by the child's exposure to sunlight and thus the synthesis of vitamin D3 [4,5,7]. Another reason for the occurrence of allergies is a genetic factor that is responsible for an individual's response to an allergen. Studies have shown that when neither parent is allergic, the probability of a child developing allergies is 5–15%. However, when one parent or both parents are affected by this disease, the probability increases to 40% and 60–80%, respectively. Moreover, food allergy is more often detected in people with a history of food allergy, atopic eczema, or asthma [10].

The severity of clinical symptoms in food allergy varies, depending on the type and concentration of the allergen in the food, age and condition of the body, and accompanying diseases. Symptoms after the ingestion of an allergen may manifest themselves in the skin, digestive system, musculoskeletal system, respiratory system and nervous system [7,11]. The most common symptoms that appear initially are prolonged blistering, increased cradle cap, skin blemishes, hay fever, and diarrhea [8]. The groups of symptoms that may be observed in children with an excessive sensitivity to food include [5]:

– in the digestive system: vomiting, colic (in newborns), persistent diarrhea, diarrhea with blood or mucus in the stool, lack of appetite and normal growth (in infants), abdominal pain (in older children);

– in the nervous system: headache, migraine, seizures accompanying migraines, attention deficit syndrome (increased activity), as well as discharge from the ear;

– in the respiratory system: runny or "stuffy" nose, bronchial asthma.

– in the skin and musculoskeletal system: eczema, urticaria, joint pain, muscle pain, rheumatoid arthritis, and AD.

Proper nutrition has a very significant influence on the development of the child's immune system. Enteral nutrition of a newborn and infant significantly affects the proper maturation of his or her immune system, and allows for the proper development of the gut-associated lymphoid tissue system, as well as the development of tolerance to allergens getting into the gastrointestinal tract [11].

The foods that sensitize children and cause food allergies may be very diverse. Food allergy usually occurs in the youngest children up to the age of 24–36 months of life. In children, the immune system undergoes the greatest changes around birth, when the system adapts to various external and internal factors, including the surrounding allergens [14]. The most common allergens are proteins, and they can cause a severe immediate allergic reaction. Among the most allergenic foods belonging to the "big eight", we can also mention milk and dairy products (cream, cheese and any dishes that contain them), eggs, fish and seafood, red meat, chicken, nuts (especially peanuts and cashews – fatalities have been reported, as well as Brazil nuts), grains (especially wheat, which contains gluten), citrus fruits, yeast, soybeans, and coffee (due to the caffeine content, which is also found in chocolate, tea and cocoa) [4,8,12,15,16].

Taking into account the most common food allergens and the likelihood of developing an allergy at a specific age, we can also distinguish the following groups: infants – cow's milk, chicken eggs, wheat, soybeans; children 2–10 years of age – cow's milk, chicken eggs, peanuts, hazelnuts, fish, shellfish, sesame, kiwi; teenagers and adolescents – peanuts, hazelnuts, fish, crustaceans, sesame, and foods cross-reacting with birch pollen [17].

Medical and social problems related to the occurrence of food allergy in children

The increasing frequency of allergies in the last two decades has particularly affected children. Food allergies are a social and medical problem, and these aspects closely correlate with each other, starting from diagnostics, through appropriately selected treatment, and the cooperation of patients and their families with medical care. The diagnosis of food immune hypersensitivity is based primarily on a detailed history and a thorough clinical examination of the patient. Currently, a wide variety of histopathological, serological and genetic tests are performed [8]. An auxiliary test in IgE-dependent reactions is the sIgE test – in the skin pool (skin prick test with airborne and food allergens, [SPT]). Another test involves the determination of individual allergens circulating in the peripheral blood or allergological panels (e.g., Phadiatop) [1,8].

Allergy tests also use modern molecular testing techniques, for the so-called allergen components, which are used to determine the detailed profile of a patient's allergy. Cell activation tests, such as the basophil activation test (BAT), help in anaphylactic reactions. Currently, it seems that the greatest benefits of the BAT are to be found in patients with an unclear medical history, those with no medical history information regarding oral allergen exposure, and those with questionable previous tests results obtained during the course of allergy [8, 18].

A very important aspect from the point of view of the doctor and, above all, the patient, is the appropriate interpretation of test results. However, difficulties in interpreting results stem from the fact that not all people with elevated levels of specific IgE (sIgE) against food allergens have clinical symptoms. This may be due to a different ratio of sIgE concentration to total IgE concentration, the ratio of sIgE concentration to concentration of specific IgG4 and/or IgA blocking antibodies, or the degree of affinity and reactivity of sIgE to food allergens [8]. According to Szmit et al. who studied the sensitivity of SPTs and the determination of sIgE concentrations, it remains the starting point for further research [1]. A double-blind placebo-controlled food challenge is also used to diagnose food allergy. However, this test is time-consuming and involves a possible risk of anaphylaxis [1, 18, 19].

The diagnosis of IgE-independent allergies is difficult and to date there are no unambiguously described standards for testing. However, it is useful to confirm the occurrence of reactions that are delayed with patch tests. The most commonly used tests are the so-called standard panels, which examine reactions to many contact allergens, including, for example, metals such as chromium, cobalt or nickel. The reaction to resins, dyes, and cosmetics can also be examined in this fashion. In food allergy tests, atopic patch tests are used, where the applied allergens may be food-derived or airborne. However, this method is not sensitive and cannot be properly interpreted [8]. Unfortunately, atopic patch tests are not standardized.

The diagnosis of food allergy is also hindered by coincidental exposure to an additional allergen that can enhance the course of allergic reactions (so-called co-factors). For example, 2–15% of anaphylaxis cases are associated with physical exercise or heat-induced sweating [20]. Accurate diagnosis of allergies can also be complicated by symptoms that are intermittent, imitating, for example, a cold (except for a year-round runny nose, which may also be allergic). A misinterpreted runny nose, cough or elevated temperature makes us reach for the standard set of cold medications. Untreated allergic rhinitis will most likely not only worsen, but may lead to the development of bronchial asthma. This condition can also promote sinusitis, middle ear inflammation, colds and angina. In turn, improperly treated asthma not only poses a risk of more frequent and dangerous attacks of breathlessness, but also an increased risk of developing chronic obstructive pulmonary disease, which can shorten life by up to 15 years. The long-term, troublesome itching that patients with AD struggle with may also cause depression [6]. In addition, untreated allergies in children can cause eating disorders, developmental disorders, and slower growth rates. These effects are associated with an inflammatory process that coexists with excessive intestinal permeability, which significantly worsens the absorption of vitamins and minerals and increases the presence of harmful metabolic products in the body [1,4].

An interdisciplinary team should be involved in the diagnosis and treatment of food allergies, consisting not only of specialist doctors (pediatrician, allergy clinician, pulmonologist, dermatologist), but also nursing specialists and nutritionists. Nursing staff, for example, can help to raise a parents awareness of the risk factors for allergy in a child, can outline the appropriate lifestyle, help with the ability to recognize the symptoms of an allergic reaction, and provide appropriate nursing care (which may include learning to prepare balanced meals, checking nutritional labels, and many other things) [21]. Healthcare professionals rarely recognize the coexistence of mental and somatic disorders in allergic patients. Mental disorders, such as depression, anxiety, other affective disorders, behavioral and cognitive difficulties, or even difficulty sleeping, may be associated with the occurrence of asthma, AD, and anaphylaxis [22,23].

Due to the significant increase in incidence, allergy must now be recognized as one of the major health care concerns. The allergic background affects the development of diseases such as AD, asthma-allergic eosinophilic esophagitis, allergic eosinophilic gastroenteritis, colitis and proctitis, and allergic rhinitis (AR) [4,18]. Other symptoms of food allergies may include sleep disorders, migraine, chronic fatigue, and swelling of the feet, hands or joints [10,24].

The management of asthma in children and adolescents is a particular challenge in clinical practice. Often, limited contact and poor cooperation with caregivers, family and the patient requires a different approach to the patient than in the care of adults. These issues have translated into numerous publications focusing on asthma in children, its treatment, detection, and the impact of the disease on academic performance and sports [25].

Food allergy is a social problem that is increasingly analyzed by psychologists and educators. Food allergies are becoming a global problem and the associated physical and emotional effects put a heavy burden on allergic children and their families. Research by Kaczmarski et al. [26] shows that children with food allergies are exposed to unfavorable social behavior that affects the patient and their family. There is, among others, the risk of making a dietary error resulting from adherence to the recommendations of an elimination diet and the associated stress. Miller et al. showed that adolescents with food allergies have a poorer quality of life than younger children who are still under the close care of their parents and guardians. In all age groups, this has a huge impact on all areas of their daily life, including social, emotional, and dietary. There is also family concern and pressure to adjust foods, and there is an increased level of stress to keep children safe from food preparation, school, restaurants, camps, and overnight stays. A worse quality of life (i.e., social and mental problems) has been attributed to the occurrence of anaphylaxis and the stress related to carrying adrenaline in adolescents, a reluctance to carry and use it, and the intensification of subjective respiratory symptoms [22]. In addition, during periods of disease worsening isolation from the peer environment can occur. Very often low self-esteem due to visible skin changes can result in absenteeism from school or work. Such a situation may cause a lowered sense of self-esteem (I am sick = worse), may lead to the child's withdrawal from contacts with other children, and may cause conflicts or aggressive behavior [27].

Many conflicts and tragedies could be avoided if people dealing with food allergy sufferers had knowledge of the causes of anaphylaxis, the methods of preventing allergic reactions, and knew how to manage the symptoms of the disease. Training should be organized for health professionals, including general practitioners, nurses and nutritionists. The problem of allergies and allergens in food should also be familiar to employees involved in catering and the mass production of food, including cooks, bartenders and waiters. The standard methods for preventing food-induced anaphylaxis include a properly selected elimination diet and carrying an adrenaline auto-injector. For further medical care, an individually selected

allergen-specific immunotherapy may be recommended [28].

The treatment of food allergies is an active area of research and remains a difficult topic. Treatment includes education, diet modification, pharmacological and non-pharmacological supportive treatments, and the prevention of anaphylactic reactions [8]. Research on the induction of tolerance has created new hopes in the treatment realm. The methods for tolerance induction in the prevention of primary food allergy include exposure to allergens, breastfeeding, and modification of dietary ingredients and the microbiome. According to Krogulska [29], these are effective methods for prevention and treatment of food allergies, while the development of immunotherapy to induce tolerance in patients with existing food allergies is becoming increasingly important.

The final procedure in the treatment of food allergies is an elimination diet, where the harmful component is completely excluded. An elimination diet is expected to completely resolve the clinical symptoms of allergy. However, special attention should be made to ensure that the foods included in an elimination diet provide the nutrients and vitamins necessary for proper functioning of the body [17]. The duration of the elimination diet will depend on the clinical symptoms, the type of allergenic food, and the age of the patient [8]. The criterion for the effectiveness of an elimination diet is the alleviation or complete disappearance of disease symptoms. The use of an elimination diet requires periodic control and possible modification, and a minimum duration of 6 months, after which a provocation test can be performed with a previously excluded food component. An elimination diet is used when an allergen is known. However, in cases with unknown causes of food hypersensitivity, and in patients who are allergic to multiple allergens, a rotational diet should be used [8]. As the current treatment for food allergy consists mainly of an elimination diet, and its use is often necessary for months or even years, it must be asked whether the expected development of tolerance to allergenic foods can be accelerated.

Breast-feeding is a natural action from the very first days of a child's life [30]. Although there are food antigens in breast milk, they are processed in the mother's body, which promotes their tolerance by the baby. In breast milk there are also substances promoting tolerance, such as immunoglobulins and immunomodulatory factors (e.g., TGF-b, IL-10), substances accelerating the maturation of the intestinal epithelium (e.g., EGF, TGF-b), and prebiotics [30].

Previously, Łoś-Rycharska and Czerwionka-Szaflarska examined the effectiveness of probiotics in the treatment of food allergy symptoms and reported that, in children receiving the probiotic bacteria, food tolerance developed faster [30]. In addition to diet, the most common treatment for the symptoms of allergic diseases is pharmacotherapy. Drugs belonging to several pharmacological groups are used to alleviate allergy symptoms, including 1st and 2nd generation antihistamines, and glucocorticosteroids. Use of these agents results in the control of disease symptoms and improvement of the patient's quality of life [31].

After summarizing the extensive and multifaceted topic of food allergies in medical and social terms, it can be observed that food allergy affects all age groups, and that the only effective treatment is to eliminate the allergen, which can have a significant impact on the patient's quality of life. Food allergy sufferers have to cope with their dietary limitations and can face great difficulties in conducting their social life. In addition, fear of a severe clinical reaction can lead to isolation or psychological and social problems in patients and in the parents of allergic children. Daily activities also become complicated due to the preparation necessary to meet dietary requirements at home and even during a stay in hospital. Clear labeling of food products is important for people with food allergies.

Conclusions

Today, allergies are diagnosed more often and are present in increasingly younger children. The problem of food allergies is multifaceted and has been considered from the point of view of medical diagnosis, compliance with dietary recommendations by the patient, and social aspects. The occurrence of food allergies in humans depends on several factors, such as diet, eating habits, genetic load, the region of residence, and environmental contamination. Given that allergies are increasing among children and young people, and considering the potentially serious medical and social consequences of this condition, medical personnel and educators should be mobilized to improve training in this area and to conduct further research.

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