UDC 616.248-056.3-053.2(477.83)

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THE DYNAMICS OF THE SENSITIZATION STRUCTURE IN CHILDREN WITH BRONCHIAL ASTHMA, LIVING IN LVIV

Keywords: *children, bronchial asthma, sensitization structure.*

During the recent years, there has been a catastrophic increase in the incidence of allergic pathology among children in Ukraine. Moreover, it affects not only the prevalence of this pathology but also a progressive increase in the severity of the course of allergic reactions and early onset of the illness [5]. Bronchial asthma remains the greatest fear of scientists and physicians. According to the latest epidemiological data, bronchial asthma is recorded in 7–10 % of children of the planet, while its prevalence in Ukraine is about 0.5 % [9]. Such significant disparities in the statistical indicators are present not because of the regional peculiarities of this pathology, but due to different approaches to obtaining statistical data. Bronchial asthma is a polyetiological disorder. Therefore, nowadays, when considering the etiology of bronchial asthma, the factors that determine the first episode of the disease and the factors that lead to the exacerbation of the illness (triggers or risk factors) are distinguished. Among the factors that predispose the emergence of asthma, the following should be distinguished: predisposing factors (genetic predisposition to allergic diseases, causative factors (allergens), favorable contributing factors that increase the risk of developing a disease combined with the influence of causative factors [4, 9]. Thus, a variety of allergens sensitize the respiratory tract, creating conditions for the development of an allergic inflammation of the bronchi and result in the clinical manifestation of the symptoms of bronchial asthma in predisposed patients. In this context, the study of the structure of sensitization of in patients with suffering from bronchial asthma, which is characterized by essential individual characteristics and changes with time, becomes especially relevant [4]. In recent years, there is growing evidence that the most important factors in the development and progression of bronchial asthma are house dust allergens [2, 6]. Today it has been proven that house dust is multicomponent in its composition and includes human epidermis particles, clothing fibers, and furniture cover, pets' dandruff and wool fur, bacteria and spores of fungi fungal spores, etc. However, the main source of allergens of house dust allergens are mites [1, 6, 10].

Considering the situation presented earlier, we managed to determine the relevance and purpose of our study.

Purpose of the study: to research the dynamics of the sensitization structure in children with bronchial asthma, living in Lviv, in 5 during years (2012–2016 years) and to analyze its age characteristics.

Materials and methods. A retrospective analysis of outpatient cards and medical files of 904 children with bronchial asthma, aged 6–18 years, from 2012 to 2016, living in Lviv, has been conducted. The sensitization profile was assessed by the results of skin allergic tests (prick and scarification tests) using Ukrainian ("Immunologist"), and foreign ("Diater," Spain and "Sevafarma," Czech Republic) allergen manufacturers.

The children were divided into three age groups: 6–8, 9–14 and 15–18 years old. Among the surveyed children, the number proportion of boys was 62 %, girls — 38 %. A statistical analysis was conducted by the calculation of relative sizes (%) and their comparison by forming the tables 2*2 and using the method of chi-square distribution.

Results. In the sensitization structure of children, house dust allergy prevailed in all age groups (662 children — 73.32 %), mainly, the sensitization to the dust mites allergen — *Dermatophagoides* pteronyssinus was

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DOI: 10.31655/2307-3373-2019-1-22-26

detected in 94.1 % of children to with house dust sensitization) (Table 1) which is more common in comparison with other household allergens (p < 0,01).

Table 1. The frequency of sensitization to domestic allergens according to skin allergy testing (n = 662)

№	Allergen type	Number of positive results	
		Absolute number	%
1	House dust with concentrated *Dermatophagoides pteronyssinus*	623	94,1
2	House dust with concentrated *Dermatophagoides farinae*	483	72,9*
3	House dust with concentrated *Dermatophagoides acarus siro*	235	35,5*
4	Pillow feathers	267	40,3*

Note. * — p <0.01 compared to the indicator "domestic dust, enriched with Dermatophagoides pteronyssinus"

The second most common reason of sensitization were was epidermal allergens (52.1 % — 471 children) of which the most commonly encountered allergen was the cat's fur (46 %, p < 0,05) (Table 2). Less commonly diagnosed was fungal (34.1 8 % — 309 patients), pollen (26.77 % –242 patients) and food (19.91 % –180 patients) sensitization.

Table 2. The frequency of sensitization to epidermal allergens according to skin allergy testing (n = 471)

№	Allergen type	Number of positive results	
		Absolute number	%
1	Cat fur	217	46,0
2	Rabbit fur	194	41,2*
3	Dog fur	185	39,3*
4	Sheep wool	141	29,9*

Note. * — p < 0.01 compared to the indicator "cat's fur "

Regarding fungal sensitization, we should note that in 2016, due to a number of objective reasons, we did not have enough fungal allergens for testing, so we failed to assess the statistical data adequately. At the same time, among 309 patients with hypersensitivity to fungal allergens, the increased sensitivity to Alternaria alternata allergens (83.2 % — 257 patients) was recorded to be the most common.

The structure of pollen sensitization in children with bronchial asthma was characterized by considerable diversity; however, among the 272 patients with positive tests, hypersensitivity was prevalent to herbs (timothy-grass allergens — 43.7 %, (p < 0,05 compared to other herbal allergens), cat grass allergens — 39.3 %, ryegrass — 37.5 %, fescues allergens — 36.4 %, wheat allergens — 33 %).

The conducted studies allowed to find interesting data on food sensitization (Table 3). In patients with bronchial asthma, hypersensitivity to citrus (orange — 60.5 %, (p< 0,05) compared with to other food allergens), mandarin — (50 %), raspberries (57.2%), grapes (48.3 %), cow's milk (41.1 %), chicken egg protein (37.7 %). As it can be seen from the presented data, the sensitization to cow's milk proteins allergens was at the sixth place by the frequency of detection, which is explained by the predominance of school-age children among the examined patients.

Table 3. The frequency of sensitization to food allergens according to skin allergy testing (n = 180)

№	Allergen type	Number of positive results	
		Absolute number	%
1	Orange	109	60,5
2	Raspberry	103	57,2
3	Mandarin	90	50,0*
4	Grape	87	48,3*
5	Lemon	81	45,0*
6	Cow's milk	74	41,1*
7	Chicken egg protein	68	37,7*
8	Cocoa	64	35,5*
9	Hake fish	53	29,4*

Note. * — p < 0.01 compared to the indicator "orange"

In the process of research, it was possible to detect the dynamic changes in the structure of sensitization of children with bronchial asthma during 2012-2016 (Figure 1). As can be seen from Figure 1, over the years, house dust sensitization, which ranged from 71.85 % to 81.85 %, was dominating in all patients.

The increase in the frequency of food, domestic, and pollen sensitization and a slight decrease in sensitization to epidermal allergens was observed. In particular, the level of pollen sensitization has grown rapidly in 2016 (61.6 % in 2016 against 22.14 % in 2012). We associate such indicators with the changing weather conditions, namely that in 2016 the summer was very hot and windy. At the same time, we failed to adequately assess the dynamics of fungal sensitization, because in 2016, due to a number of objective reasons, we did not have enough fungal allergens to conduct allergic testing and received, respectively, significantly lower sensitization indexes.

In recent years, the association between the sensitization profile of children and their age characteristics is actively studied. In the process of this research, we were able to investigate the age-specific features of the sensitization structure in children with bronchial asthma (Figure 2). In particular, children of the junior school age (6–8 years old) were most often recorded to have high sensitivity to house dust mites, and rarely — to epidermal (cat fur, rabbit fur, sheep wool, dog fur) and pollen allergens. At the same time, much more frequent sensitization to food allergens (citrus, raspberries, grapes and cow's milk) was recorded in these patients, compared with other age groups.

mites, epidermal and fungal allergens and low levels of sensitization to food allergens were recorded. Among children aged 15 to 18 years, a high frequency of hypersensitivity to house dust and pollen allergens (timothy grass, cat grass, ryegrass, and

DOI: 10.31655/2307-3373-2019-1-22-264
ISSN 2307-3373

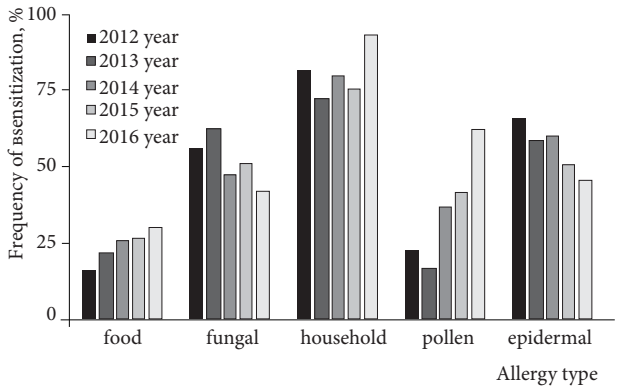

Figure 1. The dynamics of sensitization structure in children during years 2012–2016.

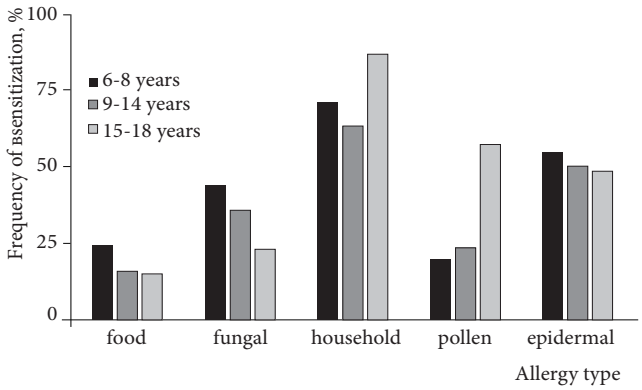

Figure 2. Age features of the sensitization structure in children with bronchial asthma.

wheat) was detected, while the sensitization to food allergens was the least common.

Thus, the results of studying the age distribution of the sensitization structure to a large extent corresponded to the age-specific characteristics of the evolution of the atopic march described in the literature [11].

Conclusions

The retrospective analysis (during 2012–2016) of the results of allergen testing of 904 children aged 6–18 years with bronchial asthma, living in Lviv, showed that household allergy predominates ($p < 0,05$) in the sensitization structure (662 children — 73.32 %), in particular, sensitization to house allergens of house dust mites Dermatophagoides pteronyssinus, found in 94.1 % of children with household sensitization. The obtained results allow to confirm literary data regarding the primary source of house dust allergens — mites.

The profile of sensitization of children suffering from bronchial asthma is characterized by certain age characteristics. With age, the sensitization to inhalation allergens, in particular, pollen, dynamically increases, while the frequency of detection of increased sensitivity and to food allergens decreases, which corresponds to the age-specific peculiarities of the evolution of atopic march in children.

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ISSN 2307-3373
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«Asthma and allergy», 2019, 1, P. 22–26.

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DOI: 10.31655/2307-3373-2019-1-22-264
ISSN 2307-3373