

PREVALENCE OF SENSITIZATION TO AIRBORNE ALLERGENS IN PATIENTS WITH ALLERGIC RHINITIS AND ASTHMA IN UKRAINE

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Background. The distribution of sensitization among children and adolescence with allergic rhinitis (AR) and asthma and their impact on various allergic symptoms have been analyzed.

Aim: investigate the distribution of sensitization among children with AR and asthma of the Ukrainian population.

Material and methods. The study involved 280 children with AR and asthma aged 2–18 years. They were tested for sIgE on the most common allergens among Ukrainians - Dermatophagoides pteronyssinus, Dermatophagoides farinae, dog, cat, cockroach, birch (t03, Bet v1, Bet v2, Bet v4), plane tree, timothy (g06, Phl p1, Phl , Phl p6, Phl p7, Phl p12), ragweed, mugwort and Alternaria. Measurements of sIgE were performed by Western blotting according to the manufacturer's protocol (Simesta-Medivis, Ukraine-Germany).

Results. Among the sensitized subjects, 165 were sensitive to pollen allergens, sIgE was positive to birch in 64 subjects (22.5%), to mugwort - 65 subjects (25.4%), ragweed - 110 subjects (42.5%), timothy - 69 subjects (24.6%), plane tree - 12 subjects (5%). Positive sIgE to feline allergen was found in 114 (43.3%), dogs - 77 (32.1%), Dermatophagoides pteronyssinus - 66 (24.6%), Dermatophagoides farinae - 32 (12%), Alternaria - 38 (15 %), cockroaches - 25 (10%).

Conclusions. Sensitization to airborne allergens is significantly associated with asthma and AR. The most important inhaled allergens consist of pollens (trees, grasses, and weeds), house dust mites, molds and animal dander. Among sensitive subjects to pollen allergens, allergy to ragweed was most spread.

Key words: allergic rhinitis, asthma, airborne allergens, sensitization.

Background. Allergic rhinitis (AR) and asthma constitute major IgE-mediated allergic disorders in children and adults, with an increasing prevalence worldwide [1,2]. Asthma is the most severe disease among all chronic respiratory pathologies. The incidence of asthma in the world is from 4 to 10% of the population [3,4]. According to epidemiological studies conducted under the international standardized program ISAAC (International Study of Asthma and Allergy in Childhood, Northern Standards and International Study of Asthma and Allergy among Children) in different regions of Ukraine on average the incidence of asthma is 20–40 per 1000 population [5]. In particular, according to the results of a study conducted in Kyiv in 1999–2000, the prevalence of asthma in children reached 6.1–8.1% [6]. According to the Center for Medical Statistics of the Ministry of Health of Ukraine, the incidence of asthma in children aged 0-17 years in 2017 was 4513 new cases of asthma or 0.59 per 1 thousand children, and the prevalence was 37246 or 4.91 per 1000

children [6]. Untimely verification of the diagnosis of asthma in children further determines the unfavorable prognosis of its course with the formation of severe forms of the disease and early disability [7-10]. The complexity of the diagnosis of asthma in children is due to the lack of reliable monopredictors of development, multifactorial disease and various clinical variants of its course - phenotypes.

Diagnosis of AR and asthma in particular in the early stages of its development, ie mild intermittent and persistent course, is especially relevant in childhood. Disability, mortality, low treatment efficiency, economic costs depend on the timeliness of allergic diseases detection [11,12]. Today the general principles of diagnosis of allergic diseases aims detection of various causally significant allergens in children, which are food, pollen, house dust mites (Dermatophagoides pteronyssinus, Dermatophagoides farinae), animals, mold spores [9,12].

IgE sensitization is not always consistent with allergy symptoms, but also it may serve as a pre-

dicator in occurrence and precede some allergic diseases [14]. Polysensitization is common, with over 50% of patients with a respiratory allergy sensitized to two or more allergens [14,15]. IgE allergen-specific multiplex panels evaluate allergen-specific IgE against several allergens simultaneously.

Regarding different models of sensitization in different geographical regions of Ukraine and their significance in allergic diseases, the aim of this study was to investigate the distribution of sensitization among children and adolescence with AR and asthma and their impact on various allergic symptoms.

MATERIALS AND METHODS

This study was conducted in Kyiv, Ukraine, from June 2020 to November 2020. Children applying for medical help at the Kyiv City Children's Clinical Hospital No. 2 were involved in the study. A total of 280 serum samples were collected from children with AR and asthma. All tests were performed at the Allergist Medical Center, Kyiv, Ukraine. This study was approved by the ethics committee of the Bogomolets National Medical University. Written informed consent was obtained from a parent or caregiver before collecting samples.

The study involved 280 children aged 2–18 years, 125 male and 155 female. The diagnosis of AR in 255 patients was determined on the basis of clinical history and a positive physical examination and one or more of the following nasal symptoms: rhinorrhea, nasal congestion, sneezing and itching for 3 months. Among them, 84 had symptoms of year-round AR, 171 - had symptoms only in the pollination season, in particular 30 patients had symptoms only in spring, 120 - in summer, among them 98 - had symptoms mainly from August to October, 21 patients had symptoms in spring and summer. 105 patients reported symptoms related to contact with animals, among them - 86 after contact with a cat, 50 - with a dog, 21 patients - with several animals.

73 patients were diagnosed with asthma, which was determined based on a history of self-reported diagnosis or wheezing symptoms in the last 12

months. 48 patients had combination of AR and asthma. 47 children had accompanying atopic dermatitis, established on the basis of Hanifin and Rajka criteria.

Subjects were tested for sIgE on the most common allergens among Ukrainians - *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, dog, cat, cockroach, birch tree (t03, Bet v1, Bet v2, Bet v4), plane tree (*Platanus*), Timothy grass (*Phleum pratense*) (g06, Phl p1, Phl , Phl p6, Phl p7, Phl p12), ragweed (*Ambrosia*), mugwort (*Artemisia vulgaris*) and *Alternaria* (*Alternaria alternata*). Measurements of sIgE were performed by Western blotting according to the manufacturer's protocol (Simesta-Medivis, Ukraine-Germany). The results were classified by classes: 0 (less than 0.35 kU / l), 1 (0.35–0.7 kU / l), 2 (0.7–3.5 kO / l), 3 (3.5– 17.5 kU / l), 4 (17.5–50 kU / l), 5 (50–100 kU / l) and 6 (100 kU / l). Class 1 or higher was defined as positive.

RESULTS

Among 280 people, 258 (92.1%) showed positive serum tests, 23 (8.2%) showed positive sIgE for at least one allergen, and 205 (83.9%) had polysensitization. Among the sensitized subjects, 165 (63.9%) were sensitive to pollen allergens, sIgE was positive to birch - in 64 subjects (24.8%), to plane tree in 12 subjects (4.6%), to mugwort - 65 subjects (25.2%), ragweed - 110 subjects (42.6%), timothy - 69 subjects (26.7%). Detection of sensitization to birch allergens showed that 40 people had elevated sIgE to Bet v1 (15.5%), 14 patients - to Bet v2 (5.4%), 24 patients - to Bet v4 (9.3%). In the study of sensitization to timothy allergens, 38 patients had positive sIgE to Phl p1 (14.7%), 8 subjects - to Phl p2 (3.1%), 40 - to Phl p5 (15.5%), 20 - to Phl p6 (7.7%), 4 - Phl p7 (1.5%), 7 - Phl p12 (2.7%). Most of subjectas had polymolecular sensitization. Positive sIgE to feline allergen was found in 114 (44.2%), dogs - 77 (29.8%), *Dermatophagoides pteronyssinus* - 66 (25.6%), *Dermatophagoides farinae* - 32 (12.5%), *Alternaria* - 38 (14.7%), cockroaches - 25 (9.7%).

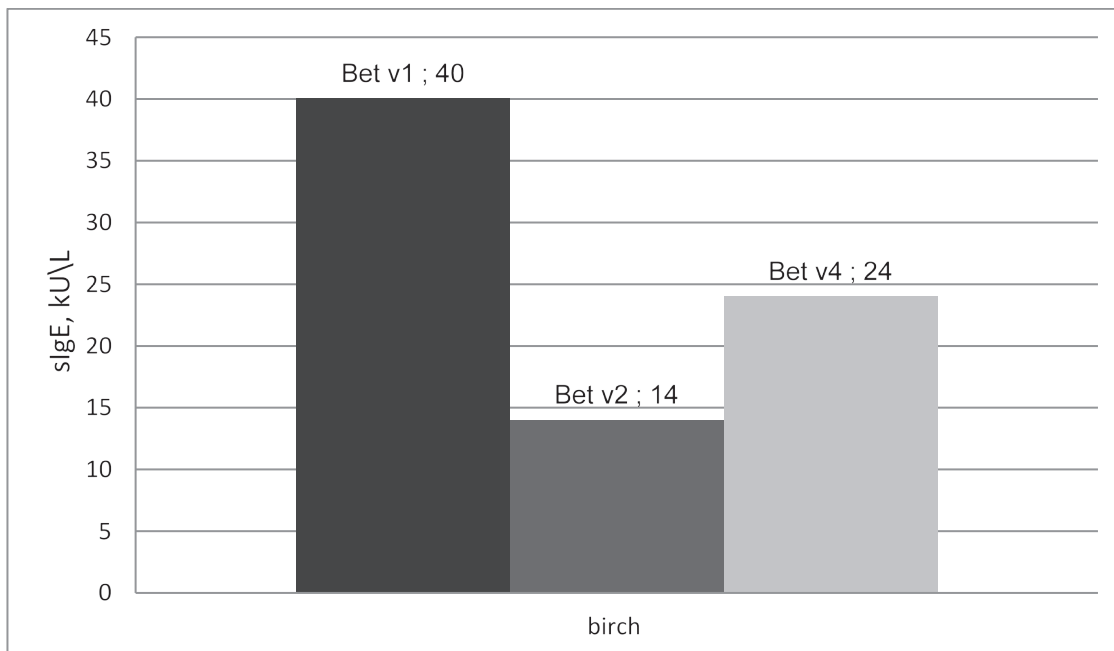


Fig. 1. Number of sIgE positive subjects (n) to birch tree molecules

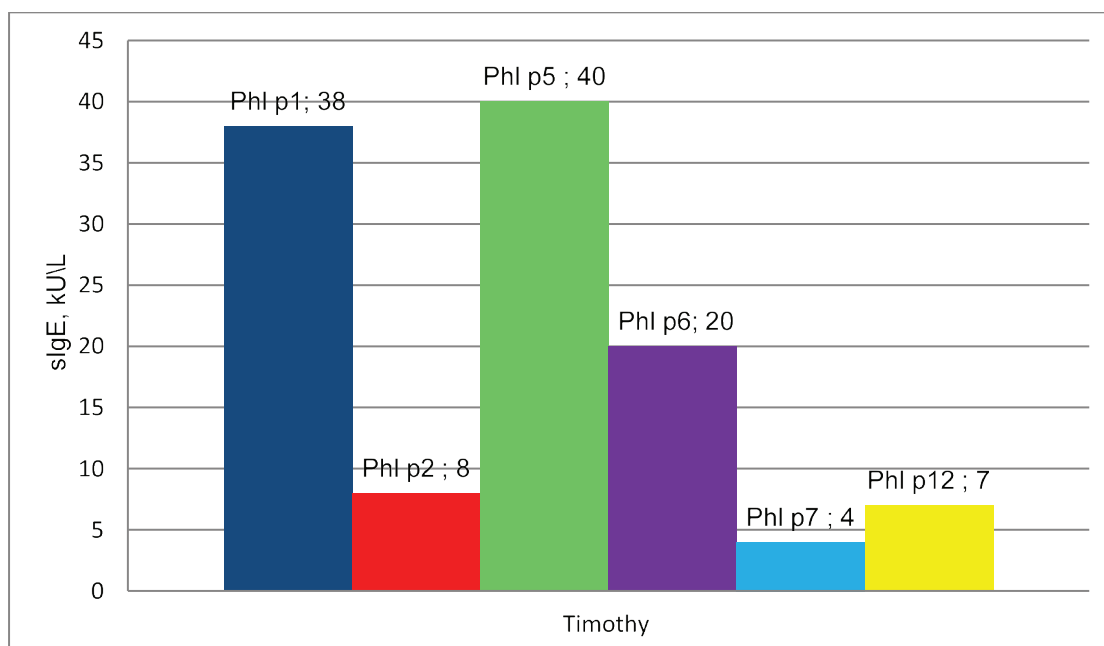


Fig. 2. Number of sIgE positive subjects (n) to Timothy grass molecules

In total, 62 patients showed clinically not significant sensitization to allergens, and patients reported no symptoms after contact with allergen. In particular, 45 patients had sensitization to cat and/or dog, and had no symptoms. The value of sIgE probably did not reach the cut-off point. Also, many patients had polysensitization but mono-allergy.

CONCLUSIONS

The most important inhalant allergens consist of pollens (trees, grasses, and weeds), house dust mites, molds and animal dander. Increasing temperatures and pollination periods lead to changes in the rate of inhalant allergens. Among 280 patients with AR and asthma, 218 (92.1 %)

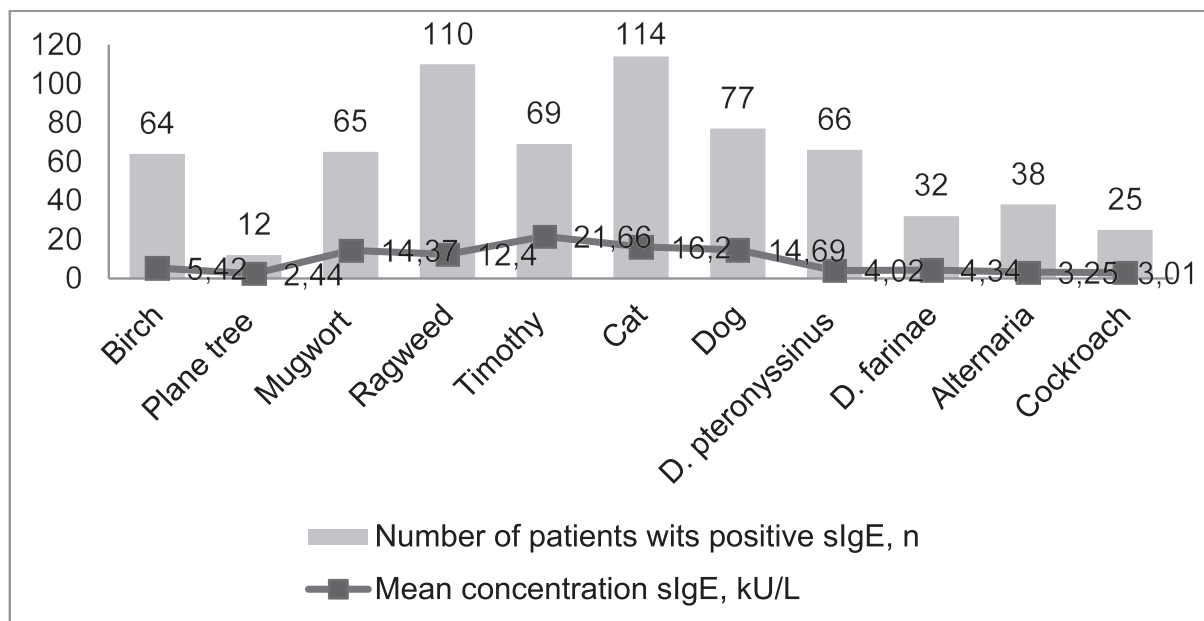


Fig. 3. Number of sIgE positive subjects (n) with mean sIgE concentration (kU/L)

had a positive test for the most common allergens in Ukraine. Among sensitive subjects to pollen allergens, allergy to ragweed was most spread. Patients whose blood testing was negative but who have a history suggestive of allergic sensitization, may have local AR, and nasal allergen provocation test with some other tests may be helpful in revealing the diagnose.

Conflict of interest. The authors of this manuscript claim that there is no conflict of interest during the research and writing of the manuscript.

Sources of funding. The study was financed at the expense of the state budget of the SRW Department of Pediatrics No. 2 of the O.O. Bogomolets National Medical University. State registration code 0120U100804.

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Article history:

Received: 14.03.2023

Revision requested: 20.03.2023

Revision received: 21.03.2023

Accepted: 23.03.2023

Published: 30.03.2023

**ПОШИРЕНІСТЬ СЕНСИБІЛІЗАЦІЇ ДО ІНГАЛЯЦІЙНИХ АЛЕРГЕНІВ
У ХВОРИХ НА АЛЕРГІЧНИЙ РИНИТ ТА БРОНХІАЛЬНУ АСТМУ В УКРАЇНІ**

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Актуальність. Проаналізовано розподіл сенсibilізації серед дітей та підлітків з алергічним ринітом та бронхіальною астмою та їх вплив на різні симптоми алергії.

Ціль: вивчити розподіл сенсibilізації серед дітей з алергічним ринітом та бронхіальною астмою в українській популяції.

Матеріали та методи. У дослідженні взяли участь 280 дітей з алергічним ринітом та бронхіальною астмою віком 2–18 років. Було визначено sIgE до найпоширеніших серед українців алергенів – Dermatophagoides pteronyssinus, Dermatophagoides farinae, собаки, кішки, таргана, берези (t03, Bet v1, Bet v2, Bet v4), платану, тимофіївки (g06, Phl p1, Phl, Phl p6, Phl p7, Phl p12), амброзії, полину та альтернативі. Вимірювання sIgE проводили методом вестерн-блоттингу згідно з протоколом виробника (Simesta-Medivis, Україна-Німеччина).

Результати. Серед сенсibilізованих дітей 165 були чутливі до пилоквіх алергенів, sIgE був позитивним до берези у 64 осіб (22,5%), до полину – у 65 осіб (25,4%), амброзії – 110 осіб (42,5%), тимофіївки – 69 осіб (24,6%), платану – 12 досліджуваних (5 %). Позитивний sIgE на котячий алерген виявлено у 114 (43,3%), собаки – у 77 (32,1%) дітей, Dermatophagoides pteronyssinus – 66 (24,6%), Dermatophagoides farinae – 32 (12%), Alternaria – 38 (15 %), тарганів – 25 (10%).

Висновки. Сенсibilізація до інгаляційних алергенів значною мірою пов'язана з алергічним ринітом та бронхіальною астмою. Найважливішими інгаляційними алергенами є пилок (дерев, трав і бур'янів), кліщі домашнього пилу, цвіль і шерсть тварин. Серед чутливих до пилоквіх алергенів дітей найбільш поширеною була алергія на амброзію.

Ключові слова: алергічний риніт, бронхіальна астма, інгаляційні алергени, сенсibilізація.