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The role of sensitization to aeroallergens and its determination in children with asthma in Ukraine

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Asthma is a very common respiratory disease in the world. In particular, asthma has a great impact on the health of children. In this study, the distribution of sensitization among children with asthma has been analyzed.

The aim of this study was to investigate the distribution of sensitization among children with asthma in the Ukrainian population.

Materials and methods. The study involved patients (n=98) with asthma aged from 12 to 18 years (median 6 (3;10)). During the examination, children underwent skin prick testing for common aeroallergens. A positive skin prick test was defined as a blister ⩾3 mm in diameter after 15 minutes.

Results. Among 98 patients, skin testing with aeroallergens showed a positive result in 76 (77.6%) people: 18 (18.4%) had positive skin testing for at least one allergen, and 58 (59.2%) had polysensitization. Among those sensitized children, 54 (55.1%) were sensitive to pollen allergens, 29 (29.6%) patients were sensitive to cats, 32 (32.6%) to dogs, 30 (30.6%) to Dermatophagoides pteronyssinus, 27 (27.6%) to Dermatophagoides farinae, and 10 (10.2%) to Alternaria.

Conclusion. The most important inhalant allergens for patients with bronchial asthma are pollens (trees, grasses, and weeds), house dust mites, molds, and animal dander. Identifying causative allergens allows for monitoring allergy triggers and determining which asthma patients will be candidates for allergen-specific immunotherapy (ASIT). Today, most children with asthma do not receive ASIT because of the lack of awareness at the primary care level, a lack of testing for aeroallergen sensitization, and financial inaccessibility of examination and treatment in Ukraine.

The study was carried out in accordance with the principles of the Declaration of Helsinki. The study protocol was approved by the Local Ethical Committee of these institutions. The informed consent of the children's parents was obtained for the research.

No conflict of interests was declared by the authors.

Keywords: asthma, aeroallergens, skin prick tests, children.

Роль сенсибілізації до аероалергенів та її визначення в дітей із бронхіальною астмою в Україні

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Бронхіальна астма є дуже поширеним респіраторним захворюванням у світі. Зокрема, бронхіальна астма має великий вплив на здоров'я дітей. У цій роботі було проаналізовано розподіл сенсибілізації серед дітей, хворих на бронхіальну астму.

Метою цього аналізу було дослідити розподіл сенсибілізації серед дітей, хворих на бронхіальну астму в Україні.

Матеріал і методи. У дослідженні взяли участь хворі (n=98) на бронхіальну астму віком від 12 до 18 років (медіана 6 (3;10)). Під час обстеження дітям було проведено шкірне прік-тестування на поширені аероалергени. Позитивний шкірний прік-тест визначався як пухир ⩾3 мм у діаметрі через 15 хвилин.

Результати. Серед 98 пацієнтів шкірне тестування з аероалергенами виявило позитивний результат у 76 (77,6%) осіб: у 18 (18,4%) — позитивна шкірна проба хоча б на один алерген, у 58 (59,2%) — полісенсибілізація. Серед сенсибілізованих 54 (55,1%) дитини були чутливими до пилкових алергенів, до кота — 29 (29,6%) хворих, собак — 32 (32,6%), Dermatophagoides pteronyssinus — 30 (30,6 %), Dermatophagoides farinae — 27 (27,6 %), альтернарію — 10 (10,2%).

Висновок. Найважливішими інгаляційними алергенами для хворих на бронхіальну астму є пилок (дерев, трав і бур'янів), кліщі домашнього пилу, цвіль і алергени тварин. Визначення причинних алергенів дає змогу контролювати тригери алергії та визначати, які пацієнти з астмою будуть кандидатами для алерген-специфічної імунотерапії (АСІТ). На сьогодні більшість дітей, хворих на бронхіальну астму, не отримують АСІТ через недостатню поінформованість на первинному рівні, відсутність алергологічного тестування, фінансову недоступність обстеження та лікування в Україні.

Дослідження виконано відповідно до принципів Гельсінської декларації. Протокол дослідження ухвалено Локальним етичним комітетом зазначеної в роботі установи. На проведення досліджень отримано інформовану згоду пацієнтів.

Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: бронхіальна астма, аероалергени, шкірні прік-тести, діти.

Introduction

Asthma is a very common respiratory disease in the world [16]. In particular, asthma has a great impact on the health of children [15,16]. The prevalence of asthma, like the prevalence of allergies, is increasing worldwide [14]. In Ukraine, the importance of asthma and allergies is also growing, as in a country with developed industrialization and the consequences of the Chernobyl disaster [2,4,17,18]. Military actions on the territory of the country can play a big role in the incidence, course, and control of the disease [19].

Due to the unavailability of examination for patients with asthma, the presence of allergies may remain undetected in many patients, and the impact of contact with the allergen may play a large role in the course of the disease [11,12].

Early diagnosis of asthma and establishment of sensitization and allergy can play a very important role in the treatment of the disease: allergen avoidance and allergen-specific immunotherapy [5,6]. Asthma guidelines or algorithms generally recommend the determination of specific IgE (sIgE) or skin prick testing for aeroallergen sensitization in subpopulations of patients with asthma [5,6].

A European primary care survey conducted by the European Academy of Allergy and Clinical Immunology (EAACI) and the International Primary Care Respiratory Group (IPCRG) found that 20.6% of practices had no access to allergy tests [1].

Aeroallergen sensitization testing increases the ability to predict the course of the disease, medication response, and the risk of future asthma exacerbations. Asthma Predictive Index (mAPI), which includes the role of allergic sensitization to at least 1 aeroallergen, is an important predictive model for childhood asthma. In the high-risk cohort, a positive mAPI significantly increased the likelihood of developing asthma in the future [4]. Allergy testing results can guide clinical precision medicine for chronic airway disease in individual patients, including allergen-specific immunotherapy (ASIT). In addition, allergy testing can help identify the presence of allergic rhinitis (AR), a common comorbidity, which, if properly treated, can improve asthma control [5,8].

The aim of this study was to investigate the distribution of sensitization among children with asthma of the Ukrainian population.

Materials and methods of the study

The study involved patients (n=98) with asthma aged from 12 to 18 years (median 6 (3; 10)), from the allergological department of the Kyiv City Children's Clinical Hospital No. 2.

The main group consisted of 82 boys and 16 girls, median age — 15 (11; 16).

The diagnosis of asthma was established in the group of examined children on the basis of clinical data and objective measurement of lung function [7]. All examined children underwent spirometry according to the ATS-ERS guidelines [9]: at least four acceptable maneuvers after the spirometers were checked for volume accuracy. The diagnosis of asthma was made if parents reported symptoms of asthma (difficulty breathing, chest tightness in the past 12 months, difficulty breathing or wheezing after exercise, wheezing in the previous 12 months, or a previous physician diagnosis of asthma and the child demonstrated significant airway reversibility (>12% increase in FEV_1).

The diagnosis of AR was determined in 80 (81.6%) patients on the basis of clinical history, positive physical examination, and the presence of one or more following nasal symptoms: rhinorrhea, nasal congestion, sneezing and itching for 3 months. Among them, 24 (30 %) had symptoms of year-round AR, and 56 (70 %) — had symptoms only in the pollen season. 33 (41.3 %) patients reported symptoms related to contact with animals.

During the examination, children underwent skin prick testing for aeroallergens (birch (Betula verrucosa), alder (Alnus glutinosa), hornbeam (Capinus betulus), hazel (Corylus avellana), timothy grass (Phleum pratense), ryegrass (Lolium perenne), orchard grass (Dactylis glomerata), ragweed (Ambrosia Artemisiifolia), mugwort (Artemisia vulgaris), sunflower (Helianthus annuus), common couch (Elytrígia) and Alternaria (Alternaria alternate), cat, dog, and dust mites (Dermatophagoides farinae and Dermatophagoides pteronyssinus). A positive skin prick test was defined as a blister ⩾3 mm in diameter after 15 minutes.

Statistical processing of the obtained data was carried out using the statistical package IBM SPSS Statistics Base (version 22) and the software EZR version 1.32 (graphical interface of the R environment, version 2.13.0). The research database was systematized in the Microsoft

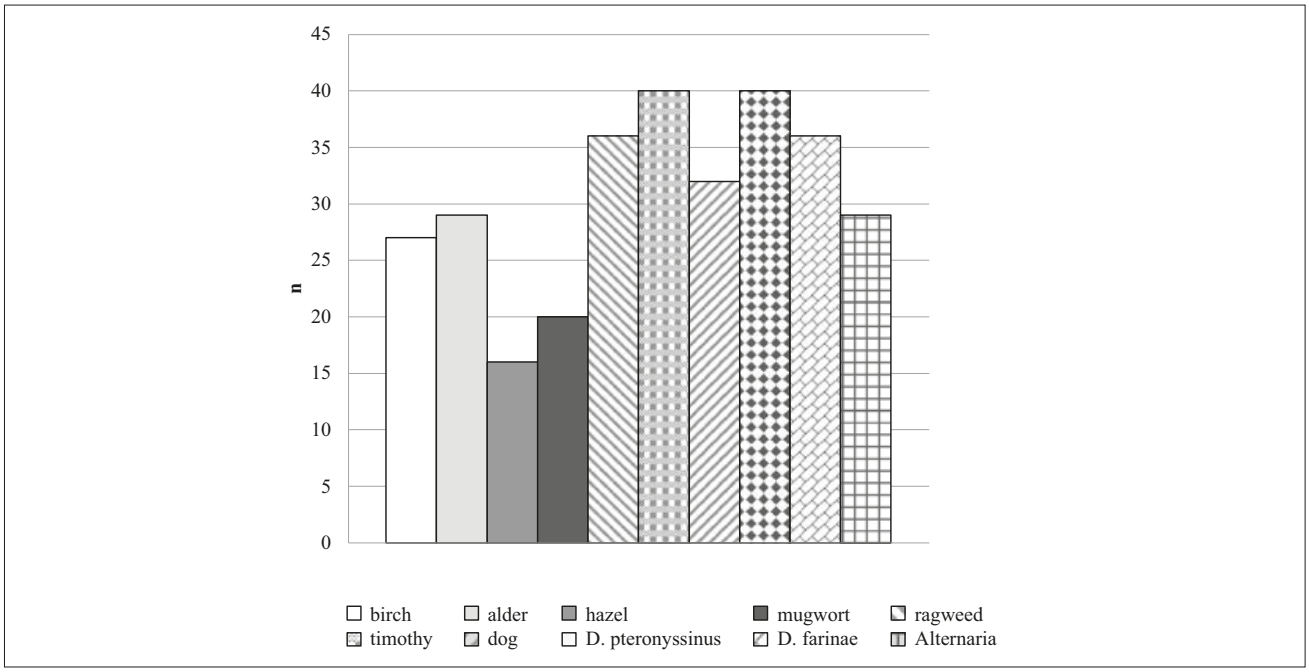

Fig. 1. Number of positive subjects (n) to aeroallergens, defined by skin tests

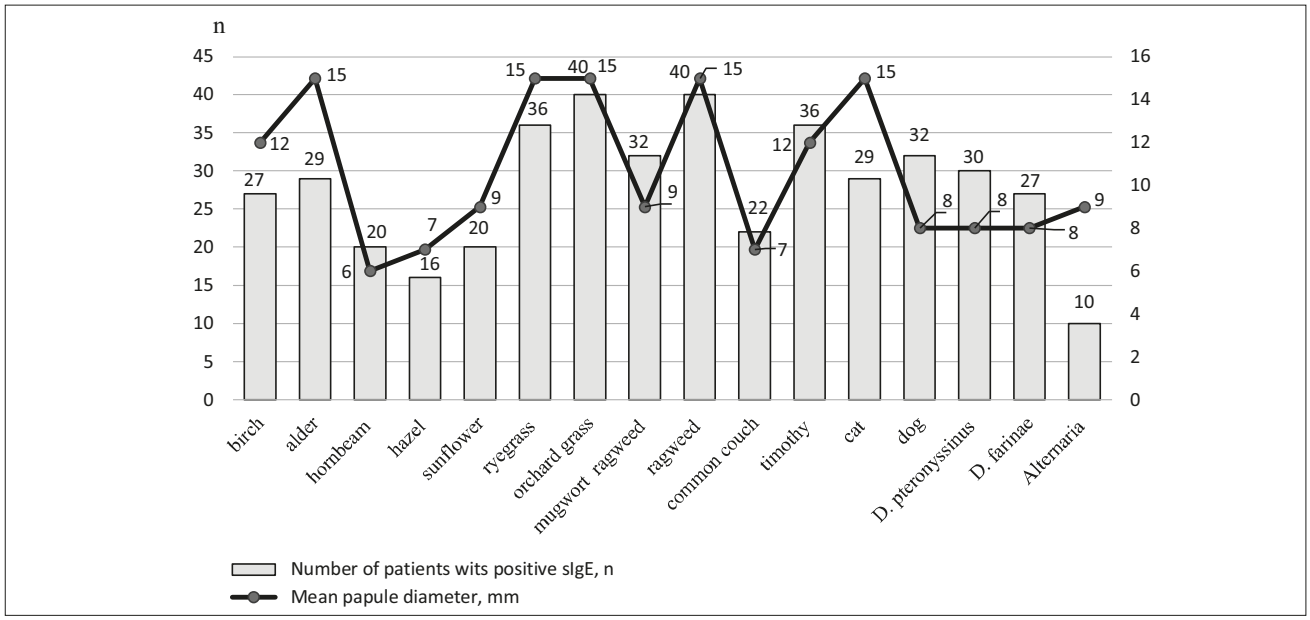

Fig. 2. Number of skin prick test positive subjects (n) with mean papule diameter (mm)

Excel editor. The relationship between clinical parameters was determined using the odds ratio (OR) with a 95% confidence interval (CI).

The research was conducted on the basis of the World Medical Association Declaration of Helsinki and the rules of good clinical practice (IGHGCP), voluntary participation, and informing patients about the nature of the research.

Results of the study and discussion

33 (33.7%) patients with asthma underwent skin testing when the diagnosis of asthma was made or within a year, according to the data anamnesis. And 65 (66%) did not undergo an examination for the presence of allergies for more than a year after the diagnosis. Such data emphasize the fact that allergy diagnosis in asthma, a disease that largely depends on allergies, is delayed. To a large extent, this can be related to the insufficient education of primary care physicians and the difficult accessibility and cost of testing for the population.

Among 98 patients, skin testing with aeroallergens showed a positive result in 76 (77.6%) people: 18 (18.4%) showed positive skin testing for at least one allergen, and

58 (59.2%) had polysensitization. Individuals with polysensitized phenotypes usually have frequent multimorbidity, with severe and persistent course of disease.

Among those sensitized patients, 54 (55.1%) were sensitive to pollen allergens, 27 (27.6%) people had a positive test for birch, 29 (29.6%) people to alder, 16 (16.3%) people to hazel, hornbeam — 20 (20.4%), ryegrass — 36 (36.7%), orchard grass — 40 (40.8%), ragweed — 40 (40.8%), mugwort — 32 (32.6%), sunflower — 20 (20.4%), common couch — 22 (22.4%), timothy grass — 36 (36.7%). A positive skin test for cat allergen was found in 29 (29.6%), dog — 32 (32.6%), Dermatophagoides pteronyssinus — 30 (30.6%), Dermatophagoides farinae — 27 (27.6%), Alternaria — 10 (10.2%). The data on skin test results are presented in Figure 1.

As can be seen from Figure 2, the largest positive reactions to allergens were found on pollen: birch, alder, ryegrass, orchard grass, and ragweed. Although this analysis has certain drawbacks: the diameter of the papule may depend on the medication, the season of testing, and other individual factors. The prevalence of sensitization and allergy to various allergens depends on the population and differs in various literary sources. In particular, according to many data, the first place among common allergens belongs to timothy, birch, cat allergens [2,4,8,12]. Such data largely depend on the cohort of the surveyed: urban or rural population; the age of the examinees; geographical latitude and spectrum of plants; level of environmental pollution.

Children with moderate and severe asthma significantly more often had year-round AR than seasonal AR (OR=3.3, CI 1.1650–9.6568, p=0.02). In this group, we did not find an association of polysensitization with a more severe asthma phenotype (OR=1.6, CI 0.5153 to 5.4584, p=0.39). Although literary data demonstrate such a connection of moderate to severe, exacerbation-prone asthma: the average number of inhalant sensitizations for school-age children was 14 positive results out of 22 tested allergens (68%) [13].

In total, 12 (12.2%) patients showed clinically not significant sensitization to allergens, and patients reported no symptoms after contact with allergens. In particular, 7 (7.1%) patients had sensitization to cats and/or dogs and had no symptoms.

Conclusions

Skin prick testing is an available research method that provides improvement in asthma care, gives opportunities for allergic trigger control, and defines which patients with asthma would be candidates for ASIT. The most important inhalant allergens are pollen (trees, grasses, and weeds), house dust mites, mold, and animal dander.

Yet most children with asthma do not receive ASIT because of the lack of awareness at the primary care level, lack of testing for aeroallergen sensitization, and financial inaccessibility of examination and treatment in Ukraine.

No conflict of interests was declared by the authors.

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