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SPECTRUM OF SENSITIZATION TO AEROALLERGENS IN PATIENTS FROM THE UPPER CHIRCHIK DISTRICT OF THE REPUBLIC OF UZBEKISTAN

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Abstract: Allergic respiratory diseases caused by hypersensitivity to aeroallergens are the most common manifestation of atopy among children and adults. However, the structure of sensitization in the population depends primarily on the allergenic composition of the air environment. Identification of sensitization is a prerequisite for successful therapy of allergic diseases, while the structure of sensitization may have regional characteristics.

The purpose of the study: study of the spectrum of sensitization in persons with allergic diseases: allergic rhinitis (AR) varying severity of bronchial asthma (BA), atopic dermatitis (AtD) in the Upper chirchik district of Tashkent region, which is characterized by a long flowering period of weeds (wormwood, solsola, quinoa) – late August – late November, cereals (Timothyka, foxtail, rye, bluegrass) grasses –the end of February – the end of July; the duration of flowering is associated with the peculiarities of climatic and geogarphic conditions.

Materials and methods: from January to May 2022, a clinical and allergological examination was performed on 100 patients with allergic diseases: 20 of them were children aged 2-18 years with AR, 12 with intermittent AD, 6 children with AD and 32 adult patients with AR, 13 with AD, 17 with AD. To study the total IgE in blood serum, "Monobyte" test systems manufactured in the USA were used; allergen-specific IgE was determined using "Alcor Bio" test systems manufactured in Russia, standard diagnostic allergens were used for scarification skin testing (NPO Microgen JSC, Stavropol).

Results: In 90.1% of patients, combined sensitization to pollen, household and food allergens was detected, in 6.2% - only to pollen allergens of different groups and in 3.7% - monosensitization to autumn pollen allergens.

Conclusion: The spectrum of sensitization to aeroallergens in the studied area of the Tashkent region is characterized to a greater extent by pollen sensitization in both children and adults with various allergic diseases, and with a predominance of multiple sensitization in all age groups. ***Keywords:*** allergic rhinitis, bronchial asthma, atopic dermatitis, pollen, food and household allergens.

Introduction. Allergic diseases - AR, BA, AtD, where the etiological factor is hypersensitivity to aeroallergens, are the most common manifestation of atopy among children and adults [1,2]. The general patterns of respiratory allergy formation include genetic predisposition to allergic diseases, age dynamics of the sensitization spectrum, and the development of polysensitization [3,4]. The structure of sensitization in the population depends primarily on the regional characteristics of the representation of allergenic plants and household allergens [5]. The most significant are allergens of house dust mites, pollen of wind-pollinated plants and spores of mold fungi-microorganisms [6]. The allergen content in the atmosphere and indoors, and, consequently, the sensitization profiles of patients are significantly influenced by regional climatic and geographical features, seasonal fluctuations in temperature and humidity, as well as the level of socio-economic status and lifestyle of the population [7,8,9].

A valuable source of information for this project is the world's largest collection of Central Asian specimens - the Central Herbarium of Uzbekistan (TASH). The TASH electronic database has become the most important resource for analyzing the features of the geographical distribution of plants [Tozhibaev K. Sh., Beshko N. Yu., Popov V. A. Botanical and geographical zoning of Uzbekistan //Botanical Journal. – 2016. – Vol. 101. – No. 10. – pp. 1105-1132.]. Tashkent region is located in the northeastern part of Uzbekistan between the western part of the Tien Shan Mountains and the Sirdarya River. Most of the territory of the Tashkent region is the foothill plain. On the territory of the Tashkent region there are deciduous trees - poplar (turangi subgenus), willow, narrow-leaved loch (djida), weeds - wormwood, Tatar quinoa, ragweed, annual sunflower and meadow grasses - timothy meadow, pasture grass, creeping wheatgrass, hedgehog, meadow bluegrass), the dusting season lasts from mid-February to the end of November [Akzhigitova N. I. et al. Botanical geography of Kazakhstan and Central Asia (within the desert region). – 2003.].
Data on the spectrum of allergic diseases and sensitization to allergens in the Republic of Uzbekistan are very limited, which was the reason to conduct this study.

The aim of the work was to study the spectrum of sensitization to aeroallergens in patients of different ages with atopic diseases (year-round and seasonal allergic rhinitis/ conjunctivitis (YrAR, SAR/AK), bronchial asthma (BA), atopic dermatitis (AtD) living in the Upperchirchik district of the Tashkent region.

Materials and methods.

A retrospective study was performed using a continuous sample of patients registered at the Republican Scientific and Specialized Allergological Center from January to May 2022

According to the diagnostic logs and individual diagnostic charts, the results of an allergological examination of 100 patients were evaluated, which included the method of skin testing (prick tests) with water-salt extracts of allergens produced by NPO Microgen and laboratory diagnostics – determination of specific immunoglobulins E to household, pollen, food allergens by IFA using diagnostic kits manufactured by Alkor Bio" (Russia).

Patients of the study group with various allergic diseases (AZ) were distributed by age, nature of the course and severity of the disease (Table 1): 20 children aged 2-18 years and 32 adults. Among children, 17 patients suffered from intermittent AR, 3 from persistent moderate AR (according to the ARIA-2020 classification). Intermittent asthma was diagnosed in 12 children – in 8 of mild course (according to GINA -2022 classification), in 4 of moderate severity. 6 children suffered from AtD, including -1 of mild severity, 4 of moderate severity, 1 of severe severity.

32 adult patients were diagnosed with AR, of which 20 had intermittent, 12 had persistent moderate-severe and severe course; 13 patients were diagnosed with AD, of which 3 had mild, 8 had moderate–severe and 2 had severe controlled asthma.

17 adults were diagnosed with AtD, of which 2 had a mild course, 11 had a moderate course, and 4 had a severe course.

Table 1.
Distribution of patients with AZ by age, nature of the course and severity of the disease (n=100)

Age of patients	AR		BA				AtD		
	Intermittent current	Persistent current	Light	Medium	Heavy Controlled	Heavy Uncontrolled	Light current	Medium current	Heavy current
2-18 years old	17	3	2	6	4	-	1	4	1
19-65 years old	20	12	-	3	8	2	2	11	4

Diagnostic allergens of house dust, pollen allergens (meadow timothy, bulbous bluegrass, wormwood, quinoa) were used for skin testing; the level of allergen-specific immunoglobulins E to extracts of food allergens (cow's milk, gluten, egg white, a mixture of allergens of nuts (hazelnuts, almonds, coconut, peanuts, walnuts) was studied in vitro.), to house dust mites d 1 - Dermatophagoides pteronyssinus, d 2 - Dermatophagoides farinae, as well as mixed allergens from meadow and weed pollen in blood serum.

Statistical processing was carried out using the chi-square criterion and the method of agreement of event frequencies calculated using the universal statistical package STADIA 6.0.**Results.**

During skin testing, positive tests with household allergens were detected in 84 patients (84%), with pollen allergens (meadow timothy, bulbous bluegrass, wormwood, quinoa) - in 97 patients (97%).

Specific IgE to food allergens (cow's milk, gluten, egg white, a mixture of allergens of nuts - hazelnuts, almonds, coconut, peanuts, walnuts) They were detected in 72 patients (72%), 58 of them children and 14 adults. In all children of the examined group, a clinic of food allergy with angioedema and urticaria was observed, in adults, symptoms of urticaria and angioedema were observed in 10 patients (71.4%), in 4 (28.6%) – signs of oral allergic syndrome (Table 2).

37 (37%) patients had symptoms of SAR, 15 (15%) - YrAR, 25 (25%) – BA, 23 (23%) – AtD. In 82% of patients with BA, sensitization to household allergens was established, in 86% of patients with SAR – to meadow timothy pollen, 88% - to meadow bluegrass, 94% - wormwood, 88% - quinoa pollen, in 74% of patients with RyAR - to house dust mites d 1 - Dermatophagoides pteronyssinus, in 52% - to house dust mites d 2 - Dermatophagoides farinae, in 82% of patients with AtD – to the allergen of house dust. Sensitization was latent in 22% of patients.

Table 2
Results of determination of allergen-specific IgE antibodies in the examined patients (n=100)

№	Type of allergen	Number of sensitized patients with AR	Number of sensitized patients with BA	Number of sensitized patients with AtD
1	h 1 - (Greer Labs, Inc) House dust	54	20	8
2	d 1 - Dermatophagoides pteronyssinus	45	25	4
3	d 2 - Dermatophagoides	31	18	3

	farinae			
4	g 6 – Timothy meadow (Phleum pratense)	57	21	8
5	g 8 - Meadow Bluegrass (Poap ratensis)	55	29	4
6	w 6 - Common wormwood (Artemisia vulgaris)	59	32	3
7	w 15 - Quinoa (Atriplex lentiformis)	51	31	6
8	f 2- Cow's milk	1	6	9
9	f 79- Gluten	-	-	2
10	f 1- Egg white	5	4	51
11	fm 61- A mixture of gens nuts (f13-f17-f20-f36-f256) peanuts, hazelnuts, lmonds, coconut, walnut	4	11	65

The data obtained by us indicate that in the studied group of patients from the Upper Chirchik district of the Tashkent region, according to the results of laboratory diagnostics, sensitization to pollen allergens was detected in 97% of patients, of which 86% to the allergen of meadow timothy (g 6), 88% to the allergen of bluegrass meadow (g 8), 94% to common wormwood allergen (w 6), 88% to quinoa allergen (w 15), 88% to house dust allergen (p 1), 74% to house dust mite allergens (b 1 - Dermatophagoides pteronyssinus), 52% to b 2 (Dermatophagoides farinae); to food allergens - 16% to cow's milk (a2), 2% to gluten (a 79), 60% to egg white (a1), 80% to a mixture of allergens of nuts fm 61 (f13-f17-a20-a36-a256). The results of skin allergological testing with household and pollen allergens coincided with the results of laboratory examination in 95% of cases.

Polysensitization (various combinations of pollen, household and food allergens) was detected in 90.1% of the examined patients, and monosensitization to weed pollen (wormwood, quinoa) was detected in 3.7%.

The general spectrum of sensitization to aeroallergens of the examined patients, taking into account the disease, is shown in Fig. 1 and in Tab. 3. According to our research, 84 patients were sensitized to household allergens (house dust mites D. pteronyssinus, D. farinae), 97 patients – to pollen (meadow timothy, bulbous bluegrass, wormwood, quinoa) and 72 patients – to food allergens (cow's milk, egg white, gluten, a mixture of allergens of nuts).

Figure 1

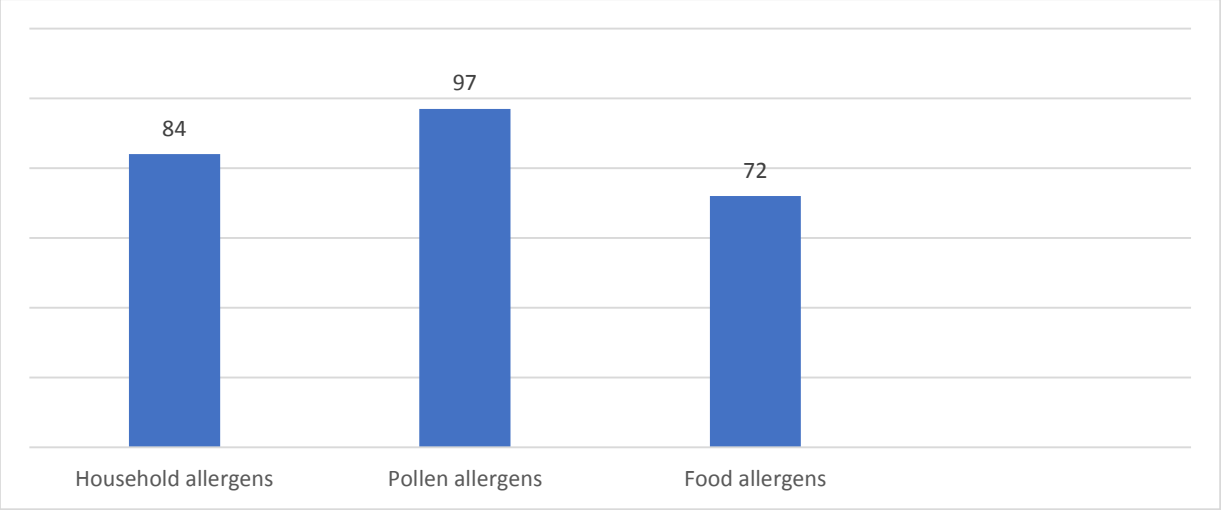


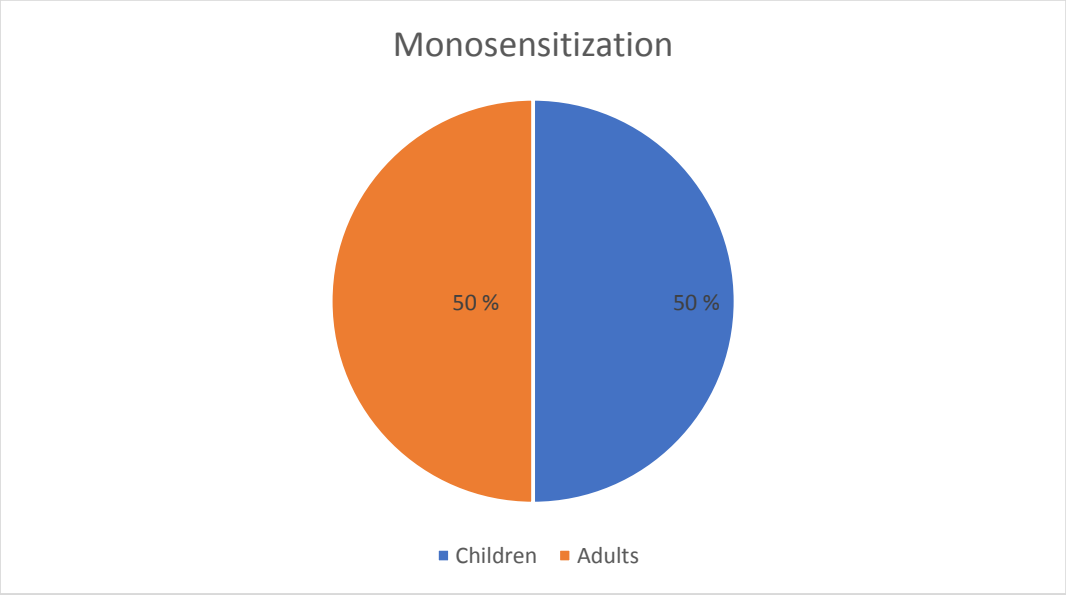
Fig.1. Spectrum of sensitization of patients with allergic diseases in Upperchirchik district of Tashkent region (n=100)

Table 3.
The spectrum of sensitization and the nature of clinical symptoms in patients with allergic diseases of the Upperchirchik district of the Tashkent region (n=100)

№	Allergen groups	Frequency of occurrence	Clinical symptoms
1	Household + pollen + food	66 %	Cough, wheezing, choking attacks, sneezing, nasal congestion, dry skin, skin rashes
2	Household+pollen	18 %	Sneezing, nasal congestion, coughing, wheezing
3	Pollen+food	6 %	Dry skin, skin rashes, sneezing, rhinorrhea, episodes of urticaria

The dominant group of allergens was plant pollen, sensitization to which was established in 97% of patients versus 72% of patients sensitized to food allergens (P<0.05). Sensitization to allergens of weed pollen (wormwood, quinoa) was detected with the same frequency (50%) both children and adults. Sensitization to household allergens was detected in 84 (84%) patients, in children the indicator was 26 (26)%, in adults – 58 (58%), among them the symptoms of AR – in 52 (52%) patients, BA – in 25 (25%) patients, AtD – in 23 (23%) of patients. The frequency of monosensitization to one group of allergens in children and adults was 1:1. (Fig.2)

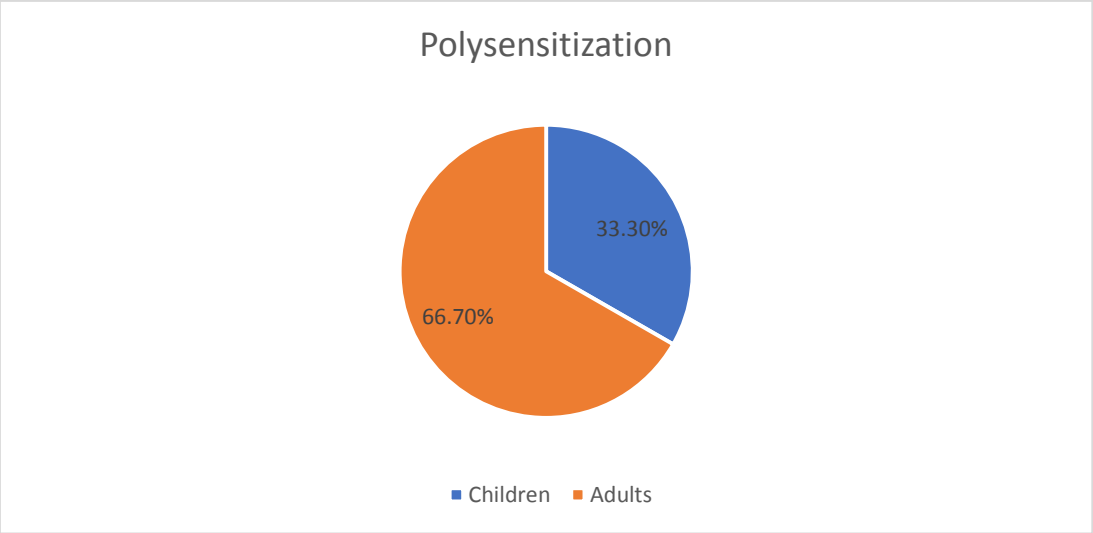
Figure 2
(n=10)



Frequency of monosensitization

While among adults, sensitization to several groups of allergens was 2 times more common than in children (Fig.3).

Figure 3
(n=90)



Frequency of polysensitization

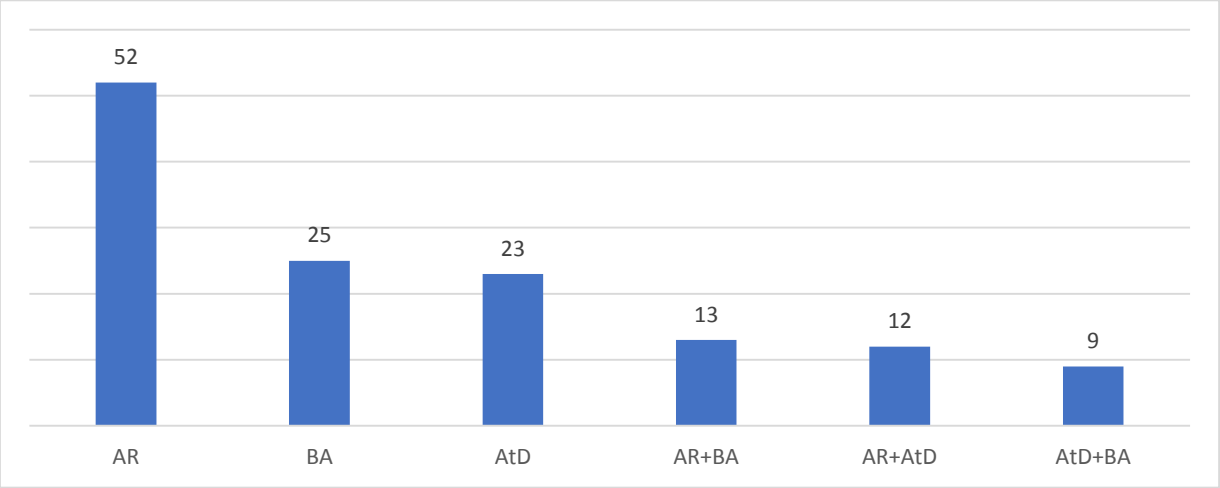
Thus, the spectrum of sensitization to allergens in patients with allergic diseases in the Upperchirchik district of the Tashkent region is characterized by the predominance of pollen allergens in children and adults with a significant proportion of polysensitized patients in all age groups.

In patients with persistent respiratory allergic symptoms (BA, YrAR), regardless of age, the sensitization structure was significantly more often dominated by a group of household allergens. Patients with intermittent allergic diseases (SAR/AK) in the vast majority of cases (more than 97%) had pollen sensitization, and the remaining 3% of patients had household sensitization. For polyvalent sensitization in patients, it did not depend on the nosological form of the allergic disease and was detected in 90 patients, 66.7% of them adults and 33.3% children.

The frequency of polysensitization to various combinations of allergens varies depending on the type of allergen. Thus, the combination of pollen and food sensitization in children is 2 times more common in comparison with adult patients. The combination of pollen and household sensitization occurs 2.3 times more often in adults than in children.

Among all the examined patients, seasonal and combined forms of AR (seasonal and year-round) were most common – in 52 (52%), BA – in 25 (25%), ATD - in 23 (23%), a combination of AR + BA - in 13 (13%), ◆

Figure 4
(n=100)



Nosological forms of allergic diseases

The results of allergological tests in vitro coincided with the results of skin tests in 95% of patients with a predominance of polysensitization to different groups of allergens (97%) over monosensitization (3%).

Discussion

We studied the spectrum of sensitization in people with allergic diseases – AR, BA and AtD in the Upperchirchik district of the Tashkent region using methods of allergological examination in vivo (skin testing) and in vitro (determination of IgE antibodies to allergens). The results obtained during the study showed that 97% of patients are sensitized to pollen allergens, of which 86% - to meadow timothy, 88% - to meadow bluegrass, 94% - to common wormwood and 88% - to swan. AR was detected in 52 patients, BA in 25, AtD in 23, among them 38 children aged 2 to 18 years, 62 adults. Sensitization to pollen of weeds (wormwood, quinoa) was detected in 10 patients, polysensitization to different groups of pollen and household allergens was detected in 90 patients. Cross-food allergy was found in 72 patients sensitized to pollen allergens.

Clinically, the most severe course was observed in patients with AR and BA with sensitization to household allergens.

Which are comparable to previous studies. According to the results of M. Y. Nilova, sensitization to household allergens (allergens of house dust, library dust, house dust mite) was detected in 71% (70/98) of patients, to epidermal allergens (cat hair, dog hair, horse dandruff, pillow feather) - in 38% (37/98) of patients, to pollen allergens (trees, cereals, weeds) in 72% (71/98) of the child [16].

Specific IgE to extracts of food allergens - cow's milk, gluten, egg white, a mixture of allergens of nuts (hazelnuts, almonds, coconut, peanuts, walnuts) detected in 72 patients (72%); mixed allergens of meadow and weed pollen - in 97 patients (97%).

In 74 % of patients with YrAR, IgE to DM extracts were detected - Dermatophagoides pteronyssinus (d 1) in 52%, Dermatophagoides farinae (d 2), in 82% of patients with ATD – to the extract of allergens of house dust. According to E. A. Vishneva, sensitization to allergens of tree pollen and house dust mites is the most common in Moscow, with cat allergens in second place [12]. According to E. N. Ismailova et al. In Uzbekistan, sensitization is noted in children to all allergenic molecules of grass pollen presented on the Madex chip panel (sensitivity to 11 of the 14 components presented was more than 10% of the examined children), while the most common sensitivity was detected to the long—term chaff molecule Lol p 1 - in 35.53% of all examined children; sensitivity to allergenic molecules of meadow timothy - to Phl p1 was detected in 33.7% of cases, to Phl p 12 — in 19.5% of cases, to Phl p 5.0101 - in 11.6%, and sensitization to Phl p 6 and Phl p 2 molecules is almost at the same level — 8.2% and 7.6% [13].

In 74 % of patients with YrAR, IgE to DM extracts were detected - Dermatophagoides pteronyssinus (d 1) in 52%, Dermatophagoides farinae (d 2), in 82% of patients with ATD – to the extract of allergens of house dust.

While according to Nilova M. Yu. et al., in the Nizhny Novgorod region of the Russian Federation, sensitization to tree pollen most often took place. This type of sensitization was detected in 58% (57/98) of children and 80% (57/71) of the number of patients who had sensitization to pollen allergens. Sensitization to allergens of pollen of cereals was detected somewhat less frequently. It was detected in 43% (42/98) of children and 59% (42/71) of patients with detected pollen sensitization. Allergy to weed pollen in this study occurred in 39% (38/98) of children and 54% (38/71) of the number of children with sensitization to pollen allergens. Of 72% (71/98) of patients who had pollen sensitization, 46% (33/71) of children had sensitization to allergens of one of the plant groups (trees, cereals or weeds), 17% (12/71) of children - simultaneously to pollen of two plant groups and 37% (26/71) of patients - to the pollen of all three groups of plants. Thus, in the Nizhny Novgorod region, sensitization to tree pollen prevails in the structure of pollen sensitization, sensitization to allergens of cereals is somewhat less frequent and sensitization to

pollen of weeds is significantly less frequent, whereas in the Upperchirchik district, according to our results, sensitization to pollen of cereals and weeds prevails, which confirms the features of climatic and geographical conditions. According to our results, 88% of patients have sensitization to the allergen of house dust, 74% to the allergen of house dust mites Dermatophagoides pteronyssinus, 52% of patients have sensitization to Dermatophagoides farinae, which corresponds to the data of a number of published works that recorded a higher frequency of sensitization to house dust mites. K.L. Hon et al. according to skin testing data, sensitization to the D. pteronyssinus mite (79.5%) and to the D. farinae mite (76.5%) was demonstrated in children with AtD (average age 5.9 ± 2.84 years) [23]. In the study of C. Ochoa-Aviles et al. positive prick tests were found in 20% of children for the D. pteronyssinus mite and in 19.6% for the D. farinae mite [24]. Sensitization to food allergens was detected in 16% of patients to cow's milk, in 2% to gluten, in 60% to egg white, in 80% to a mixture of allergens of nuts (peanuts, hazelnuts, almonds, coconut, walnut), where the coincidence with the data of the allergological history was 90%. Whereas K.L. Hon et al. the frequency of sensitization to milk was recorded in 13% of children with AtD, and to chicken egg — in 39.8% [23].

According to the data of Okhapkina I. G. et al., in the Moscow region, a positive reaction to only one STEP of the studied was detected in 25 (23.36%) people. At the same time, 55 (51.40%) people demonstrated polysensitization to two AG or more [25]. According to comparative statistical data obtained as a result of our studies, polysensitization (various combinations of pollen, household and food allergens) was detected in 90.1% of the examined patients, and monosensitization (allergens of wormwood, quinoa) was detected in 3.7%.

The dominant group of allergens in most patients was plant pollen – in 97% of patients versus 72% sensitized to food allergens ($P<0.05$). Sensitization to allergens of pollen from various weeds was detected with approximately the same frequency in children and adults. Sensitization to household allergens was detected in 84% of patients, in children the indicator was 26%, in adults – 58%, among them the symptoms of AR – in 52% of patients, BA – in 25% of patients, ATD – in 23% of patients. Among adults, polysensitization was 2 times more common than in children. The frequency of monosensitization in children and adults did not differ and amounted to 50%.

Thus, the spectrum of sensitization to aeroallergens in patients with allergic diseases in the Upperchirchik district of the Tashkent region is characterized by the predominance of pollen allergens in children and adults with a significant proportion of polysensitization of patients in all age groups.

Conclusion

The spectrum of sensitization to aeroallergens in patients with allergic diseases in the studied area of the Tashkent region is characterized to a greater extent by pollen sensitization in both children and adults with various allergic diseases, and with a predominance of multiple sensitization in all age groups.

In the patients we examined, seasonal and year-round forms of AR, BA, as well as AtD and combinations of AR+BA, AR+AtD, AtD+BA were most common.

The frequency of polysensitization to various combinations of allergens varied depending on age - the combination of pollen and food sensitization in children was 2 times more common than in adult patients. The combination of pollen and household sensitization was detected 2.3 times more often in the adult population than in children.

The dominant group of aeroallergens in the patients we examined was plant pollen (97%), the dominant role in the development of seasonal manifestations of allergy is occupied by pollen of weeds - wormwood (in 94% of the examined patients), quinoa (in 88%), the second most important allergens are pollen of grasses - meadow timothy (in 86% of patients) and meadow bluegrass (88%). Sensitization to allergens of weed pollen was detected with approximately the same frequency in children and adults. Sensitization to household allergens was established in 84% of patients, which characterizes a significant contribution of household sensitization to the development of year-round forms of AR, BA, and AtD. Among food allergens, cow's milk, egg, gluten, a mixture of nuts deserve special attention, sensitization to them has been revealed in the

vast majority of young children with clinical signs of FA. In adult patients, food allergy - (OAS) was detected in 28.6% of cases and is due to cross-sensitization to pollen allergens.

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Contribution of the authors: Ilmira Razikova — research design, article editing; Nazifa Dustbabayeva — literature review, collection and analysis of literary sources; Venera Baibekova — preparation and writing of the text of the article; Nargiza Aidarova — writing of the text and editing of the article. All authors confirm that their authorship meets the international ICMJE criteria (all authors have made a significant contribution to the development of the concept, research and preparation of the article, read and approved the final version before publication).

Author contribution*:* Ilmira Razikova – edited an article; Nazifa Dustbabayeva - conducted a literature review, collected and analyzed literary sources; Venera Baibekova V. F. Baybekova - prepared and wrote the manuscript; Nargiza Aidarova - wrote the manuscript and edited an article. All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

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