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# Age features of allergic diseases in children and youth in Vinnytsia region

**Key words:** allergies, age characteristics of children and youth.

Currently, about 150 million people in Europe and 1 billion people in the world suffer from allergic diseases (AD). According to the latest data, only in Europe prevalence is approximately 30 % for allergic rhinoconjunctivitis and 20 % — for allergic asthma, 15 % — for allergic dermatitis or a combination of these diseases together [3, 7]. In Ukraine in recent years, we have the trend to a significant increase of the AD occurrence [1]. These natural dynamics has a maximum prevalence of atopic dermatitis (AtD) in early childhood and the possibility of AD progression from skin symptoms to asthma (BA) and allergic rhinitis (AR), called atopic march [2, 4]. The risk of respiratory allergies may depend on the manifestation time of the first symptoms of AtD, its severity, the severity of exacerbations [5].

The turbulent growth of the prevalence of AD, increasingly young age of their clinical manifestation constantly changing the structure of allergic march in the most of the world [6]. Thus, multicentered epidemiological programs, including «International study of asthma and allergies in children» (ISAAC) showed significant fluctuations between the symptoms of BA and AD in the various countries and continents. Even the results in one country can have the large variability with a frequency of AR, BA, AtD symptoms, due to climatic and geographical, environmental factors, lifestyle, the level of health etc; so that should be taken into consideration while describing allergic march [8]. In addition, investigation of the age features of AD evolution in childhood is important for the pediatric practice because its analysis makes it possible to predict morbidity, study factors that are able to determine the formation and severity allergopathology, conduct effective treatment and preventive measures etc. This prompted us to conduct appropriate studies among children and youth of Vinnytsia region in order to examine the age characteristics of AD in these groups.

#### Materials and methods

For this purpose,we questioned 7 784 respondents aged from 3 to 27 years (among them – 4 532 children and 3 252 – youth). To obtain reliable results we used random sampling of schools, kindergartens and universities. In the first phase, it was conducted questionnaire screening (for the children to the questionnaire answered their parents), the second phase – in-depth additional examination, which included: history, clinical examination, evaluation of the function of external breathing (optional), skin prick testing. According to the aim, all respondents were divided into 3 age groups: the 1st – children 3–6 years old, the 2nd – children 7–18 years old and the 3rd – young people 19–27 years old. The resulting study data were processed using statistical methods.

## **Results and Discussion**

The first clinical manifestation of AtD was recorded in 65 (13.95 %, 95 % CI: 0.11; 0.17) from examined in four months of age, and 2/3 (41 patients) of them were children with severe AtD. In 214 (45.92 %, 95 % CI: 0.41; 0.50) cases disease debuted in the age 5-12 months old, in 153 (32.83 %, 95 % CI: 0.29; 0.37) cases it began aged 1 to 2 years, and only 34 (7.3 %; 95 % CI: 0.05; 0.10) persons had pathological process of the skin arose over the age of 2 years. Clinical manifestation of AtD decreased with age, but it started to join the respiratory form of AD. In 225 (48.28 %, 95 % CI: 0.44; 0.53) persons from AtD subsequently later BA and / or AR formed. Thus, 106 (47.11 %, 95 % CI: 0.40; 0.53) patients had AR from background of AtD, 41 (18.22 %, 95 % CI: 0.1; 0.24) person had BA development and in 78 (34.67 %, 95 % CI: 0.29; 0.41) cases AtD combination of AR and BA was observed.

Persons with a different AD combination had much earlier clinical manifestation of AtD signs. Thus, in 27.90 % (95 % CI: 0.24; 0.32) of cases they appeared

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Table Age features of sensitization to certain allergenes in the patients with AtD						
Allergen groups	1 <sup>st</sup> age group (n = 175)	2 <sup>nd</sup> age group (n = 184)	3 <sup>rd</sup> age group (n = 107)	φemp¹	φemp²	φemp³
Food Domestic Pollen Epidermal	78,3 44,6 37,7 19,4	56,0 61,9 57,1 26,0	47,7 70,1 63,4 30,8	4,555* 3,315* 3,546* 3,149*	5,272* 4,245* 4,432* 0,254	1,365 1,407 1,321 3,325*

Note: φemp1- comparing the frequency of sensitization in the 1st and 2nd age group; φemp2 - comparing the frequency of sensitization in the 1st and 3rd age group; φemp3 - comparing the frequency of sensitization in the 2nd and 3rd age group. \* The difference between the frequencies in groups statistically significant

within 1st year of life, in 11.16 % (95 % CI: 0.08; 0,14) cases - in terms from 1 till 2 years of life and only in 9.23 % (95 % CI: 0.07; 0.12) cases – after two years old age (incidence decreased significantly with the age of the patients). At the same time, in the group with isolated AtD signs these changes were diagnosed in 12.45 % (95 % CI: 0.09, 0.15) persons within 1st year of life, in 15.24 % (95 % CI: 0.12, 0.19) cases from 1 till 2 years of life and in 24.03 % (95 % CI: 0.20; 0.28) cases after the age of two years old  $(\phi emp1 = 2.693, \phi emp2 = 11.525, a significant dif$ ference). Also we found that in persons with combination of AtD with BA and / or AR probably more expected severe and moderate-severe AtD (92.68 % and 68.07 % of cases,  $\phi$ emp = 10.256, a significant difference) compared to those with isolated AtD (7.32 % and 31.93 % of cases,  $\phi$ emp = 6.534, significant difference). At the same time, the beginning of the first clinical manifestation of AtD was independent of gender.

Age features of sensitization to certain allergens (Ag) in the patients with AtD, which was determined using the skin test given at the table.

As can be seen from table, sensitization to the food Ag significantly more often (78.3 % of cases) met among the children of the first age group compared to the 2nd and the 3rd age groups (56.0 and 47,7 % of cases). Thus, with the age, etiologic role of food in the development of AtD is decreasing. The second place (44.6 % of cases (95 % CI: 0.38, 0.52)) in the etiological structure of AtD in children from the 1st age group took domestic sensitization, but much more often (61.9 % (95 % CI: 0.56, 0.67) and 70.1 % (95 % CI: 0.62; 0.78) observations, respectively) it was seen in the 2nd and 3rd age groups. This data indicates that the role of domestic Ag in the implementation of atopic skin process increases with age, unlike food Ag role importance decreases with age. Most often in the patients we observed sensitization to Dermatofagoides pteronissinus (71,2 % (95 % CI: 0.68, 0.75) of cases) and *Dermatofagoides* farinae (72.1 % (95 % CI: 0.68; 0.76) of cases). Epidermal and pollen sensitization also significantly more common among the 2nd and the 3rd age group compared to the contingents of the 1st age group. Thus, pollen sensitization was detected in 37.7 % (95 % CI: 0.32, 0.43) persons from the 1st age group, 57.1 % (95 % CI: 0.52, 0.62) — on the 2nd and in 63.4 % (95 % CI: 0.64; 0.67) persons – on 3rd age group ( $\phi$ emp1 = 6,751,  $\phi$ emp2 = 1.214, significant difference between the frequencies of the 1st age group and other groups, insignificant — between the frequencies of signs in the 2nd and the 3rd age groups) and epidermal sensitization — in 19.4 % (95 % CI: 0.14; 0.24), 26.0 % (95 % CI: 0.23, 0.30) and 30.8 % (95 % CI: 0.24; 0.34) patients, respectively ( $\phi$ emp1 = 2,693,  $\phi$ emp2 = 1,525, a significant difference between the frequencies of 1st age group and other groups, insignificant — between the frequencies of signs in the 2nd and 3rd age groups).

Similarly, we also studied the age features of AR. In all groups of patients with perennial AR mild forms of the disease were dominated - 71 cases (67.62 %, 95 % CI: 0.63; 0.70) – in the 1st age group, 103 cases (62.05 %, 95 % CI: 0.60, 0.65) – in the 2nd age group and 56 cases (58.33 %, 95 % CI: 0.55, 0.61) – in the 3rd age group  $(\phi \text{emp1} = 3,235, \phi \text{emp2} = 3,459, \phi \text{emp3} = 3.123 - \text{the}$ difference between the frequencies of indicator groups was not statistically significant in all cases). The frequency of moderate forms of perennial AR was similar in the two groups: 28 cases (26.68 %) in the 1st age group, 47 cases (28.31 %) – in the 2nd age group and 34 cases (35.42 %) – in the 3rd age group, with p > 0.05 for all cases. The incidence of severe forms of the disease prevalent among children slightly older children compared with younger age groups and young people: 16 cases (9,64 %) vs. 6 cases (5.70 %) and 6 cases (6.25 %) respectively, p > 0,05 for all cases. It is usually severe perennial AR doctors diagnosed more often than mild (57.1 % and 35.0 % respectively), with p < 0.001.

In 51.5 % cases of perineal AR, hypersensitivity occurred to only domestic Ag, in 41 (11.2 %) patients – to only epidermal Ag. In addition, often the patients with perennial AR showed (137 pers. or 37.3 %) multiple sensitizations, i.e. hypersensitivity was observed for two or more groups of Ag. Thus, sensitization to domestic and epidermal Ag had 98 patients (26.7 %), 25 (6.8 %) patients with perennial AR showed sensitization to pollen and 14 patients (3.8 %) showed sensitization to 3 groups (domestic, epidermal and pollen) of inhalant Ag. Among the household Ag most common causal factors of perennial AR were mites (78.2 %, 95 % CI: 0.75, 0.81 cases) and house dust Ag (49.32 %, 95 % CI: 0.46; 0,53 observations). An important role in the etiological structure was in epidermal Ag (21.53 %, 95 % CI: 0.19; 0.25). It is necessary to note that in a group of children compared with young people frequency of sensitization to dog hair was higher appr. 1,1 times to cat wool – in 1,3 times, to mites – more than 2 times, but significant differences in the frequency

of detection of allergy to house dust various series has not been established (p > 0.05).

Regarding the prevalence of seasonal AR within the age groups, it was found no significant differences between 1st and 3rd age groups (9.17 % vs. 8.17 %, with p > 0.05). However, analyzing the prevalence of seasonal AR attention was made to a substantial increase in its frequency among older children compared with younger children and young people: 89 (16.42 %) vs. 31 persons (9,17 %) vs. 37 (8,17 %) patients. When comparing the severity of seasonal AR depending on the age we observed that the moderate-severe severity prevailed in all age groups. Thus, it were 58.06% (95 % CI: 0.55, 0.62, 91 cases) in the 1st age group, 60.67 % (95 % CI: 0.58; 0,62, 54 cases) — in the 2nd age group and 51.35 % (95 % CI: 0.48; 0.54, 19 cases) – in the 3rd age group. In addition, nearly a third of the patients experienced mild course of seasonal AR – at 29.03 % (95 % CI: 0.24, 0.34, 9 pers.) cases in the 1st age group, 28.09 % (95 % CI: 0.24, 0.32, 25 pers.) cases – in the 2nd age group and 32.43 % (95 % CI: 0.30, 0.35, 12 pers.) cases – 3rd age group. Severe seasonal AR was diagnosed in 12.91 % (95 % CI: 0.10; 0.15, 4 pers.), 11.91 % (95 % CI: 0.08, 0.14, 10 pers.) and 16.22 % (95 % CI: 0.12, 0.21, 6 pers.) cases in different groups. So, the severity of seasonal AR did not depend on the age of the patients (p > 0.05 for all cases).

When analyzing the characteristics of pollen sensitization among the patients it seasonal AR depends on their age we found the enlargement of hypersensitivity spectrum to pollen Ag with age. In particular, in the 1st age group more than a half (54.84 %) of patients revealed sensitization to pollen of one group of Ag, among the patients of the 2nd and the 3rd age groups – monosensitization revealed significantly less frequently – at 4.49 % and in 5.41 % of patients, respectively, p < 0.05 in both cases. Among older children and youth prevailed sensitization to two groups of pollen Ag - at 48.31 % and 54.05 % of people respectively, compared (19,35 % surveyed) with younger children, p < 0.05 in both cases. Sensitization to three groups of pollen Ag also revealed significantly more common among older children and young people compared to younger children, with 44.95 % of the 2nd age group and in a 40.54 % surveyed in the 3rd age group and compared with the younger age group, in a first sensitization to pollen following three groups of Ag was detected in 25.81 % of those with p < 0.05 in both cases.

The same way we analyzed the age evolution of BA. Mild forms of BA usually manifested in all age groups. Thus, almost equally in the 1st and the 3rd age groups (68.91 % in the 1st and 66.34 % in the 3rd age group,  $\phi = 0.407$ , the difference insignificant) and was significantly less in the 2nd age group (57.72 % of cases,  $\phi = 1.812$ , a significant difference). Moderate-severe BA also almost equally met in all groups (21.85 %, 23.58 %, 22.77 % observations, respectively,  $\phi$ emp = 0.322, insignificant difference). Severe BA met much more frequently in the 2nd compared to the 1st and the 3rd age group, 18.70 % vs 9.24 % in the 1st ( $\phi$ emp = 2.162, a significant difference) and 10.89 % in the 3rd age group ( $\phi$ emp = 1,646, a significant difference).

Analyzing the distribution of Ag range depending on the age of the patients with BA noted that sensitization to household Ag significantly more often detected in the 2nd (91.1 %) and the 3rd (89.1 %) age group compared to the 1st (70,6 % of cases). Among the 2nd and the 3rd age groups, the difference between the frequencies of the signs was insignificant. The same tendency was also in the case of pollen sensitization. Significantly more sensitization to pollen Ag revealed the 2nd (48.0 %) and the 3rd (48.5 %) age groups in comparison with the 1st (40.3 % of cases). Sensitization to epidermal Ag significantly more often detected in the 2nd age group (28.4 %) compared to the 1st (20.2 % of cases). In this case, between the ages range of other causative Ag in BA did not differ significantly. At the same time, sensitization to food Ag significantly more frequently (p < 0.01 in both cases) was detected in the 1st (35.3 %) group compared to the 2nd and the 3rd age groups (18.7 % and 10.9 % of cases, respectively).

Thus, the age characteristics of the formation and subsequent transformation of skin and respiratory manifestations of allergic pathology require from the primary care physicians, pediatricians, dermatologists, pulmonologists, ENT specialists, allergists a wide range of knowledge for detection of AD, choice of rational methods of treatment, prevention, prognosis and risk of further AtD, AR and BA progression.

#### **Conclusions**

- 1. Almost 60 % of patients, regardless of their gender first clinical manifestation of the allergic pathology in the form of AtD appear at the age of one year, and 2/3 of them have severe AtD. The same characteristic can be done for children with combined forms of AD.
- 2. In the etiological spectrum of cause-significant Ag in children with AtD food Ag are dominated. Become older, the etiologic role of food Ag at AtD decreases and increases sensitizing effect of inhaled (household, pollen, epidermal) Ag.
- 3. Unlike perennial AR, which frequency is substantially independent of the age of the patients, in older children compared with younger children and young people observed a significant increase in the frequency of seasonal AR.
- 4. The vast majority of those with perennial AR is a hypersensitivity to only domestic, epidermal Ag and hypersensitivity to inhaled Ag from 2–3 groups (domestic, epidermal, pollen), the frequency of the latter increases with age. When analyzing the characteristics of pollen sensitization among the patients with seasonal AR also the noteworthy enlargement of hypersensitivity to pollen Ag with age.
- 5. Severe BA occurs much more frequently at the age of 7–18 years compared to the age of 3–6 and 19–27 years.
- 6. Hypersensitivity to the household, pollen, and epidermal Ag in BA significantly more often can be found in older children and young people compared with the youngest children, including more frequent sensitization to food Ag.
- 7. In the patients with a combination of AR and BA in 51.7 % of cases AR became first, in 27.2 % initially it was the development of BA, and in 21.1 % of cases BA and AR occurred simultaneously.

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# ВОЗРАСТНЫЕ ОСОБЕННОСТИ АЛЛЕРГИЧЕСКИХ ЗАБОЛЕВАНИЙ У ДЕТЕЙ И МОЛОДЕЖИ ВИННИЦКОЙ ОБЛАСТИ

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#### Резюме

Цель исследования: изучение возрастных особенностей аллергических заболеваний у детей и молодежи Винницкой области.

Исследование проведено в соответствии с технологией прескриптивного скрининга в 2 этапа. На первом этапе было опрошено 7 784 респондента (возраст от 3 до 27 лет). На втором этапе после проведения аллергологических и клинико-функциональных исследований диагноз аллергических заболеваний был подтвержден у 1 333 участников.

Выявлено, что почти у 60 % обследованных, независимо от их пола, первые клинические проявления аллергопатологии в форме атопического дерматита отмечаются уже в возрасте до одного года, причем в 2/3 из них наблюдается тяжелое течение атопического дерматита. Это характерно и для детей с комбинированными формами аллергических заболеваний.

В этиологическом спектре причинно-значимых аллергенов у детей с атопическим дерматитом преобладают пищевые аллергены. С возрастом этиологическая роль пищевых аллергенов при атопическом дерматите уменьшается, а возрастает сенсибилизирующее влияние ингаляционных (бытовых, пыльцевых, эпидермальных) аллергенов.

В отличие от круглогодичного аллергического ринита, частота которого существенно не зависит от возраста обследованных, у детей старшей возрастной группы в сравнении с младшими детьми и молодежью наблюдается достоверное увеличение частоты сезонного аллергического ринита.

У большинства обследованных с круглогодичным аллергическим ринитом имеет место гиперчувствительность только к бытовым, эпидермальным аллергенам и гиперчувствительность

## ВІКОВІ ОСОБЛИВОСТІ АЛЕРГІЧНИХ ЗАХВОРЮВАНЬ У ДІТЕЙ ТА МОЛОДІ ВІННИЦЬКОЇ ОБЛАСТІ

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#### Резюме

**Мета дослідження:** вивчення вікових особливостей алергічних захворювань у дітей та молоді Вінницької області.

Дослідження проведено відповідно до технології прескриптивного скринінгу в 2 етапи. На першому етапі було опитано 7 784 респонденти (віком від 3 до 27 років). На другому етапі, після проведення алергологічних і клініко-функціональних досліджень, діагноз алергічних захворювань був підтверджений у 1 333 учасників.

Виявлено, що майже у 60 % обстежених незалежно від статі перші клінічні прояви алергопатології у формі атопічного дерматиту відмічаються вже у віці до одного року, причому у 2/3 з них спостерігається тяжкий перебіг атопічного дерматиту. Те саме характерно і для дітей з комбінованими формами алергічних захворювань.

В етіологічному спектрі причинно-значущих алергенів у дітей з атопічним дерматитом переважають харчові алергени. З віком етіологічна роль харчових алергенів при атопічному дерматиті зменшується, а зростає сенсибілізувальний вплив інгаляційних (побутових, пилкових, епідермальних) алергенів.

На відміну від цілорічного алергічного риніту, частота якого суттєво не залежить від віку обстежених, у дітей старшої вікової групи в порівнянні з молодшими дітьми та молоддю відмічається істотне збільшення частоти сезонного алергічного риніту.

У переважної більшості осіб з цілорічним алергічним ринітом має місце гіперчутливість лише до побутових, епідермальних алергенів та гіперчутливість до 2—3 груп інгаляційних алергенів (побутові, епідермальні, пилкові), причому частота останньої збільшується з віком. При аналізі особливостей пилкової сенсибілізації

к 2—3 группам ингаляционных аллергенов (бытовым, эпидермальным, пыльцевым), причем частота последней увеличивается с возрастом. Анализируя особенности пыльцевой сенсибилизации среди обследованных с сезонным аллергическим ринитом также обращает на себя внимание расширение спектра гиперчувствительности к пыльцевым аллергенам с возрастом.

Тяжелое течение бронхиальной астмы встречается достоверно чаще в возрасте 7—18 лет в сравнении с возрастом 3—6 и 19—27 лет. Гиперчувствительность к бытовым, пыльцевым и эпидермальным аллергенам при бронхиальной астме достоверно чаще выявляется среди детей старшей возрастной группы и молодежи в сравнении с младшими детьми, среди которых чаще встречается сенсибилизация к пищевым аллергенам.

Среди обследованных с сочетанием аллергического ринита и бронхиальной астмы у 51,7 % ринит появлялся первым, у 27,2 % развитие астмы опережало ринит, а в 21,1 % аллергический ринит и бронхиальная астма возникали одновременно.

**Ключевые слова:** аллергические заболевания, возрастные особенности, дети и молодежь.

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тел.: +38 (044) 275-57-11 e-mail: zaikov1960@gmail.com серед обстежених з сезонним алергічним ринітом також звертає на себе увагу розширення спектру гіперчутливості до пилкових алергенів з віком.

Тяжкий перебіг бронхіальної астми зустрічається істотно частіше у віці 7—18 років в порівнянні з віком 3—6 та 19—27 років. Гіперчутливість до побутових, пилкових та епідермальних алергенів при бронхіальній астмі достовірно частіше виявляється у дітей старшої вікової групи та молоді в порівнянні з наймолодшими дітьми, серед яких частіше зустрічається сенсибілізація до харчових алергенів.

У обстежених з поєднанням алергічного риніту і бронхіальної астми у 51,7 % випадків риніт з'являвся першим, у 27,2 % розвиток астми випереджав риніт, а у 21,1 % спостережень алергічний риніт та бронхіальна астма виникали одночасно.

**Ключові слова:** алергічні захворювання, вікові особливості, діти та молодь.

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