

## The Frequency of Bronchial Asthma in Children Under 5 Years of Age

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**Abstract:** Bronchial asthma (BA) is a disease based on a chronic inflammatory process in the bronchial tree, characterized by migration and infiltration of mast cells and eosinophils of the mucous membrane, regulated by Th2 lymphocyte cytokines. It seems that asthma in children is the result of the interaction of genetic predisposition and factors acting on the child's body in perinatal and early childhood. The article presents current data on the main endogenous and exogenous risk factors for the development of asthma in children.

**Key points;-** bronchial asthma, children, risk factors, hereditary predisposition.

### **Introduction**

The end of the 20th and beginning of the 21st centuries are characterized by an alarming increase in the number of patients with various allergic diseases, among which bronchial asthma (BA) occupies one of the first places. In developed countries, from 10 to 30% of the population suffers from allergic diseases, and in areas with unfavorable environmental conditions - more than 50% [1].

There is no doubt that the first and main environmental factor for a child during intrauterine development is the mother's body. The postulate about the leading importance of perinatal pathology for the occurrence of diseases of any age period is considered generally accepted. Domestic scientists have shown that already in the first months of life, the majority of children whose mothers have suffered severe gestosis experience allergic reactions and a high incidence of acute respiratory viral infections [2].

It is known that "wheezing" syndrome may be the first sign of the development of asthma in a child. A number of studies have revealed an increase in the incidence of this syndrome in children born to mothers who had preeclampsia or noted an increase in blood pressure during pregnancy. The influence of pregnancy pathology on the development of AR in the child has also been confirmed [3]. According to P.G. Holt, predisposition to allergic diseases may be associated with hyperactivity of the control mechanisms that intrauterine protect the fetoplacental complex from the toxic effects of Th1 cytokines characteristic of complicated pregnancy, and, as a consequence, with a shift of the intrauterine environment towards the Th2 phenotype. A number of studies have shown a connection between preterm birth and an increase in the incidence of asthma in children of preschool and primary school age [4]. However, as the authors point out, this applies to a greater extent to children born with extremely low body weight.

One of the most important indicators of an uncomplicated pregnancy is the baby's body weight at birth. Previously, it was generally accepted (GINA (Global Initiative for Asthma) recommendations,

2002) that low birth weight predisposes to the development of asthma. However, recent studies, including a meta-analysis of studies that included 147 thousand children of European descent, have shown that the increased risk of developing asthma may be due to a child's birth weight of more than 4000 g and rapid weight gain in the first year of life. S.W. Turner et al., observing children from the age of one month, found a significant association of high birth weight with a decrease in forced expiratory volume in 1 second and an increased risk of developing asthma in the first 3 years of a child's life [5].

Indisputable evidence of the importance of hereditary burden in the formation of allergic pathology was obtained as a result of numerous clinical, genealogical, population-statistical and twin studies. It is known that if one of the parents has asthma, the risk of asthma in the offspring increases by 3 times compared to the population and by 6–7 times if both parents suffer from asthma. According to E.T. Lilina et al., if one of the parents has the disease, BA develops in 31% of children, in both parents - in 70% of cases, and the empirical risk of developing BA in a child born after a patient with BA is 14%. Work on the study of hereditary predisposition to AD has shown that the development of this pathology is observed in 82% of children if both parents suffer from allergies, and in 59% if only one of the parents has AD and the other has an allergic pathology of the respiratory tract [6].

The family history of allergic pathology on the mother's side is more significant than on the father's side. It is known that children whose mothers suffer from allergic diseases, in particular asthma, are much more likely to have manifestations of atopy and high levels of immunoglobulin E (IgE) than children from families where fathers suffer from allergic pathology. According to R.G. Ruiz et al., children born to mothers suffering from allergic diseases have a 5 times greater risk of developing AD than children whose fathers had manifestations of atopy. Thus, genetic predisposition to allergic diseases is an important risk factor for the development of this pathology in offspring. However, in addition to genetic predisposition, external influences to which the child's body is exposed during the perinatal and early postnatal stages of life also play a role in the development of allergic diseases [7]. The onset of asthma in early childhood is more often observed in boys, but at an older age, the hormonal background characteristic of the female body has an undoubted impact on the severity of the inflammatory process in the respiratory tract, increasing the risk of developing asthma. Boys born prematurely have a greater risk of developing asthma than girls. However, gender differences as a cause of different ages at the onset of AD have not been fully studied. Differences in the level of sex hormones produced intrauterinely and a higher level of interleukin-8 (IL-8) during female pregnancy are discussed as possible reasons for the greater predisposition of boys to the early onset of BA. Moreover, it has been shown that stressful situations experienced by the mother during pregnancy have a greater impact on the health of boys than girls. There is information about the protective role of reproductive system infections in relation to BA, suffered by the mother while carrying a female, but not a male, fetus.

Infectious diseases suffered during pregnancy, such as vulvovaginitis caused by *Candida albicans*, bacterial chorioamnionitis, group B streptococcal infection, negatively affect the development of the respiratory system and the immunological status of the fetus.

Viral infections are traditionally considered a factor that increases the risk of developing asthma, both in the case of maternal illness during pregnancy and in children with illnesses during the neonatal period. However, in a cohort study by A. Zutavern et al. It has been shown that respiratory infections suffered by the mother during gestation are associated with a reduced risk of developing asthma and atopy in the child [8].

The natural development of symptoms of an allergic disease in a child as he grows up with a sequential change of target organs involved in the pathological process, as well as a change in the

spectrum of sensitization, is usually called the “atopic march.” The “atopic march” is characterized by various manifestations of AD and food allergy (FA) at an early age, followed by the development of AR, BA and a change in the spectrum of sensitization at an older age, when household and pollen allergies become the most relevant.

It should be noted that this sequence of development of pathology is not observed in all patients. A number of studies in recent years have been devoted to the study of the natural course of allergies and asthma in children, in which the following conclusions were made:

- 1) PA and AD are most common in children in the first 2 years of life;
- 2) food sensitization is most typical for young children and can serve as a risk factor for the development of AD and BA;
- 3) the development of allergic pathology of the respiratory tract is more common in children at an older age (3–5 years) and correlates with the development of sensitization to inhalation allergens [9]. Sensitization to food allergens is most often initial and, as a rule, is caused by IgE-mediated immunological reactions, manifested by PA. Sensitization to household allergens, as a rule, occurs somewhat later and is typical for children aged 1–10 years. The presence of sensitization to food allergens at an early age is a predictor of sensitization to aeroallergens. The most common manifestations of atopic pathology in children are AD and PA. The maximum prevalence of PA occurs at an early age, and the most significant allergens are antigens of cow's milk and chicken egg proteins. It is known that among children in the first year of life, an allergy to cow's milk proteins occurs in 0.5–1.5% of breast-fed infants, and up to 2–7% in bottle-fed infants. Among patients with AD, 85–90% of children are allergic to cow's milk proteins. Skin lesions are one of the most common manifestations of PA. Respiratory symptoms have a smaller share in the structure of PA [10].

At an older age, a child may develop AR. The share of AR among all allergic diseases is 60–70% in the adult population and 10–15% in the pediatric population. Allergic rhinitis is a significant risk factor for the development of asthma (ARIA (Allergic Rhinitis and its Impact on Asthma), 2010). 45–70% of patients with AR subsequently develop asthma, and conversely, 60–70% of children with asthma develop symptoms of AR.

The “wheezing” syndrome in young children is often a predictor of the development of asthma in the future. However, the pronounced heterogeneity of this pathology in childhood causes different outcome options. According to F.D. Martinez et al., A. Wing, in the vast majority of children suffering from recurrent wheezing syndrome in the first 3 years of life, these phenomena are not observed after 6 years. J. Henderson et al. expressed the opinion that wheezing syndrome in children under 18 months is not associated with atopy and bronchial hyperreactivity, provided there is no persistence at an older age. According to most studies, the most significant factor in the formation of asthma in children with recurrent wheezing syndrome at an early age is atopy.

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