

RISK FACTORS FOR OBESITY IN CHILDREN WITH ASTHMA

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Abstract

A pressing issue in modern medicine is the optimization of treatment for patients with combined pathology, the number of which has been increasing in recent years. The presence of several diseases simultaneously affects each of them, aggravating their course, contributing to the earlier development of complications and creating difficulties for the treatment of patients.

Introduction

Bronchial asthma is one of the most common chronic diseases, and its incidence continues to grow. It is known that bronchial asthma is a heterogeneous disease, which is characterized by the presence of chronic inflammation of the respiratory tract, and this heterogeneity is manifested not only in the differences between individual patients, but also in the dynamics of the pathological process in each patient.

In recent years, studies have been conducted, the results of which show that weight gain is accompanied by an increased risk of developing bronchial asthma. According to other data, children suffering from asthma have a higher risk of obesity. There is also a point of view according to which bronchial asthma and obesity are proposed to be considered not as concomitant pathology, but as a separate phenotype of the disease.

It is now known that obesity in children with asthma leads to a more severe course of the disease, worse quality of life, and reduced response to treatment. Some studies have shown that weight loss interventions can lead to improved outcomes of asthma in children.

Despite the growing awareness of the comorbidity of bronchial asthma and obesity, questions remain unresolved regarding the risk factors for the development and progression of obesity in children with bronchial asthma, the impact of this

metabolic disorder and its severity on the course of the underlying disease, respiratory function, as well as the prevention and correction of excess weight in children with bronchial asthma, including the use of modern educational technologies.

In 2019, WHO estimated that 262 million people had asthma and 461,000 deaths were reported. It is one of the most common chronic diseases among children. The prevalence of asthma varies across countries and is not only a public health problem in high-income countries; it affects all countries, regardless of their level of development.

The incidence and prevalence of asthma differ between children and adults. It is well known that asthma often begins in childhood but can occur at any time during life, with some people developing asthma for the first time in adulthood. Interestingly, the incidence and prevalence of asthma differ by gender with life expectancy. Prepubertal boys have higher rates of asthma and hospitalizations than girls of the same age, but this trend reverses during adolescence. Women continue to suffer from asthma more often than men throughout the 5th decade of life. However, the gap between women and men narrows around the 5th decade.

It is now recognised that the prevalence of asthma in both children and adults may have peaked in some regions, primarily in high-income countries, while it may continue to increase in low- and middle-income countries.

There are marked differences in the lifetime prevalence of asthma between countries around the world. Overall, prevalence has increased significantly in children and adolescents, likely due to greater awareness of the condition and changes in diagnostic practices. For example, according to the US National Center for Health Statistics, the prevalence of asthma in the population was 7.8% in 2019, with 7.0% in children under 18 years and 8.0% in adults over 18 years. Among children, boys are more likely (8.4%) to have asthma than girls (5.5%), and among adults, the prevalence is higher among women (9.8%) than men (6.1%). In Australia, about 10% (about 460,000) of Australian children aged 0-14 years had asthma in 2017-2018. Asthma was more common among boys aged 0-14 years (12%) compared to girls (7.9%). This pattern has persisted since 2001. Asthma prevalence was highest among children aged 5-9 years among boys (15%) and girls (10%). While childhood asthma prevalence increased during the 1980s and early 1990s, prevalence among children aged 0-15 years decreased from 13.5% to 9.9%

between 2001 and 2007-2008. Childhood asthma prevalence remained roughly the same (9.3% to 11%) between 2007-2008 and 2017-2018. The prevalence of asthma in the population under 20 years of age in the Middle East countries ranged from 1% to 35.4% and in adults over 20 years of age from 2% to 15%. According to the ISAAC (International Study of Asthma and Allergy in Childhood) survey, the highest prevalence of asthma in children was recorded in Tehran, Iran in ISAAC phase I at 35.4% and the lowest at 1% in Kermanshah, Iran. Similarly, the highest prevalence of asthma in adults was 15% in Kuwait and the lowest prevalence was 2% in Tehran, Iran.

In the Russian Federation, according to the latest epidemiological studies, the prevalence of bronchial asthma among adults is 6-6.9%, and among children and adolescents - about 8-10%. The most common method for studying the epidemiology of bronchial asthma in the pediatric population is the International Study of Asthma and Allergies in Childhood (ISAAC) program. The study was conducted in 105 countries. Phase 1 of the study 1993-1997 and the third phase 2000-2003, covering the age groups of 6-7 and 13-14 years. In most countries, the prevalence of asthma signs between the 1st and 3rd phases did not change significantly, and in some it decreased. Since 2023, no studies have been conducted in the world under epidemiological programs in children, so it is not possible to assess the prevalence and severity of bronchial asthma on a global scale. Bronchial asthma and obesity, due to their high prevalence and medical and social significance, are global health problems. For modern pediatrics, obesity is one of the important medical and social problems. In almost all countries of the world, there is an increase in the number of children and adolescents suffering from excess weight and obesity.

According to WHO, in 2016, more than 1.9 billion adults over the age of 18 were overweight, of whom over 650 million were obese. Between 1975 and 2016, the number of people suffering from obesity worldwide more than tripled. In 2016, about 41 million children under the age of 5 and 340 million children and adolescents aged 5 to 19 years were overweight or obese. The prevalence of overweight and obesity among children and adolescents aged 5 to 19 years increased sharply from 4% in 1975 to 18% in 2016. This increase is equally distributed among children and adolescents of both sexes: in 2016, 18% of girls and 19% of boys were overweight. Childhood obesity is a serious problem in the



United States. For children and adolescents aged 2-19 years in 2017-2018, the prevalence of obesity was 19.3% and affected about 14.4 million children and adolescents, of which 13.4% were among children aged 2 to 5 years, 20.3% among children aged 6 to 11 years, and 21.2% among children aged 12 to 19 years. According to domestic researchers, the prevalence of overweight and obesity in children and adolescents in different regions of Russia ranges from 2.3% to 26.1%. Thus, when studying the incidence of obesity in children of the Sverdlovsk region, a two-fold increase was revealed according to the data on appealability of children aged 0-14 years (from 8.3% in 2015 to 16.3% in 2019) and a three-fold increase in adolescents aged 15-17 years (from 11.8% to 35.5%, respectively). More than 50% of obesity cases occur in the age group of 10-14 years, in the age group of 15-17 years the disease is registered more often in boys than in girls. When assessing the incidence of obesity in children of Udmurtia, the indicator in the group of children aged 0-14 years from 2015 to 2016 increased from 2.2 to 4.4 per 1000 children's population, in the group of adolescents aged 15-17 years - from 2.4 to 14.0. The average annual growth rate in children aged 0-14 years was 10.2%, 15-17 years - 28.8%. A higher incidence of obesity was found in rural areas compared to urban areas (7.3% and 6.1%, respectively). The disease was more often recorded in boys than in girls (8.7% and 4.7%, respectively). The prevalence of overweight and obesity in the North-West District and the Urals in children aged 7 to 17 years increased from 4-9% in 1994-2005 to 12.9-26.1% in 2008-2018. When assessing the age and regional characteristics of obesity incidence, carried out from 1992 to 2012, an increase in the overall incidence of obesity in children by 190%, adolescents - by 283%, adults by 324% was observed. After 2002, the most unfavorable dynamics were observed in the age group from 15 to 17 years inclusive. If in the period from 1992 to 2002 the overall incidence of obesity in children increased by 106%, adolescents - by 41%, adults - by 82%, then from 2002 to 2012 the increase was 60, 171 and 133%, respectively. The jump in the overall incidence of children occurred in 2002, adolescents - in 2002 and 2006, and the adult population - in 2006.

In a multicenter study, the prevalence of overweight and obesity in children averaged 19.9% and 5.6%, respectively. The maximum prevalence of obesity was found in 10-year-old boys and amounted to 9.1%, in 5-year-old girls - 4.4%, the minimum at 15 years (3.9% in boys and 2.2% in girls). At the same time, in

different regions, the prevalence of overweight fluctuated from 18.7 to 22%, obesity from 4.7% to 6.7%. According to epidemiological data, in 2017, the prevalence of overweight in primary school children was 16.1%, obesity - 9.2%. At the same time, the prevalence of overweight in schoolchildren increased from grade 1 (13.7%) to grade 4 (21.5%), obesity remained at a stable level. Thus, the global asthma epidemic continues, particularly in low- and middle-income countries, although it has stabilized or declined in some high-income countries. There are differences in the prevalence of asthma across countries. This may partly indicate that asthma is more readily diagnosed in some countries, while it remains unrecognized in others. The parallel increase in the prevalence of asthma and obesity has generated widespread interest in the clinical and pathogenetic features of the combined course of these chronic diseases.

Physical development, one of the main criteria of children's health, is a complex of morphofunctional features of the body that characterize the level of its biological development and is one of the important components that determine the child's health. It is known that many chronic diseases in children disrupt growth processes. The growth of children with bronchial asthma can be affected by gender, severity and duration of the disease, disease control, and the volume of basic therapy. There are many studies in the literature on the characteristics of growth and weight in children with bronchial asthma, but the data are contradictory and ambiguous; different approaches were used to assess physical development. Thus, some studies used regional standards for assessing physical development, others - Vorontsov I.M. centile tables, and others - WHO/UNICEF 2006 standards. Some studies show higher physical development in children with bronchial asthma, while others, on the contrary, show growth retardation compared to healthy children. A number of researchers have not found any deviations in growth rates regardless of the severity, duration of the disease, and intake of inhaled glucocorticosteroids. When assessing the body weight of children with bronchial asthma, some researchers have found a predominance of underweight, others - overweight, and others have found no deviations. A number of studies have been conducted to assess physical development depending on the severity of bronchial asthma. Thus, no differences in physical development were found in children with mild and moderate severity, but children with severe bronchial asthma had lower body weight indicators, but no differences were found depending on the severity of asthma in growth

indicators. Underweight is more clinically pronounced in children with severe bronchial asthma compared to mild and moderate. Another study found that with an increase in the severity of bronchial asthma, regardless of gender, the proportion of children with high BMI indicators increases. There are also studies assessing physical development in children with bronchial asthma depending on the duration of the disease. Thus, in some studies, no deviations in height and weight in children were found depending on the duration of the disease. In others, excess body weight and growth retardation were found in children, which increase with age and the duration of bronchial asthma. There are also different data on the characteristics of the physical development of children with bronchial asthma depending on gender and age. Thus, in one study, the greatest deviations in the form of high height and excess body weight were found in boys. In another, excess body weight and growth retardation were most pronounced in pubertal girls. In preschoolers aged 4-6 with bronchial asthma, when comparing height with healthy children in general and depending on gender, no reliable differences were found, however, girls had a higher BMI. The body length of boys and girls aged 7-10 and 11-15 with bronchial asthma turned out to be reliably lower than that of healthy peers.

Several studies evaluating physical development in the dynamics of bronchial asthma were analyzed. Mohor S (2013) conducted growth dynamics over 2 years in 200 patients aged 5-19 years with mild to moderate bronchial asthma receiving low doses of ICS. The difference in the decrease in growth rates in patients with bronchial asthma compared to the control group was less than 1 mm in the first year of treatment and 0.85 mm in the second year of treatment, which did not have reliable differences ($p > 0.05$). Truntsova E.S. (2016) conducted a prospective and retrospective assessment of the dynamics of physical development of 173 children with bronchial asthma. Patients diagnosed with bronchial asthma had significantly higher anthropometric parameters (body weight, body length, and BMI) in the neonatal period and were ahead of the control group children in early childhood (1 and 3 years). By the beginning of puberty (10 years), a significant increase in body weight was noted in females compared to males and the control group. By the age of 17 inclusive, children with bronchial asthma did not differ from healthy adolescents in body weight and height, regardless of the duration of bronchial asthma. Retrospective analysis of anthropometric parameters in children with bronchial asthma living in the Republic of Belarus showed that over 10 years, there

is an increase in the frequency of body length distribution in the range of >75 percentiles and a decrease in the median BMI value, to a greater extent in girls. Thus, in the available literature there are a number of studies assessing physical development in children with bronchial asthma depending on various factors with conflicting results, while there are insufficient prospective individual observations assessing the prevalence of obesity in school-age children in the dynamics of bronchial asthma.

The body weight of children and adolescents is more susceptible to environmental factors. This indicator is mainly determined by the quantitative and qualitative composition of food, diet, physical activity, and organization of physical education. The most common form of obesity in children is exogenous-constitutional, the risk factors of which are considered to be genetic predisposition, poor nutrition, low physical activity, and lifestyle factors. An increased risk of developing bronchial asthma in obese children may be due to genetic predisposition. The relative risk of developing bronchial asthma in adolescents and young children is 50% higher than in similar age groups of children without signs of obesity. Nutrition and physical activity can be considered a significant and controllable factor. So-called hypoallergenic diets are often widely used in children with allergic diseases, which is not always justified, and their duration and effectiveness are not always justified. Thus, a lack of antioxidants in the diet, contained in vegetables and fruits, an excess of fats, saturated fatty acids can contribute to the inflammatory process. And vice versa, mono- and polyunsaturated, omega 3 fatty acids have an anti-inflammatory effect. A diet with excess fats reduces the response to bronchodilators in patients with bronchial asthma, and an excess of salty foods, pizza, desserts and salted meat in the diet increases the risk of exacerbations. Accordingly, the GINA strategy recommends a diet enriched with vegetables and fruits. Consumption of high-calorie foods with low nutritional value and low content of vitamins, zinc and magnesium is associated with bronchial hyperreactivity. The mechanisms of asthma and obesity are closed in a vicious circle, because in primary bronchial asthma, the physical activity of the patient decreases, and with the treatment of bronchial asthma with steroids, appetite increases, which leads to weight gain.

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