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EVALUATION OF PHYSICAL DEVELOPMENT IN CHILDREN WITH BRONCHIAL ASTHMA

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ABSTRACT

Among the diseases capable of negatively affecting the course of bronchial asthma in children and adolescents, disruptions in nutritional status play an important role, including not only excess body weight and obesity, but also insufficient body weight. Since children with the consequences of perinatal central nervous system damage often exhibit signs of protein-energy deficiency, the aim of the research conducted was to assess the indicators of nutritional status of children with bronchial asthma depending on accompanying neurological symptoms by evaluating the body mass index. 126 children with bronchial asthma were examined, divided into two subgroups: the main group included 65 children (51.6%) with the disease occurring against the background of consequences of perinatal central nervous system damage; the comparison group included 61 patients (48.4%) without accompanying neurological symptoms. The average age of the children was 11.4 ± 2.9 years. According to the results obtained, in 50.8% of observations, children in the main group had insufficient body weight and a decrease in body mass index, while in the comparison group, excess body weight was observed in 37.7% of cases.

KEYWORDS: children, bronchial asthma, anthropometry, body mass index, nutritional status, central nervous system

RELEVANCE

Despite the advances achieved today in healthcare, the incidence of bronchial asthma (BA) is on the rise worldwide. The main reasons for the growth of this disease, including among children and adolescents, is the allergization of the population due to the chemicalization of agriculture and air pollution, as well as the increased use of various chemicals in industrial production. Along with this, the widespread use of antibiotics, vaccines and serums in medical practice is of particular importance. Due to the multiplicity of etiological factors and pathogenetic mechanisms of the disease, the treatment of bronchial asthma is difficult [6,7,15].

The main goal of therapy for asthma is primarily to achieve control over the symptoms, course and risk factors for exacerbation of the disease. It is believed that control of this disease can be achieved in all patients, which has been repeatedly discussed in international consensus documents, including GINA 2016 [1,14]. Despite this fact, in some patients, modern methods of treating BA do not provide adequate control [2,4,14]. That is why, in recent years, much attention has been paid to a personalized approach to the treatment of asthma, taking into account the phenotypes of the disease and comorbid conditions that can affect the course of asthma in a particular patient [5,6], including those with concomitant neurological symptoms.

In the list of diseases that can potentially negatively affect the course of asthma, an important place is occupied by disturbances in the nutritional status of patients, both overweight and obesity, and underweight [7,8].

According to the World Health Organization (WHO) report for 2021, the prevalence of overweight in the population of children under 5 years of age in the world is 7.2%, in the European population - 13.2%. Among children in the European region aged 11 to 13 years, overweight ranges from 5% to 25%. It has been noted that overweight is observed more often among boys than among girls [9]. Based on the results of an epidemiological study for 2020-2021 in Uzbekistan, which included data on 10,223 adolescents aged 12-17 years, the incidence of overweight was 12.8%, obesity was detected in 3.2% [10,14]. According to the same study, in Navoi observed 11.2% of adolescents 12-17 years old with overweight, including 4% with obesity. In some regions of Uzbekistan, in recent years there has been a trend toward an increase in the prevalence of overweight and obesity among children and adolescents [11,14].

Overweight and obesity are defined as excess and abnormal fat deposits that can be detrimental to health. They can be assessed using several indicators, including body mass index (BMI), body fat content, and anthropometric indices [9]. BMI is currently considered as the main screening tool for assessing nutritional status [12,14].



THE PURPOSE OF THE STUDY was to assess the nutritional status of children with bronchial asthma depending on concomitant neurological symptoms by assessing body mass index.

MATERIALS AND METHODS

We analyzed data from a study of 126 patients with asthma aged 5 to 17 years, whose average age was 11.4±2.9 years. According to the gender distribution, there are 71 (56.3%) boys and 55 (43.7%) girls. The research group of children with asthma, depending on the presence of concomitant consequences of perinatal damage to the central nervous system (CNS), was divided into two subgroups: the main group included 65 children with asthma (51.6%), occurring against the background of the consequences of perinatal damage to the central nervous system; The comparison group included 61 patients with asthma (48.4%) without concomitant neurological symptoms. Figure 1 shows the distribution of children in the observation groups by gender, from which it follows that in the main group, compared with the comparison group, boys predominated (Figure 1).

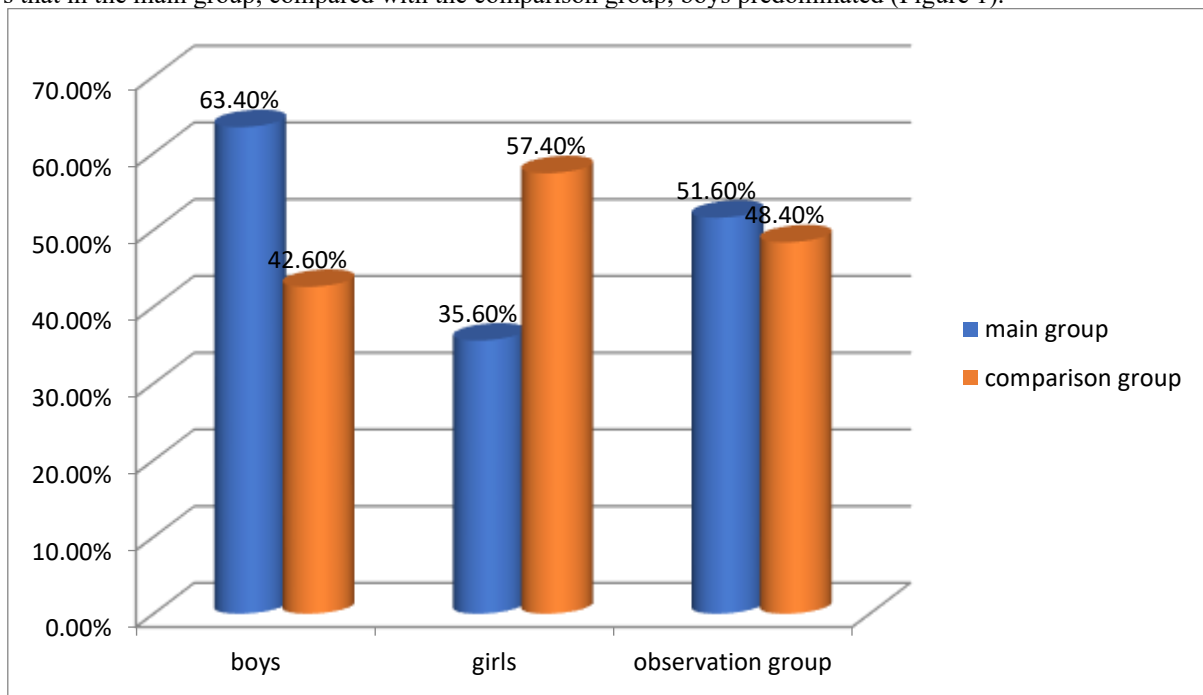


Figure 1. Distribution of children according to gender in observation groups

The diagnosis of asthma and severity of the disease were established in accordance with the existing GINA 2016-2021 recommendations [14]. All children underwent a standard examination in a hospital setting, which, along with other methods, included the determination of anthropometric indicators, such as body weight in kilograms and height in centimeters, after which BMI was calculated. To assess the physical development and adaptive capabilities of the children's body, graphs and curves were used, developed as a result of multicenter studies based on the guidelines recommended by WHO.

BMI was calculated using the generally accepted formula:

$$BMI = \frac{weight(kg)}{height(m^2)}$$

and assessed using percentile tables (WHO, 2006; ASPEN 2008). WHO tables are BMI parameters for children of the same age and gender in the form of graphs with boundaries of 3, 10, 25, 50, 75, 90 and 97 percentile intervals, and the average values are located between the 25 and 75 percentiles. The graphs have 5 curves: «median - 0, curves -2 and +2 standard deviations (SD), BMI between -2SD and -3SD, between +2SD and +3SD - low and high indicators on the verge of exhaustion and obesity, and the results are below -3SD and above +3SD – abnormal results».

Informed consent was obtained from all patients aged 15-17 years and from parents of patients under 15 years of age.

RESULTS AND ITS DISCUSSION

An analysis of the severity of bronchial asthma showed that 15.1% of children were diagnosed with mild intermittent BA, 35.7% with mild persistent BA, 28.6% with moderate BA and 20.6% with severe BA. From the presented data it follows that the children of the main group were characterized by persistent moderate severity of BA (32.3%), while in the comparison group there was persistent mild severity of the disease (40.9%) (Table 1).



Table 1
Clinical characteristics of the subjects

Asthma severity	Study group (n=126)	Main group (n=65)	Comparison group (n=61)
Intermittent	19 (15.1%)	8 (12.3%)	11 (18.1%)
Persistent lung	45 (35.7%)	20 (30.8%)	25 (40.9%)
Persistent moderate severity	36 (28.6%)	21 (32.3%)	15 (24.6%)
Persistent severe	26 (20.6%)	16 (24.6%)	10 (16.4%)

BMI, characterizing the nutritional status of the patient, is a quantitative indicator adjusted for the sex and age of the child. The values of this indicator obtained in this study are presented in table. 2. The distribution of BMI in groups of patients grouped depending on the percentile corridor for BMI (Table 2) showed that there was a statistically significant difference between the groups ($p < 0.01$).

Table 2
BMI characteristics in observation groups

Note: * - reliability of the values in relation to the indicators of the -1SD-(+1SD) group (*- $P < 0.05$; ** - $P < 0.01$)

Groups	Body mass index indicators				
	≤ -2 SD	≤ -1 SD	Median \pm 1SD	$\geq +1$ SD	$\geq +2$ SD
Total group of patients (n=126), abs. number, %	12** (9.5%)	35 (27.8%)	46 (36.5%)	26* (20.6%)	7** (5.6%)
Main group (n=65), abs. number, %	10* (15.4%)	23 (35.4%)	22 (33.8%)	8 (12.3%)	2* (3.1%)
Comparison group (n=61), abs. number, %	2** (3.3%)	12* (19.7%)	24 (39.3%)	18* (29.5%)	5** (8.2%)

Among the examined children in the study group, about a third of the patients had normal BMI values (median BMI -1SD-(+1SD)) - 36.5% of children (46/126): 33.8% in the main group and 39.3% in the comparison group. Somewhat less frequently, overweight was detected in 20.6% (26/126), obesity was diagnosed in 5.6% of patients (7/126). Depending on the severity of neurological symptoms, the proportion of patients with normal BMI values decreased progressively. In the main group, 35.4% of patients (23/65) showed a decrease in BMI -1SD-(-2SD), and in 15.4% (10/65) a decrease in body weight to -2SD-(-3SD), then 50.8% of children had nutritional status disorders such as protein-energy malnutrition. In patients from the comparison group, a decrease in BMI was diagnosed 2 times less often, which amounted to 22.9% (14/61): while a decrease in BMI was within -1SD-(-2SD) in 19.7% (12/61), and only 3.3% (2/61) are below -2SD.

Differences in nutritional status in patients with BA in the observation groups had a tendency, $\chi^2=25.92$; $p=0.07$. Clear differences in nutritional status were revealed in patients with asthma of varying severity based on BMI analysis depending on concomitant neurological symptoms. Noteworthy is the greater correlation between nutritional status and the course of asthma in the main group ($\chi^2=26.83$; $p=0.049$) in comparison with the comparison group ($\chi^2=9.12$; $p=0.89$): if in the main group such a relationship has the character of a clear trend, then in children of the comparison group without neurological symptoms it is weakly expressed.

In the comparison group, analysis of the distribution of patients into groups taking into account their BMI demonstrates statistically significant differences in comparison with the median -1SD and +1SD. The presented results show that this group of patients is most characterized by overweight +1SD- (+2SD), identified in 28.5% of children (18/61), and also in 8.2% (5/61) - obesity more than + 2SD, accounting for 37.7% of all observations (23/61). In the main group, nutritional status disorders within +1SD or more were diagnosed 2.3 times less often, amounting to 15.4% (10/65).

CONCLUSION

Children and adolescents with bronchial asthma experience disturbances in nutritional status of a multidirectional nature, depending on the presence of concomitant neurological symptoms. Thus, children with perinatal complications of damage to the central nervous system are characterized by a decrease in body mass index, while children in the comparison group have an increase in BMI. That is, concomitant neurological symptoms aggravate existing imbalances in the physical development of children with chronic respiratory diseases.

Comparing the possibilities of studying nutritional status and its relationship with bronchial asthma in children and adolescents using body mass index can significantly simplify the analysis of clinical data and obtain new information that is not available when using standard characteristics.



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