Original Article

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Indicators of Biochemical Studies in Children with Bronchial Asthma and Obesity

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Abstract

The aim of the study was to identify the biochemical features of obesity in children with bronchial asthma. The results of the study showed that obesity occurs in 16.2% of the total number of children with bronchial asthma and develops against the background of unfavorable perinatal factors, concomitant and transferred diseases affecting the development, course and outcome of the disease. Diagnostic criteria were determined, including a combination of indicators of low-density lipoproteins, fasting glucose, serum insulin level, HOMA-R index. The main diagnostic criteria are: decreased concentration of high-density lipoproteins and triglycerides and impaired carbohydrate metabolism.

Keywords: Bronchial Asthma, Obesity, Biochemical Parameters, Clinical Manifestations.

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Introduction

In recent decades, simultaneously with the increase in the incidence of AD, there has been a progressive increase in the number of overweight people of varying degrees of severity, as evidenced by numerous epidemiological studies.[1–4] Therefore, both asthma and obesity, due to their high prevalence and medical and social significance, belong to the global problems of modern healthcare. At the same time, the combination of AD and obesity is an urgent problem of practical health care. Epidemiological studies show that in those regions of the world where there is an increase in the incidence of asthma, there is also a progressive increase in the number of overweight people of varying severity among the population.[5–7] The presence of obesity is combined with a higher incidence of asthma, as well as with a higher degree of severity of its course.

It has been established that asthma in obese patients is characterized by a more severe course, a decrease in disease control, therefore timely diagnosis, prevention and correction of obesity risk factors are important in clinical practice.[8–10]

The purpose of the study: to identify the biochemical features of obesity in children with bronchial asthma.

Materials and Methods

The study was conducted in the departments of pulmonology and allergology of the RSNPMC Pediatrics of the Ministry of Health of the Republic of Uzbekistan and located in the Regional Children's Multidisciplinary Medical Center, in the City Children's Hospital of Andijan, Andijan district Multidisciplinary Central Polyclinic. The analysis of the parameters of the lipid and carbohydrate spectrum of blood (TG, cholesterol, HDL and LDL, IR) in children with obesity and normal body weight was carried out. The interrelations of indicators characterizing the severity of obesity with the parameters of carbohydrate and lipid metabolism were studied. The children were divided into the following groups: 190 children, including 130 BA with OJ and 60 with BA. Insulin resistance (IR) was determined in all examined BA children with LV (130 children) and in 45 children with BA. The control group consisted of 20 practically healthy children.

Statistical processing of the results was carried out using the Statistica 7.0 software package (StatSoft, USA). Data analysis was carried out using a set of nonparametric procedures, since most of the distributions of the studied features differed from normal, the values of the criteria corresponding to $p<0.05$ were considered. Statistically significant.

Results & Discussion

Studies of the basal level of insulin, glucose and insulin resistance coefficient in patients with OH and BA and their combination are presented in [Table 1].

As can be seen from [Table 1], in patients with LV in combination with AD, the glycemic level was naturally significantly higher than the glucose content of the control groups ($p<0.001$). The average concentration of blood glucose on an empty stomach and 2 hours after exercise (during the glucose tolerance test) in the group of children with OJ is significantly higher ($P<0.05$, $P<0.01$, respectively) compared with children without OJ. Patients with AD had a tendency to increase the concentration of blood glucose, but it did not go beyond normal values.

The increase in blood glucose concentration occurred against the background of a significant increase in insulin resistance. In children with LV and in combination with BA, the HOMA – IR indicator indicates the presence of insulin resistance. In the group of patients with AD, the HOMA – IR index significantly exceeded the control and the value of 2.77, which also suggests the presence of insulin resistance in these examined patients. At the same time, the degree of insulin resistance in patients with AD is two times lower than in case of LV and in combination with AD.

Combinations of carbohydrate metabolism disorders were detected in 26 (76.5%) children. The most common combination was an increased fasting glycemia with an increase in basal insulin, respectively, an increase in the index of insulin resistance-R -in 21 (61.8%) children ($P<0.05$).

With obesity and in the presence of insulin resistance, there are changes in the activity of enzymes: hepatic triglyceride lipase, lipoprotein lipase and the process of decay of lipoproteins rich in

triglycerides. Lipid metabolism disorders in metabolic syndrome are expressed by a triad of symptoms: hypertriglyceridemia, increased LDL, low HDL. The features of lipid metabolism in the observed children were analyzed. The changes affected all parameters of the lipid profile in BA children with LV. An increase in OH was found in 70/22 (31.4%) children, an increase in TG in 24 (34.2%) children, an increase in LDL cholesterol in 12 (17.1%) children, a decrease in HDL cholesterol in 29 (41.4%) children. The atherogenicity coefficient (CA), indicating the atherogenic orientation of lipid metabolism, was increased in 28 (40.0%) patients.

The vast majority of children had dyslipidemia. Violation of certain parameters of lipid metabolism was observed in all examined patients with LV against the background of AD. Analysis of the frequency of lipid metabolism disorders by gender showed that an increase in total cholesterol and a decrease in HDL were statistically significantly more common in children in the group with LV, they also more often had deviations from the norm in several indicators at once. In the group of obese children, the indicators of total cholesterol in the blood serum corresponded to the norm, however, they were significantly higher in comparison with the control group. The level of triglycerides turned out to be the most stable indicator in the studied groups, which is associated with a later reaction of the indicators of fat metabolism in children, as opposed to adults. hypertriglyceridemia, an increase in LDL cholesterol and a decrease in HDL were the most pronounced in qualitative and quantitative terms of the lipid transport system indicators detected in our sick children [Table 2]. As can be seen from this table, in BA children with LV, there is an increase in OHC indicators (5.1 ± 0.03 mmol/l versus 4.2 ± 0.18; $P<0.01$), TG (1.63 ± 0.01 mmol/l versus 1.3 ± 0.04 mmol/l; $P<0.01$) and HDL (1.1 ± 0.02 mmol/l vs. 1.32 ± 0.05 mmol/l; $P<0.01$) against the background of a decrease in LDL (3.43 ± 0.03 mmol/l vs. 2.8 ± 0.04 mmol/l; $P<0.01$).

There is also a significant imbalance in lipid metabolism in comparison with children with AD.

In children with AD, the lipid metabolism indices were within the reference values and did not significantly differ from those of the control group, however, in this category of children there is still a tendency to an imbalance of OHS indicators (4.38 ± 0.01 mmol/l vs. 4.2 ± 0.18; $P<0.05$), TG (1.2 ± 0.05 mmol/l vs. 1.3 ± 0.04 mmol/L), HDL (1.24 ± 0.02 mmol/l vs. 1.32 ± 0.05 mmol/L) and (2.8 ± 0.04 mmol/l versus 2.4 ± 0.05 mmol/l).

The obtained results were also reflected in the CA (3.24 ± 0.11 units versus 1.81 ± 0.04; $P<0.001$), which had a significant increase in children with BA with LV, in the group of children with BA there was a tendency to pathological increase (2.14 ± 0.06 units versus 1.81 ± 0.04) relative to the control. Only 12% of obese adolescents had an increase in serum TG levels. In 16% of obese children, a decrease in the number of HDL was revealed, which perform a protective function in the formation of atherosclerosis and, in combination with violations of other parameters of the blood lipid spectrum, make a significant contribution to the development of cardiovascular pathology.

Conclusions

Heterogeneous clusters of independent variables characterizing carbohydrate and fat metabolism were identified in groups of adolescents with different body weights. For groups of obese children, diagnostic criteria were determined, including a combination of low-density lipoprotein, fasting glucose and fasting serum insulin levels, after 30 minutes, and the HOMA-R index, classifying 97.6% of cases, which is diagnostically significant.

Table 1: Indicators of carbohydrate metabolism in childrenwith bronchial asthma, (M ±m)

Indicators	BA with obesity (n=130)	BA without obesity (n=60)	Control group (n=20)
Fasting glycemia mmol/l	5,4±0,16**^^^	4,3±0,12	3,8±0,46
Glycemia after 120 minutes	6,6±0,44	5,9±0,35	5,0±0,38
Fasting insulin mkEd/l	28,6±5,31**	18,9±3,78	12,2±2,54
IRI after 120 min, mkEd/l	64,44±10,1**^	36,5±6,22	26,8±5,64
IRnoma	3,83±0,52**^	2,38±0,48	1,82±0,36

Note: * - differences relative to the control groupdata are significant (** - P<0.01), ^ - differences relative to the BA groupdata without MS are significant (^ - P<0.05, ^^ - P<0.01)

Table 2: Comparativeanalysis of lipid metabolism indicators in the examined children

Indicators	BA with obesity (n=130)	BA without obesity (n=130)	Control group (n=20)
OHS, mmol/l	5,1±0,03**	4,38±0,01^	4,2±0,18
TG, mmol/l	1,63±0,01**	1,2±0,05^	1,3±0,04
HDL, mmol/l	1,1±0,02**	1,24±0,02^	1,32±0,05
LDL, mmol/l	3,43±0,03**	2,8±0,04^^	2,4±0,05
KA, ed	3,24±0,11**	2,14±0,06^^	1,81±0,04

Note: * - reliability of data for the control group(* - P<0.05; ** - P<0.01); ^ - reliability of data between the group ofchildren with BA and BA+MS (^ - P<0.05; ^^ - P<0.01)

The main diagnostic criteria for AD in obese children are: a decrease in the concentration of high-density lipoproteins and triglycerides and a violation of carbohydrate metabolism (a change in the glucose tolerance test, leading to further metabolic and respiratory disorders.

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