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# Clinical course of asthma in children, depending on the somatotype and modified risk factors of disease

Key words: children, bronchial asthma, somatotype, risk factors.

According to the statistics of WHO there are 300 millions persons in the world suffer from bronchial asthma (BA). Asthma prevalence ranges from 1 to 18 % in different countries, in a population of children – up to 10 %. However, children have more often of asthma, since there are objective difficulties of diagnosis of the disease, especially in early years of the life. These are causing patients and the formation nedovyyavlennya severe [1-3].

Prediction of asthma devoted a lot of scientific works, including interest are those that consider the relationship phenotypes, functional tests of performance characteristics of genetic determination. There forecasting model which allows to calculate genotypic level risk factors proband according phenotypic levels of risk factors it blood relatives. Used models with regression of genotypic on phenotypic deviation proband rejection of his family and their phenotypic deviation [4].

There are various ways for prognosis severity asthma such as a mathematical model, based on multiple regression analysis results of the study of inflammatory cytokines and C-reactive protein, uric acid, the intensity of peroxide oxidation of proteins and lipids of superoxide dismutase, the genotyping by detection polymorphisms of genes, determine prognostic criterias depending on the activity of the endocrine system and physical development of children [5–7].

It is important that scientists from over the world have concluded that asthma is a classic example of multifactorial disease, whose development is determined by the interaction of hereditary factors (mutations or combinations of alleles) and environmental factors and is characterized by certain external stigmas dysmorfohenesis. In numerous associative studies have been shown that there are many functionally interrelated genes (gene networks), including the main key genes and gene-modifiers phenotypic effect which depends on environmental factors, have been involved in the pathogenesis of asthma involved [4, 8 - 10].

**Aim:** To establish clinical course of bronchial asthma (BA) in children, depending on somatotype and identify risk factors for severe forms of disease.

# Materials and methods

The study involved 211 patients with asthma, aged 3 to 17 years. All patients were examined after obtaining informed consent of the child and his parents in accordance with GCP IHC.

Diagnosis of asthma, its severity and accountability established on the basis of the Ministry of Health of Ukraine of October 8, 2013 № 868 «Unified clinical protocols of primary, secondary (specialized) medical care. Asthma in children» [2].

There were the following age groups: preschool -3 to 5 years -32 patients; shkilnyky - from 6 to 11 years -55 patients; teens - from 12 to 18 years -33 patients. Depending on the severity of the disease there were the following groups: patients with mild asthma -40 patients; patients with moderate asthma -64 patients; patients with severe asthma -16 patients.

To address the problems commonly applied research, clinical and special techniques. Research has undergone a set of factors and indicators that can be easily identified practitioner, including outpatient basis.

In order comprehensive assessment of the health of children, the characteristics of asthma study was conducted

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anamnesis by interviewing parents and older children. All data obtained through surveys of parents, confirmed by analysis of the relevant medical records (history of the child (p. 112), statement Epicrisis).

Were used parameters of the cardiovascular system, on the basis of which determine the level of functional adaptation – adaptation potential for the diagnosis of the vegetative changes [5]. Index functional changes (IFC) of the body evaluated by the formula:

IFC =  $0,011 \cdot HR + 0,014 \cdot SBP + 0,008 \cdot DBP + 0,014 \cdot A + 0,009 \cdot BW - 0,009 \cdot H - 0.27$ ,

where HR – heart rate; SBP – systolic blood pressure; DBP – diastolic blood pressure; A – age, number of years BW– body weight, kg; H – Height (sm).

There were rate of adaptive capabilities for boys and girls of pre-school age based on the average deviation and sygma's deviation were find four levels IFC [5]: satisfactory, stress adaptation, the poor, the failure of adaptation. The value IFC adaptive potential to be classified by levels: satisfactory adaptation (2,59), stress adaptation mechanisms (2.6–3.09), poor adaptation (3.10–3.49), failure of adaptation (3,50 and more). Assessment IFC for all its simplicity provides a systematic campaign to solve the problem of quantitative measurement of health. It means, that IFC as a complex integral indicator, reflecting a complex system of relationships and characterizes the operation of all systems.

In the course of disease were find: exacerbation – a progressive increase in asthma, coughing, whistling wheezing, feeling of chest compression or any combination of these symptoms; controled – elimination of the disease on the background of the basic treatment of asthma, control – drug remission (in the primary diagnosis level of control is not specified); remission – complete elimination of symptoms on a background of standard treatment discontinuation.

The standardized questionnaire asthma control test (ACT) was used for monitor of severity of asthma, which allows fast, only on the basis of history, to assess the level control of disease. The level of asthma control assessed every three months treatment according to the degree of care and patients were divided into groups in which asthma was controlled, partly controlled and uncontrolled according to the evaluation of the physician. Patient and parents filled the asthma control test (ACT-test).

ACT test is a specially designed tool for evaluating asthma control in children of different age: ACT-children – for children from 4 to 11 years and ACT test – for children older than 12 years. Children under 12 years are used (ACT-children) containing 4 questions which corresponds child and 3 questions for parents. If the test result  $\leq$  19 points – asthma not controlled,  $\geq$  20 points – controlled asthma effectively.

Children older than 12 years ACT test containings 5 questions that correspond only for children. If the test result < 20 points – asthma is not controlled, from 20 to 24 points – not controlled asthma, 25 points – asthma effectively controlled.

#### **Results and discussion**

Article wrote and research were did with budget funds.

Age is one of the most important criteria that determine the phenotype of asthma and cours of disease in children. That is why one of the objectives was to research susceptibility to severe asthma, depending on age. Distribution of children by age and severity of asthma presented in table 1.

In our previous studies, we found that with increasing age significantly increased the number of patients with severe asthma. A similar trend was noted in our future research. As can be seen from Table 1, in the age group 3-5 years dominated patients with mild (21.5 %) and moderate (29.2 %) course. Patients with severe course of the disease among young children was observed.

In the age group 12 and older number of patients have severe disease, was 60.0 %. Thus, with increasing age of the child an increase in the incidence of severe asthma, which was significantly more common in children older than 12 years.

Thus, severe asthma was observed significantly more frequently in adolescents aged over 12 years. Thus, 60 % of children older than 12 years had significantly more severe course of the disease, 2,5 times more compared to the number of children with mild asthma this age (p < 0.05).

In the examined group of children prevailed boys (63,0 %), while girls made up 37,0 %, which coincides with the data of different researchers. Sex differences is in asthma in children. Regarding the severity of asthma, we found no significant differences among girls and boys

Table 1   Allocation children by age and severity of asthma							
	Severity of asthma						
Age (years)	Mild (n = 51)		Moderate (n = 120)		Severe (n = 40)		
3- () /	n	(M ± m) %	n	(M ± m) %	n	(M ± m) %	
3–5	11	21,5 ± 4,5	35	29,2 ± 5,3	-	0 ± 25,3	
6–11	28	54,0 ± 7,3	58	48,3 ± 6,9	16	40,0 ± 6,2	
≥ 12	12	23,5 ± 4,7	27	22,5 ± 4,7	24	60,0 ± 7,7#*	
Notes: * definitely with mild asthma ( $p < 0.05$ ): # definitely from moderate asthma ( $p < 0.05$ ).							

Table 2   Allocation children with disease duration and severity of asthma							
Duration of asthma (years)	Severity of asthma						
	Mild (n = 51)		Moderate (n = 120)		Severe (n = 40)		
	n	(M ± m) %	n	(M ± m) %	n	(M ± m) %	
< 2	39	76,5 ± 8,8	81	67,5 ± 8,2	16	40,0 ± 6,2#*	
> 2	12	23,5 ± 4,5	39	32,5 ± 5,7	24	60,0 ± 7,7#*	
Notes: * definitely with mild actions $(n < 0.05)$ ; # definitely from moderate actions $(n < 0.05)$							

Notes: \* definitely with mild asthma (p < 0.05); # definitely from moderate asthma (p < 0.05).

Table 3   Allocation children for the presence of harmful factors and severity of asthma							
	Severity of asthma						
Harmful	Mild (n = 51)		Moderate (n = 120)		Severe (n = 40)		
	n	(M ± m) %	n	(M ± m) %	n	(M ± m) %	
Passive smoking	12	23,5 ± 4,7	67	55,8 ± 7,4*	26	65,0 ± 8,0*	
Unhealthy food	30	58,8 ± 7,6	73	60,8 ± 7,8	30	75,0 ± 8,6	
Gas stove at home	24	47,1 ± 6,8	57	47,5 ± 6,9	22	55,0 ± 7,3	
Unhealthy parent's work	9	17,6 ± 4,0	23	19,2 ± 4,3	8	20,0 ± 4,2	
Note: * definitely with mild asthma (p < 0,05).							

with different degrees of severity of asthma. Thus, severe asthma occurred in 45.0 % of girls and 55.0 % boys.

Place and living conditions, cological environment has a significant impact on human health in general, especially the condition of the respiratory and asthma, in particular. Severe asthma significantly more often observed among residents (67,0  $\pm$  8,2) % against (32,5  $\pm$  5,6) % children among urban residents, but significant differences were found on the seriousness of the disease. Children in rural areas significantly more often observed mild course of asthma (33,3 %) than moderate (16,7 %). At the same time, a third of rural residents occurred and severe course 32,5 %, (p < 0.05). That is, to our knowledge, we found no trend of severe asthma among residents of villages and towns. Among rural residents experienced severe asthma almost on par with a slight ((32,5  $\pm$  5,6) % and  $(33,3 \pm 5,7)$  %, respectively). Children with severe course of disease were more likely compared with moderate asthma in children in rural areas  $(32,5 \pm 5,6)$  % against  $(16,7 \pm 4,0)$  %, (p < 0,05). We believe this is due to the socio-economic conditions that have developed in recent years in Ukraine, where rural residents are unable to receive adequate medical care (Lack of money in the family to the survey, on the road to the hospital, for medicines and so on. f.). Children are not timely and / or adequately treated with basic therapy by IGCC and / or leikotrien drugs or LABA, without treatment compliance was maintained without time were kept basic treatment and dose of drugs. The data we will further refine in our research, when we examine the issue of the treatment of asthma in children.

According to the literature and our data disease duration significantly affect the course of asthma in children, especially in older children with asthma disease which began in the first years of life. In our previous studies, we found that a diagnosis of asthma is installed in 65,0 % of cases in time.

We analyzed whether the term presence of the disease in a patient on the formation of the severity of asthma. For a point of reference was taken two years to the duration of the disease staging and early basic therapy, ie otsinyuvsya «seniority» of the disease: over 2 years and less than 2 years duration of disease without adequate treatment (table 2).

As have shown in table 2, this term is not treated disease has a significant impact on the course of asthma. Children who have suffered from asthma for 2 years, did not receive proper treatment, significantly more likely to have the disease intermedius ( $67,5 \pm 8,2$ ) % children.

Children experienced the disease for more than 2 years before the date of diagnosis, there was significantly more severe course of disease, compared with a mild (2,5-times difference) and moderate (difference of 1.8 times). Harmful environmental factors affect both the occurrence of disease, and its uncontrolled. We studied the effect of passive smoking, the use of harmful food and beverages (juice and sweet drinks), availability of gas stove in the apartment, work of parents (table 3).

According to the literature smoking is a factor that leads to asthma, but also significantly affects the disease. As for children, passive smoking can contribute to uncontrolled and severe asthma.

Table 4   Dependence severity of asthma in children by body mass index (Quetelet index)							
	Severity of asthma						
Quetelet index	Mild (n = 51)		Moderate (n = 120)		Severe (n = 40)		
	n	(M ± m) %	n	(M ± m) %	n	(M ± m) %	
The chronic energy deficiency, $\leq$ 18,0	37	72,5 ± 8,5	81	67,5 ± 8,2	24	60,0 ± 7,7	
Normal, 18,1–24,9	13	25,5 ± 4,9	34	28,3 ± 5,3	14	35,0 ± 5,8	
Overweight, 25,0–29,9	1	2,0 ± 0,2	5	4,2 ± 1,8	2	5,0 ± 1,5*	
Note: * definitely with mild ast	thma (p < 0,05).						

As can be seen from table 3 in children whose parents smoke, and the children were in such homes, dominated moderate (55.8 %) and severe (65.0 %) of asthma. That is, passive smoking promotes moderate and severe asthma in children. For other harmful factors, significant difference in the occurrence of severe asthma were not found.

In our previous studies and analysis of the literature on clinical and constitutional laws of development of asthma determined that within each constitutional type can be defined characteristic profile of pathological processes and states, which has important prognostic value in the development of severe asthma. Analyzed Quetelet index (body mass index, BMI) [7] as a direct indicator of generalized harmony structure of the human body and indirect indicator of nutrition and health, which is a modified factor in the child's life.

We have studied the development of the severity of the disease, depending on harmonicity physical development of children with asthma by Quetelet body mass index. In our previous studies among patients with varying degrees of disease severity low body weight was observed in 75,5 % of mild asthma and in 68,2 % of patients with moderate asthma, which was significantly higher than among patients with a severe course of its 36,4 %.

As shown in table 4 children are overweight severe asthma was observed significantly more often than light (p < 0,05). At the same time, children with low body mass (Quetelet index  $\leq 18,0$ ) and harmonic physical development had no significant difference in the severity of asthma.

Thus, severe asthma were more children in violation of inherent structure of the body due to excess body weight. Children with BMI or Quetelet index, which exceeded 25,0 units. (25, 0 –29,9 units.) Was significantly longer in the group with severe asthma (p < 0.05), compared with children who were overweight and mild asthma.

One approach to forecasting is to assess the health of psychosomatic constitution. The human body – a system based not only on the combination of physical and mental relationships. The impact of environmental change these relations directly affecting the state of physical health in general and is displayed on asthma in particular. Adaptive capacity and predisposition to various diseases correlated with affiliation to certain constitutional types. Constitutional type – is integral indicator which characterizing the physical and functionality of the human body. Expression of morphological constitution is somatotype, and the impact of environmental influences on psychosomatic indicators of a somatotype whose outcome influences the course of the emergence of new and existing diseases.

We determined the orientation of morphological development in all 211 children to assess harmonicity physical development index Pushkarev and rated the dependence of developing severe forms of asthma in children, according to somatotype: piknoyid, normostenoyid, astenoyid (for Pushkarev, 1983), or makrosomal, microsomal and mezosomal. For each group of boys and girls are designed for the modern values of anthropometric data. In our previous studies, we found that children with asthma, regardless of severity in 42,5 % of cases developed harmoniously, and 57,5 % of patients were children disharmonious development, while makrosomal type was installed in 38,3 % and microsomal – in 19,2 % of patients.

In our studies the evaluation harmonious development of children's physical body we determined the morphological development direction, somatotype, namely rejection of normal type, and evaluated the trend of severe asthma in children. Mild asthma exposed to children with harmonious physical development, that children who had normal somatotype (index Pushkarev 95-110 units.). Thus, almost half  $(49,0 \pm 6,9)$  % of children with mild asthma were normal somatotype  $(25.8 \pm 5.0)$  % of children with moderate asthma and  $(15,0 \pm 3,6)$  % of children with severe (p < 0.05). At the same time, severe asthma significantly more frequently observed among children with disharmonious development index Pushkarev makrosomal (piknoid) somatotype and the degree of deviation. Asteno somatotype was significantly more common in children with moderate  $(63,3 \pm 7,9)$  %, and severe  $(70,0 \pm 8,3)$  % of asthma.

Thus, patients with mild asthma are mostly harmonious development (49,0 %) and microsomal type (1 degree deviation) of (39,2 %). Among patients with moderate astma harmonious development tends to decrease and is only 25,8 %, while the increasing number of patients with disharmonious development microsomal type (63,3) % by I degree rejection (59,2) %. Among patients with severe 85,0 % have disharmonious development by microsomal somatotype (70,0) %. Thus, assessing the effect of physical harmonicity child development index Pushkarev the development of severe asthma in children, we found that severe asthma significantly more (p < 0,05) observed in children with disharmonious development, namely ( $85\ 0\pm 9,2$ ) % children. Children with mild disease experienced significantly more harmonious development index Pushkarev ( $49,0\pm 6,9$ ) % children.

The development of severe asthma depends on many factors and adaptation abilities play a role in these relations. Adaptation of the organism – a margin of functional reserves, which are constantly used to maintain a balance between organism and environment. The need to adapt to environmental conditions that are constantly changing, maintenance of homeostasis requires a certain tension of regulatory mechanisms. The higher the level of functional reserves, the lower the degree of tension mechanisms are required to maintain homeostasis. Therefore, the most active in terms of developing modern trend, based on an assessment of the level of health in terms of the theory of adaptation.

We analyzed whether relationship between development of severe asthma in children and level of adaptive capacity of the child. As can be seen from table 5 only 30,0 % of children with severe asthma had a good stock of functional reserves, while the remaining 70,0 % of children had a failure of adaptation of the organism due to stress (40,0 %) and poor adaptation (30,0 %).

A similar pattern also noted in mild and moderate asthma in children. However, the state of unsatisfactory adaptation when functionality reduced, and homeostasis saved only if a significant tension of regulatory systems, or through the inclusion of additional compensatory mechanisms, significantly more often observed in severe asthma in children (30 %) compared to the number of children with mild (15,7%), (p < 0,05). That is, the severe course of asthma in 2 times more than mild asthma, reserve capacity of the organism were reduced, and they had a condition marked by poor adaptation. At the same time, intermedius severity of disease more likely (p < 0.05) developed against the background of stress adaptation abilities (46,7 %) compared with mild (29,4 %), and mild course even more characteristic of children good margin functional reserves, ie with a satisfactory adaptation (54,9 %).

Thus, severe asthma developed against background on state of organism adaptation disorders due to stress and poor adaptation (70,0 %) and the disease intermedius significantly more (p < 0,05) developed against the background of stress adaptation abilities. Mild asthma more exposed to children with a good stock of functional reserves, ie with a satisfactory adaptation. Level of adaptations of the organism, which is determined by the index of functional changes may be one of the criteria of severe asthma in children.

Autonomic dysfunction is one of the most common conditions among children. In physiological conditions, the increasing influence of one of the divisions of the autonomic nervous system leads to compensatory load of other regulatory mechanisms, which puts the system to a new level of functioning. In a state of overvoltage, failure of adaptation that, according to our observations, occurs in children with asthma, broken regulatory function and, therefore, increased activity of one department does not lead to corresponding changes in the other, which clinically manifested symptoms of autonomic dysfunction. According to the literature dyzrehulyatsiyni changes in the autonomic nervous system at different stages of asthma are characterized by a gradual increase vagotonia, inadequate response to load and rapid exhaustion of compensatory mechanisms in the process of restoring homeostasis. They decompensation promotes clinical manifestation of disease. Given the above, we decided to assess the condition of the autonomic nervous system in children with asthma and determine whether autonomic dysfunction on formation of severe forms of asthma in children.

With definitions vegetative index (Fig. 1) found that children with mild asthma often characterized eytoniya likely, that the balance between the sympathetic and parasympathetic systems. As the progression of the disease in children the number of children who had moderate asthma probably was more towards autonomic dysfunction sympathicotonia (67,5 ± 8,2) %, (p < 0,05), which is a reflection of the stress reaction organism (stress by adapting our previous data). The stress response is a characteristic of the degree of destruction of the body. For children with severe asthma course, according to our research, inherent failure of adaptation of the organism and, where the index

Table 5   Dependence severity of asthma in children by the Index functional changes (IFC)							
Index functional changes	Severity of asthma						
	Mild (n = 51)		Moderate (n = 120)		Severe (n = 40)		
	n	(M ± m) %	n	(M ± m) %	n	(M ± m) %	
Satisfactory adaptation (< 1,89)	28	54,9 ± 7,3	41	34,1 ± 5,8*	12	30,0 ± 5,3*	
Poor adaptation (1,9–2,14)	15	29,4 ± 5,3	56	46,7 ± 6,8*	16	40,0 ± 6,2	
Failure of adaptation (2,15–2,41)	8	15,7 ± 3,7	23	19,2 ± 4,3	12	30,0 ± 5,3*	
Note: * definitely with mild asthma (p < 0,05).							





Fig. 1. The severity of asthma in children, depending on the index Kerdo

Kerdem, changes in the autonomic nervous system of the type vagotonia (50,0  $\pm$  7,0) %, which exceeds the figure by 2,3 times compared with mild asthma.

Thus, severe asthma based on the disruption of adaptation of the organism and changes in autonomic nervous system like vagotonia (index Kerdo).

## Conclusions

Summarizing research results on modified factors of asthma in children, we have to note that the age of a child over 12 years, duration of disease before diagnosis more than 2 years, passive smoking are factors that contribute to the formation of severe asthma in children. Overweight, dysharmonic development, failure of adaptation of the organism (poor adaptation) and changes in the autonomic nervous system by type a vagotonia (index Kerdo) are risk factors for development of moderate and severe asthma in children. Kerdo's index and the index of Quetelet can be used as prognostic criteria of severe asthma in children.

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# ОСОБЕННОСТИ КЛИНИЧЕСКОГО ТЕЧЕНИЯ БРОНХИАЛЬНОЙ АСТМЫ У ДЕТЕЙ В ЗАВИСИМОСТИ ОТ СОМАТОТИПОВ И МОДИФИЦИРОВАННЫЕ ФАКТОРЫ РИСКА РАЗВИТИЯ ТЯЖЕЛЫХ ФОРМ БРОНХИАЛЬНОЙ АСТМЫ У ДЕТЕЙ

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#### Резюме

Цель исследования: установить особенности клинического течения бронхиальной астмы (БА) у детей в зависимости от соматотипов и определить модифицированные факторы риска развития тяжелых форм заболевания.

Материалы и методы. Было обследовано 211 больных БА в возрасте от 3 до 17 лет. Все пашенты обследовались после получения информационного согласия ребенка и его родителей в соответствии с требованиями GCP IHC. С целью определения риска развития тяжелой БА применялись общеклинические и специальные методы обследования больных. Исследованию подверглась совокупность факторов и показателей, которые легко могут быть определены практикующим врачом: было проведено изучение анамнестических данных путем опроса родителей и детей старшего возраста, определен уровень функциональной адаптации организма (адаптационный потенциал, индекс функциональных изменений — ИФИ). использован стандартизированный опросник-тест по контролю над астмой АСТ-детский – для детей от 4 до 11 лет и АСТ-тест – для детей старше 12 лет, проводились лабораторные, антропометрические, функциональные исследования. Накопление и обработку данных проводили с использованием лицензионных программных продуктов, входящих в пакет Microsoft Office Professional 2003. Математическая обработка результатов и хранения данных исследования проводилась с использованием пакета программы Statistica 6.0.

Результаты и их обсуждение. Возраст является одним из наиболее весомых критериев, определяющих фенотип БА, а именно –характер течения заболевания у детей. С увеличением возраста ребенка наблюдается увеличение частоты развития тяжелого течения БА, который достоверно чаще наблюдается у детей старше 12 лет. Так, 60 % детей старше 12 лет достоверно чаще (в 2,5 раза) имели тяжелое течение заболевания по сравнению с количеством детей с легкой астмой в этом возрасте. Относительно степени тяжести БА, авторы не обнаружили достоверной разницы среди девочек и мальчиков. Тяжелое течение БА достоверно чаще наблюдалось среди жителей города (67,0 ± 8,2) % против (32,5 ± 5,6) % детей из сельской местности. У детей со стажем заболевания более 2 лет до момента постановки диагноза достоверно чаще наблюдалось тяжелое течение заболевания по сравнению с легким (разница 2,5 раза) и среднетяжелым (разница 1,8 раза).

У детей, родители которых курили, преобладали среднетяжелое (55,8%) и тяжелое (65,0%) течение БА. Таким образом, пассивное курение способствует развитию тяжелых и среднетяжелых форм БА у детей. Относительно других вредных факторов, достоверной разницы в возникновении тяжелых форм БА не выявлено.

Авторами было изучено развитие степени тяжести заболевания в зависимости от гармоничности физического развития детей с БА по индексу массы тела Кетле. Тяжелое течение БА у детей с избыточной массой тела. Детей с ВМІ или индексом Кетле, который превышал 25,0 ед. (25,0–29,9 ед.), было достоверно больше в группе с тяжелым течением БА (р <0,05) по сравнению с детьми, которые имели избыточную массу тела и наличие легкого течения заболевания.

Оценивая влияние гармоничности физического развития ребенка по индексу Пушкарева на развитие тяжелых форм БА у детей, авторы обнаружили, что тяжелое течение БА достоверно чаще (p < 0,05) наблюдается у детей, имеющих дисгармоническое развитие, — ( $85,0 \pm 9,2$ ) %. У детей с легким течением заболевания достоверно чаще наблюдался гармоничное развитие по индексу Пушкарева — ( $49,0 \pm 6,9$ ) % детей.

Тяжелое течение БА развивается на фоне нарушений адаптационных возможностей организма за счет напряжения и неудовлетворительной адаптации (70,0%), а среднетяжелое течение заболевания достоверно чаще (p < 0,05) развивается на фоне напряжения адаптационных возможностей организма. Тяжелое течение БА астмы развивается на фоне срыва адаптационных возможностей организма и дисрегуляторных изменений вегетативной нервной системы по типу ваготонии (по индексу Кердо).

Выводы. Обобщая результаты исследования по изучению модифицированных факторов развития БА у детей авторы отметили, что возраст ребенка старше 12 лет, продолжительность заболевания до постановки диагноза более 2 лет, пассивное курение являются факторами, которые способствуют формированию тяжелых форм БА у детей. Избыточная масса тела, дисгармоничное развитие, срыв адаптационных возможностей организма (неудовлетворительная адаптация) и дисрегуляторные изменения вегетативной нервной системы по типу ваготонии (по индексу Кердо) являются факторами риска по развитию среднетяжелых и тяжелых форм БА у детей. Индекс Кердо и индекс Кетле могут быть использованы как прогностические критерии развития тяжелого течения БА у детей.

**Ключевые слова:** дети, бронхиальная астма, соматотип, факторы риска.

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## CLINICAL COURSE OF ASTHMA IN CHILDREN, DEPENDING ON THE SOMATOTYPE AND MODIFIED RISK FACTORS FOR SEVERE ASTHMA IN CHILDREN

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#### Summary

**Aim:** To establish clinical course of bronchial asthma (BA) in children, depending on somatotype and identify risk factors of severe forms of disease.

Materials and methods. The study involved 211 patients with asthma, aged 3 to 17 years. All patients were examined after obtaining informed consent of the child and his parents in accordance with GCP IHC. In order to determine the risk of severe asthma applied clinical and special methods of examination of patients. The study underwent a combination of factors and indicators that can be readily determined by the practitioner: a study was made medical history by interviewing parents and older children, defined level of functional adaptation of the organism (adaptive capacity index of functional changes (IFC)), used a standardized questionnaire – test control asthma ACT for kids – for children from 4 to 11 years and ACT-test – for children older than 12 years, conducted laboratory, anthropometric, functional studies. Accumulation

and processing of data was performed using licensed software included in the package Microsoft Office Professional 2003. Mathematical processing of results and data storage studies were performed using the program package Statistisa 6.0.

Results. Age is one of the most important criteria that determine the phenotype of asthma, namely, the nature of disease in children. With increasing age of the child, an increase in the incidence of severe asthma, which is significantly more common in children older than 12 years. Thus, 60 % of children older than 12 years were significantly more (2.5 times) had a severe course of the disease, compared to the number of children suffering from mild asthma at this age. With respect to the severity of asthma, we found no significant differences among girls and boys. Severe asthma were significantly more frequently observed among residents of the city (67,0  $\pm$  8,2) % against (32,5  $\pm$  5,6) % of rural children. Children who experienced the disease for more than 2 years prior to diagnosis were significantly more severe course of the disease was observed, compared with a slight (2.5-fold difference) and moderate (difference of 1.8 times). Children whose parents smoke, dominated by moderately (55.8%) and severe (65.0%) for asthma. Thus, second-hand smoke contributes to the development of severe and moderate forms of asthma in children. Regarding other hazards, significant differences in the occurrence of severe forms of asthma have been identified.

We have studied the development of the severity of the disease, depending on the harmony of the physical development of children with asthma by body mass index Quetelet. Severe asthma in children with overweight. Children with a BMI or Quetelet index, which exceeded 25.0 units. (25.0 – 29.9 units.), Was significantly higher in the group with severe asthma (p < 0.05) compared with children who were overweight and the presence of lung disease course.

We assessing the influence of harmonious physical development of the child index Pushkarev on the development of severe asthma in children, we found that severe asthma were significantly more (p < 0,05) observed in children with disharmonious development ( $85,0 \pm 9,2$ )% children. In children with mild disease significantly more frequently observed harmonious development index Pushkarev ( $49,0 \pm 6,9$ )% of children.

Severe asthma develops on the background of violations of adaptation of the organism due to stress and poor adaptation (70.0%), and moderate course of the disease significantly more frequently (p < 0,05) develops in the voltage adaptation of the organism. Severe asthma asthma develops in the disruption of the body's adaptive capabilities and disregulatory changes in the autonomic nervous system by type vagotonia (index Kerdo).

**Conclusions.** Results of a study on modified factors of asthma in children, we noted that the child's age over 12 years, duration of illness before diagnosis for more than 2 years, passive smoking are factors that contribute to the formation of severe asthma in children. Overweight, disharmonious development, disruption of the body's adaptive capabilities (poor adaptation) and disregulatory changes the autonomic nervous system by type vagotonia (index Kerdo) are risk factors for the development of moderate and severe asthma in children. Kerdo index and Quetelet index can be used as predictors of the development of severe asthma in children.

Key words: children, bronchial asthma, somatotype, risk factors.

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