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Features of the course of perinatal period in children with bronchial asthma. Analysis of comorbid pathology

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The formation and course of bronchial asthma are associated with risk factors of the perinatal period. When analyzing the morbidity of the examined patients, it was noted that almost all children had concomitant pathology represented by acute respiratory viral infections (ARVI), diseases of ENT organs, iron-deficiency anemia, diseases of the endocrine, kidney and urinary systems, infectious and parasitic diseases, as well as concomitant allergopathology. The aim of the study is to study the peculiarities of the course of perinatal period in children with bronchial asthma and to analyze the comorbid pathology in these children.

Material and methods. To solve the set tasks, 983 children with several episodes of bronchial obstruction in the anamnesis, who were subsequently diagnosed with bronchial asthma of varying severity, were included in the study. There were also 116 children under observation with a diagnosis of acute bronchitis with bronchial obstructive syndrome. These children formed the comparison group. The analysis of variance F-Fisher and nonparametric Wilcoxon U-criterion and Kruskel–Wallis criterion were used for comparison and probabilistic evaluation of differences between the values of the compared groups.

Results. We took into account the following criteria: the course of pregnancy in mothers of the examined children, the obstetric and gynecological history of mothers. When analyzing concomitant pathology, it was found that infectious and helminthic-parasitic diseases were most frequently observed in children with bronchial asthma – in 516 (52.5±1.6%) cases. Conclusion. The results of the study showed that various perinatal pathologies are more often diagnosed in mothers of children with both moderate bronchial asthma and concomitant allergic rhinitis, in children with severe asthma and do not occur in the group of children with mild persistent disease. In general, concomitant diseases were significantly more common in children with severe bronchial asthma compared to mild and moderate ($p<0.05$).

Keywords: perinatal period, children, bronchial asthma, comorbid pathology, bronchial obstructive syndrome.

Особливості перебігу перинатального періоду в дітей, хворих на бронхіальну астму. Аналіз коморбідної патології

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Формування та перебіг бронхіальної астми пов'язані з факторами ризику перинатального періоду. Під час аналізу захворюваності обстежених пацієнтів встановлено, що майже всі діти мали супутню патологію, представлену гострими респіраторними вірусними інфекціями (ГРВІ), захворюваннями ЛОР-органів, залізодефіцитною анемією, захворюваннями ендокринної системи, нирок та сечовидільної системи, інфекційними та паразитарними захворюваннями, а також супутньою алергопатологією.

Мета дослідження – вивчити особливості перебігу перинатального періоду в дітей, хворих на бронхіальну астму, та проаналізувати коморбідну патологію в них.

Матеріал і методи. У дослідженні взяло участь 983 дитини з декількома епізодами бронхообструкції в анамнезі, в яких надалі було діагностовано бронхіальну астму різного ступеня тяжкості. Також під спостереженням перебувало 116 дітей із діагнозом: гострий бронхіт із бронхообструктивним синдромом. Ці діти становили групу порівняння. Для порівняння та ймовірнісної оцінки відмінностей між значеннями порівнюваних груп використано дисперсійний аналіз F-Фішера та непараметричний U-критерій Вілкоксона та критерій Краскеля–Уолліса.

Результати. Під час аналізу пренатальних факторів враховано такі критерії: перебіг вагітності в матерів обстежених дітей, акушерсько-гінекологічний анамнез матерів. Під час аналізу супутньої патології встановлено, що інфекційні та глистно-паразитарні захворювання найчастіше спостерігалися в дітей, хворих на бронхіальну астму – у 516 (52,5±1,6%) випадках.

Висновки. Результати дослідження показали, що різноманітні перинатальні патології частіше діагностуються в матерів дітей, які хворіють як на бронхіальну астму середнього ступеня тяжкості, так і з супутнім алергічним ринітом, у дітей з тяжкою формою бронхіальної астми та не простежується у групі дітей із легким перебігом захворювання. Загалом супутні захворювання достовірно частіше зустрічалися в дітей із тяжкою бронхіальною астмою порівняно з легкою та середньою тяжкістю ($p<0,05$).

Ключові слова: перинатальний період, діти, бронхіальна астма, коморбідна патологія, бронхообструктивний синдром.

Introduction

Factors related to maternal health, peculiarities of pregnancy and childbirth have a significant influence on child's health at early age. It is established that children born to mothers with complications during pregnancy have the bronchial asthma earlier and more severe [1,2]. The formation and course of bronchial asthma are associated with risk factors of the perinatal period. When analyzing the morbidity of the examined patients, it was noted that almost all children had concomitant pathology represented by acute respiratory viral infections, diseases of ENT organs, iron-deficiency anemia, diseases of the endocrine system, diseases of the kidney and urinary systems, infectious and parasitic diseases, as well as concomitant allergopathology [3,4,5,6,7,8,9,10].

The aim of the study was to study the peculiarities of the course of perinatal period in children with bronchial asthma and to analyze the comorbid pathology in these children.

Materials and methods of the study

A total of 1099 children and adolescents aged 1 to 18 years who had acute bronchitis with bronchial obstructive syndrome in early childhood were under observation.

To solve the set tasks, 983 children with several episodes of bronchial obstruction in the anamnesis, who were subsequently diagnosed with bronchial asthma of varying severity (boys – 850, girls – 133), were included in the study. The patients were divided into groups based on the severity of the condition: 12 children with mild asthma, 375 with moderate asthma, 393 with moderate asthma and allergic rhinitis, and 203 with severe asthma. There were also 116 children under observation with a diagnosis of acute bronchitis with bronchial obstructive syndrome (boys – 74, girls – 42). These children also had episodes of bronchial obstructive syndrome in their anamnesis, but bronchial asthma did not develop in the dynamics of observation. These children formed the comparison group.

Statistical processing. For the purpose of correct application of statistical procedures, the mean values of the obtained samples (M), their standard deviations (σ), standard errors (m), 95% confidence intervals (95% CI), minimum (min) and maximum (max) values of the series were calculated, in the groups were determined. The analysis of variance (F-Fisher) and nonparametric Wilcoxon U-criterion (Mann–Witney) and Kruskel–Wallis criterion (Kruskel–Wallis) were used for comparison and probabilistic evaluation of differences between the values of the compared groups. Pearson's χ^2 method (Pearson Chi-Square) was used to determine the degree of contiguity between qualitative features. The statistical significance was set at $p \leqslant 0.05$.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and National Research Committee and with the Declaration of Helsinki 1964 and its later amendments or comparable ethical standards.

Results of the study and discussion

In this regard, we analyzed the assessment of unfavorable factors affecting the developing fetus. When analyzing prenatal factors, we took into account the following criteria: the course of pregnancy in the mothers of the examined children, and the obstetric and gynecological history of the mothers. When studying the number of pregnancies and births, it was found that differences between these characteristics in children with bronchial asthma and acute bronchitis with bronchial obstructive syndrome were statistically insignificant ($p>0.05$). Patients with bronchial asthma were born, on average, from 1.7±0.0% (95% CI: 1.6–1.7) of pregnancies, children with acute bronchitis with bronchial obstructive syndrome – from 1.9±0.1% (95% CI: 1.7–2.1) of pregnancies ($p=0.127$). The average number of births in mothers of children with bronchial asthma was 1.6±0.0% (95% CI: 1.5–1.6), in children in the comparison group – 1.7±0.1% (95% CI: 1.5–1.8) births ($p=0.185$).

The characteristics of the number of pregnancies and births in mothers of children with bronchial asthma of varying severity are presented in Tables 1, 2.

We analyzed the features of the course of pregnancy in mothers of the observed patients. The course of pregnancy in a significant number of cases was normal in mothers of children with both bronchial asthma and acute bronchitis with bronchial obstructive syndrome (Table 3).

The complicated course of pregnancy was manifested by preeclampsia. Preeclampsia occurred with equal frequency in women of both observation groups. In our study, preeclampsia in mothers of chil-

Table 1

Number of pregnancies in mothers of examined children

Bronchial asthma forms	N	Medium	Std. error	Medium 95% CI for		PF	PH
				down border	up border		
Obstructive bronchitis	116	1.9	0.1	1.7	2.1	<0.127	<0.127
Mild asthma	12	1.8	0.3	1.0	2.5		
Moderate asthma	375	1.6	0.0	1.5	1.7		
Moderate asthma and allergic rhinitis	393	1.6	0.0	1.5	1.7		
Severe asthma	203	1.6	0.1	1.4	1.9		
Total	1099	1.7	0.0	1.6	1.7		

Notes: differences statistical significance PF – Fisher on, Рн – Kruskal-Wallis on.

Table 2

Number of births in mothers of examined children

Births	N	Medium	Std. error	Medium 95% CI for		PH
				down border	up border	
Obstructive bronchitis	116	1.7	0.1	1.5	1.8	<0.185
Mild asthma	12	1.6	0.3	1.0	2.2	
Moderate asthma	375	1.6	0.0	1.5	1.7	
Moderate asthma and allergic rhinitis	393	1.5	0.0	1.5	1.6	
Severe asthma	203	1.5	0.1	1.4	1.6	
Total	1099	1.6	0.0	1.5	1.6	

Table 3

Maternal complications of pregnancy

Pregnancy pathologies	Bronchial asthma weight degree								Total		Rn	Chi-square
	Mild		Moderate		Moderate and allergic rhinitis		Severe					
	n	%	n	%	n	%	n	%	n	%		
Preeclampsia	0		19	5.1±1.1	33	8.4±1.4	13	6.4±1.7	65	6.6±0.8	0.000	20.183
Urogenital infection	0		3	0.8±0.5	9	2.3±0.8	2	1.0±0.7	14	1.4±0.4	0.000	32.538
ARVI	0		15	4.0±1.0	11	2.8±0.8	0	0	26	2.6±0.5	0.073	8.572
Operative births	0		15	4.0± 1.0	13	3.3±0.9	3	1.5±0.8	31	3.2±0.6	0.370	4.273
Ahead of time births	0		8.0	2.1±0.7	7	1.8±0.7	6	3.0±1.2	21	2.1±0.5	0.005	21.930
Multifetal pregnancy	0		3	0.8±0.15	2	0.5±0.4	4	2.0±1.0	9	0.9±0.3	0.304	4.838

dren with bronchial asthma was noted in 65 (6.6±0.8%) cases. In mothers of children with acute bronchitis with bronchial obstructive syndrome, preeclampsia was noted in

6 (5.1±1.4%) observations (p=0.352). Preeclampsia in mothers of children with moderate bronchial asthma was noted in 5.1±1.1%, with moderate bronchial asthma and concomitant allergic rhinitis in 8.4±1.4%, and with severe bronchial asthma in 6.4±1.7% of observations (χ^2=20.183; p=0.000). The odds ratio (OR) value of the development of bronchial asthma in children depending on the maternal factor of preeclampsia was OR=3.2 (95% CI: 1.1–9.1; p<0.05).

Urogenital infections were represented by ureaplasmosis, mycoplasmosis, chlamydia, candidal colpitis, and genital herpes. Chronic urogenital infections were detected in 14 (1.4±0.4%) mothers of children with bronchial asthma and 9 (7.7±1.6%) – with acute bronchitis with bronchial obstructive syndrome, respectively (p=0.000). Urogenital infections in mothers of children with moderate bronchial asthma were noted in 0.8±0.5%, with moderate bronchial asthma and concomitant allergic rhinitis – in 2.3±0.8%, with severe bronchial asthma – in 1.0±0.7% of observations (χ^2=32.538; p=0.000).

Among the variety of pathologies during pregnancy, the development of acute respiratory viral infections was most frequently registered in mothers of the studied patients. Maternal acute respiratory viral infections during pregnancy were observed in 26 (2.6±0.5%) mothers of children with bronchial asthma and in 7 (6.0±0.9%) mothers of children with acute bronchitis with bronchial obstructive syndrome (p=0.000). Acute respiratory infections during pregnancy in mothers of the examined children were noted in 4.0±1.0% of observations in the group with moderate asthma, in 2.8±0.8% – in the group with moderate asthma and concomitant allergic rhinitis. In the group of children with mild and severe bronchial asthma, maternal acute respiratory infections during pregnancy were not observed (χ^2=8.572; p=0.073).

One of the factors triggering the formation of bronchial asthma is the disruption of the normal course of labor [2,15]. The proportion of deliveries by caesarean section was 3.2±0.6% (n=31) and 3.1±0.8% (n=4) in groups with bronchial asthma and acute bronchitis with bronchial obstructive syndrome (p=0.750), respectively. Depending on the severity of bronchial asthma in children, the proportion of operative deliveries in mothers with moderate asthma was 4.0±1.0%, moderate asthma with concomitant allergic rhinitis was 3.3±0.9%, and severe asthma was 1.5±0.8% (χ^2=4.273;p=0.370).

Table 4

Neonatal of the era complications

Pathologies	Bronchial asthma weight degree										Rn	Chi-square
	Mild		Moderate		Moderate and allergic rhinitis		Severe		Total			
	n	%	n	%	n	%	n	%	n	%		
Birth asphyxia	0	0	31	8.3±1.4	58	14.8±1.8	24	11.8±2.3	113	11.5±1.0	0.001	13.293
Intrauterine infections	1	8.3±8	24	6.4±1.3	41	10.4±1.5	13	6.4±1.7	79	8.0±0.9	0.000	32.578
Birth trauma	0	0	24	6.4±1.3	57	14.5±1.8	18	8.9±2.0	99	10.1±1.0	0.001	18.254
Perinatal injuries of central nervous system	0	0	21	5.6±1.2	19	4.8±1.1	17	8.4±1.9	57	5.8±7.0	0.070	8.661

There were no statistically significant differences between the groups in the course of labor. The frequency of premature births (at 28-37 weeks of pregnancy) was observed in 21 (2.1±0.5%) and 2 (1.7±0.8%) women in the groups with bronchial asthma and acute bronchitis with bronchial obstructive syndrome (p=0.671). The remaining children were born at term. The distribution of the number of premature births in mothers of children with moderate bronchial asthma was 2.1±0.7%, with moderate bronchial asthma and allergic rhinitis – 1.8±0.7%, with severe bronchial asthma – 3.0±1.2%. Preterm birth was observed 1.4–1.7 times more often in mothers of children with severe bronchial asthma compared to isolated moderate bronchial asthma and bronchial asthma with concomitant allergic rhinitis (χ^2=21.930; p=0.005).

Multiple pregnancies were observed in 9 (0.90±0.3%) mothers of the examined patients with bronchial asthma and 1 (0.86±0.2%) mother of a patient with acute bronchitis with bronchial obstructive syndrome (p=0.911). The distribution of the number of multiple pregnancies in mothers of children with moderate bronchial asthma was 0.8±0.15%, with moderate bronchial asthma and allergic rhinitis 0.5±0.4%, and with severe bronchial asthma 2.0±1.0% (χ^2=4.838; p=0.304).

The results of the study showed that different pathology of pregnancy was more often diagnosed in mothers of children with both moderately severe course of bronchial asthma and concomitant allergic rhinitis and was not found in the group of children with mild persistent course of the disease.

The neonatal period in the history of the examined patients was also characterized by a complicated course (Table 4). Birth asphyxia in the history of children with bronchial asthma was noted in 11.5±1.0% of cases. Moreover, no asphyxia was registered in patients with a mild degree of bronchial asthma in anamnesis. In a moderate course of the disease, birth asphyxia was diagnosed in 8.3±1.4% of children, in a severe course – in 11.8±2.3%, in a moderate course with concomitant allergic rhinitis – in 14.8±1.8% (χ^2=13.293; p=0.001). The value of the odds ratio for the development of bronchial asthma in children depending on the factor of birth asphyxia was OR=4.7 (95%CI: 1.5–14.4; p<0.05).

Asphyxia in labor can be caused by intrauterine hypoxia of the fetus against the background of obstetric and gynecological or somatic complications in the mother, as well as congenital lung malformations [1,3,15]. Severe asphyxia can lead to dysfunction of many organs and systems [15]. Perinatal hypoxia recorded in children with moderate and severe bronchial asthma can lead to central nervous system (CNS) damage in the future.

Among all perinatal factors, the birth traumatic factor causes both mechanical damage and various disorders of cerebral hemodynamics. Thus, birth trauma in all examined patients with bronchial asthma was diagnosed in 10.1±1.0% of cases. As in the case of asphyxia in labor, no cases of birth trauma were recorded in the mild course of the disease.

In the moderate course of the disease, birth trauma was diagnosed in 6.4±1.3% of children, in the severe course in 6.4±1.7%, and in the moderate course with concomitant allergic rhinitis in 14.5±1.8% (χ^2=18.254; p=0.001). The value of the odds ratio of bronchial asthma development in children depending on the birth trauma factor was OR=5.1 (95%CI: 1.4–18.1; p<0.05).

Functional immaturity of organs and systems caused by perinatal CNS damage is accompanied by impaired adaptation processes and decreased resistance to unfavorable exogenous factors, which predisposes to earlier development of bronchial asthma

Table 5

Parental age

Indicators		N	Medium	Std. error	Medium 95% CI for		Min	Max	PF	PH
					down border	up border				
Father's age	Obstructive bronchitis	103	33.3	0.6	32.1	34.4	24	56	<0.001	<0.001
	Mild asthma	9	41.3	2.7	35.1	47.6	26	51		
	Moderate asthma	267	39.8	0.4	39.0	40.6	26	57		
	Moderate asthma and allergic rhinitis	300	42.1	0.4	41.3	42.8	26	70		
	Severe asthma	149	43.3	0.6	42.1	44.4	30	63		
	Total	828	40.5	0.3	40.0	41.0	24	70		
Mother's age	Obstructive bronchitis	103	28.8	0.5	27.8	29.9	20	54	<0.001	<0.001
	Mild asthma	9	34.8	2.4	29.3	40.2	23	45		
	Moderate asthma	266	35.2	0.4	34.4	36.0	21	54		
	Moderate asthma and allergic rhinitis	301	37.1	0.4	36.4	37.8	21	55		
	Severe asthma	149	38.7	0.5	37.7	39.7	26	57		
	Total	828	35.7	0.2	35.3	36.2	20	57		

Table 6

The nature of the burden of family history of allergy

Allergic diseases	Bronchial asthma		Acute bronchitis with bronchial obstructive syndrome		P	Chi-square
	n	%	n	%		
Allergic diseases on the mother's side	227	23.10±1.3	9	7.8±2.5	0.000	14.468
Allergic diseases on the father's side	241	24.5±1.4	7	6.0±2.2	0.000	20.283
Allergic diseases on both sides of the family	399	40.6±1.6	15	12.9±3.1	0.000	33.806

in children [15]. The incidence of perinatal CNS lesions in the general group of bronchial asthma patients was 5.8±7.0%, in moderate asthma – 5.6±1.2%, in severe asthma – 8.4±1.9%, in moderate asthma with concomitant allergic rhinitis – 4.8±1.1% (χ^2=8.661; p=0.070).

The age of the patient's parents at the time of childbirth was analyzed (Table 5). Thus, the mean age of the fathers of children with bronchial asthma was 40.5±0.3 years (95% CI:40.0–41.0 years), and of children with acute bronchitis with bronchial obstructive syndrome was 33.3±0.6 years (95% CI: 32.1–34.4 years p<0.001). The mean age of the mothers of children with bronchial asthma was 35.7±0.3 years (95% CI: 35.3–36.2 years) and of those with acute bronchitis with bronchial obstructive syndrome was 28.8±0.5 years (95% CI: 27.8–29.9 years; p<0.001). The value of the OR of developing bronchial asthma in children depending on the factor of the father's age was OR=2.4 (95% CI: 1.1–5.2; p<0.05). The value of the OR of bronchial asthma development in children depending on the factor of the mother's age was not reliable: OR=0.8 (95% CI: 0.4–1.7; p>0.05).

We analyzed the hereditary family history of allergy of the examined children. The burdened heredity for bronchial asthma and other atopic diseases was clarified. Other allergic diseases included allergic rhinitis, allergic conjunctivitis, acute and recurrent urticaria, acute allergic reaction, and atopic dermatitis [7,10,13,16]. The data are presented in Table 6.

When collecting the family allergologic anamnesis, it was noted that in 88.2% of children with bronchial asthma, parents and close relatives had an aggravated family history of allergy, while in the group of children with acute bronchitis with bronchial obstructive syndrome, an indication in the genealogical anamnesis of the presence of allergic pathology was present only in 26.7% of cases (p<0.001). According to the obtained statistical data, the family

history of allergy increased from acute bronchitis with bronchial obstructive syndrome to bronchial asthma.

It was found that 9 (7.8±2.5%) children with acute bronchitis with bronchial obstructive syndrome and 227 (23.1±1.3%) children with bronchial asthma had a maternal hereditary predisposition to allergic diseases (χ^2=14.468; p=0.000). At the same time, maternal aggravated heredity was detected in 4 (33.3±13.6%) children with mild course of the disease, 70 (18.7%±2.0%) with moderate course, 101 (25.7%±2.2%) with moderate course and concomitant allergic rhinitis, and 52 (25.6%) children with severe bronchial asthma (p<0.001). The value of the OR of bronchial asthma development in children depending on the factor of maternal allergic diseases was OR=3.3 (95% CI: 1.4–7.7; p<0.05).

Paternal allergic disease symptoms were noted in 7 (6.0±2.2%) patients with acute bronchitis with bronchial obstructive syndrome and in 241 (24.5±1.4%) children with bronchial asthma (χ2=20.283; p=0.000). Aggravated paternal heredity was detected in 80 (21.3±2.1%) patients with a moderate course of bronchial asthma, in 109 (27.7±2.3%) with a moderate course and concomitant allergic rhinitis, and 52 (25.6±3.1%) with severe bronchial asthma. In children with a mild form of the disease, no cases of aggravated heredity on the paternal line were detected (p<0.001). The value of the odds ratio of bronchial asthma development in children depending on the factor of allergic diseases in the father was OR=3.4 (95%CI: 1.3–8.5; p<0.05).

The combination of clinical manifestations of allergy in both lines of descent had 15 (12.9±3.1%) patients with acute bronchitis with bronchial obstructive syndrome and 399 (40.6±1.6%) with bronchial asthma (χ^2=33.806; p=0.000). Aggravated heredity in both lines of descent was found in 5 (41.7±14.2%) children with a mild course of the disease, 134 (35.7±2.5%) with a moderate course, 169 (43.0±2.5%) with a moderate course and concomitant allergic rhinitis, and 91 (44.8±3.5%) with severe bronchial asthma (p<0.001). The value of the odds ratio for the development of bronchial asthma in children depending on the factor of the presence of allergic diseases in both lines of descent was OR=2.2 (95% CI: 1.1–4.5; p<0.05).

Thus, the analysis of hereditary predisposition depending on the degree of severity showed that the presence of various allergic pathologies in the family history is more often detected in the group of children with severe bronchial asthma, which may contribute to the early onset of the disease and influences its formation.

Recurrent respiratory infections and inflammatory processes in the upper respiratory tract can take a chronic character, increase bronchial hyperreactivity, worsen bronchial asthma control, and contribute to the formation of chronic obstructive pulmonary disease in the future [11,12,14,17–19]. In 496 (50.5±1.6%) children with bronchial asthma, the most frequent history was indications of various pathologies of ENT organs (rhinitis, sinusitis, adenoiditis, tonsillitis). In the group of children with acute bronchitis with bronchial obstructive syndrome, diseases of ENT organs were noted in the anamnesis of 12 (10.3±2.8%) patients (χ^2=11.484; p=0.022). On objective examination, hypertrophy of palatine tonsils of different degrees of severity was noted in children. In the mild form of bronchial asthma, these conditions were noted in 4 (33.3±13.6%) observations, in the moderate form – in 5 (1.3±0.6%), in the severe form – in 120 (59.1±3.5%), in the moderate form of bronchial asthma with concomitant allergic rhinitis – in 367 (93.4±1.3%)

When analyzing concomitant pathology, it was found that infectious and helminthic-parasitic diseases were most frequently observed in children with bronchial asthma – in 516 (52.5±1.6%) cases, whereas in children with acute bronchitis with bronchial obstructive syndrome – in 14 (12.1±3.0%) cases (χ^2=71.026; p=0.000) (Table 7). Such anthelmintic-parasitic diseases as enterobiasis, ascariasis, giardiasis, trichocephalosis, as well as staphylococcal and streptococcal infections and candidiasis were diagnosed in the examined children. In the mild form of bronchial asthma, infectious and parasitic diseases were noted in 4 (33.3±13.6%) observations, in the moderate form – in 206 (54.9±2.6%), in the severe form – in 102 (50.2±3.5%), in the moderate form of bronchial asthma with concomitant allergic rhinitis – in 204 (51.9±2.5%) cases (p<0.001). The value of the odds ratio of the development of bronchial asthma in children depending on the factor of the presence of worm-parasitic invasions was OR=11.9 (95% CI: 5.6–25.4; p<0.05).

Iron-deficiency anemia was noted in 460 (46.8±1.6%) patients with bronchial asthma and in 41 (35.3±3.4%) patients with acute bronchitis with bronchial obstructive syndrome (χ^2=24.024; p=0.000). Anemia was diagnosed in 4 (33.3±13.6%)

Table 7

Concomitant diseases in patients with bronchial asthma and obstructive bronchitis

Parametrs	Anemia		Acute respiratory diseases		Infections pneumonia		Endocrine diseases		Infectious and parasitic diseases		Kidney diseases	
	n	%	n	%	n	%	n	%	n	%	n	%
Total	460	46.8±1.6	23	2.3±0.5	496	50.5±1.6	30	3.1±0.5	516	52.5±1.6	12	1.2±0.4
Mild asthma	4	33.3±13.6	2	16.7±10.8	4	33.3±13.6	0	0	4	33.3±13.6	0	0
Moderate asthma	206	54.9±2.6	8	2.1±0.7	5	1.3±0.6	8	2.1±0.7	206	54.9±2.6	4	1.1±0.5
Moderate asthma and allergic rhinitis	173	44.0±2.5	10	2.5±0.8	367	93.4±1.3	10	2.5±0.8	204	51.9±2.5	5	1.3±0.6
Severe asthma	77	37.9±3.4	3	1.5±0.8	120	59.1±3.5	12	5.9±1.7	102	50.2±3.5	3	1.5±0.8
Obstructive bronchitis	41	35.3±3.4	3	2.6±1.5	12	10.3±2.8	3	2.6±1.5	14	12.1±3	4	3.4±1.7
P	0.000		0.073		0.022		0.108		0.000		0.423	
Chi-square	24.024		8.572		11.484		7.593		71.026		3.876	

patients with mild bronchial asthma, 206 (54.9±2.6%) patients with moderate asthma, 77 (37.9±3.4%) patients with severe asthma, and 173 (44.0±2.5%) patients with moderate bronchial asthma with concomitant allergic rhinitis ($p<0.001$).

Analysis of the morbidity structure in children showed that in the group of patients with bronchial asthma, the debut respiratory disease was the development of ARVİ with upper and lower respiratory tract involvement [20,21,22]. Acute respiratory diseases were diagnosed in 23 (2.3±0.5%) cases in patients with bronchial asthma, and in 3 (2.6±1.5%) observations in patients with acute bronchitis with bronchial obstructive syndrome. The differences between the groups were not statistically significant ($\chi^2=8.572$; $p=0.073$). Respiratory diseases were detected in 2 (16.7±10.8%) cases in children with mild form of bronchial asthma, in 8 (2.1±0.7%) cases in children with moderate form, in 3 (1.5±0.8%) cases in children with severe form and in 10 (2.5±0.8%) cases in children with moderate form of bronchial asthma and concomitant allergic rhinitis ($p<0.05$). The maximum incidence of acute respiratory infections was observed at the age of 3–7 years, which could be associated with the beginning of children's attendance at preschool institutions. The value of the OR of bronchial asthma development in children depending on the factor of ARVI presence was OR=10.9 (95% CI: 1.4–86.0; $p<0.05$).

Endocrine pathology in children was represented by obesity and hypotrophy at an early age. Endocrine diseases were noted in the history of 30 (3.1±0.5%) children with bronchial asthma and in 3 (2.6±1.5%) with acute bronchitis with bronchial obstructive syndrome, which, however, was not supported by statistical reliability ($\chi^2=7.593$; $p=0.108$). Endocrine diseases were identified in 8 (2.1±0.7%) cases in children with moderate bronchial asthma, 12 (5.9±1.7%) cases in children with severe form, and 10 (2.5±0.8%) cases in children with moderate bronchial asthma and concomitant allergic rhinitis ($p<0.05$). Endocrine system diseases were not encountered in children with mild severity of bronchial asthma. It should be noted that some endocrine disorders are likely to influence the course and severity of bronchial asthma. As a risk factor, obesity contributes to the development of bronchial asthma, but it also has a direct impact on the severity of its course and control of the disease.

Diseases of the renal and urinary systems were represented in our study by dysmetabolic nephropathy, glomerulonephritis, pyelonephritis, and cystitis. In patients with bronchial asthma, these diseases were found in 12 (1.2±0.4%) cases, in patients with acute bronchitis with bronchial obstructive syndrome – in 4 (3.4±1.7%). No statistically significant differences were observed ($\chi^2=3.876$; $p=0.423$). Diseases of the renal and urinary systems were diagnosed in 4 (1.1±0.5%) children with a moderate form of bronchial asthma, in 3 (1.5±0.8%) children with a severe form, and in 5 (1.3±0.6%) children with a moderate form of bronchial asthma and concomitant allergic rhinitis ($p>0.05$). These diseases did not occur in children with mild severity of bronchial asthma.

We also retrospectively studied the morbidity of the examined children in infancy. The most frequently diagnosed pathologies in children under

Table 8

Diseases of children under 1 year of age depending on the severity of bronchial asthma

Unfavorable factors	Number of patients								R	Chi-square
	Mild asthma		Moderate asthma		Moderate asthma and allergic rhinitis		Severe asthma			
	n	%	n	%	n	%	n	%		
Allergic diseases	1	8.8±8	61	16.3±1.9	98	24.9±2.2	49	24.1±3.0	0,001	19.118
Infectious diseases	0	0	19	5.1±1.1	21	5.3±1.1	22	10.8±2.2	0.043	9.853
Congenital defects	0	0	6	1.6±0.6	372	94.7±1.1	0	0	0.288	4.997

1 year of age were diathesis, infectious diseases, and congenital malformations of the tracheobronchial tree (Table 8).

A large number of patients with allergic diseases were recorded during the work. In the first year of life, the clinical manifestations of allergic diseases (atopy) in children were food allergy and atopic dermatitis, with food allergy peaking at about 6 months of age and atopic dermatitis at 1–1.5 years of age. According to the results of our study, concomitant allergic pathology was diagnosed in 209 (21.3±1.3%) patients with bronchial asthma and in 12 (10.3±2.8%) patients with acute bronchitis with bronchial obstructive syndrome (χ^2=7.697; p=0.006). Concomitant allergopathology was identified in 1 (8.8±8.0%) observation in mild course of bronchial asthma, in 61 (16.3±1.9%) cases in children with a moderate course, in 49 (24.1±3.0%) cases in children with a severe course, and in 98 (24.9±2.2%) cases in children with a moderate course of bronchial asthma and concomitant allergic rhinitis (χ^2=19.118; p=0,001).

Various staphylococcal and streptococcal infections in children under 1 year of age were recorded in the history of 62 (6.3±0.8%) children with bronchial asthma and 6 (5.2±2.1%) children with acute bronchitis with bronchial obstructive syndrome (χ^2=0.230; p=0.631). Depending on the severity of the course of bronchial asthma, these infections were diagnosed in 19 (5.1±1.1%) patients with a moderate course of the disease, in 22 (10.8±2.2%) with a severe course, and in 21 (5.3±1.1%) with a moderate course with concomitant allergic rhinitis (χ^2=9.853; p=0.043).

Congenital malformations of trachea and bronchi arise due to disruption of embryonic formation of bronchopulmonary structures and are manifested by changes in shape, size, structure, and localization. Congenital malformations of the tracheobronchial tree were noted in the anamnesis of 11 (1.1±0.3%) children with bronchial asthma. In patients with acute bronchitis with bronchial obstructive syndrome this pathology was not observed (χ^2=1.311; p=0.252).

Conclusion

The results of the study showed that various perinatal pathologies are more often diagnosed in mothers of children with both moderate bronchial asthma and concomitant allergic rhinitis, in children with severe asthma and do not occur in the group of children with mild persistent disease, preeclampsia was the most commonly encountered condition. In general, concomitant diseases were significantly more common in children with severe bronchial asthma compared to mild and moderate ($p<0.05$). It was established that the most common conditions in children with asthma were infectious and helminthic-parasitic diseases, ENT disorders and iron-deficiency anemia.

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