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PREDICTIVE FACTORS OF BRONCHIAL OBSTRUCTION IN RECURRENT CHILDHOOD BRONCHITIS

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ХУЛОСА

Тадқиқотнинг мақсади. *Тадқиқотимиздан мақсад қайталовчи бронхит билан касалланган болаларда бронхиал обструкция синдромнинг ривожланиши учун хавф омиллари онасининг акушерлик ва соматик анамнезини аниқлаш.*

Материал ва усуллар. *Тадқиқотга 1 ёшдан 15 ёшгача бўлган 164 нафар бронхиал обструктив синдром (БОС) билан кечувчи қайталанувчи бронхитли бола жалб этилди. Таққослаш гуруҳи таркибига 105 нафар ўткир обструктив бронхит (ООБ) билан касалланган бола, 76 нафар бронхиал астма (БА) билан оғриган бола ва 50 нафар соғлом бола (бир хил ёшдаги назорат гуруҳи) киритилди.*

Натижалар. *Тадқиқотдан ўтган болаларда преморбид фонни таҳлил қилиш шуни кўрсатдики, қайталанувчи бронхиал обструкция (ҚБО) кечиши анемия (78,0%) фонида ишончли даражада кўпроқ кузатилган. Озиқланишнинг сурункали бузилишлари, яъни 2- даражали оқсил-энергия танқислиги, ҚБО ва бронхиал астма (БА) билан касалланган болаларда бир хил тезликда учраган. Диатез ва овқат аллергияси эса БА билан касалланган болаларда кўпроқ қайд этилган (47,4% га нисбатан 23,8%), овқат аллергияси – 60,5% га нисбатан 28,0%.*

Хулоса. *Тадқиқотимиз натижаси шуни кўрсатадики ўткир респиратор инфекция юқори частотали болаларда РОБ ривожланиши учун хавф гуруҳларини ташкил қилади. Ҳомиладорлик даврларида камқонлик, ЎРВИ, шунингдек туғруқдаги асфиксия болаларда қайталанувчи бронхитнинг ривожланиши учун прогностик салбий омил ҳисобланади. Чалалик ва абортлар, бундан ташқари аллергик касалликлар, сурункали ЛОР патологиялари бронхиал обструкция қайталанувчи кечуви учун салбий омил бўлиб ҳисобланади.*

Калит сўзлар: *болалар, бронхиальная обструкция, бронхит, хавф омили.*

РЕЗЮМЕ

Целью настоящего исследования *являлось выявление факторов риска, способствующих формированию рецидивирующей бронхиальной обструкции у детей, на основании анализа акушерского и соматического анамнеза их матерей.*

Материал и методы исследования. *В исследование были включены 164 ребёнка в возрасте от 1 до 15 лет, страдающих рецидивирующим бронхитом, сопровождающимся бронхообструктивным синдромом (БОС). У всех обследованных пациентов эпизоды бронхиальной обструкции имели повторяющийся характер, проявляясь три и более раза в течение года. Для сопоставления были сформированы контрольные группы: 105 детей с острым обструктивным бронхитом (ООБ), 76 детей с бронхиальной астмой (БА), а также 50 практически здоровых детей того же возраста, составивших контрольную группу.*

Результаты. *Анализ преморбидного фона показал, что у детей с рецидивирующей бронхиальной обструкцией (РБО) заболевание достоверно чаще протекало на фоне анемии (78,0%). Хронические нарушения питания в форме белково-энергетической недостаточности I–II степени отмечались с одинаковой частотой у детей с РБО и БА. Диатезы и пищевая аллергия регистрировались преимущественно у детей с БА – 47,4% против 23,8% в группе РБО; при этом пищевая аллергия встречалась соответственно в 60,5% и 28,0% случаев.*

Заключение. *Проведённое исследование показало, что дети, часто болеющие острыми респираторными вирусными инфекциями (ОРВИ), относятся к группе повышенного риска по развитию рецидивирующего бронхообструктивного синдрома. Кроме того, анемия и ОРВИ у матерей во время беременности, а также асфиксия в родах являются неблагоприятными прогностическими факторами, повышающими вероятность развития рецидивирующего бронхита у детей в последующем.*

Ключевые слова: *дети, бронхиальная обструкция, бронхит, фактор риска.*

Bronchitis remains one of the most widespread respiratory conditions in the pediatric population and is often characterized by recurrent episodes and a prolonged clinical course. Preventing recurrent bronchial obstruction continues to be one of the most urgent and complex challenges in pediatric practice. In recent years, the increasing incidence of acute obstructive bronchitis (AOB) with recurrent manifestations has been further complicated by the high rate of bronchial obstruction syndrome (BOS) relapses occurring within several weeks after hos-

pital discharge. Such cases frequently progress to persistent recurrent bronchial obstruction (RBO) or eventually to bronchial asthma (BA) [1,6]. Multiple studies have shown that in infants and preschool-aged children, a combination of adverse environmental and perinatal factors plays a significant role in the onset of recurrent bronchitis. Contributing factors include air pollution, passive exposure to tobacco smoke, poor socioeconomic and living conditions, and frequent contact with infectious agents in crowded environments such as preschools. Among perinatal influences, threatened miscarriage, previous stillbirths, and intrauterine infections are of particular significance. Recent research also indicates that respiratory viral infections may induce temporary bronchial hyperreactivity lasting 4–6 weeks after illness onset, caused by the irritation of submucosal nerve endings by pathogenic microorganisms.

A comprehensive analysis of both domestic and international studies highlights several main categories of factors that most frequently predispose children to recurrent bronchial obstruction in the setting of respiratory infections. One of the key pathogenetic mechanisms is the development of bronchial hyperreactivity following an acute lower respiratory tract infection [2,3].

THE AIM OF THE STUDY

To determine the risk factors for the formation of recurrent bronchial obstruction based on the obstetric and somatic history of mothers**.**

MATERIAL AND METHODS

The study included 164 children aged 1–15 years who were diagnosed with recurrent bronchitis associated with bronchial obstruction syndrome (BOS). In all participants, BOS exhibited a recurrent course, characterized by three or more episodes within one year. The diagnosis was established based on clinical and anamnestic data, supported by standardized diagnostic procedures, including laboratory and instrumental assessments such as spirometry with a bronchodilator test, chest X-ray (when indicated), and a structured questionnaire specifically designed for this study. For comparison, three groups were formed: 105 children with acute obstructive bronchitis (AOB), 76 children with bronchial asthma (BA), and 50 age-matched healthy children, who served as the control group.

RESULTS AND DISCUSSION

Comparative analysis showed that the largest proportion of children with RBO were aged 3–7 years (35.4%) (Fig. 1). This age predominance corresponds to the developmental characteristics of the respiratory and immune systems, which are still undergoing maturation. Between ages 1 and 6, immune responses to infectious antigens are reoriented, resulting in higher susceptibility to respiratory infections. In early childhood, the differentiation of bronchopulmonary structures and mucosal defenses is still in progress. The biocenosis of the upper respiratory tract is unstable and polymorphic, evolving under environmental influences and age-related changes [4,5].

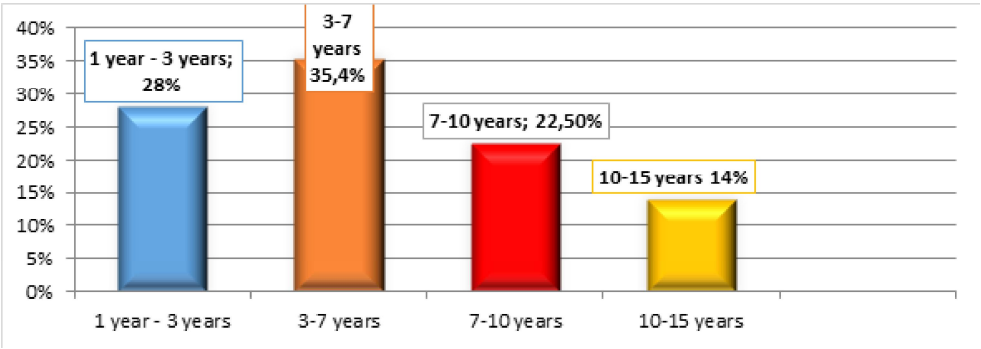

Fig. 1. Prevalence of RB in children, depending on age, %.

Recurrent bronchitis (RB) associated with BOS is often considered an early manifestation of atopic predisposition, especially in children whose BOS episodes coincide with acute respiratory infections. Clinically, BOS is most common in children categorized as “frequently ill”, i.e., those who experienced 7–8 or more upper respiratory infections per year during the first three years of life, or 5–6 infections annually at preschool and early school ages [3,7]. In the present study, a considerable portion of participants fit this category: 41 children (39.0%) in the AOB group, 128 children (78.0%) in the RBO group, and 36 children (47.4%) in the BA group. The frequency of acute respiratory viral infections (ARVI) was particularly high in children aged 1–3 years (78.3%) and 3–7 years (84.5%). Notably, respiratory infections occurring during the first year of life were associated with an increased risk of subsequent recurrent bronchitis. In children with RBO, the rate of early viral infections was significantly higher than in those with AOB (78% vs. 39%, $p < 0.05$). Age-based analysis also showed that recurrent bronchitis occurred most frequently among children aged 3–7 years (84.5%), while the lowest rate was recorded in those aged 7–10 years (39.1%). Children frequently affected by ARVI were therefore at a higher risk for developing RBO. This predisposition is explained by transient bronchial hyperreactivity lasting 4–6 weeks after infection and by direct viral-induced mast cell activation, which releases histamine and inflammatory mediators that affect smooth muscle tone, goblet cells, and blood vessels–contributing to recurrent obstruction. Importantly, even

after clinical recovery from ARVI, signs of airway hyperreactivity may persist for several weeks, facilitating subsequent respiratory episodes. Analysis of the maternal obstetric and somatic history revealed that most affected children were born from second or third pregnancies. Among their mothers, 62.2% had anemia during pregnancy, 44.5% experienced toxicosis, 8.5% had previous abortions, and 34.1% took medications while pregnant. Most children with RBO were born at term; however, 26.2% were premature, and 14.3% experienced perinatal asphyxia (Figure 2). Previous abortions were nearly twice as common among mothers of children with RBO compared with those in the AOB group. Among maternal complications, ARVI during pregnancy was the most frequent (51.8%). Statistical analysis confirmed that maternal anemia represents an unfavorable prognostic factor for the future development of recurrent bronchitis and bronchial asthma in children. Examination of the premorbid background revealed that RBO was more commonly associated with: Anemia (78.0%), Protein-energy deficiency (26.2%), Food allergies (28.0%), and Chronic ENT infections (39.0%) compared with the control group (18.0%, $p < 0.05$). Coexisting allergic diseases were also shown to worsen the clinical course and predispose to recurrence (Fig.2).

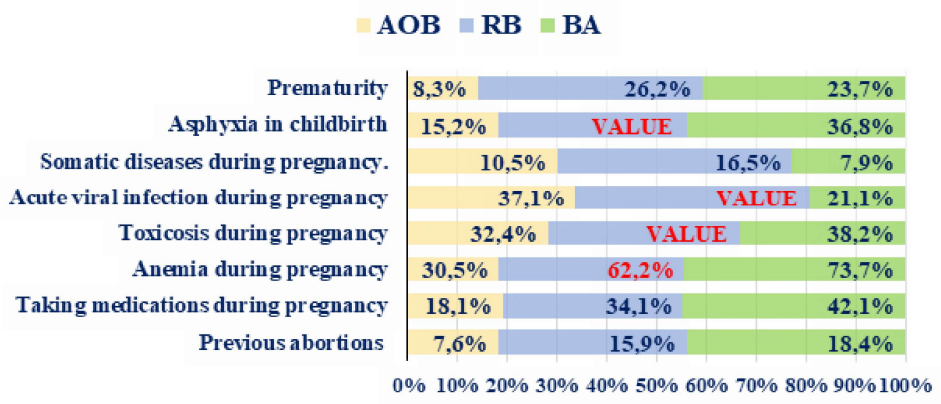

Fig. 2 Risk factors based on obstetric and somatic history of mothers in children with RB, %

Analysis of the premorbid background in the examined groups of children demonstrated that the course of recurrent bronchial obstruction (RBO) was significantly more common in the presence of anemia (78.0%). Chronic nutritional disorders, manifested as grade 1–2 protein-energy deficiency, occurred with comparable frequency among children with RBO and those with atopic dermatitis (AD). Diathesis and food allergies were notably more prevalent in the AD group (47.4% vs. 23.8%), while food allergies alone were also observed more frequently (60.5% vs. 28.0%). Furthermore, chronic foci of ENT infections were detected significantly more often among children with RBO (39.0%) compared with the control group (18.0%) ($p < 0.05$). The presence of concomitant allergic diseases was identified as an unfavorable prognostic factor, contributing to the recurrent course of bronchial obstruction syndrome (BOS) (table).

Results of a comparative analysis of the premorbid background in the examined children, %

Premorbid background	RBO		AOB		BA		Контроль		P
	n	%	n	%	n	%	n	%	
Anemia	128	78,0	52	49,5	51	67,1	18	36,0*	t=4.88 p<0,001
Protein energy deficiency	43	26,2	14	13,3	16	21,1	6	12,0*	t=2.70 p=0.007
Paratrophy	31	18,9	8	7,6	17	22,4	5	10,0*	
Diatheses	39	23,8	18	17,1	36	47,4*	7	14,0	t=2.74 p=0.006
Psychomotor development delay	11	6,7	8	7,6	8	10,5	8	16,0	
Food allergy	46	28,0*	16	15,2	46	60,5**	4	8,0*	t=4.91 p<0,001
Chronic infections ENT organs	64	39,0	29	27,61	22	28,90	9	18,0*	t=3.17 p=0.0017

Note: p<0.001-p<0.05-statistically significant differences between the study groups

CONCLUSION

In children suffering from bronchitis, the leading causes of protein-energy deficiency (PED) and anemia were found to be nutritional in origin. These included an early transition to artificial or mixed feeding, as well as imbalanced diets deficient in essential proteins, vitamins, and trace elements necessary for normal growth and immune system development. Such deficiencies can impair the body's resistance to infections, weaken mucosal barriers, and reduce the regenerative capacity of respiratory tissues, thereby creating a background favorable for chronic or recurrent respiratory diseases. The influence of premorbid (pre-existing) factors on the development of bronchial obstruction syndrome (BOS) is well rec-

ognized in pediatric pulmonology. Our findings confirm that several interrelated maternal and child factors play a crucial role in the formation of recurrent bronchial obstruction (RBO). Key among these are: Frequent acute respiratory viral infections (ARVI) during early childhood, which increase airway hyperreactivity and inflammation; Maternal anemia and ARVI during pregnancy, which adversely affect fetal oxygenation and immune system development; and Perinatal asphyxia, which can lead to postnatal hypoxia and long-term respiratory vulnerability. In addition, premature birth, a history of maternal abortions, chronic ENT infections, and the presence of allergic diseases were identified as secondary but significant contributors to the recurrent course of bronchial obstruction. These conditions either impair the structural integrity of the respiratory mucosa, increase microbial colonization, or perpetuate immune dysregulation, thus predisposing the child to repeated bronchial episodes. The combination of these clinical and anamnestic features allows for the identification of high-risk groups – children who are more likely to develop recurrent bronchitis with BOS. Recognizing these risk profiles enables clinicians to implement proactive diagnostic screening and preventive interventions long before the disease manifests clinically. Moving forward, further in-depth research into the pathogenetic and genetic mechanisms underlying recurrent bronchitis as a multifactorial disorder is essential. Understanding the molecular pathways and genetic susceptibility factors will help in developing personalized preventive and therapeutic strategies, optimizing long-term respiratory health outcomes in children.

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