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**Anamnestic risk factors for the formation of bronchial asthma in infants**

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Introduction: Allergies rank as some of the most common chronic health conditions in the modern world. Almost 700 million people worldwide suffer from this disorder [1,2]. Almost 330 million of these patients have respiratory diseases and suffer from bronchial asthma (BA) [3,4]. Bearing in mind that chronic inflammation is the main link in the pathogenesis of asthma of the bronchopulmonary system, the formation of the disorder mainly begins in early childhood [5,6]. Therefore, an important issue today is the early recognition of asthma development in the early stages. The problem of medical society at this stage is the interest in early diagnosis of the disease, because the onset of the disease, namely, manifestations of bronchial obstructive syndrome (BOS) are most often observed up to 6 years of age [5,6,7,]. However, late diagnosis entails the formation of chronic bronchopulmonary disease in children with recurrent BOS [5]. The main difficulty in identifying the onset of BA in children under 6 years of age is that BOS is accompanied by a large number of nosological forms. Yet, diagnosis and differential diagnosis of these diseases in children cause some difficulties [8]. The prevalence of BOS in recent years has increased and is 16.1% [9]. About half of young children with acute bronchitis develop symptoms of BOS. BOS recurrences, namely repeated episodes of prolonged exhalation, occur in 32.2% of children [9,10]. Approximately 30% of first-year children have at least one episode of BOS, and in 20% of children the symptoms of BOS persist later on [10]. One in every four children under the age of 6 has bronchial obstruction, most often secondary to acute respiratory diseases. The share of BOS secondary to acute respiratory conditions is about 50% in children under 6 years, its recurrence is typical for 25% of children [9,11].

Thus, differential diagnosis of the disease that caused BOS and detection of BA development in the early stages is a pressing issue today.

The purpose of the study: To identify anamnestic risk factors for BA in children with recurrent episodes of BOS.

Materials and methods: The study involved evaluation of clinical data of 94 children (56 boys and 38 girls) aged from 1 to 7 years with repeated episodes of BOS undergoing examination and treatment at the municipal healthcare institution Kharkiv City Clinical Children’s Hospital No. 16. The children were monitored continuously for 5 years to verify BA development.

All patients underwent a comprehensive examination according to the protocol of treatment of children with BA No. 18 of 13.01.2005 “On approval of the Protocols of providing medical care to children in the specialty “Pediatric Pulmonology”, and the protocol of treatment of children with BA No. 868 of 08.10.2013 “On approval and introduction of medical-technological documents on standardization of care in bronchial asthma”.

Statistical analysis of the data was performed using statistical software “EXCEL FOR WINDOWS” and “STATISTICA 8.0. FOR WINDOWS”. Normal distribution of the samples was determined by Gauss's law. The χ2Person test was used to determine the characteristics and strength of the relationship between quality indicators. The study implied assessment of relative risk (RR) of event occurrence with the determination of 95% confidence interval. Characteristics and compliance of the obtained values ​​of statistical criteria were evaluated according to Rea & Parker recommendations.

The planned clinical examinations were approved by the Ethics Committee of Kharkiv National Medical University. The study complied with the principles of Helsinki Declaration. All parents of the children who participated in the study provided informed written consent to participate.

Results of the study: The first group included 62 patients (n = 62, mean age 2.89 ± 1.47 years), diagnosed with acute obstructive bronchitis, the second group included 32 children (n = 32, mean age 4.33 ± 1.57 years), who were diagnosed with asthma. Among the total number of patients, gender distribution showed no statistically significant difference p> 0.05, namely there were 56 (59.57 ± 5.06%) boys and 38 (40.43 ± 5.06%) girls.

Anamnestic data were carefully studied, such as, features of pregnancy, namely threat of miscarriage, TORCH infection and acute diseases or exacerbation of chronic respiratory diseases in the mother during pregnancy, taking into account trimester, preterm birth, delivery and asphyxia in the antenatal period, lower respiratory tract diseases in the neonatal period, IVF in the newborn period, early artificial feeding, frequent acute respiratory and diseases (5 years and over a year) during the first year of life, use of antibacterial therapy in the first 6 months of life, onset of allergic disorders and first episodes of BOS in the first year of life, presence of concomitant allergic diseases (atopic dermatitis and allergic rhinitis), presence of concomitant diseases, family history of allergic diseases. Social-household history was also evaluated, namely smokers in the family, presence of animals. The frequency of risk factors and statistically significant analysis data are presented in Figure 1 and Figure 2.

Further statistical analysis determined the strength of the relationship between the factors that had significant differences and disease formation.

Discussion: Factors that could be considered as risk factors for BA in young children were distinguished during the assessment. The so-called critical periods are distinguished in the antenatal period, during which the fetus is extremely sensitive to the effects of various harmful factors, especially the period of implantation of the fertilized egg and the period of placentation. Adverse effects during these periods lead to various consequences [9]. Therefore, the unfavorable course of pregnancy and the mother's acute respiratory diseases, especially in the first trimester of pregnancy, affect the antenatal period and the formation of the baby's body as a whole, and in particular the bronchopulmonary system. The study showed that compromised obstetric history increases the risk of BA development by 3 times.

The history of frequent acute respiratory diseases, especially in the first year of life, can significantly affect the body's defenses. With this in mind, in the first place, the negative influx will be directed to the immune system and to the further development of chronic diseases of the bronchopulmonary system [14,15]. At the same time, along with frequent respiratory diseases, the development of the immune system is affected by antibacterial therapy. These data were confirmed during the study and statistically significant risk outcomes were obtained. Namely, frequent acute respiratory diseases in the first year of life (5 and more times a year) increase the risk of BA development by 5 times, antibacterial therapy at the age of 6 months increases the risk of BA development by 3 times. Data that frequent respiratory diseases are a significant adverse factor in BA development have been described in modern scientific literature [16]. Whereas asthma is, first and foremost, an allergic disease, and BOS has an allergic link in its pathogenesis, we carefully studied life and, above all, allergic and family history [1,3]. Since concomitant allergic diseases or congenital susceptibility to allergic reactions play a significant role in the formation of the disease [1,2]. The study found that the risk of developing the disease in children with the presence of a common form of atopic dermatitis is 3 times higher, the onset of concomitant allergic diseases, namely first manifestations of atopic dermatitis in the first year of life increases the risk of developing the disease three times, the presence of allergic rhinitis is 2 times higher, compromised family history of allergic diseases increases the risk of BA development in children by 2 times.

Chronic inflammation is considered to be the basis of its pathogenesis, which is determined by the variable narrowing of the bronchi, which is regulated by various cellular elements and mediators of inflammation [5,6]. In every chronic process, early onset of the disease is prognostically unfavorable. Contemporary literature describes the importance of early BOS onset as a predictor of AD development [16]. Therefore, the study paid attention to the early onset of BOS, namely the presence in the history of the first episode of BOS in the first year of life. The findings revealed the patterns of bronchial asthma formation in children under 6 years of age, with recurrent episodes of BOS. Thus, a history of the first episode of BOS up to 1 year increases the risk of developing the disease twice.

Social and household factors play an important role in the development and formation of functions of the bronchopulmonary system. This is due to the direct influence of exogenous factors on the respiratory tract [12]. So exogenous factors include smokers in the family, pollution, presence of animals in the house, the use of various chemicals in everyday life [12,13]. All of the above relates to inhalation agents, which contributes to the pathological restructuring of the respiratory tract. As for social and household factors, presence of smokers in the family increases the risk of developing the disease by 2 times and the presence of animals in the dwelling by almost 2 times.

The data obtained can be incorporated into an algorithm for the examination of patients with BOS for objective assessment of risk factors and the possibility of BA formation, which is extremely important for pediatric practice. Therefore, careful history taking and identification of these factors is of great importance when managing patients with recurrent episodes of BOS.

Conclusions: BA formation can be affected by unfavorable factors occurring during the course of pregnancy, neonatal period, the period of the first year of life, by compromised family and allergic history, social and living conditions. The course of pregnancy complicated by concomitant bronchopulmonary disease of the mother in the first trimester of pregnancy, frequent acute respiratory diseases in the first year of life (5 or more times a year), antibacterial therapy at the age of 6 months, the first episode of BOS in the first year life, children with common form of atopic dermatitis, onset of concomitant allergic diseases in the first year of life, allergic rhinitis, compromised family allergic history, smokers in the family, animals in the house increase the risk of BA development in children. Careful history taking and identification of these risk factors can be used to predict the formation of BA in children under 6 years.

**Frequency of adverse factors in children with recurrent episodes of BOS**

**Fig.1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factor | Group 1 (n=62) | | Group 2 (n=32) | | p |
| n | р%±sp% | n | р%±sp% |
| Male sex | 37 | 59.7±6.23 | 19 | 59.4±8.68 | >0.05 |
| Pregnancy complicated by concomitant bronchopulmonary disease of the mother in the first trimester | 11 | 17.74±4.85 | 20 | 62.50±8.56 | < 0.01 |
| Pregnancy complicated by concomitant bronchopulmonary disease of the mother in the second trimester | 6 | 9.68±3.75 | 3 | 9.37±5.15 | >0.05 |
| Pregnancy complicated by concomitant bronchopulmonary disease of the mother in the third trimester | 2 | 3.22±2.24 | 1 | 3.12±3.07 | >0.05 |
| Preterm labor | 1 | 1.61±1.60 | 2 | 6.25±4.30 | >0.05 |
| Labor by cesarean section | 6 | 9.68±3.75 | 5 | 8.06±4.81 | >0.05 |
| Diseases of the lower respiratory tract during infancy | 3 | 4.84±2.72 | 4 | 12.50±5.85 | >0.05 |
| Severe asphyxia during labor | 1 | 1.61±1.60 | 1 | 3.12±3.07 | >0.05 |
| Artificial lung ventilation during infancy | 1 | 1.61±1.60 | 2 | 6.25±4.30 | >0.05 |
| Acute respiratory diseases during the first year of life (5 and more episodes a year) | 28 | 45.16±6.32 | 26 | 87.50±5.85 | < 0.01 |
| Frequent antibacterial therapy at the age under 6 months | 24 | 38.71±6.19 | 25 | 78.13±7.31 | < 0.01 |
| Early artificial feeding | 35 | 59.45±6.24% | 17 | 53.13±8.82 | >0.05 |
| Compromised family history with maternal relatives with BA | 11 | 17.74±4.85 | 14 | 43.75±8.77 | < 0.01 |
| Compromised family history with paternal relatives with BA | 6 | 9.68±3.75 | 4 | 12.50±5.85 | >0.05 |
| A common form of atopic dermatitis | 27 | 43.55±3.00 | 25 | 78.13±7.31 | < 0.01 |
| The onset of manifestations of atopic dermatitis during the first year of life | 22 | 35.48±6.08 | 24 | 75.00±7.65 | < 0.01 |
| Allergic rhinitis | 5 | 8.06±3.46 | 10 | 31.25±8.19 | < 0.01 |
| First BOS episode during the first year of life | 13 | 20.97±5.17 | 14 | 43.75±8.77 | < 0.05 |
| Concomitant ENT disorder | 4 | 6.45±3.12 | 4 | 12.50±5.85 | >0.05 |
| Smokers in the family (passive smoking) | 5 | 8.06±3.46 | 9 | 28.13±5.06 | < 0.01 |
| Animals in the house | 16 | 25.81±5.56 | 15 | 46.87±8.82 | <0.05 |

Note:

1. selective share in percent; sp% is the statistical error of the sample fraction, expressed as a percentage;
2. \* -% of the total number of patients.

**The nature and strength of the association between risk factors and BA formation in children with recurrent BOS episodes**

**Fig.2**

|  |  |  |  |
| --- | --- | --- | --- |
| Factor | **RR** | ***χ2*** | **С’** |
| Pregnancy complicated by concomitant bronchopulmonary disease of the mother during the first trimester | 3.39 [CI 95% 1.91-6.00]\* | 19.130 | 0.582 |
| Acute respiratory diseases during the first year of life (5 and more episodes a year) | 4.75 [CI 95%1.81-12.45]\* | 11.245 | 0.462 |
| Antibacterial therapy at the age under 6 months | 3.28 [CI 95% 1.57-6.83]\* | 13.140 | 0.495 |
| Atopic dermatitis | 2.89 [CI 95% 1.39-6.00]\* | 10.209 | 0.443 |
| Onset of atopic dermatitis during the first year of life | 3.13 [CI 95% 1.57-6.24]\* | 13.189 | 0.496 |
| Allergic rhinitis | 2.39 [CI 95% 1.46-3.96]\* | 8.460 | 0.406 |
| First episode of BOS at the first year of life | 1.9 [CI 95% 1.13-3.30]\*\* | 5.350 | 0.328 |
| Compromised family history with relatives with BA | 2.15 [CI 95% 1.13-3.30]\* | 7.313 | 0.380 |
| Smokers in the family | 2.24 [CI 95% 1.33-3.76]\* | 6.701 | 3.765 |
| Animals in the house | 1.79 [CI 95% 1.04-3.09]\*\* | 4.239 | 0.294 |

Notes:

1. RR is the relative risk of an event occurring with a 95% confidence interval;
2. χ2 is the criterion for assessing the significance of differences in results depending on the interaction of the risk factor;
3. C’ is the normalized value of the Pearson coefficient;
4. \* is the level of statistical significance р˂0.001;
5. \*\* is the level of statistical significance р<0.005.

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**Анамнестичні чинники ризику формування бронхіальної астми у дітей раннього віку.**

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**Вступ.** Алергійні захворювання являють собою одну з головних проблем сьогодення. Майже 700 мільйонів людей у світі страждають на дану патологію. Серед них респіраторні алергози займають значну частку, на даний час близько 330 мільйонів людей страждають на бронхіальну астму.

**Мета дослідження.** Виявити анамнестичні фактори ризику розвитку бронхіальної астми у дітей з повторними епізодами бронхообструктивного синдрому.

**Об’єкт і методи дослідження.** Проведено аналіз клінічних даних 94 дітей у віці від 1 до 7 років з повторними епізодами БОС, що проходили лікування у КЗОЗ «ХМКДЛ № 16». Діти знаходились під постійним динамічним спостереженням протягом 5 років з метою верифікації формування бронхіальної астми. Усім пацієнтам проведено повне дослідження згідно протокольних методик. До першої групи увійшло 62 пацієнта із встановленим діагнозом гострий обструктивний бронхіт, до другої групи увійшло 32 дитини, котрим діагностовано бронхіальну астму.

**Результати досліджень та їх обговорення.**Серед вивчених показників анамнестичних даних виявлено статистично значимі несприятливі чинники формування бронхіальної астми та встановлено характер та силу зв’язку між факторами ризику та формуванням захворювання у дітей з повторними епізодами бронхообструктивного синдрому.

**Висновки.** Отримані дані можуть бути включені в алгоритм обстеження пацієнтів з БОС для об’єктивної оцінки факторів ризику та можливості формування бронхіальної астми, що надзвичайно важливо для педіатричної практики.Тому ретельний збір анамнезу та виявлення цих факторів має велике значення при ведені пацієнтів із повторними епізодами бронхообструктивного синдрому.

**Ключові слова**. **бронхообструктивний синдром, бронхіальна астма, діти, анамнестичні дані, несприятливі чинники.**

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**Введение.** Аллергические заболевания представляют собой одну из главных проблем современного мира. Среди них респираторные аллергозы занимают значительную часть, на данный момент около 330 миллионов людей страдают на бронхиальную астму.

**Цель исследования.**Выявить анамнестические факторы риска развития бронхиальной астмы у детей с повторными эпизодами бронхообструктивного синдрома.

**Объект и методыисследования.**Проведен анализ клинических данных 94 детей в возрасте от 1 до 7 лет с повторными эпизодами бронхообструктивного синдрома, которые проходили обследование и лечение в КУОЗ «ХГДКБ № 16». Дети находились под постоянным динамическим наблюдением в течении 5 лет с целью верификации формирования бронхиальной астмы. В первую группу вошло62 пациентас установленным диагнозом острого обструктивного бронхита, ко второй группе отнесены 32 пациента, которым установлен диагноз бронхиальной астмы.

**Ключевые слова:** бронхообструктивный синдром, бронхиальная астма, дети, анамнестические данные, факторы риска.

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**The risk factors for the formation of bronchial asthma in infants**

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**Introduction.** Allergic diseases are one of the major problems of the present. Almost 700 million people in the world are suffering from this disorder. Respiratory allergies rank as some of the most common chronic health conditions among them. About 330 million people are suffering from bronchial asthma today.

**The aim of the study.** To identify the risk factors for the development of bronchial asthma in children with BOS.

**Objective.** The purpose of this study was to determine the risk factors for asthma formation. The study involved assessment of clinical data of 94 children aged 1 to 7 years with recurrent BOS. Children were observed for 5 years. They were examined and treated at the Children's Clinical Hospital No. 16. The first group included 62 patients with diagnosed acute obstructive bronchitis, and the second group included 32 patients diagnosed with bronchial asthma.

**Results.** Assessment of anamnestic data revealed significant risk factors for the formation of bronchial asthma. The study showed a relationship between the risk factor and the development of the disease in children with recurrent BOS.

**Conclusions.** The obtained data can be used in the algorithm of examination of patients with BOS. The study implied the assessment of risk factors for the formation of bronchial asthma. This is important for pediatric practice. Thorough history taking and determination of risk factors are important when examining patients with recurrent BOS.

**KEYWORDS:** BOS, bronchial asthma, children, anamnestic data, risk factors.

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