

ANAMNESTIC RISK FACTORS FOR ASTHMA DEVELOPMENT IN INFANTS

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Abstract

Introduction. Allergic diseases are one of the major problems of the present responsible for almost 700 million cases in the world. Respiratory allergies rank as the most common chronic health condition among them. About 330 million people have bronchial asthma today. The aim of the study was to identify the risk factors for development of asthma in children with wheezing.

Objective. The purpose of this study was to determine the risk factors for asthma development. The study consisted in assessment of clinical data of 94 children aged 1–7 years with recurrent wheezing. Children were observed for 5 years. The first group included 62 patients with diagnosed acute obstructive bronchitis, and the second group included 32 patients diagnosed with asthma.

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

Conclusions. The obtained data can be used in the algorithm of examination of patients with wheezing. Assessment of risk factors for asthma development is important for pediatric practice. Thorough history taking and determination of risk factors are important when examining patients with recurrent wheezing.

Key words: *wheezing, asthma, children, anamnestic data, risk factors.*

Allergies rank as the most common chronic health conditions in the contemporary world. Almost 700 million people worldwide suffer from this disorder [1, 2]. Almost 330 million of these patients have respiratory diseases and suffer from asthma [3, 4]. Bearing in mind that chronic inflammation is the main link in the pathogenesis of asthma of the bronchopulmonary system, the disorder development mainly begins in early childhood [5, 6]. Therefore, an important issue today is early recognition of asthma development. 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 wheezing are most often observed up to 6 years of age [5–7]. However, late diagnosis entails formation of chronic

bronchopulmonary disease in children with recurrent wheezing [5]. The main difficulty in identifying the onset of asthma in children under 6 years of age is that wheezing is accompanied by a large number of nosological forms. Thus, diagnosis and differential diagnosis of these diseases in children cause some difficulties [6, 8]. The prevalence of wheezing in recent years has increased and is 16.1% [9]. About half of young children with acute bronchitis develop symptoms of wheezing. Recurrent wheezing, 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 wheezing, and in 20% of children the symptoms of wheezing persist later on [6, 10, 12]. One in every four children under the age of 6 has bronchial obstruction, most often secondary to acute respiratory diseases. The share of wheezing secondary to acute respiratory conditions is about 50% in children under 6 years, its recurrence is typical for 25% of children [6, 11, 13].

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Differential diagnosis of the disease that cause wheezing and detection of asthma development in the early stages is a pressing issue today.

2. Purposes, subject and methods

2.1. The purpose of the work was to identify anamnestic risk factors for asthma in children with recurrent wheezing.

2.2. Subjects and methods

The study consisted in evaluation of clinical data from 94 children (56 boys and 38 girls) aged 1 to 7 years with recurrent wheezing, undergoing examination and treatment in the city clinical children's hospital. Children were constantly monitored for 6 years to verify asthma development.

All patients underwent a comprehensive examination according to the protocol of treatment of children with wheezing No. 18 dated 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 asthma No. 868 dated 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". Gaussian normal distribution of the samples was determined. χ^2 Person 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.

Planned clinical examinations were approved by the local ethics committee. The study was in line with the principles of the Helsinki Declaration. All parents of the children who participated in the study gave written consent to participate.

Conflict of interest. There is no conflict of interests.

3. Results

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 ($59.57 \pm 5.06\%$) boys and 38 ($40.4 \pm 5.06\%$) girls.

Anamnestic data, 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 wheezing 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, were carefully studied. Further statistical analysis determined the strength of the relationship between the factors that had significant differences and disease formation. The frequency of risk factors and statistically significant analysis data are presented in *Table 1* and *Table 2*.

4. Discussion. Factors that could be considered as risk factors for asthma 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, 14]. 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 asthma 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 [11, 14, 15]. At the same time, along with frequent respiratory diseases, 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

Table 1

Frequency of adverse factors in children with recurrent wheezing

Factor	Group 1 (n=62)		Group 2 (n=32)		p
	n	p%±sp%	n	p%±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 asthma	11	17.74±4.85	14	43.75±8.77	< 0.01
Compromised family history with paternal relatives with asthma	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 wheezing episode during the first year of life	13	20.97±5.17	14	43.75±8.77	< 0.05
Concomitant otolaryngology 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.

acute respiratory diseases in the first year of life (5 and more times a year) increase the risk of asthma development by 5 times, antibacterial therapy at the age of 6 months increases the risk of asthma development by 3 times. Data that frequent respiratory diseases are a significant adverse factor in asthma development have been described [6, 14, 16]. Whereas asthma is, first and foremost, an allergic disease, and wheezing 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 asthma 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 wheezing onset as a predictor of development asthma [16–18]. Therefore, the study paid attention to the early onset of wheezing, namely the presence in the

Table 2

The nature and strength of the association between risk factors and asthma formation in children with recurrent wheezing

Factor	RR	χ^2	C'
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 wheezing at the first year of life	1.9 [CI 95% 1.13-3.30]**	5.350	0.328
Compromised family history with relatives with asthma	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. χ^2 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 $p < 0.001$;
5. ** is the level of statistical significance $p < 0.005$.

history of the first episode of wheezing in the first year of life. The findings revealed the patterns of asthma formation in children under 6 years of age, with recurrent wheezing. Thus, a history of the first episode of wheezing 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, 18, 19]. Thus exogenous factors include smokers in the family, pollution, presence of animals in the house, the use of various chemicals in everyday life [12, 20, 21]. 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 wheezing for objective assessment of risk factors and the possibility of asthma 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 wheezing.

Conclusions

1. Asthma development can be caused 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.

2. 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 wheezing 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 asthma development in children.

3. Careful history taking and identification of these risk factors should be used to predict asthma development in children under 6 years.

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