

ASSESSMENT OF RISK FACTORS FOR THE DEVELOPMENT OF BRONCHOBSTRUCTIVE SYNDROME IN CHILDREN

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Abstract. Through a retrospective study, we processed 912 medical records of children, aged from 2 months to 5 years, hospitalized in the intensive care unit of pediatrics No. 1 and pediatric intensive care unit of the SFRNCEMP for the period from 2012 to 2015. BOS developed against the background of AOB was diagnosed in 494 (54.2%) children (group 1). In the comparison group, identical in age and gender to the previous one (copy-pair), the diagnosis of OB without symptoms of bronchial obstruction was stated in 418 (45.8%) patients (group 2). In all 494 children, BOS developed against the background of AOB, an acute respiratory disease of the lower respiratory tract.

Keywords: BOS, development of asthma, children.

Material and methods. To achieve our goals, we conducted a cohort study using a retrospective analysis of medical histories of 912 children using a specially developed chart, followed by statistical processing of the material. Data from medical histories, results of anamnestic, objective and laboratory-instrumental research methods were used as sources of information. In the process of studying and comparing the characteristics of the control and experimental groups, out of 49 risk factors we identified, 28 turned out to be the most potential for the occurrence and development of BOS in AOB.

We assessed risk factors for the development of BOS using statistical methods in epidemiological analysis. Determining the frequency of new cases in the two study groups is used as evidence of the influence of any etiological factor. In particular, our cohort study was aimed at finding the causes and risk factors, i.e. to prove etiological hypotheses. In this retrospective epidemiological analysis, our task was to identify the main causes that determine the development of the epidemic process of individual infections among the population served, and to decipher the mechanism of action of these causes.

To compare the sample variances of two series of observations, we used the Pearson χ^2 test, which in statistics is used to compare sample variances and form estimates in regression and variance analysis. If the obtained value of the χ^2 criterion is greater than the critical value, a conclusion was drawn about the presence of a statistical relationship between the studied risk factor and the outcome at the appropriate level of significance.

Results. For all patients, the clinical diagnosis was established based on the results of clinical and laboratory-instrumental research methods. Of the 912 children examined, infants

made up 499 (54.7%), children from 1 to 3 years old made up 277 (30.4%), and children from 3 to 5 years old made up 136 (14.9%). Among all the examined boys there were only 540 (59.2%), girls – 372 (40.8%). In the group of children with BOS against the background of AOB, the number of male patients was 325, where a clear predominance was noted over females (65.8% and 34.2%, respectively). In the second group, among children with OB there were 215 (51.4%) boys and 203 (48.6%) girls, thus we did not note a significant difference in the gender of the patients. Among all those examined, children under 1 year of age suffered from AOB and OB more often (54.7%) than older children (1-3 years - 30.4%; 3-5 years - 14.9%). Among the total number of sick rural residents, there were 529 (58%) children, urban residents were 383 (42%). All observed patients were from among the residents of the city of Samarkand and the Samarkand region.

Among all children who were hospitalized in the period from 2012 to 2015, the following seasonality of this disease was noted. Thus, most often children with AOB were admitted in winter (201 patients) and spring (175 patients). In the fall, 102 patients were admitted and in the summer, only 56 patients. And if in relatively cold and humid periods of the year the increase in the incidence of AOB can be compared with an increase in the activity of the corresponding viral infections, then in the summer period the role of pollen and food allergies is possible as a risk factor for the development of AOB. We can also make the assumption that during the studied period of time, we identified a violation of the classical seasonality of diseases, as was described in all available textbooks and teaching aids on pediatrics 15-20 years ago.

Repeated cases of ARI (6 times or more) during the year were noted in 212 (42.9%) patients with AOB. The majority of children with AOB (358 patients - 72.5%) had deficient conditions and a burdened premorbid background: 313 (63.4%) children were early transferred to artificial feeding, 278 (56.3%) had a history of perinatal damage to the central nervous system, 222 (45%) had rickets and 481 (97.37%) had anemia. A combination of iron and vitamin D deficiency was observed in 23.2% of those examined. At the same time, as a result of iron deficiency and disturbances in phosphorus-calcium metabolism, children experienced muscle hypotension, deformities of the chest and spine, which, as is known, adversely affects the function of external respiration and contributes to a more severe course of the disease.

Among the studied family history factors, it is significant that more than half (272 children; 55%) of patients with AOB had a family history of allergic diseases and atopy, more often through the mother. In children with ARF with symptoms of 2nd degree ARF, as well as in children in the first year of life, this figure was significantly higher (63.9%) than in children with 1st degree ARF – 34%. The most common was asthma, which was observed in close relatives in 15.8% of cases.

The majority of children were born full-term (90.6%) and had a body weight of more than 2500 g. The majority of children were born full-term (851 (90.6%) children and had a body weight of more than 2500 g. There were only 61 (9.4%) premature infants, with -46 children with OB, and 15 children with OB.

Half of the examined OOB children had impaired physical development. At the same time, high and disharmonious physical development was more common (in 223 children, 36.4%) due to an increase in body weight above the 90th percentile. Low and disharmonious physical development was recorded in 98 (13.9%) children due to a decrease in body weight below the 10th percentile.



A retrospective analysis of archival material showed that the development of ARF of the type of bronchial obstruction in patients with AOB depends on a combination of many factors, age differences, the presence of concomitant diseases, their combination, risk factors, etc. The work has shown that one of the main risk factors is constitutional anomalies, in particular cases of exudative forms of atopic dermatitis. Thus, in the entire sample of sick children it prevailed and accounted for 39.1% of cases, LGD was observed in 19.5% of patients. It should be noted that the ratio of constitutional anomalies in children of groups 1 and 2 showed that in group 1 there was a significant predominance of manifestations of both atopic dermatitis (54%, versus 23% in group 1) and LGD (30% versus 8.6% in group 1).

Of the clinical factors characterizing the state of the macroorganism, determining the severity and duration of AOB in children, we paid special attention to the presence of respiratory failure, physical data, the nature of the cough, laboratory parameters, and the degree of involvement of the cardiovascular system in the pathological process.

According to our data, physical symptoms of bronchial obstruction in AOB were observed in all children. Frequent and productive cough occurred in 1/3 of the children (36.4%), and rare cough, more often in the morning, in the remaining 2/3 (63.5%) of patients, which is associated with insufficient mucociliary clearance in this age period.

According to the severity of the condition, 494 patients with acute obstruction with symptoms of bronchial obstruction and 418 patients with acute obstruction without symptoms of biofeedback were distributed as follows: 311 children of group 1 (63%) and 295 children of group 2 (70.5%) were hospitalized in a state of moderate severity. There were 183 (37%) children in serious condition in group 1 and 123 children (29.5%) in group 2. The severity of the condition was primarily determined by the degree of respiratory failure and signs of intoxication.

An increase in body temperature was found in 212 (42.9%) patients in group 1, and in 241 patients (57.6%) in group 2. Deterioration of the general condition in 342 patients (69.1%) with AOB, and in 256 patients (61.2%) in group 2. Weakness and headache in older children were noted in 356 patients (72.1%) with AOB and in 290 (69.4%) patients with OB. Dyspeptic symptoms in the form of decreased appetite and breast refusal were detected in 320 patients (64.8%) with acute obstructive syndrome, and in 214 (51.2%) patients with acute obstructive illness in the control group.

Organ-specific symptoms and data from radiological research methods turned out to be more informative in diagnostic and differential diagnostic terms. Thus, a dry cough at the beginning of the disease, with a further transition to a wet one, was noted in all patients with AOB and OB. A wet cough with the discharge of viscous, mucopurulent sputum or vomiting was noted in the medical histories of 303 (61.3%) patients with AOB and in 264 (63.2%) patients with OB. Noisy wheezing (wheezing) and expiratory shortness of breath, as clear signs of bronchial obstruction of the lower respiratory tract (460 - 93.1% and 448 - 90.6%, respectively), were identified only in patients with AOB, in contrast to patients in the control group with OB in whom this symptomatology was not recorded in the medical history.

Small- and medium-bubble moist rales over both lungs were observed in 456 (92.3%) patients with AOB and medium- and large-bubble rales in 391 (93.5%) patients with OB, which confirmed damage to the deeper structures of the bronchial tree in patients with AOB, in differences from patients with OB, where the pathological process occurred predominantly in larger bronchi. Among the physical data, the vast majority (472 children - 95.5%) of patients with AOB had scattered dry wheezing over the entire surface of the lungs, in contrast to patients



with OB (206 children - 49.2%), which also confirmed the diagnosis of bronchial obstruction, characterizing the phenomena of bronchospasm in them. Percussion box sound was noted in 445 (90.1%) patients in the experimental group and in 107 (25.6%) patients in the control group.

Signs of retraction of the compliant areas of the chest and the participation of auxiliary muscles in the act of breathing were identified in 2/3 of patients with AOB (340 children - 68.8%), and only in 1/3 of patients with AOB (125 children - 29.9%), which also confirmed a more severe course of the disease in patients with AOB, with the addition of acute respiratory failure of the broncho-obstructive type.

Signs of swelling of the lung tissue due to increased transparency, horizontal position of the ribs, high position of the diaphragm were found in the vast majority of patients with AOB (463 children - 93.7%), in contrast to patients with OB, in whom this radiological picture was recorded only in 86 (20.6%) patients. When analyzing X-ray images and calculating the thymic-thoracic index, we found that thymomegaly was observed in 18% of children in group 1 and 4.3% of observed patients in group 2.

Having carefully processed the medical histories of patients in both groups, we found that in the general blood test, patients in both groups had approximately the same changes. Thus, a decrease in hemoglobin content below 100 g/l in 97.4% of patients with AOB and in 92.3% of patients with OB, acceleration of ESR in 68.6% of children in group 1 and 66.2% of patients in group 2, moderate leukocytosis was found in 34.0% of patients with AOB and 57.6% of patients with OB. Lymphocytosis was determined in 57.6% of patients with AOB and 51.7% of patients with OB, which confirmed the viral-bacterial etiology of the disease in them.

According to the objectives of the study, it was necessary to systematically inform the risk factors for the development of BOS, and therefore, we differentiated the risk factors we studied into the main, predisposing and possible risk factors for the development of BOS in children with AOB, depending on their share of participation in the development of the disease, according to the criteria Pearson's χ^2 and the significance of the results. The reliability of the results of epidemiological indicators of morbidity risk given above is confirmed by a comparative analysis of qualitative characteristics, carried out according to the χ^2 criterion, taking into account the significance level of the χ^2 criterion using an arbitrary contingency table.

Statistical processing of the study results showed that boys most often suffer from BOS (χ^2 criterion - 19.316), with a high level of significance χ^2 ($p < 0.05$) compared to girls (respectively - 1.165 and $p > 0.1$). We found that one of the important risk factors for the development of biofeedback is the age of children. In particular, we noted that although young children were most often found among all those examined, statistical analysis using the epidemiological method revealed that Pearson's χ^2 criterion in older children was equal to 13.486 with a high level of significance ($p < 0.05$), against indicators in young children (2.273; $p > 0.1$).

We found that in patients with AOB with BOS, the Pearson χ^2 criterion was 22.710 ($p < 0.05$) in the winter season of the year, 19.681 ($p < 0.05$) in the spring, 1.947 ($p > 0.1$) in the fall, and 1.947 ($p > 0.1$) in the summer. 2.463 ($p > 0.1$).

The majority of patients (529 children) lived in rural areas. Among residents living in rural areas, the number of patients with AOB was 328, patients with OB - 201. Their χ^2 criterion was 3.214 with a low level of significance $p > 0.1$. In our opinion, unfavorable social and living conditions, as well as an unfavorable environmental situation at the place of residence, contribute to the development of biofeedback in children.



During the 1st year of life, 156 children with OB and 181 children with OOB were breastfed. We found early transfer to artificial feeding in 313 patients with AOB and in 226 patients with OB (χ^2 criterion - 23.952 with a high level of significance $p < 0.05$).

Statistical analysis showed that a burdened family allergic history was observed to a greater extent in patients with AOB (272 children), compared with patients with OB (154 children). Pearson's χ^2 criterion was 18.638 ($p < 0.05$). It should be noted that allergic diseases such as bronchial asthma, hay fever, allergic rhinitis, etc., were often identified in close relatives on the maternal side.

Manifestations of the exudative form of atopic dermatitis were noted in 267 children with AOB and 96 children with OB (χ^2 criterion - 15.380; $p < 0.05$). Episodic manifestations of food allergies were observed in 63 patients of group 1 and 33 patients of group 2 (χ^2 - 13.241; $p < 0.05$).

Of the background conditions, the percentage of iron deficiency anemia is high, which was detected in 481 children with acute obstructive syndrome and in 398 children with obstructive obstructive illness. Although we found a large number of children with iron deficiency anemia, statistical analysis, according to the Pearson χ^2 criterion for anemia in patients was 0.126 ($p > 0.1$), and therefore we can conclude that iron deficiency anemia is not a risk factor development of biofeedback in AOB in children.

Signs of rickets were found in 222 patients with AOB and in 163 patients with OB. Pearson's χ^2 criterion for rickets in patients was 6.449 ($p < 0.01$). Manifestations of rickets such as chest deformity (χ^2 - 3.566; $p > 0.1$), spinal deformity (χ^2 - 2.976; $p > 0.1$), as well as muscle hypotonia (χ^2 - 3.253; $p > 0.1$) also influence the development of biofeedback. In 107 patients, we detected thymomegaly on chest x-ray. Pearson's χ^2 criterion for thymomegaly was quite high and amounted to 14.559 ($p < 0.05$), and therefore this condition was classified as the main risk factor for the development of biofeedback, which is consistent with the literature data.

We also noted high indicators of Pearson's χ^2 criterion with a high level of significance for the risk of developing BOS in children in paratrophy and lymphatic-hypoplastic diathesis (LHD) (respectively - 12.228, $p < 0.05$ and 11.831, $p < 0.05$). It should be noted that overweight children with LHD are prone to swelling (pasty), therefore, with any viral-bacterial disease, they may experience swelling of the upper and lower respiratory tract.

Hypoxic-ischemic encephalopathy (HIE) was diagnosed in 278 children of group 1 and 167 patients of group 2. Pearson's χ^2 test for HIE was 3.671 with a low level of significance ($p > 0.1$).

The premorbid background in the patients we studied in both groups was characterized by a high incidence of respiratory infections. Thus, frequent ARIs were found in 212 patients with AOB and 145 patients with OB. Pearson's χ^2 test for frequent ARIs was 5.881 ($p < 0.01$). We classified frequent episodes of biofeedback in children as predisposing risk factors, due to the fact that the χ^2 criterion, calculated by us using a statistical method, met these criteria, amounting to 4.653 ($p < 0.01$).

According to literature sources, BOS recurs significantly more often in the first year of life in premature infants. In this regard, it should be noted that during a detailed processing of the data



from the materials we studied, it was revealed that risk factors for the development of biofeedback in children with a sufficient level of significance also include prematurity (4.710, $p < 0.01$), unfavorable course of pregnancy associated with gestosis (5.418, $p < 0.01$), as well as bad habits on the part of parents.

Particularly noteworthy is the high level of Pearson's criterion for passive smoking, which amounted to 16.612 with a high level of significance ($p < 0.05$). The inclusion of passive smoking in the main group of risk factors for the development of BOS in children was consistent with the literature, due to the fact that as a result of passive smoking, tobacco smoke promotes the destruction of the bronchial epithelium in children, reduces the phagocytic activity of alveolar macrophages, disrupts mucociliary clearance and leads to the development of the disease.

Taking into account the literature that taking paracetamol during pregnancy leads to the development of asthma in children, we analyzed the use of paracetamol during pregnancy. Thus, we found that in the entire sample of patients, 18.2% of mothers took paracetamol during pregnancy. Moreover, it is worth emphasizing that the ratio of mothers who took these drugs in children of groups 1 and 2 showed that in group 1 there was a predominance of such anamnestic signs (22.0%, versus 13.6% in group 1). Pearson's χ^2 criterion in this case turned out to be unreliable and amounted to 0.766 ($p > 0.1$).

When statistically processing archival material, we obtained higher indicators for Pearson's χ^2 criterion when we established social factors and the local environmental situation. Thus, unsatisfactory social and living conditions in patients with AOB were found in 48 cases, in patients with OB – in 30. Pearson's χ^2 criterion in this case was 5.493 ($p < 0.01$). Pearson's χ^2 criterion in case of unfavorable state of the external environment associated with living in ecologically unfavorable areas, dust, gas contamination, use of chemicals, etc. , was 5.631 ($p < 0.01$).

It should be especially emphasized that despite the achievements of scientific and technological progress and the development of healthcare in Uzbekistan, in some families a feature of the local mentality is the use of folk remedies for self-medication and turning to healers. As you know, even the use of the most "harmless" herbs can cause the development of severe reactions, including the development of anaphylactic shock. Such "therapeutic" measures, aggravating the condition of children, contribute to a later request for specialized medical care, leading to the loss of precious time, since early and targeted etiopathogenetic and symptomatic therapy of respiratory diseases in children leads to a speedy recovery and a significant reduction in the number of complications. In our study, we proved that late admission to the hospital ($\chi^2 - 5.422$, $p < 0.01$), as well as unjustified use of traditional methods of treatment ($\chi^2 - 4.861$, $p < 0.01$) are risk factors for the development of biofeedback in children.

It should be especially emphasized that we are the first to attempt to systematize indicators that form risk factors that affect the child's body and contribute to the occurrence of biofeedback in children with acute obstructive disorders. Thus, as the main risk factors, we selected those identified conditions in which the Pearson χ^2 criterion was more than 6.635, with $p < 0.05$. Among the main criteria were the older age of children, male gender, atopic dermatitis, winter and spring seasons of the year, burdened allergic history, thymomegaly, paratrophy, LGD, food allergy, passive smoking, early transfer to artificial feeding.

We classified the identified conditions as predisposing risk factors when the Pearson χ^2 criterion ranged from 3.841 to 6.635 with $p < 0.01$. The group of predisposing risk factors included such signs as frequent respiratory viral diseases, frequent episodes of biofeedback, rickets, prematurity, unfavorable social and living conditions and unfavorable environmental conditions at the place of residence, complicated pregnancy, manifested by gestosis in pregnant women, use as self-medication folk remedies, late admission to the hospital, bad habits of parents. Subsequently, the criteria we identified for the main and predisposing risk factors were generalized into a group of high-risk factors for biofeedback.

We selected identified criteria for the group of possible risk factors, according to which Pearson's χ^2 criterion was less than 3.841, with a significance level of less than $p > 0.1$. Possible criteria included living in a rural area, summer and autumn seasons, HIE, foreign bodies in the respiratory tract, muscle hypotension, deformation of the chest and spine associated with rickets, and others. Among the risk factors for the development of biofeedback that we have identified, there are signs that can be eliminated by local doctors - pediatricians, pulmonologists, allergists, and independently - by parents and family members. We designate such risk factors as controllable risk factors. At the same time, without a doubt, the risk of developing BOS in patients depends on most of these factors, primarily on the number of so-called. high modifying risk factors: the more there are, the greater the risk. The accumulation and systematization of reliable risk factors makes it possible to predict with a high degree of probability the occurrence and, in the future, to develop or optimize the prevention of biofeedback in children, primarily by eliminating controllable risk factors.

In order to form a group at increased risk for the development of asthma in children who have undergone BOS, we studied the influence of the main, predisposing and possible risk factors for the development of BOS in AOB in children on the prognosis of the disease; we conducted a follow-up observation of patients during the year who were treated in a hospital and were then discharged.

We observed 35 patients with AOB who had a history of biofeedback, who were divided into 2 groups: group 1 - 18 patients who had increased risk factors, group 2 - 17 patients with possible risk factors for the development of biofeedback. Follow-up monitoring of patients was carried out once a quarter for a year. The work showed that during the year in group 1, repeated episodes of biofeedback were observed 3 times more often compared to the second group (59.2% versus 14.3% in the second group). Moreover, in 3 cases the patients were diagnosed with asthma.

Based on the follow-up observation, in patients with AOB who had a history of biopsy, with the main and predisposing risk factors that we identified as increased risk factors for the development of asthma, frequent recurrence and progression of the underlying disease were noted. It should be noted that in a number of cases we observed transmission of AOB with BFB phenomena in BA.

Conclusion. Thus, high prognostic risk factors that are significant for the development of AOB with BOS, leading subsequently to the development of asthma, include frequent ARI, the presence of allergopathology, older age, male gender, etc. All this dictates the need for preventive work in families, in SVPs and SPs with patients who have manageable risk factors for the prevention of BA.

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