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Observation of somatic and neurological pathology in low birth weight infants with Asphyxia on the first year of life

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I. INTRODUCTION

Reducing the number of perinatal mortality rates and improving the health condition of a prematurely born baby during catamnesis are the most important issues that modern neonatology faces. Therefore, in the recent years, new concepts regarding the nutrition methodology of newborns are developed in the world. Modern diagnostic analyzes especially on low-birth-weight infants, modern technologies and the use of improved respiratory therapy increases the chance of survival for those babies. These reforms are constantly in the attention of the Medical Aid Organization of the Republic of Azerbaijan's Health Care system. As a result of such initiatives, the construction and improvement of the centralized Perinatal Centers, the application of technologically advanced equipment and the use of effective reanimation measures have increased the chance of survival for premature babies.

It is acknowledged, that early adaptation period in children with perinatal risk, who had suffered from asphyxia, is extremely tense and carries multiple life-threatening risks. As the probability of survival increases for those newborns, we experience the development of somatic disorders or the chronic course in various pathologies, resulting in serious health-related medical and social problems in the future [3].

The limited rehabilitation opportunities for low and extremely-low-birth-weight infants can also increase the chances of becoming disabled. Therefore, it is still vital to diagnose possible pathologies prior to the further development of those premature babies [2]. In that regard, it is curious to observe numerous somatic and neurological conditions in the catamnesis as well as to learn characteristics of development during the rehabilitation of low-birth-weight infants.

The purpose of the research was to evaluate the somatic and neurological conditions of premature infants with and without asphyxia during the catamnesis.

II. MATERIAL AND METHODS

The initial stage of the scientific research was conducted at the Neonatology Department of the ESCAMU (Educational-Surgical Clinic of Azerbaijan Medical University that is the basis of II Department of Pediatric Diseases, Azerbaijan Medical University. Infants with

conditions of intrauterine infection, congenital growth-development defects and developmental delays are not the subject of this study.

It was possible to carry out dynamic-clinical prospective control among 53 premature children (gestational age 29-36) for the first twelve months. Each child was subject to routine and enhanced studies, in other words, children without being conducted to both dynamic laboratory and clinical findings are not part of this study.The general examination focuses on physical features, anemia, neurological pathologies, respiratory system diseases, gastrointestinal dysfunction, allergy and formation of hypovitaminosis D. Laboratory examination findings include data regarding blood analysis, general stool analysis, iron blood test, B12, folic acid, ferritin, iron-binding capacity, IgE, vitamin D, ionized calcium. Children conducted to catamnesis examination fall into following groups:

Group 1: *17 children with anemia during pregnancy and perinatal asphyxia*

Group 2: *14 children with hestosis during pregnancy and perinatal asphyxia*

Group 3: *22 healthy children born of a physiological pregnancy*

III. RESULTS

We have noted a slight increase in the weight, height, chest size while studying development in the physical features (weight, height, head and chest size) of all the children we have conducted.

As given in ***Table 1***, delay in the physical development can clearly be noticed at ***Group 1***. The visible difference is in the chest sizes.

Table 1. Catamnesis control on physical development of one year old children among compared groups

Physical features	*Group 1*	*Group 2*	*Group 3*	P
Weight	7,9±1,1	8,2±0,9	8,9±2,1	P=0,322
Height	69±2,2	71±3,1	73,5±2,1	P=0,655
Head size	42±1,0	43±1,5	43±1,5	P=0,234
Chest size	43,8±1,1	44,3±0,9	45,1±3,1	p<0,05

This result is mostly due to the negative impact of asphyxia on the digestive system as it has caused damages to other organs as well. In particular, delay in the mineral absorption and mineral deficiency can affect the development rate of chest size. It is acknowledged that, iron deficiency anemia is the most common pathology in the pediatric studies. Clearly, the iron deficiency anemia is the most common pathology in pediatric studies. Thus, the next step of the research was to examine the characteristics of anemia progression in premature infants. Anemia is clinical, hematologic and symptom complex. It causes a decline in circulating erythrocytes, changes in their quality, low hemoglobin count, low hemoglobin count in a unit scale, clinically mucous membranes, skin depigmentation and change in internal organs.

According to the laboratory blood test on participating children with iron-deficiency anemia; hemoglobin is less than 109 g\l, erythrocytes are less than (3,5-4 $*10^9$) l, iron transferrin is less than 14 mkm\l, serum ferritin is less than 10-12 ng\ml, iron-binding capacity is more than 63 mkm\l.

Table 2. Catamnesis control on a general blood test of one-year-old children among compared groups

Parameter	*Group 1* n=23	*Group 2* n=48	*Group 3* n=30	p
HGB	98±1,1	101±0,9	109±3,2	p<0,05
RBC	2,8±0,2	2,9±1,3	3,5±0,8	P=0,344
MCV	57±2,6	77±1,1	84±2,0	P=0,478
MCHC	31±0,9	33,1 ±1,4	34±1,8	P=0,340
Fe	31±5,4	29±2,1	115±5,8	p<0,001
Serum Ferritin ng\l	8,7±9,9	10±1,0	11±1,2	P=0,240
Iron-binding capacity mkm\l	64±1,2	61±0,9	63±3,1	P=0,800
B 12	289±4,6	345±2,1	445±3,4	P=0,435
Folic acid	23,4±6,7	1,8±5,6	30±4,7	P=0,930

The research on the antenatal anamnesis found hypotrophy, along with iron-deficiency anemia significantly in children with asphyxia. Children born of mothers with anemia has 89% chance to have anemia (p <0.001). Children of pre-eclampsia mothers have a folic acid deficiency along with an iron deficiency.Children born of mothers with constipation had not only iron and folic acid, but also anemia. This is due to the disbalance of micro and macro elements on the one hand, and the misuse of folic acid on the background of asphyxia. Firstly, this is due to the imbalance of micro and macro elements; secondly, it is due to the disrupted folic acid consumption for asphyxia.

IV. DISCUSSION

During the early anemia period, we observe less circulating erythrocytes and enough amount of iron supplements in bone marrow as well as in the mononuclear phagocyte system. However, premature babies have poor endogenous iron rehabilitation and negative iron balance in their first months (ferrioxamine excretion in fecal rises). In the third and fourth week, hemoglobin reaches the lowest level of 70-90 g/l and even lower in the low-birth-weight infants. Growing anemia stimulates the secrete erythropoietin, and as a result erythropoiesis recovers, initial phase ends. At the same time, peripheral blood forms reticulocytes that were not found in the early phase. Children diagnosed with early anemia were noted to have hypochromic anemia in their peripheral blood.

Children with anemia develop chronic infectious diseases in respiratory organs and gastrointestinal diseases. Iron also maintains the normal cognitive function of a brain. We have experienced a delay in psychomotor development due to iron-deficiency in children.

It has been determined that iron deficiency anemia in children during the breastfeeding period causes disharmony in the central nervous system while transmitting pulses to the periphery or to spiral and visual organs. Later, the disorder of the central pontine myelinolysis and at last, nerve transmission disorder develops.

Neurological catamnesis examination revealed that low-birth-weight children are exposed to minimal brain dysfunction two times more than other neurosensory disorders.

Among children with asphyxia, eight of them developed hypoxic-ischemic encephalopathy, three of them developed convulsion syndrome and one of them developed cerebral palsy.

Atopic dermatitis (eczema), allergic rhinitis and bronchial asthma dominate allergic diseases in recent years. atopic phenotype begins at the antenatal period. Atopic phenotype starts to develop during the antenatal period.

At the end of fetal development, Th2 is there to sustain conformation and to prevent intoxication of Th1. Despite the proportional difference among Th1 and Th2, such dominance continues to exist for few months after birth [1,4].

During this time the child is likely to develop atopia; so, the "open window" phenomenon occurs, external atopic sensitization and manifestation run against atopic dermatitis and bronchiolitis [5,6,7,8]. The respiratory tract diseases such as bronchiolitis and allergic rhinitis found mainly in the participants of ***Group 1***. The reason could be the impact of the respiratory tract failure and medications for asphyxia. Intensive care unit has a positive correlation among the timeframe of stationary treatment and the development of allergic diseases in children treated with intensive care. IgE is noted in the 54,8±8,1 (1,25-418) BV\ml range, but the statistics are not accurate (p=0,201). The development of somatoform disorder is mostly found in children from ***Group 1***. Fourteen children from ***Group 1*** developed iron-deficiency anemia; eight children developed a gastrointestinal disorder, seven children developed a neurological disorder, nine children developed bronchiolitis, six children developed allergies, eleven children developed hypotrophy and seventeen children developed Vitamin D deficiency. Seven children from ***Group 2*** developed iron-deficiency anemia; five children developed a gastrointestinal disorder, six children developed a neurological disorder, six children developed bronchiolitis, three children developed allergies, four children developed hypotrophy and thirteen children developed Vitamin D deficiency. Three children from ***Group 3*** developed iron-deficiency anemia; two children developed a gastrointestinal disorder, four children developed bronchiolitis, three children developed allergies, one child developed hypotrophy and ten children developed Vitamin D deficiency.

Table 3. **Number of children in the compared groups who develops somatoform disorders at the age of one**

Pathologies	***Group 1*** **17**	***Group 2*** **14**	***Group 3*** **22**	**p**
Iron-deficiency anemia	14	7	3	p<0,001
Gastrointestinal	8	5	2	p<0,05
Hypoxic-Ischemic Encephalopathy	7	6	0	P=0,345
Bronchiolitis	9	6	4	p<0,001
Allergen-specific	6	3	3	P=0,200
Hypotrophy	11	4	1	P=0,655
Vitamin D deficiency	17	13	10	P<0,001

As seen in ***Table 3***, developing iron-deficiency anemia has increased twice. According to statistical data, we have identified that children with asphyxia have higher Vitamin D deficiency. (p<0,001). Children with Vitamin D deficiency are likely to develop an illness more than others.

Thus, asphyxia occuring slightly after birth may affect neonatal and breastfed periods as well as child's later development. According to the research on perinatal asphyxia and catamnesis period of premature babies under one year old, such babies have higher chance to develop iron-deficiency anemia, gastrointestinal disorders, respiratory tract diseases, and Vitamin D deficiency than to develop other somatic pathologies. Children with allergic diseases are also yielded to develop bronchiolitis and gastrointestinal dysfunction. Simultaneous occurrence of all these pathologies challenges low-birth-weight-children even more who have an undeveloped immune system. In order to avoid such pathologies, complex preventive measures have to be taken in the prenatal and early neonatal period.

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