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# MICROELEMENTS IMBALANCE AS A PREDICTOR OF DEFICIT ANEMIA DEVELOPMENT IN INFANT CHILDREN

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***Annotation.*** *The problem of deficiency anemia, as well as other types of microelementoses, i.e. diseases, syndromes and conditions associated with a violation of the metabolism of macro- and microelements in the body, today it seems to be very important and relevant, both for scientific medicine and for practical health care. The paper presents the results of conventional laboratory, paraclinical and special examinations in 24 young children (from 1 to 3 years old) with anemia, who were hospitalized in the department of pediatric oncohematology of Samarkand Regional Children's Multidisciplinary Medical Center. The established facts of the imbalance of microelements in the hair of patients, in the form of a deficiency of the main essential microelements and an increase in the content of conditionally essential, toxic and some conditionally toxic trace elements in the body of sick children, dictate the need for further corrective pathogenetically substantiated therapy, by prescribing preparations containing a complex of essential trace elements and detoxifiers.*

***Keywords.*** *Children, deficiency anemias, microelementoses, diagnostics*

***Аннотация.*** *Проблема дефицитных анемий, как и других видов микроэлементозов, т.е. болезней, синдромов и состояний, связанных с нарушением обмена макро- и микроэлементов в организме, на сегодняшний день представляется весьма важной и актуальной, как для научной медицины, так и для практического здравоохранения. В работе представлены результаты общепринятых лабораторных, параклинических и специальных обследований у 24 детей раннего возраста (от 1 года до 3-х лет) с анемией, находившихся на стационарном лечении в отделении детской онкогематологии СОДММЦ. Установленные факты дисбаланса микроэлементов в волосах больных, в виде дефицита основных эссенциальных микроэлементов и повышения содержания условно-эссенциальных, токсичных и некоторых условно-токсичных микроэлементов в организме больных детей, диктуют необходимость в дальнейшем проведения корригирующей патогенетически обоснованной терапии, путем назначения препаратов, содержащих комплекс эссенциальных микроэлементов и детоксикантов.*

***Ключевые слова.*** *Дети, дефицитные анемии, микроэлементозы, диагностика*

***Annotatsiya****. Defitsitli anemiyalar muammosi, shuningdek, boshqa turdagi mikroelementozlar, ya'ni organizmdagi makro va mikroelementlar almashinuvining buzilishi bilan bog'liq kasalliklar, sindromlar va patologik holatlar bugungi kunda nafaqat ilmiy tibbiyotda, balkim sog'liqni saqlash amaliyotida ham muhim o'rin egallab, juda muhim va dolzarb muammo bo'lib turibdi. Maqolada SVBKTTM bolalar onkogematologiyasi bo'limida kamqonlik bo'yicha davolangan 24 nafar (1 yoshdan 3 yoshgacha) erta yoshdagi bolalarning an'anaviy, paraklinik va maxsus tekshiruv natijalari keltirilgan. Bemorlar sochidagi mikroelementlarning nomutanosibligi, asosiy essentsial mikroelementlarning etishmasligi va bemor bolalar organizmida ayrim shartli essentsial, toksik va shartli toksik mikroelementlar miqdorining ko'payishi ko'rinishida aniqlangan o'zgarishlarni essentsial mikroelementlar va detoksifikatsiya qiluvchi vositalar majmuasini o'z ichiga olgan preparatlarni buyurish, hamda korrektsiyalsh uchun qo'shimcha patogenetik asoslangan davolash o'tkazish zaruriyatini tug'diradi.*

***Kalit so'zlar.*** *Bolalar, yetishmovchilik anemiyalari, mikroelementozlar, diagnostika*

**The relevance of research.** *The problem of deficiency anemia, as well as other types of microelementoses, i.e. diseases, syndromes and conditions associated with impaired metabolism of macro- and microelements in the body, is currently very important and relevant for both scientific medicine and practical healthcare [1,5]. According to the WHO, more than 1 billion people of the planet suffer from anemia. Anemia is widespread among pregnant women, women, and children aged 1 to 5 years [2,6]. The number of patients in this category in developing countries is 50-60%, and in industrialized countries - 10-20% [3,7,9]. The prevalence of iron deficiency anemia is very high in South Asian countries (up to 90%) and Africa [4,8].*

**The aim** *of the work is to study the state of trace elements in the body of young children living in the Samarkand region suffering from anemia deficiency and to identify the relationships characteristic of this pathology between the content of some basic essential, conditionally essential, toxic and conditionally toxic trace elements.*

**Materials and methods of research.** *The paper presents the results of generally accepted laboratory, paraclinical and special examinations in 24 young children (from 1 to 3 years old) who were undergoing inpatient treatment at the Department of Hematology of the Samarkand Regional Children's Multidisciplinary Medical Center. The data obtained were compared with those of the control group, which consisted of 20 healthy children of the same age.*

*The final diagnosis of anemia deficiency was established on the basis of aggregates: anamnestic data (the nature of growth and development, the number of pregnancies in the mother, how the patient was born, etc.); laboratory parameters: blood Hb level, Hb concentration in one erythrocyte, the number of erythrocytes and their morphology, reticulocytes, CP, hematocrit; biochemical data (total bilirubin and its fractions, total protein, activity transaminases (ALT, AsAT), cholesterol, β-lipoproteins, HBsAp, serum iron, and others); instrumental (ultrasound, ECG) and general clinical studies. Neutron activation analysis (Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan) was used as special research methods, studies were conducted to determine some essential (iron, iodine, chromium, zinc, copper, manganese, cobalt, selenium), conditionally essential (arsenic), toxic (mercury) and conditionally toxic (silver, uranium, antimony, rubidium) trace elements in hair samples.*

*Special cards were filled out for all patients, which included all information about each specific sick child, his parents (age, profession, bad habits), diet, previous illnesses, place of residence, living conditions, and possible harmful environmental factors. When diagnosing anemia, we were based on the WHO recommended standards for Hb/Ht levels. The values of Hb<110 g/l, Ht<33% were regarded as anemia.*

**Discussion of the research results.** *An analysis of the clinical material was carried out to determine the nature of their distribution depending on the gender and place of residence of sick children. Thus, among 24 children with anemia deficiency, there were 13 boys (54.2%) and 11 girls (45.8%). Among these patients with anemia deficiency, there were 9 urban residents (37.5%) and 15 rural residents (62.5%). In the control group, there were 11 boys (55.0%), 9 girls (45.0%), 7 residents of Samarkand (35.0%), and 13 districts of the Samarkand region (65.0%).*

*From the medical history, an increased incidence of acute intestinal and respiratory infections was noted in 17 (70.8%) patients who have been undergoing inpatient and outpatient treatment for acute respiratory viral infections, pneumonia, and diarrhea. Hemogram changes were characterized by a decrease in hemoglobin levels in 100% of cases, hypochromia in 22 (91.6%) patients, and microcytosis in 10 (41.6%) patients. Aniso- and poikilocytosis were detected in 7 (29.1%) patients.*

*Clinically, the sideropenic syndrome in the examined patients was characterized by the following manifestations. General anemic symptoms in the form of pallor of the skin and mucous membranes, as well as tachycardia were detected in 100% of patients. Systolic murmur was heard in 12 children. Epithelial changes in the form of trophic disorders of the skin, nails, hair, and mucous membranes were observed in 5 (21%) patients. Taste perversion was noted in 8 (33%) patients. Weakness and lethargy were noted in 20 (83.3%) children, intestinal malabsorption was detected in 7 (29.1%) of the examined. Dysphagia and dyspeptic changes were observed in 10 (41.6%) patients. An increase in liver size by 1.5-2.0 cm below the edge of the costal arch was noted in 12 patients (50%) and by more than 2.5 cm in 7 patients (29.1%). The spleen was enlarged in 2 children.*

*In young children with anemia, a violation of the microelement composition of the hair was revealed,*

*which fully reflected the state of the microelement portrait of the body as a whole. The imbalance of trace elements was expressed by a significant decrease in the content of essential iron, iodine, manganese and cobalt in the hair of patients with anemia deficiency compared with healthy children, which averaged 25.2±2.1 micrograms/g (P<0.001), 3.4±0.3 micrograms/g (P<0.001), 0.42±0.03 micrograms/g (P<0.001) and 0.022±0.002 micrograms/g (P<0.001).*

*The indicators of essential trace elements – zinc and copper in patients with anemia deficiency were also reduced, compared with the data in the control group, but these changes were of low significance (P<0.02). The content of such an important essential trace element as selenium in the hair of children suffering from anemia deficiency was 0.32±0.02 micrograms/g, which was on average 0.19 micrograms/g lower than in healthy children (P<0.01). Although the indicators of the essential trace element chromium were reduced compared to the control group, these changes were not significant (P>0.2).*

*When studying the conditionally essential element of arsenic in the hair of patients, an increase in its content was found in comparison with the data in healthy people - 0.20± 0.02 micrograms/g. The difference in comparison with the indicators of healthy people is highly significant (P<0.001). As for the studied indicators of the toxic trace element mercury in children with anemia deficiency, its increased content can be noted in relation to the control grouWhen studying the conditionally essential element of arsenic in the hair of patients, an increase in its content was found in comparison with the data in healthy people - 0.20± 0.02 micrograms/g. The difference in comparison with the indicators of healthy people is highly significant (P<0.001). As for the studied indicators of the toxic trace element mercury in children with anemia deficiency, its increased content can be noted in relation to the control group. This change was highly significant and averaged 0.083±0.007 micrograms/g compared to the control of 0.040±0.006 micrograms/g (P<0.001).*

*We have obtained similar data regarding the levels of conditionally toxic trace elements - uranium and antimony in the hair of patients with anemia deficiency. On average, their content was 0.092±0.008 micrograms/g and 0.32±0.03 micrograms/g, respectively, the significance of the difference (P<0.001 and P<0.001). The content of silver and rubidium in the hair of patients We have obtained similar data regarding the levels of conditionally toxic trace elements - uranium and antimony in the hair of patients with anemia deficiency. On average, their content was 0.092±0.008 micrograms/g and 0.32±0.03 micrograms/g, respectively, the significance of the difference (P<0.001 and P<0.001). The content of silver and rubidium in the hair of patients with anemia was significantly reduced and averaged 0.265±0.016 micrograms/g (P<0.001) and 0.84±0.07 micrograms/g (P<0.001), respectively.*

*Thus, studying the content of certain tracThus, studying the content of certain trace elements in the hair of children with anemia deficiency in young children, a significant change in their content was revealed, which differs to varying degrees from those of healthy children. These changes were expressed in an increase in the level of conditionally essential (arsenic), conditionally toxic (uranium, antimony) and toxic (mercury) trace elements in the body. A decrease in the content of essential and some conditionally toxic (silver, rubidium) trace elements was also found to varying degrees. We found higher levels of mercury, uranium and antimony in the hair of urban children and those living in the Urgut district of the Samarkand region. However, these changes did not exceed acceptable toxic levels.*

*Studying the correlations between the reduced content of the studied essential trace elements and the increased content of the conditionally essential trace element arsenic and toxic mercury in the hair of children suffering from anemia deficiency, a certain correlation was revealed. A high studying the correlations between the reduced content of the studied essential trace elements and the increased content of the conditionally essential trace element arsenic and toxic mercury in the hair of children suffering from anemia deficiency, a certain correlation was revealed. A high correlation was noted between As–I (r=0.921), As–Cr (r=0.899), As–Cu (r=0.895), As–Mn (r=0.898), and As–Co (r=0.759). The average correlation was found between As–Fe (r=0.508), As–Zn (r=0.482), and As–Se (r=0.525). Analyzing similar dataAnalyzing similar data between some essential trace elements and the toxic trace element mercury, we found a high direct correlation between Hg–Fe (r=0.963), Hg–I (r=0.940), Hg–Cu (r=0.946), Hg–Mn (r=0.839) and Hg–Co (r=0.917). The average correlation was found between Hg–Cr (r=0.611), Hg–Zn (r=0.684) and Hg–Se (r=0.611). The established correlation allows us to evaluate the activity of toxic and conditionally essential trace elements in relation to essential trace elements characteristic of patients with anemia deficiency.*

**Conclusions.** *Thus, the changes in the trace element composition of hair in the body of children with anemia deficiency, which we have identified, are obviously associated with a violation of the formation of*

*oxidative enzyme systems, in which they are included as specific components. The established facts of an imbalance of trace elements in the hair of patients, in the form of a deficiency of basic essential trace elements and an increase in the content of conditionally essential, toxic and some conditionally toxic trace elements in the body of sick children, dictate the need for further corrective pathogenetically based therapy by prescribing drugs containing a complex of essential trace elements and detoxifiers*

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