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THE CURRENT STATE OF THE PROBLEM OF IRON DEFICIENCY ANEMIA IN PEDIATRICS

ABSTRACT. Iron deficiency anemia (IDA) in children is one of the most pressing issues in modern pediatrics and remains the leading cause of anemia in childhood. This condition is the most common manifestation of micronutrient deficiency in children and has significant clinical and social significance due to its impact on growth, development, and quality of life. The high prevalence of IDA is due to a combination of factors, including the anatomical and physiological characteristics of a growing organism, intensive tissue growth and differentiation processes, increased iron requirements at different ages, and inadequate dietary intake of this micronutrient. Particularly vulnerable groups include young children, adolescents, and patients with chronic diseases, nutritional disorders, and malabsorption syndromes. Iron deficiency in childhood not only leads to decreased hemoglobin levels but is also accompanied by impaired tissue respiration, decreased enzyme activity, cognitive decline, delayed physical and psychomotor development, and increased susceptibility to infectious diseases. Therefore, timely diagnosis and correction of IDA are crucial for preventing long-term adverse effects.

This abstract emphasizes the importance of a comprehensive approach to diagnosing iron deficiency conditions, including an assessment of clinical manifestations, laboratory data, and risk factors for iron deficiency. Particular attention is paid to modern laboratory diagnostic methods that enable the detection of latent iron deficiency before severe anemia develops. The article discusses the basic principles of treating IDA in children, based on eliminating the causes of the deficiency, nutritional adjustments, and the rational use of iron supplements, taking into account the patient's age, degree of anemia, and individual characteristics.

Key words: iron deficiency anemia, iron deficiency, children, diagnosis, treatment, prevention.

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СОВРЕМЕННОЕ СОСТОЯНИЕ ПРОБЛЕМЫ ЖЕЛЕЗОДЕФИЦИТНОЙ АНЕМИИ В ПЕДИАТРИИ

АННОТАЦИЯ. Железодефицитная анемия (ЖДА) у детей является одной из наиболее актуальных проблем современной педиатрии и остается ведущей причиной анемии в детском возрасте. Это состояние является наиболее распространенным проявлением дефицита микронутриентов у детей и имеет значительное клиническое и социальное значение из-за своего влияния на рост, развитие и качество жизни. Высокая распространенность ЖДА обусловлена сочетанием факторов, включая анатомические и физиологические особенности растущего организма, интенсивные процессы роста и дифференцировки тканей, повышенную потребность в железе в разном возрасте и недостаточное потребление этого микронутриента с пищей.

К особенно уязвимым группам относятся маленькие дети, подростки и пациенты с хроническими заболеваниями, нарушениями питания и синдромом мальабсорбции. Железодефицитная анемия в детском возрасте приводит не только к снижению уровня гемоглобина, но и сопровождается нарушением тканевого дыхания, снижением активности ферментов, когнитивными нарушениями, задержкой физического и психомоторного развития и повышенной восприимчивостью к инфекционным заболеваниям. Поэтому своевременная диагностика и коррекция железодефицитной анемии имеют решающее значение для предотвращения неблагоприятных последствий.

В данной статье подчеркивается важность комплексного подхода к диагностике состояний, связанных с дефицитом железа, включая оценку клинических проявлений, лабораторных данных и факторов риска железодефицитной анемии. Особое внимание уделяется современным лабораторным методам диагностики, позволяющим выявлять латентный дефицит железа до развития тяжелой анемии. В статье обсуждаются основные принципы лечения железодефицитной анемии у детей, основанные на устранении причин дефицита, коррекции питания и рациональном использовании препаратов железа с учетом возраста пациента, степени анемии и индивидуальных особенностей.

Ключевые слова: железодефицитная анемия, дефицит железа, дети, диагностика, лечение, профилактика.

Introduction. Iron deficiency anemia (IDA) in children is the most common pathological condition resulting from an imbalance between the body's iron requirements and its actual stores. According to the WHO, signs of latent or overt iron deficiency are observed in 30–60% of children under five years of age [1–5].

Iron deficiency develops significantly faster in children than in adults due to their rapid growth rates, immaturity of the hematopoietic system, and high metabolic demands [6–9].

. These characteristics of the child's body determine the specificity of the clinical course of the disease, the diversity of its manifestations, and its impact on the child's physical and psychoneurological development [1,5,13,14].

In the early stages of iron deficiency, the pathological process is latent and may remain unnoticed, as there are no pronounced clinical symptoms. Iron depletion manifests itself primarily through changes in behavior and general well-being: children become lethargic, tire easily, have difficulty tolerating physical activity, and become more irritable and capricious.

Infants experience feeding difficulties, sleep disturbances, and decreased weight gain.

Gradually, the child's resistance to infectious agents decreases, which is explained by impaired enzymatic activity and a decrease in the functional capacity of the immune system [10-12].

Risk Factors for Iron Deficiency Anemia

The main factors contributing to the development of iron deficiency anemia (IDA) in children include:

• anemia in pregnant women;
• prematurity;
• poor nutrition;
• gastrointestinal diseases;
• helminthic infestations;
• blood loss of various origins.

Clinical Manifestations of Iron Deficiency Anemia in Children

The clinical picture of IDA in children can be characterized by a predominance of symptoms from various syndromes: asthenovegetative, epithelial, dyspeptic, cardiovascular, immunodeficiency, and hepatosplenic.

Asthenovegetative syndrome develops as a result of tissue hypoxia, including cerebral hypoxia. Children may experience muscle hypotonia, delayed physical and psychomotor development (in severe cases, intellectual disability), increased irritability, tearfulness, dizziness, fainting, episodes of orthostatic collapse, and signs of vegetative-vascular dystonia.

Epithelial syndrome manifests itself through changes in the skin and its appendages: dry skin, hyperkeratosis on the elbows and knees, cracks at the corners of the mouth (angular stomatitis), glossitis, cheilitis, dullness and hair loss, and brittle and striated nails.

Dyspeptic syndrome is characterized by decreased appetite, including anorexia, dysphagia, flatulence, constipation, or diarrhea. Taste perversion is often observed—a craving for inedible substances (chalk, earth, etc.)—and altered olfactory preferences (an attraction to the smells of gasoline, paint, and varnish). Gastrointestinal lesions exacerbate iron malabsorption, which contributes to the progression of anemia.

Cardiovascular changes are observed in severe forms of IDA and are manifested by tachycardia, shortness of breath, arterial hypotension, systolic murmurs, and signs of myocardial dystrophy.

Secondary immunodeficiency syndrome is characterized by prolonged low-grade fever, frequent acute respiratory and intestinal infections, and their protracted course.

Hepatosplenomegaly (hepatosplenomegaly) is typically found in children with severe iron deficiency anemia, often associated with rickets or other chronic diseases.

Diagnosis of Iron Deficiency Anemia in Children

The diagnosis of iron deficiency anemia (IDA) is based on a combined assessment of clinical manifestations and laboratory parameters, which help determine the presence, severity, and nature of iron metabolism disorders in the child's body.

The key laboratory criteria confirming the presence of IDA are:

• decreased hemoglobin levels - Hb <110 g/L;
• decreased color index (CI <0.86);
• decreased serum iron concentration - <14 μmol/L;
• increased total iron-binding capacity of serum (TIBC >63 μmol/L);
• decreased serum ferritin level — <12 μg/L [2–10].

The primary diagnostic method for IDA is a complete blood count, which includes assessment of the following parameters:

• red blood cell count;
• hemoglobin level;
• color index;
• mean corpuscular hemoglobin content (MCH);
• mean corpuscular hemoglobin concentration (MCHC);
• mean corpuscular volume (MCV);
• morphological features of red blood cells;
• reticulocyte count.

Biochemical indices of iron metabolism

Serum iron reflects the concentration of non-heme iron in blood plasma.

Normal values:

in newborns — 5.0–19.3 μmol/L;

in children over 1 month — 10.6–33.6 μmol/L.

Total iron-binding capacity (TIBC) characterizes the amount of iron that can be bound by the transport protein transferrin. The normal range is 40.6–62.5 μmol/L.

Determining serum iron levels and performing a complete blood count are possible in an outpatient setting.

More in-depth tests—determination of ferritin, TIBC, transferrin saturation, and other biochemical parameters—are performed in a hospital setting [9–11].

Treatment of Iron Deficiency Anemia in Children

The main principles of treating iron deficiency anemia (IDA) in children are:

1. Eliminating the underlying causes of iron deficiency;
2. Adjusting diet and daily routine;

3. Prescribing iron supplements to replenish iron stores.

Diet Therapy and Breastfeeding

Exclusive breastfeeding is recommended until the child reaches six months of age as it provides the optimal source of bioavailable iron. Breastfed children with established iron deficiency should be given iron supplements starting at six months of age.

Formula-fed children should use iron-fortified formula until they begin eating solid foods (approximately 12 months).

Teaching parents the principles of a balanced diet for their children—one that includes sufficient iron-rich foods (meat, liver, fish, buckwheat, apples, and green vegetables)—is important.

Drug Therapy

The basis of treatment is the correction of iron deficiency with iron-containing supplements [3, 6].

The most commonly used are:

• divalent iron supplements: Aktiferrin, Sorbifer Durules, Tardiferon, Totema, Ferroplex, and Fenuls;

• trivalent iron supplements in the form of a hydroxide-polymaltose complex: Maltofer, Ferrum Lek.

For young children, iron supplements are primarily prescribed in liquid dosage forms (drops, syrups, suspensions).

It is recommended to take the supplements 1–2 hours before meals, with water or fruit juices (not milk, as calcium reduces iron absorption).

The use of injectable iron supplements is only justified in exceptional cases, such as posthemorrhagic anemia or impaired iron absorption in the intestine [4]. The course of the disease is largely determined by the timeliness of diagnosis and the comprehensiveness of the treatment. Adequate treatment includes eliminating the causes of the deficiency, normalizing nutrition, replenishing iron stores with oral medications, and ongoing monitoring.

Thus, iron deficiency anemia in children remains a significant medical and social problem in childhood, characterized by a variety of clinical manifestations and significant impact on the child's physical, cognitive, and psycho-emotional development. Early diagnosis and comprehensive treatment are key to preventing long-term adverse effects and ensuring the child's healthy growth and development.

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