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Treatment of Iron Deficiency Anemia in Young Children

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Abstract: This article presents approaches to the diagnosis and modern treatment methods for iron deficiency anemia in young children. It defines clinical and laboratory diagnostic criteria and a modern approach to the selection of medical treatment of young children with iron deficiency anemia.

Keywords: Young children, iron deficiency anemia, sideropenic syndrome, anemic syndrome, iron supplements.

Introduction: Iron deficiency anemia (IDA) is currently a significant medical and social problem among children. According to the WHO, 200 million people worldwide suffer from iron deficiency, but 500-600 million people suffer from it as a concomitant syndrome or complication. IDA is a polyetiologic disorder caused by iron deficiency due to impaired intake, absorption, or increased losses, characterized by microcytosis and hypochromic anemia. The onset of IDA is typically preceded by the development of latent iron deficiency, which is considered an acquired functional condition and characterized by latent (hidden) iron deficiency, decreased iron stores in the body, and insufficient iron content in tissues (sideropenia, hyposiderosis), without anemia. Anemia is a pathological condition characterized by a decrease in hemoglobin (Hb) per unit volume of blood [1]. The risk of developing IDA, both latent and manifest, is highest in children (especially in the first two years of life) and women of reproductive age [2]. It has been established that if the incidence of anemia is 20% in a population, iron deficiency is observed in 40% of the population, and if the incidence of anemia reaches 40%, iron deficiency occurs in 100% of the population. Worldwide, almost 50% of preschool-age children and pregnant women have IDA. About 200 million children worldwide do not achieve full development corresponding to their potential due to iron deficiency. Even in developed countries, where the problems of diagnosis, treatment and prevention are practically solved, a high level of iron deficiency is observed in children, including adolescents. Impaired functioning of iron-containing proteins, present in all organs and tissues, leads to changes in a number of vital processes [3-10]. It should be noted that the presence of iron deficiency at an early age has delayed adverse effects [11-12]. Iron deficiency in children can result in impaired brain development, including decreased cognitive function, impaired motor skills, and impaired social and emotional behavior. Furthermore, nervous system development is disrupted, speech and logical thinking are delayed, and intellectual development is impaired. Children with iron deficiency are more likely to suffer from respiratory illnesses and are more susceptible to viral infections.

Objectives. The aim of the study was to develop ways to improve the prevention and treatment of iron deficiency dermatitis in young children based on clinical data, laboratory diagnostic results, and the medical and social characteristics of the study population and their families.

METHODS

A review of the medical histories and laboratory diagnostic results of children at the 4th City Clinical Hospital in Tashkent from September to December 2025. A total of 459 children aged six months to one year were examined.

RESULTS AND DISCUSSION

Each child was diagnosed with anemia upon admission. Differential diagnosis of IDA was carried out with other types of anemia, such as other deficiency anemias (B12-deficiency, folate deficiency), other microcytic anemias (thalassemia, etc.), anemia of chronic

diseases. Iron deficiency was observed in almost all children: 75% of children had sideropenic syndrome, 25% had anemic syndrome. Sideropenic syndrome was characterized by the following symptoms: dystrophic changes in the skin and appendages, mucous membranes; perversion of taste and smell; muscle pain; muscle hypotonia; changes in the nervous system in the form of delayed psychomotor development and impaired cognitive functions. The following symptoms were observed for anemic syndrome: asthenovegetative disorders; pallor of the skin and mucous membranes; changes in the cardiovascular system.

The criteria for IDA in laboratory diagnostics were: decreased hemoglobin concentration (Hb less than 110 g/l); slight decrease in the number of erythrocytes (less than 3.8x1012/l); decrease in the color index (less than 0.85); increased ESR (more than 10-12 mm/hour); decreased or normal number of reticulocytes (10-20%); decreased mean corpuscular volume (less than 80 fl), mean corpuscular Hb content (less than 26 pg), mean corpuscular Hb concentration (less than 320 g/l), increased degree of erythrocyte anisocytosis (more than 14%). Iron deficiency anemia was confirmed by a biochemical blood test: decreased serum iron concentration (less than 12.5 µmol/L), increased total iron-binding capacity (more than 69 µmol/L), decreased transferrin saturation (less than 17%), and decreased serum ferritin concentration (less than 30 ng/mL or µg/L).

Regarding the medical and social characteristics of patients, the health status during the neonatal period and subsequent age periods, the frequency of acute diseases, the presence of chronic gastrointestinal pathology, the social status of the parents, the health of the parents, the level of medical activity, including family lifestyle factors, and the family's living conditions were analyzed. The most common causes of iron deficiency in young children were prematurity/low birth weight (<2500 g); children over 6 months of age who are exclusively breastfed and do not receive prophylactic iron supplements; and children receiving cow's milk for up to 1 year.

The goal of IDA treatment was to eliminate the underlying cause (dietary correction, identification and elimination of the source of blood loss) and restore iron deficiency. Treatment strategies for iron deficiency in children were selected based on the type and severity of anemia and individual characteristics. Treatment of IDA in young children should be comprehensive and based on four principles: normalization of the child's routine and diet; possible correction of the cause of iron deficiency; prescription of iron supplements; and concomitant therapy.

A balanced diet, especially breastfeeding, is the most important factor in correcting iron deficiency. Breast milk not only contains iron in a highly bioavailable form but also enhances the absorption of iron from other foods consumed simultaneously. However, the intense metabolic processes in infants lead to the depletion of prenatal iron stores by the fifth to sixth month of life, even in children with a favorable perinatal history and breastfed infants. A complete and balanced diet only meets the body's physiological need for iron, but does not eliminate its deficiency. It is important to consider the influence of various nutrients on the absorption of non-heme iron. Substances that promote iron absorption in the intestine include ascorbic acid, animal protein, and lactic acid. Substances that reduce the absorption of this micronutrient include soy protein, phytates, calcium, dietary fiber, and polyphenols. Therefore, when planning a proper diet for children, the above-mentioned characteristics of iron metabolism were taken into account. Iron supplements were prescribed to patients with IDA in conjunction with adequate nutritional adjustments.

For the treatment of anemia in children, oral iron preparations characterized by high efficiency and safety, with good organoleptic properties were used. Iron (III) preparations based on hydroxide polymaltose complex (HPC) meet these requirements to the greatest extent. Iron (III) preparations based on HPC have the following properties and advantages: high safety, no risk of overdose, intoxication and poisoning; no darkening of gums and teeth; pleasant taste; excellent tolerability determining high compliance; no interaction with other drugs and food products; antioxidant properties. The daily therapeutic dose of iron (III) preparations based on HPC was 3-5 mg / kg throughout the entire treatment period. The duration of IDA treatment is: for mild anemia (Hb level 90-110 g / l) - 3 months; for moderate anemia (Hb level 70-90 g / l) - 4.5 months; for severe anemia (Hb level less than 70 g/l) – 6 months.

In young children, iron deficiency is never isolated and is often accompanied by deficiencies of vitamins C, B12, B6, PP, A, E, folate, zinc, copper, and others. This is because nutritional insufficiency and impaired intestinal absorption, which lead to iron deficiency, also affect the absorption of these micronutrients. Therefore, multivitamin supplements were included in the complex therapy of IDA.

The effectiveness of IDA therapy was determined by a doubling of reticulocyte count compared to the baseline (the so-called reticulocyte crisis). Hemoglobin increase was also assessed, which should be 10 g/L or more per week. Accordingly, target hemoglobin levels were achieved, on average, within 3-5 weeks of

treatment initiation, depending on the severity of the anemia. However, treatment with iron preparations should be carried out in sufficient doses and for a long time (at least 3 months) even after the hemoglobin level has normalized, in order to replenish iron stores in the depot.

CONCLUSIONS

The goal of IDA treatment is to eliminate iron deficiency and restore iron stores. An individualized approach to iron replacement therapy, based on monitoring ferrokinetic parameters during therapy, helps replenish iron deficiency and promotes the normalization of all body systems. Therefore, given the high prevalence of iron deficiency in young children, the negative impact of iron deficiency and its long-term health consequences, timely diagnosis of this condition followed by adequate iron therapy is essential. For young children, the optimal treatment is polymaltose hydroxide complex, which has proven to be well-tolerated and causes fewer complications than ionic iron salt preparations. Timely prevention and treatment of iron deficiency in young children can improve their immune system and prevent weakening of the body's defenses.

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