

## Original Research

### Prevention and treatment of Iron Deficiency Anemia in children

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#### ABSTRACT:

Currently, the urgency of the problem of early diagnosis and adequate treatment of IDA in children is beyond doubt, since iron is involved in many vital processes: in redox and enzymatic reactions, hematopoiesis, supply of organs and tissues with oxygen. Iron deficiency can delay the growth and development of children, reduce working capacity, and contribute to an increase in the incidence of acute respiratory diseases. Early diagnosis, adequate therapy and prevention of IDA are the main components of a modern comprehensive approach to the treatment of anemia to ensure the health of children.

**Keywords:** Iron, iron deficiency anemia, hematology, anemia, iron supplements.

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#### INTRODUCTION

According to the WHO, from 4 to 5 billion people in the world are iron deficient, with 2 billion of them suffering from iron deficiency anemia [1]. The main causes of anemia are unbalanced nutrition, deficiency of iron, folate and vitamin B12, pathology of the gastrointestinal tract, impaired erythropoiesis, systemic inflammation and renal failure. Treatment of iron deficiency anemia involves, in addition to eliminating the main cause of this pathological condition, the use of iron preparations [2].

Evaluation of the effectiveness of medical care in the treatment of iron deficiency anemia in children. Iron belongs to essential trace elements, is part of the structure of proteins, participates in the work of enzymatic systems that provide systemic and cellular aerobic metabolism, as well as redox homeostasis of the body. Iron, being a structural component of a number of enzymes, is involved in the transport of electrons (cytochromes, iron sulfur proteins), oxygen (myoglobin, hemoglobin), as well as in redox reactions (oxidases, hydrolases, superoxide dismutase) [3, 4, 5].

Disruption of the functioning of iron-containing proteins present in all organs and tissues leads to changes in a number of vital processes. It is known that iron is not only a component of various heme proteins, which are necessary for the normal

implementation of redox reactions, but also a cofactor of some enzymes. Trivalent iron from food with the help of copper-dependent ferredoxinase on the membrane of enterocytes under the action of vitamin C is reduced to ferrous iron and through manganese-dependent protein transporters of bivalent metals (DMT proteins) enters the enterocyte, from where ferroportin on the basement membrane passes through the protein into the blood copper-dependent ferroxidases are oxidized to the trivalent state in order to bind to the transport protein, transferrin [6, 7].

This complex (transferrin - iron) interacts with specific receptors on the membrane of erythroid cells in the bone marrow, then enters the cells, where iron is transferred to mitochondria and incorporated into protoporphyrin, participating in the formation of heme. Transferrin is normally about 30% saturated with iron.

Transferrin freed from iron can participate in the transfer of iron several times. Iron is stored in the depot as part of the proteins ferritin and hemosiderin. Iron can also enter the depot when red blood cells are naturally destroyed. With a normal balance of iron in the body, a balance is established between the content of ferritin in plasma and depot. The level of ferritin in the blood reflects the amount of deposited iron. An iron deficiency develops in the erythron system,

which leads to a decrease in the production of erythrocytes and reticulocytes and to a decrease in hemoglobin in them [8].

Thus, ineffective erythropoiesis may develop. Further, the depletion of iron reserves in the depot occurs - the content of ferritin and hemosiderin decreases. Hormonal factors play an important role in the development of IDA, especially in adolescence, since androgens stimulate erythropoiesis, absorption and utilization of iron, hemoglobin synthesis, and estrogens inhibit these processes

## MATERIAL AND METHODS

The survey was carried out among 45 children, of whom 16 were organized, 19 were unorganized children from 2 to 14 years old. All children underwent a complete clinical and laboratory examination. Children and parents of children complained of general weakness, fatigue, dizziness and poor sleep.

## RESULTS AND DISCUSSION

On examination, 80% of children were clinically diagnosed with iron deficiency anemia of varying severity. After establishing the clinical diagnosis of iron deficiency anemia, all patients were prescribed the appropriate standard treatment with the inclusion of iron supplements with folic acid. After the course of treatment, the level of hemoglobin in the blood reached 110 g/l. After carrying out medical and preventive work with the inclusion of iron-containing drugs, 90% of sick children showed an improvement in their general condition and a decrease in subjective complaints. It is necessary to strictly monitor the duration of treatment with iron preparations. No one can cancel iron supplements, neither the patient, let alone the doctor, after reaching a normal concentration of hemoglobin. Clinical experience shows that the duration of treatment with iron preparations for mild iron deficiency anemia is at least 3 months, for moderate anemia - 4–4.5 months, for severe anemia - 6 months. The ineffectiveness of iron-deficiency anemia therapy with iron preparations is often associated with the use of low doses of iron preparations and unnecessarily short courses of treatment [9, 10].

The basic principles of IDA treatment, formulated back in 1981 by LI Idelson, remain relevant today [11]:

- It is impossible to replenish DI without iron-containing preparations;
- IDA therapy should be carried out mainly with iron preparations for oral administration;
- IDA therapy should not be stopped after the normalization of Hb concentration;
- Blood transfusion should be carried out only for strict health reasons.

The effectiveness of therapy for iron deficiency anemia can be judged by several indicators:

reticulocytic reaction (an increase in reticulocytes 2 times after 7–10 days compared to the initial amount); an increase in hemoglobin after 4 weeks of treatment (10 g / l or more per week); the disappearance of the clinical manifestations of the disease after 1-2 months of treatment; overcoming tissue sideropenia in 3-6 months from the start of treatment, which can be fixed by the normalization of the SF level [12].

There is a reasonable opinion that with IDA, as a rule, there is no indication for transfusion of erythrocyte mass even in cases of severe course of the disease, since it develops gradually and the child adapts to anemization.

Treatment of IDA is based, firstly, on eliminating the cause underlying the development of anemia, and secondly, on replenishing the iron deficiency in the body. It is impossible to restore iron stores without prescribing iron medications.

Basic principles of IDA treatment [13]:

1. The use of predominantly iron preparations for oral administration.
2. Appointment of adequate doses of iron drugs, which are calculated for each specific patient individually, taking into account his body weight, the severity of anemia and the results of laboratory diagnostics.
3. The duration of the course of treatment with iron preparations should be sufficient: depending on the severity of the anemia, it ranges from 3 to 6 months.
4. Therapy for iron deficiency anemia should not be stopped after the hemoglobin level has returned to normal.
5. In case of ineffectiveness of oral drugs or the impossibility of their use, drugs for parenteral administration are used.
6. Blood transfusions for iron deficiency anemia should be carried out only for health reasons.

The decision to carry out a transfusion of erythrocyte mass can be made by a doctor who is currently at the patient's bedside, taking into account the nature of his disease, the severity of anemia, the threat of a further decrease in hemoglobin, the tolerance of anemia to patients, and the stability of hemodynamic parameters. A common mistake is to ask doctors to name the hemoglobin numbers at which a red blood cell transfusion is necessary, which does not take into account the above indicators [14, 15].

Prevention of IDA in young children includes antenatal and postnatal prophylaxis. Antenatal prophylaxis includes the correct regimen and nutrition of the pregnant woman, the timely detection and treatment of anemia in the pregnant woman, the preventive prescription of iron preparations for women at risk of developing IDA.

Postnatal prevention consists in maintaining the hygienic conditions of the child's life, adequate feeding, and timely introduction of complementary foods.

Premature babies (from 2 months of age) need a prophylactic appointment of iron preparations; children from multiple pregnancies, complicated pregnancies and childbirth; large children with high rates of weight gain and growth; children who are artificially fed with unadapted formulas; children with chronic diseases, with malabsorption syndrome; as well as after blood loss and surgical interventions [16].

During puberty, girls in the first 2-3 years after menarche require special attention, as well as adolescents (both girls and boys) who are actively involved in sports. Prophylaxis should be carried out with iron preparations for oral administration, at a dose of 1-2 mg / kg / day (for children under 3-5 years old) or 50-60 mg / day (for children over 5 years old and adolescents) for 3- 4 weeks, at least 1 time per year (in each case, the course of ferrotherapy is personalized!) [17].

Observation on the site for children who have undergone I-II degree IDA is carried out for at least 6 months, who have undergone III degree IDA - at least 1 year. It is advisable to control the level of hemoglobin at least 1 time per month, the content of PS - after the completion of the basic and rehabilitation courses of FT, as well as when removed from dispensary registration [18, 19].

Prophylactic vaccinations in children with ID is not contraindicated, does not require hemoglobin normalization, since the number of immunocompetent cells is sufficient.

## CONCLUSION

As a result of the introduction of modern standards of treatment and consultation skills, it became possible to significantly improve the quality of medical care. It is necessary to conduct extensive explanatory work among the population about iron deficiency anemia and its prevention, about possible severe complications and disability.

The significance of the IDA problem in children is due to its high prevalence and frequent development in various diseases, severe and sometimes irreversible consequences of iron deficiency for children, the presence on the modern pharmaceutical market of a large number of iron preparations of different composition and properties, which are difficult for a practitioner to navigate. It is important to realize that, despite the fact that at the present stage in the doctor's arsenal there are enough diagnostic and therapeutic possibilities for early detection and timely correction of sideropenic conditions, the problem of ID is a developing problem and every year brings a lot of new information.

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## CONSENT

Written informed consent was obtained from all participants of the research for publication of this paper and any accompanying information related to this study.

## CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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