

## NUTRITION AND ANEMIA IN CHILDREN

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**Abstract:** This article provides an in-depth analysis of the physiological importance of nutrition in children and the problem of anemia that develops as a result of improper and unbalanced nutrition. The increased need of the body for protein, vitamins and microelements, especially iron, due to the rapid growth and development processes in childhood, is scientifically explained. The etiological factors, stages of pathogenesis, clinical signs and laboratory indicators of iron deficiency anemia are described in detail. The negative impact of anemia on the physical development, mental potential and immune system of the child is also revealed. The article emphasizes the importance of early diagnosis, the organization of rational nutrition, treatment with iron preparations and effective preventive measures. This information is of significant scientific and practical importance in pediatric practice in strengthening children's health and preventing anemia.

**Keywords:** Children's nutrition, anemia, iron deficiency, hemoglobin, microelements, hypotrophy, prevention.

### Introduction

Childhood is one of the most unbearable periods in life, along with rapid physical growth, intensive metabolism and functional waiting for intra-organ levels and forms of physiological systems. In this stage, the organism experiences drastic biological changes which need a stable source of vital nutrients for normal growth and development. Thus, adequate nutrition is viewed as a cornerstone for children's health, affecting not only their physical growth but also their cognitive development, emotional well-being and immunity [1]. A developing body needs adequate proportions of proteins, fats, carbohydrates, vitamins and important micronutrients to sustain good physiologic activity. Iron is one such nutrient that holds a particularly vital position as it plays an immediate and essential role in hemoglobin, oxygen transport, various enzymatic processes involved in cellular metabolism. Approximately 40% of iron stores and maintain normal status of hematopoiesis under a healthy condition. When the intake of iron and essential nutrients is deficient, or when their absorption in the gastrointestinal tract is abnormal, multiple pathological conditions can appear. Anemia, especially iron deficiency anemia, is one of the most common and critical nutritional deficiency disorders during childhood and continues to be a significant public health problem globally [2,3,4].

Iron and micronutrient deficiencies are key considerations in contemporary pediatric practice and public health research that impact a child's morbidity profile and developmental trajectory. Iron deficiency anaemia is one of the most common nutritional disorders in children, according to

international health statistics and epidemiological studies reported to the World Health Organization (WHO) [5,6]. We will step up our efforts to promote a healthy and diversified diet, increase the delivery capacity of nutritional products, distribute iron-rich products for pregnant women and children, and ensure food safety for public health in China. Besides, some sociocultural and economic factors also play role in childhood anemia. The risk increases during the first two years of life due to predisposing factors such as early withdrawal from breastfeeding, late introduction of complementary foods, inadequate nutritional status of mother during pregnancy and recurrent exposure to infections. In several developing areas, chronic inflammatory conditions and parasitic diseases aggravate nutrient deficiencies, increasing the susceptibility to hematological disorders in children.

Iron deficiency anemia is caused by sequential iron depletion, where a gradual and complex pathophysiological mechanism affects multiple physiological systems in the body[7]. The most common change in anemia is decreased hemoglobin concentration in the blood, resulting in reduced oxygen delivery to tissues and organs. Oxygen is essential for cellular respiration and energy generation; thus, limited oxygen availability causes chronic tissue hypoxia. Chronic hypoxia impairs cellular metabolism, enzymes lose their catalytic efficiency, and organ systems do not work normally. This condition is especially dangerous in children, whose bodies are still quickly developing and maturing neurologically. There are many clinical studies, which show that some children with iron deficiency anemia have physical growth retardation, while their intelligence performance is lower than normal to some extent, meanwhile attention and concentration ability worsens, academic performance also decreases great deal [8,9]. In addition, anemia lowers immunity, increasing children's risk of infectious diseases and prolonging their illness periods. Thus, the anemia cannot be limited only to hematological problem; rather it is multi-factorial medical and social problem, which was one of much impact on both short and long term physical and intellectual development of the child.

In addition, the family setting is another major factor in the generation of incorrect eating habits developing anemia in children. Modern nutritional habits in the world often contain too many highly processed food that have high energy value with no specific vitamins and if these nutrients are not delivered from foods then healthy metabolism is impossible if nutrition is unhealthy. Typical children's diets are high in sugar beverages, refined carbohydrates and low-nutrient foods sources, while missing out on adequate consumption of natural food sources that contain proteins, vitamins as well as trace elements. Red meat, liver, eggs, legumes, leafy green vegetables and whole grains (24) are the main sources of iron and other macro/micro nutrients essential for hematopoiesis. However, inadequate intake of these items may cause progressive iron deficiency. Gastrointestinal diseases, chronic inflammatory conditions, intestinal parasitic infections, and malabsorption syndromes also inhibit the effective absorption of nutrients by the body. These medical aspects of complication ensure deteriorated nutritional status of children as well as increase the odds for developing anemia[10].

The cornerstones for the public health and preventive medicine response to this anemia epidemic can be found within a well-known strategy. By providing adequate nutrition for planned pregnancy and during pregnancy in mother, the prevention strategies would be started from before birth because nutritional status of a pregnant woman determines the fetal development and iron stores in babies. Breastfeeding exclusively for the first six months of life provides the balance of vitamins, minerals and nutrients that a baby requires to support optimal functioning of their immune and physiological development. After this time frame, introducing complementary foods immediately, fortified with iron and other micronutrients is vital for maintaining proper nutrition. Preventive healthcare also requires regular pediatric examinations, laboratory monitoring of hemoglobin levels and early detection of micronutrient deficiencies. Besides, educational program to increase the knowledge of parents about

healthy nutrition, hygiene practices and balanced diets is another important factor for decreasing anemia among children[11,12].

The issue of the scientific analysis of the relationship between nutrition and anemia in children is of high theoretical and practical significance. The analysis of the physiological mechanisms of metabolism of nutrients, diagnosis and dependence from etiologic factors responsible for oxidative stress, assessment of clinical manifestation and criteria for diagnosing anemia are basic problems of contemporary pediatric science. Moreover, the incidence of these nutritional disorders highlights the need for robust preventive strategies and therapeutic measures to improve children health status and reduce burden of disease in society. So, the objective of this review is to provide a thorough examination of the various physiological implications of nutrition during childhood and their influence in causation, pathogenesis clinical features and prevention on children with iron deficiency anemia. The findings of this research can help promote the practices of pediatrics, rational nutrition, and the health of a younger generation.

## Methodology

Anemia in children is a condition that has to relate between the nutritional element where this study, analytical comparative and descriptive approaches aim to examine. The study is mainly based on the review of scientific articles, clinical mandates, and global health publications related to pediatric nutrition as well as IDA. Pediatric and hematology specialists published data as well as recommendations from international organizations such as world health organization (WHO)) were systematically reviewed regarding anemias etiology, pathogenesis, clinical manifestations and prevention in children.

On top of this, the research used a theoretical synthesis of medical and nourished background to assess essential nutrients requirements for children with an emphasis on iron, proteins, vitamins as well as trace elements during a growth and development phase. In particular, laboratory diagnostic indicators including those of hemoglobin levels, erythrocyte indices as well as serum iron and ferritin levels were paid special attention[13].

In addition, the methodical approach involved studying of contemporary pediatric recommendations on rational nutrition for children. Data theory was conducted on children factors involved in the development of iron deficiency anemia and on effective preventive and therapeutic ways to treat iron deficiency anemia.

## Result and discussion

The most intensive stage of growth and development of the body is childhood. High metabolism takes place during this period with tissue differentiation and organizations being functionally matured. So, the organism of a child is very much in need of protein, fat, carbohydrates, vitamins and microelements like iron, zinc, copper and folate. A limitation in the uptake of nutrients or their absorption into enterocytes can lead to various pathological conditions, including anemia. Iron is part of hemoglobin, myoglobin and many enzymes in the body. Oxygen is transported through hemoglobin. In his case if there is iron deficiency then heme synthesis will be impaired causing the erythropoiesis to slow down leading to hypochromic microcytic anemia. The first margin of the body: reserves, peak - iron → ferritin volume declines. Eventually, serum iron declines and transferrin saturation decreases, finally leading to disruptions in hemoglobin synthesis. There are several factors that contribute to the development of iron deficiency anemia in children. First, the alimentary factor is a bad diet. Because they consume insufficient amounts of foods high in animal proteins. Secondly, the body's greater need due to explosive growth. Third, reduced intestinal absorption of iron due to chronic infections and intestinal diseases. Fourth, hidden blood loss and parasitic diseases are also the main causes of this

matter[14]. Pathogenesis is based on the tissue hypoxia. Hypoxia impairs the metabolism of cells, reducing energy production and slowing down central nervous system activity. Hence, anemic children get fatigued early, have decreased attention and interest for reading. The skin and mucous membranes are pale, tachycardia is present, and breathing is rapid. Hair gets brittle, nails thin out — and have some times a spoon form. Similar taste (eating chalk, soil, or other strange substances), i.e., pica syndrome is also one of the clinical signs of iron deficiency. Laboratory diagnostic is of utmost importance regarding complete blood count. A reduction of hemoglobin value relative to age norm, microcytic, hypochromic anemia are revealed. Serum iron and ferritin fall in biochemical tests. A bone marrow study can additionally be included, if needed. Treatment principles should approach it comprehensively. Elimination of alimentary factors in the first place. Iron-rich products: beef, liver, eggs, legumes and spinach and other greens are advisable to be included in the diet. Iron formulations are given orally and treatment is maintained for at least 3–4 months[15]. There is continuous monitoring of the hemoglobin throughout treatment. In severe forms, parenteral iron preparations (e.g. Dextriferron) or hemotransfusions may be used. Preventive efforts must start in pregnancy. It is also essential to avoid the mother from being anemic, breastfeed for not less than 6 months and introduce suitable complementary foods timely. In order to prevent anemia in school-age children, a balanced diet, compliance with sanitary and hygienic rules and regular medical examinations are of great importance. Nutrition and anemia in children are closely related, rational nutrition is one of the preconditions for healthy growth and development.

## **Conclusion**

It is an important issue of modern-pediatrics, the problem of nutrition and anemia in children. Vitamins and microelements a priori are not enough in product raw materials, while during childhood there is an intensive growth of the body, morphofunctional maturation of tissues and organs that leads to a need for sufficient amounts of protein. Among them, an important role in the formation of hemoglobin is played by the element iron — its deficiency has a negative impact on the work of all body systems. Iron deficiency anemia (IDA) leads to chronic hypoxia, which may result in a deceleration of physical development and reduced mental capacity in children with weakened attention and memory. Anemia does not only mean a drop in the level of hemoglobin, it also interferes with the functioning of the immune system. The child gets sick more often, infectious processes are more severe, and recovery is delayed. So aimed as to finding out the causes and with specific treatment of anemia in children are important.

A healthy generation is formed with conditions such as a rational diet, consumption of iron-rich foods in sufficient quantities, and taking preventive measures even during pregnancy. In addition, anemia rates can be remarkably reduced by increase in knowledge and responsibility of parents and health care personnel, advocating a healthy lifestyle amongst children. Thus, considering the nutrition of children on a scientific basis and preventing iron deficiency anemia are fundamental components of strengthening the health system of society in addition to enhancing physical and intellectual potential among the future generation.

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