

**CLINICAL FEATURES AND RISK FACTORS OF IRON DEFICIENCY ANEMIA
IN PEDIATRIC PATIENTS**

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Abstract: Iron deficiency anemia (IDA) is the most common nutritional deficiency and hematological disorder among pediatric populations worldwide. It is particularly prevalent in infants, preschool children, and adolescents due to increased iron requirements during periods of rapid growth. Iron deficiency adversely affects physical growth, immune function, cognitive development, and academic performance. Early recognition of clinical features and identification of risk factors are essential for timely diagnosis and effective management. This article reviews the epidemiology, pathophysiology, clinical manifestations, risk factors, diagnostic approach, and preventive strategies of iron deficiency anemia in pediatric patients.

Keywords: iron deficiency anemia, pediatrics, risk factors, clinical features, nutrition, childhood anemia.

Introduction

Iron deficiency anemia remains a significant public health problem, especially in developing countries. According to the World Health Organization, anemia affects nearly half of children under five years of age globally, with iron deficiency being the leading cause. Pediatric patients are particularly vulnerable due to increased iron requirements associated with growth, inadequate dietary intake, and frequent infections.

Iron deficiency anemia in children is often underdiagnosed because early symptoms may be mild or nonspecific. However, prolonged iron deficiency can result in irreversible neurocognitive impairment. Therefore, understanding the clinical features and risk factors of IDA is crucial for pediatricians and primary healthcare providers.

Iron Metabolism and Pathophysiology

Iron is an essential micronutrient required for hemoglobin synthesis, oxygen transport, and cellular metabolism. In children, iron balance depends on adequate dietary intake, proper absorption in the duodenum, and minimal losses.

Iron deficiency develops in stages:

Depletion of iron stores (low serum ferritin)

Iron-deficient erythropoiesis

Iron deficiency anemia (low hemoglobin and hematocrit)

Inadequate iron intake, impaired absorption, increased requirements, or chronic blood loss lead to insufficient hemoglobin production, resulting in microcytic, hypochromic anemia.

Epidemiology of Iron Deficiency Anemia in Children

Iron deficiency anemia is most prevalent in:

Infants aged 6–24 months

Preschool children

Adolescent girls

Risk is higher in low-income populations, premature infants, and children with chronic diseases. In many regions, nutritional anemia remains a major cause of morbidity in pediatrics.

Clinical Features of Iron Deficiency Anemia

Clinical manifestations depend on the severity and duration of anemia.

General Symptoms

Fatigue and weakness

Pallor of skin and mucous membranes

Irritability and poor appetite

Decreased physical activity

Neurological and Cognitive Manifestations

Delayed psychomotor development

Impaired attention and memory

Learning difficulties and poor school performance

Cardiorespiratory Signs

Tachycardia

Systolic murmur

Dyspnea on exertion (in severe cases)

Specific Signs of Iron Deficiency

Glossitis

Angular cheilitis

Brittle nails or koilonychia

Pica (craving for non-food substances)

Risk Factors for Iron Deficiency Anemia in Pediatric Patients

Several factors contribute to the development of IDA in children.

Nutritional Factors

Inadequate intake of iron-rich foods

Prolonged exclusive breastfeeding without iron supplementation

Excessive consumption of cow's milk in infancy

Physiological Factors

Prematurity and low birth weight

Rapid growth during infancy and adolescence

Socioeconomic Factors

Low socioeconomic status

Poor dietary diversity

Limited access to healthcare

Medical Conditions

Chronic gastrointestinal blood loss

Parasitic infections

Malabsorption syndromes

Chronic inflammatory diseases

Diagnostic Evaluation

Diagnosis of iron deficiency anemia is based on clinical assessment and laboratory findings.

Laboratory Investigations

Complete blood count: low hemoglobin, low MCV, low MCH

Serum ferritin: decreased

Serum iron: decreased

Total iron-binding capacity (TIBC): increased

Peripheral blood smear: microcytic hypochromic erythrocytes

Early detection through screening is especially important in high-risk groups.

Management Strategies

The primary goals of treatment are to correct anemia, replenish iron stores, and address underlying causes.

Iron Supplementation

Oral iron therapy is the first-line treatment

Ferrous sulfate, gluconate, or fumarate preparations

Treatment duration: at least 3 months after normalization of hemoglobin

Dietary Modification

Increased intake of iron-rich foods (meat, liver, legumes, green vegetables)

Vitamin C supplementation to enhance iron absorption

Limiting cow's milk intake in young children

Treatment of Underlying Conditions

Deworming in parasitic infections

Management of gastrointestinal disorders

Prevention of Iron Deficiency Anemia

Preventive strategies include:

Iron supplementation in high-risk infants

Nutrition education for parents

Food fortification programs

Routine screening during pediatric visits

Prevention plays a key role in reducing the long-term consequences of iron deficiency.

Impact of Iron Deficiency Anemia on Child Development

Iron deficiency during early childhood can have lasting effects on brain development. Studies show that children with untreated IDA may have persistent cognitive and behavioral deficits even after correction of anemia, highlighting the importance of early intervention.

Conclusion

Iron deficiency anemia is a common and preventable condition in pediatric patients. Recognition of clinical features and identification of risk factors enable early diagnosis and effective management. A comprehensive approach combining nutritional interventions, iron supplementation, and preventive strategies is essential to reduce the burden of IDA and improve child health outcomes.