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## NUTRITIONAL DEFICIENCY IN CHILDREN: A GROWING CONCERN

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### Abstract

Nutritional deficiency among children remains one of the most important public health challenges worldwide. Adequate nutrition during childhood is essential for proper physical growth, cognitive development, immune competence, and emotional well-being. Deficiency of proteins, calories, vitamins, and minerals can adversely affect a child's development and may lead to severe short-term and long-term complications. Common nutritional deficiencies observed in children include protein-energy malnutrition, iron deficiency anemia, vitamin D deficiency, vitamin B12 deficiency, zinc deficiency, calcium deficiency, iodine deficiency, and folic acid deficiency. Factors such as poor dietary habits, food insecurity, socioeconomic limitations, infections, and malabsorption disorders contribute significantly to these deficiencies. Early identification, nutritional education, dietary modifications, supplementation, and public health interventions are necessary to reduce morbidity and improve child health outcomes. The present article discusses common nutritional deficiencies in children, their causes, clinical manifestations, preventive strategies, and management approaches.

**Keywords:** Nutritional deficiency, Malnutrition, Micronutrients, Protein-energy malnutrition, Vitamins, Child health.

## **Introduction**

Nutrition plays a fundamental role in the growth and development of children. Childhood is a critical period characterized by rapid physical, mental, and emotional development, requiring adequate intake of essential nutrients. Balanced nutrition provides energy, supports tissue growth, strengthens immunity, and promotes optimal cognitive function. Deficiency of nutrients during this period can result in impaired growth, delayed development, poor academic performance, increased susceptibility to infections, and long-term health complications.

According to the World Health Organization, malnutrition includes deficiencies, excesses, or imbalances in a person's intake of energy and nutrients. In children, undernutrition commonly manifests as wasting, stunting, underweight, and micronutrient deficiencies. These conditions remain prevalent in many developing countries due to poverty, inadequate dietary intake, recurrent infections, and lack of awareness regarding balanced nutrition.

Nutritional deficiencies not only affect individual health but also contribute to reduced productivity, increased healthcare burden, and impaired national development. Therefore, early recognition and prevention of nutritional deficiencies are essential for improving child health and quality of life<sup>1</sup>.

## **Importance of Nutrition in Children**

Adequate nutrition is essential for maintaining overall health and supporting developmental milestones in children. Proper nutrition helps in:

- Development of strong bones and muscles
- Maintenance of healthy body weight
- Brain growth and cognitive performance
- Enhancement of immunity
- Prevention of infections and diseases
- Emotional and behavioral stability

Deficiency of essential nutrients during childhood may permanently affect physical and intellectual potential<sup>2</sup>.

## **Causes of Nutritional Deficiencies in Children**

Several factors contribute to nutritional deficiencies in children:

### **1. Inadequate Dietary Intake**

Children consuming diets lacking proteins, vitamins, and minerals are at increased risk of malnutrition and micronutrient deficiencies.

### **2. Picky Eating Habits**

Selective eating behaviors may limit intake of nutrient-rich foods, leading to deficiencies over time.

### **3. Food Allergies and Malabsorption**

Conditions such as lactose intolerance, celiac disease, and chronic gastrointestinal disorders can impair nutrient absorption.

### **4. Socioeconomic Factors**

Poverty, food insecurity, and limited access to nutritious foods significantly increase the risk of childhood malnutrition.

### **Recurrent Infections**

Frequent illnesses can reduce appetite, impair absorption, and increase nutritional requirements.

### **Consequences of Nutritional Deficiency<sup>3</sup>**

Nutritional deficiencies can have serious effects on child health, including:

- Delayed physical growth
- Cognitive impairment and poor academic performance
- Reduced immunity and recurrent infections
- Behavioral and emotional disturbances
- Delayed wound healing
- Increased risk of chronic diseases in adulthood

Severe malnutrition may even increase childhood morbidity and mortality.

### **Protein-Energy Malnutrition (PEM)**

Protein-Energy Malnutrition is one of the most common nutritional disorders among children, especially in low-income populations. It results from inadequate intake of proteins and calories required for normal growth and metabolic activities<sup>4</sup>.

## **Types of PEM**

### **A. Kwashiorkor**

Kwashiorkor mainly occurs due to severe protein deficiency despite relatively adequate calorie intake.

#### **Clinical Features**

- Edema
- Muscle wasting
- Hair discoloration and loss
- Skin lesions
- Fatigue and irritability
- Enlarged fatty liver

### **B. Marasmus**

Marasmus results from severe deficiency of both calories and proteins.

#### **Clinical Features**

- Severe wasting
- Marked weight loss
- Loss of subcutaneous fat
- Weakness and lethargy
- Stunted growth

#### **Causes of PEM**

- Inadequate dietary intake
- Poverty and food scarcity
- Chronic infections
- Poor maternal nutrition
- Digestive and absorption disorders

#### **Consequences of PEM**

- Growth retardation

- Delayed cognitive development
- Weak immunity
- Increased susceptibility to infections
- Higher mortality risk

### **Prevention and Management**

- Balanced diet rich in proteins and calories
- Breastfeeding and proper complementary feeding
- Nutritional rehabilitation
- Treatment of underlying illnesses
- Public health nutrition programs

### **Iron Deficiency**

Iron deficiency is the most common micronutrient deficiency among children and a leading cause of anemia<sup>5</sup>.

### **Clinical Features**

- Fatigue
- Pallor
- Reduced concentration
- Weakness
- Delayed cognitive development

### **Prevention**

Iron-rich foods such as green leafy vegetables, beans, meat, fortified cereals, and jaggery should be included in the diet.

### **Iron Supplementation**

Ferrous sulfate is commonly prescribed at 3–6 mg/kg/day of elemental iron in divided doses depending on severity.

### **Vitamin D Deficiency**

Vitamin D is essential for calcium metabolism and bone mineralization.

### **Clinical Features**

- Bone pain
- Delayed growth
- Rickets
- Muscle weakness

### **Prevention**

- Adequate sunlight exposure
- Vitamin D fortified foods
- Dietary supplementation when necessary

Children with deficiency may require higher therapeutic doses under medical supervision.

### **Vitamin B12 Deficiency**

Vitamin B12 is necessary for neurological development and red blood cell formation.

### **Clinical Features**

- Weakness
- Developmental delay
- Tingling sensation
- Megaloblastic anemia

### **Prevention**

Animal products such as milk, eggs, fish, and meat are important sources of vitamin B12. Vegetarian children may require supplementation.

### **Vitamin C Deficiency**

Vitamin C is important for collagen synthesis, immunity, and wound healing<sup>6</sup>.

### **Clinical Features**

- Bleeding gums
- Poor wound healing
- Weakness
- Scurvy

### **Prevention**

Consumption of citrus fruits, tomatoes, guava, strawberries, and green vegetables helps prevent deficiency.

### **Zinc Deficiency**

Zinc is required for growth, immunity, and cellular repair.

### **Clinical Features**

- Growth retardation
- Frequent infections
- Loss of appetite
- Delayed wound healing

### **Prevention**

Foods rich in zinc include meat, poultry, legumes, nuts, and fortified cereals.

### **Calcium Deficiency**

Calcium is essential for healthy bones and teeth.

### **Clinical Features**

- Weak bones
- Muscle cramps
- Delayed skeletal development
- Increased fracture risk

### **Prevention**

Milk, cheese, yogurt, sesame seeds, and leafy vegetables are good calcium sources.

### **Folic Acid Deficiency**

Folic acid plays an important role in DNA synthesis and red blood cell production.

### **Clinical Features**

- Megaloblastic anemia
- Weakness
- Poor growth

### **Prevention**

Leafy vegetables, pulses, beans, and fortified grains are rich in folate.

### **Magnesium Deficiency**

Magnesium is necessary for muscle and nerve function.

### **Clinical Features**

- Muscle cramps
- Weakness
- Irritability
- Neuromuscular disturbances

### **Prevention**

Magnesium-rich foods include nuts, seeds, whole grains, and green leafy vegetables.

### **Potassium Deficiency**

Potassium is important for muscle contraction and cardiac function.

### **Clinical Features**

- Muscle weakness
- Fatigue
- Irregular heartbeat
- Constipation

### **Prevention**

Bananas, potatoes, sweet potatoes, avocados, and coconut water are rich potassium sources.

### **Iodine Deficiency**

Iodine is essential for thyroid hormone production and brain development.

### **Clinical Features**

- Goiter
- Cognitive impairment
- Developmental delay

- Hypothyroidism

### **Prevention**

Use of iodized salt and inclusion of seafood and dairy products in the diet are effective preventive measures.

### **Prevention of Nutritional Deficiencies**

Nutritional deficiencies can be prevented through combined efforts of parents, schools, healthcare professionals, and public health systems.

### **Important Preventive Measures<sup>7</sup>**

1. Provide a balanced and diversified diet.
2. Promote breastfeeding and timely complementary feeding.
3. Encourage healthy eating habits.
4. Conduct regular growth monitoring.
5. Ensure proper vaccination and infection control.
6. Educate parents regarding child nutrition.
7. Use nutritional supplementation when necessary.
8. Encourage outdoor physical activities and sunlight exposure.

### **Discussion**

Childhood nutritional deficiencies continue to be a major health concern globally, especially in developing countries. Poor dietary habits, poverty, infections, and lack of awareness remain the leading causes. Among various deficiencies, protein-energy malnutrition and iron deficiency anemia contribute significantly to childhood morbidity.

Micronutrient deficiencies often coexist and may affect multiple organ systems simultaneously. Early diagnosis and intervention are therefore essential. Community nutrition programs, school health initiatives, food fortification, and awareness campaigns can play an important role in reducing the burden of childhood malnutrition.

A multidisciplinary approach involving pediatricians, dietitians, educators, and caregivers is necessary for effective prevention and management.

## **Conclusion**

Adequate nutrition is essential for healthy childhood growth and development. Nutritional deficiencies can adversely affect physical health, cognitive performance, immunity, and quality of life. Protein-energy malnutrition and micronutrient deficiencies remain major concerns in pediatric health.

Early identification, balanced dietary practices, nutritional education, supplementation, and public health interventions are crucial for preventing malnutrition and promoting healthier future generations. Awareness regarding proper nutrition should be strengthened at family, school, and community levels to ensure optimal child health and development.

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