Ten-minute consult – iron deficiency in children

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A recent study conducted with children in Western Australia revealed that one third of one-year-olds and nearly two thirds of three-year-olds had iron deficiency, presumed to be predominantly nutritional.

The subtle but serious implications of iron deficiency include potential harm to neurodevelopment, a weakened immune system and impaired overall health. Early detection and correction is vital.

The causes of iron deficiency in children generally fall into five main categories: insufficient dietary intake, chronic blood loss, rapid growth spurts, malabsorption, and genetic factors like TMPRSS6 gene mutation.

Infants, toddlers, and adolescent girls face increased risks of iron deficiency due to heightened iron needs during times of rapid growth or menstruation.

Prevalence is also influenced by factors such as age, socioeconomic background, and ethnicity. Indigenous Australian children and those from low-income families are disproportionately affected by iron deficiency.

Left untreated, iron deficiency can progress to iron deficiency anaemia (IDA) with notable implications on growth; cognitive, psychomotor, and neurodevelopmental outcomes; mortality, and overall quality of life.

Refractory iron deficiency arises from mutations within the TMPRSS6 gene, which causes elevated hepcidin levels impeding iron absorption and storage. This culminates in iron-refractory iron deficiency anaemia (IRIDA), a subgroup characterised by persistent, lifelong iron deficiency anaemia despite adequate supplementation.

Diagnosis

Diagnosing iron deficiency anaemia in children requires a comprehensive approach that combines clinical evaluation, laboratory testing, and exploration of possible underlying factors.

A detailed medical history should include dietary patterns, growth trends, history of bleeding or chronic health issues. A physical examination might uncover signs such as pallor, fatigue, irritability, and delayed developmental milestones.

Although these indicators are not exclusively tied to iron deficiency, neither their absence eliminates the possibility.

Laboratory analysis is crucial for confirming the diagnosis and determining the severity of anaemia. A complete blood count shows decreased haemoglobin levels, a lower red blood cell count, and altered red blood cell indices (MCV and MCH).

Serum iron measures the amount of iron circulating in the blood, bound to transferrin. However, it fluctuates diurnally and is affected by recent iron intake, making it a less reliable indicator of overall iron status.

Ferritin, an intracellular protein that stores iron, reflects the body's iron reserve.

A low ferritin level is generally considered the most specific indicator of depleted iron stores. However, ferritin is also an acute-phase reactant, meaning that its levels can be elevated in the presence of inflammation, infection, liver disease or malignancy, masking underlying iron deficiency.

In these situations, additional parameters can yield vital information. In iron deficiency, the total iron-binding capacity (TIBC) and transferrin levels are often elevated – the body increases transferrin production to compensate for lack of iron – while transferrin saturation – the percentage of transferrin carrying iron – is typically reduced.

Management

The cornerstone is identifying the root cause and replenishing iron stores through dietary modifications, iron supplementation, or, in severe cases, intravenous iron infusions.

Dietary approaches focus on increasing the intake of iron-rich foods like lean meats, poultry, fish, beans, and fortified cereals. Increasing intake of foods high in vitamin C can enhance iron absorption improving overall iron status.

Oral iron supplementation is typically prescribed to correct iron deficiency either prophylactically at a dose of 1-2mg/Kg/day, or to treat IDA at 3-6mg/Kg/day.

Higher oral doses of up to 10mg/Kg/day or iron infusions can be used for severe anaemia or IRIDA. Supplementation should continue at least three months after anaemia has been corrected, to replenish stores. Poor compliance is the leading cause of treatment failure – be mindful of this.

It is crucial to inform parents about possible side effects, including gastrointestinal discomfort, blackish discoloration of stool, staining of teeth and constipation.

Additionally, addressing underlying medical conditions that may contribute to iron deficiency, such as coeliac disease or inflammatory bowel disease, is essential for long-term management. Refer for further specialist workup if suspected.

Prognosis in children is generally favourable with timely diagnosis and appropriate management. Early intervention can prevent or reverse many of the adverse effects associated with iron deficiency, including cognitive impairment and developmental delays.

Emerging therapies targeting hepcidin pathways offer hope for personalised management in IRIDA in the near future.

Preventing iron deficiency through public health initiatives, for example food fortification and iron supplementation programs along with vitamin C, is important.

Community based education, screening and early intervention is crucial for reducing the burden of iron deficiency in toddlers and children, with specialist input in refractory cases as needed. MF

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