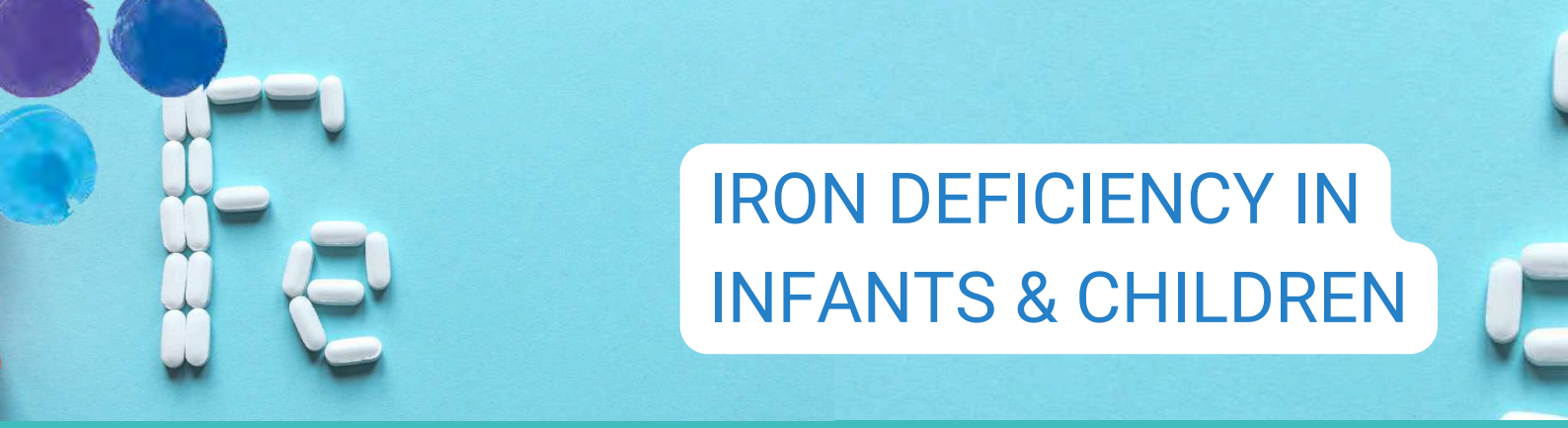

IRON DEFICIENCY IN INFANTS & CHILDREN

NEWSLETTER

Compiled by: Cerba Lancet Kenya

What is IRON DEFICIENCY?

Iron deficiency is the most common nutritional deficiency in children. The prevalence of anemia in children in Africa, South and Central America, and Southeast Asia ranges between 45% and 65%. When iron deficiency remains unrecognized, it can result in iron deficiency anemia (IDA). Children with IDA have **poorer neurocognitive outcomes,** including **slower auditory and visual processing**, compared with **those without IDA.**

Screening for Iron deficiency

A focused dietary history is the most important screening test for detecting **iron deficiency, and is more accurate** and specific than an isolated hemoglobin concentration. If resources permit, risk assessment for iron deficiency through a brief review of dietary risk factors should be performed **at all well-child checks from four months to three years of age, and annually thereafter**. Infants with a history of **low birth weight or prematurity are considered at risk for iron deficiency.**

• The simplest and most cost-effective test for iron deficiency is a full blood count (FBC), which includes hemoglobin, hematocrit, MCV, and RDW. For children at high risk, adding a serum ferritin test can help diagnose iron deficiency early—even before anemia develops.

Consider universal laboratory screening for IDA for all children, rather than selective screening for those with risk factors.

The frequency of screening will depend on patient characteristics:

- For **all children, screen once at 9 to 12 months of age**.
- For children at high risk for IDA by **dietary history** (i.e. excessive cow's milk intake) or prematurity – screen a second time several months later (e.g. at 15 to 18 months or when a risk factor is identified).
- **Children with special health needs** (e.g. chronic infection, inflammatory disorders, chronic gastrointestinal dysfunction, restricted diets, or other significant dietary risk factors for IDA) – **repeat screening at 15 to 18 months of age, and again in early childhood** (e.g. at two to five years of age).

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DIAGNOSTIC EVALUATION

IDA should be suspected in children with laboratory finding of anemia (Hemoglobin **< 11 g/dL in children 6 months to 5 years of age, and < 11.5 g/dL in children 5 to 12 years of age**).

The Diagnosis can be confirmed through the following additional steps:

Review the history for risk factors for IDA (dietary, gastrointestinal blood loss, or malabsorptive disease) and for evidence of other causes of anemia (e.g. acute infection, chronic diseases, or family history of anemia or haemoglobinopathy

If the history is consistent with likely or possible IDA, performing a limited laboratory evaluation can confirm the diagnosis.

If the presentation is typical for IDA, (age < 3 years, with any dietary risk factors for IDA), a FBC is sufficient.

Children with atypical features for IDA should have additional laboratory testing, which typically includes a reticulocyte count, serum ferritin, peripheral blood smear, and testing for faecal occult blood (at least three samples).

The combination of a hemoglobin concentration below 11 g/dL with low serum ferritin supports a provisional diagnosis of IDA. In these patients MCV is typically low, and RDW elevated.

Interpretation of iron measures must account for the full clinical context as most of these measures can be affected by factors other than iron status.

In particular, interpretation of serum ferritin is complicated as it is an acute phase reactant, so levels may increase in states of **acute or chronic inflammation, malignancy and liver disease**. A **low serum ferritin value is always consistent with iron deficiency.**

For children with presumed IDA, consider an empiric trial of oral iron therapy AND dietary changes. The diagnosis of iron deficiency is confirmed if there is an appropriate response to empiric iron therapy.

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Treatment : Initial Approach

Children with presumed **iron deficiency anemia** (based on history and initial laboratory testing), consider a trial of empiric **oral iron therapy AND dietary changes** rather than either intervention alone:

To initiate oral iron therapy, a **dose of 3 mg/kg of elemental iron once daily, rather than higher doses,** should be used. For maximum absorption, the iron should be given **30 to 45 minutes** before meals or two hours after meals. It should be given only wit**h juice or water, and not with food or milk.**

CONCURRENTLY, THE FOLLOWING DIETARY GOALS SHOULD BE IMPLEMENTED TO PREVENT RECURRENCE:

Infants younger than 12 months of age should be fed with breast milk or an iron-fortified formula milk. A cow's milk-based formula is acceptable if there is no evidence of cow's milk protein-induced colitis. Infants should not be given low-iron formula or unmodified cow's milk

For patients six months and older, especially breastfed infants, ensure adequate consumption of iron in complementary foods. These include iron-fortified infant cereals, foods rich in vitamin C, and puréed meats.

Intake of milk (cow, almond, or soy) should be limited to less than 600 mL per day, and bottle feeding should be discontinued to limit milk intake for children older than 12 months of age. Excessive milk intake is the primary reason for the development of IDA in this age group and can be associated with occult gastrointestinal blood loss.

After therapeutic iron treatment is started, follow-up testing, (a full blood count or hemoglobin) should be performed to evaluate the response. Testing should be performed when the child is healthy, approximately four weeks after beginning iron therapy.

Children with mild anemia or one to two weeks after beginning iron therapy in those with moderate to severe anemia. Follow up testing is essential to confirm that the anemia was due to iron deficiency and to ensure that it is adequately treated. This is particularly important because of the effects of iron deficiency on neurodevelopment.

If the Hemoglobin (Hb) has increased by 1 g/dL, therapy is continued and the FBC is repeated at three months to ensure that the Hb and other parameters reach the age adjusted normal range. Oral iron therapy should be continued for at least one month after the Hb reaches the normal range for age to ensure that iron stores are replenished. A serum ferritin concentration can also be measured to check iron stores prior to discontinuation of iron therapy.

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Further Evaluation:

Patients who do not demonstrate an adequate response within four weeks of initiating iron therapy should be re-evaluated. Potential causes of recurrent or refractory IDA include ineffective treatment (non-adherence or incorrect dosing), an incorrect diagnosis, or ongoing blood loss or malabsorption.

- • Interview the parent to determine whether the iron therapy has been given at the appropriate dose and timing, whether the appropriate dietary modifications have been made, and if there has been any significant intercurrent illness (which might cause a transient decrease in Hb).
- The most common reason for failure is that the treatment plan was not followed correctly.
- If the treatment plan has been adhered to, and there has not been an intercurrent illness, additional laboratory testing should be performed to confirm the diagnosis (e.g. iron profile, if not previously performed).

Conditions that might simulate or complicate IDA such as thalassemia trait or anemia of chronic disease should be ruled out. Furthermore, several (at least three) stool samples should be tested for occult blood. If the results are positive, additional screening should be performed for common causes of gastrointestinal blood loss, including cow's milk protein induced colitis in infants, and coeliac disease and inflammatory bowel disease in older children.

Refractory Iron Deficiency Anemia

Intravenous (IV) iron therapy may be warranted for patients with severe or persistent anemia who have proven oral iron intolerance, malabsorption, or non-adherence despite family education and support to optimize oral therapy. Several forms of IV iron therapy with good safety profiles are available, including iron sucrose, low molecular weight iron dextran and ferric carboxymaltose. Selection may depend on relative costs and availability, maximum permissible dose per infusion, and time required for administration.

Prevention of Iron Deficiency

Measures to prevent iron deficiency and IDA include:

Iron supplementation for breastfed infants, beginning at two weeks of age for premature infants, and four months of age for term infants. Iron supplementation should be continued until the infant is taking sufficient quantities of iron-rich complementary foods, such as infant cereal.

- Introducing iron-rich complementary foods (e.g. iron-fortified cereals) at four to six months of age.
- Avoiding non-formula (unmodified) cow's milk until 1 year of age, and intake should be limited to a maximum of 600 mL per day.

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