Anaemia

Anaemia refers to a state in which the level of haemoglobin in the blood is below the reference range appropriate for age and sex. Other factors, including pregnancy and altitude, also affect haemoglobin levels and must be taken into account when considering whether an individual is anaemic. The clinical features of anaemia reflect diminished oxygen supply to the tissues. A rapid onset of anaemia (e.g. due to blood loss) causes more profound symptoms than a gradually developing anaemia. Individuals with cardiorespiratory disease are more susceptible to symptoms of anaemia.

Iron (Fe) defi ciency anaemia

- Microcytic anaemia is common and the commonest cause is chronic Fe deficiency.
- Fe physiology and metabolism Normal (Western) diet provides 15mg of Fe/d, of which 5–10% is absorbed in duodenum and upper jejunum. Ferrous (Fe2+) Fe is better absorbed than ferric (Fe3+) Fe. Total body Fe store 4g. Around 1mg of Fe/d lost in urine, faeces, sweat, and cells shed from the skin and GIT. Fe deficiency is commoner in ♀ of reproductive age since menstrual losses account for 20mg Fe/month and in pregnancy an additional 500–1000mg Fe may be lost (transferred from mother l fetus)

Causes of iron deficiency anemia

Reproductive system	Menorrhagia
GIT	Oesophagitis, oesophageal varices, hiatus hernia (ulcerated; simple hiatus hernia would not cause Fe deficiency), peptic ulcer, inflammatory bowel disease, haemorrhoids, carcinoma: stomach, colorectal, (rarely angiodysplasia, hereditary haemorrhagic telangiectasia)
Malabsorption	Coeliac disease, atrophic gastritis (*Note*: may also result from Fe deficiency), gastrectomy
Physiological	Growth spurts, pregnancy
Dietary	Vegans, elderly
Genitourinary system	Haematuria (uncommon cause)
Others	PNH, frequent venesection, e.g. blood donation

Iron absorption

Factors favouring absorption	Factors reducing absorption
Haem iron	Inorganic iron
Ferrous form (Fe^{2+})	Ferric form (Fe^{3+})
Acids (HCl, vitamin C)	Alkalis – antacids, pancreatic secretions
Solubilizing agents (e.g. sugars, amino acids)	Precipitating agents – phytates, phosphates, tea
Reduced serum hepcidin	Increased serum hepcidin
Ineffective erythropoiesis	Decreased erythropoiesis
Pregnancy	Inflammation
Hereditary haemochromatosis	

Body iron distribution

BODY IRON DISTRIBUTION

	IRON CONTENT, mg	
	ADULT MALE, 80 kg	ADULT FEMALE, 60 kg
Hemoglobin	2500	1700
Myoglobin/enzymes	500	300
Transferrin iron	3	3
Iron stores	600–1000	0–300

The multiple forms of iron in the body

Iron in Food

Heme sources: Meat

Nonheme sources: Beans, clams, vegetables

Iron in Storage

Ferritin: Found in liver, spleen, skeletal muscle, bone marrow

Hemosiderin: Found in excreted urine

Iron in Circulation

Iron and globin are recycled as a result of red cell senescence

Food with high iron value

- Clams
- Soybeans
- Lentils
- Pinto beans
- Liver
- Garbanzo beans
- Tofu
- Packaged oatmeal

Enhancer of iron absorption

- Orange juice
- Vitamin C
- Pickles
- Soy sauce
- Vinegar
- Alcohol

Inhibitors of iron absorption

- Tea
- Coffee
- Oregano
- Milk

Sign & symptoms of iron deficiency anemia

- Fatigue
- Pallor
- Vertigo
- Dyspnea
- Cold intolerance
- Lethargy

, these patients may experience cardiac problems such as palpitations and angina.

Symptoms unique to the IDA patient are:

pica (an abnormal craving for unusual substances such as dirt, ice, or clay), cheilitis (inflammation around the lips), and koilonychias (spooning of the nail beds) . A syndrome of dysphagia and glossitis (Plummer–Vinson or Paterson–Brown–Kelly syndrome.

Koilonychia

Causes of iron deficiency

Related to Increased Iron Demands

Growth spurts in infants and children

Pregnancy and nursing

Related to Lack of Iron Intake

Poor diet

Conditions that diminish absorption

Related to Blood Loss

Menorrhagia

Gastrointestinal bleeding (GI bleed)

Hemolysis

Other physical causes of bleeding

DIAGNOSIS OF MICROCYTIC ANEMIA

TEST	IRON DEFICIENCY	INFLAMMATION	THALASSEMIA	SIDEROBLASTIC ANEMIA
Smear	Micro/hypo	Normal micro/hypo	Micro/hypo with targeting	Variable
SI	<30	<50	Normal to high	Normal to high
TIBC	>360	<300	Normal	Normal
Percent saturation	<10	10–20	30–80	30–80
Ferritin (μg/L)	<15	30–200	50–300	50–300
Hemoglobin pattern on electrophoresis	Normal	Normal	Abnormal with β thalassemia; can be normal with α thalassemia	Normal

ORAL IRON PREPARATIONS

GENERIC NAME	TABLET (IRON CONTENT), mg	ELIXIR (IRON CONTENT), mg IN 5 mL
Ferrous sulfate	325 (65)	300 (60)
	195 (39)	90 (18)
Extended release	525 (105)	
Ferrous fumarate	325 (107)	
	195 (64)	100 (33)
Ferrous gluconate	325 (39)	300 (35)
Polysaccharide iron	150 (150)	100 (100)
	50 (50)	

Management

- Unless the patient has angina, heart failure or evidence of cerebral hypoxia, transfusion is not necessary and oral
- iron replacement is appropriate. Ferrous sulphate 200 mg 3 times daily (195 mg of elemental iron per day) is adequate and should be continued for 3–6 months to replete iron stores. Many patients suffer gastrointestinal side effects with ferrous sulphate, including dyspepsia and altered bowel habit. When this occurs, reduction in dose to 200 mg twice daily or a switch to ferrous gluconate 300 mg twice daily (70 mg of elemental iron per day) should be tried. Delayed release preparations are not useful, since they release iron beyond the upper small intestine, where it cannot be absorbed.

- The haemoglobin should rise by around 10 g/L every 7–10 days and a reticulocyte response will be evident within a week.
- A failure to respond adequately may be due to noncompliance, continued blood loss, malabsorption or an incorrect diagnosis.
- sPatients with malabsorption or chronic gut disease may need parenteral iron therapy. Previously, iron dextran or iron sucrose was used, but new preparations of iron isomaltose and iron carboxymaltose have fewer allergic effects and are preferred. Doses required can be calculated based on the patient's starting haemoglobin and body weight. Observation for anaphylaxis following an initial test dose is recommended.