Definition of Anemia

- Decrease in RBC mass
- Deficiency in the oxygen-carrying capacity of the blood due to a diminished erythrocyte mass.

May be due to:

- Erythrocyte loss
- Decreased Erythrocyte production
- Increased Erythrocyte destruction
## Type of Anaemia

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>14 – 17.5 gm%</td>
<td>12.5 – 15.5 gm %</td>
</tr>
<tr>
<td>Mild Anaemia</td>
<td></td>
<td>Up to 11 gm %</td>
</tr>
<tr>
<td>Moderate Anaemia</td>
<td></td>
<td>8 to 11 gm %</td>
</tr>
<tr>
<td>Severe Anaemia</td>
<td></td>
<td>Less than 8 gm %</td>
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</tbody>
</table>
Cause of Anaemia

1. Decrease Production
2. Increase destruction
3. Loss of Blood
Cause of Decrease Production of RBC

- **Nutritional deficiency**
  - Iron deficiency
  - Folic acid deficiency
  - Vitamin B12 deficiency

- **Genetic defect (defective chain synthesis)**
  - Thalassemia
  - Sickle Cell anemia

- **Bone Marrow defect**
  - Aplastic anemia
  - Bone marrow depression
  - Myelodysplastic anemia

- **Renal Failure** – Decrease erythropoien production

- **Inhibiton of Heme Synthesis**
  - Lead Poisoning – Petrochemical Occupation
  - Congenital erythropoietic porphyria
Cause of Increase Destruction of RBC

- **Intrinsic abnormalities**
  - paroxysmal nocturnal hemoglobinuria
  - Hereditary spherocytosis
  - Hereditary elliptocytosis

- **Enzyme deficiencies**
  - Pyruvate kinase & hexokinase deficiencies
  - G-6-PD deficiency

- **Hemoglobinopathies**
  - Sickle cell anemia

- **Extrinsic (extracorpuscular) abnormalities**
  - Blood Transfusion reaction
  - Erythoblastic fetalis
  - hemolytic disease of the newborn
  - Autoimmune hemolytic
  - Systemic Lupus Erythematosus
  - Chronic lymphocytic leukemia

- **Infections**
  - Malaria

- **Drugs Induce**
  - Aspirin
  - Quinine
Cause of Increase Loss of RBC (Blood)

- Polytrauma
- Post Major Surgery
- Internal Hemorrhage
  - Haematemesis - Malena
    - Portal Hypertension – Cirrhosis of Liver
    - Peptic ulcer
    - Inflammatory Bowel Disease
  - Haemoptysis
    - Lung malignancy
    - Tuberculosis
  - Haematuria
    - Renal Malignancy
    - Renal Stone
- Menorrhagia
CLINICAL FEATURES

• SYMPTOMS
  – Fatigue
  – Headaches
  – Faintness
  – Breathlessness
  – Angina
  – Intermittent claudication
  – Palpitation

• SIGNS
  – Pallor
  – Tachycardia
  – Systolic murmur
  – Congestive Cardiac failure
CLINICAL FEATURES

• Specific Signs in Iron deficiency anemia
  – Koilonychia - Spoon nail - (Logitudinal ridge)
  – Brittle nails
  – Atrophy of tongue
  – Angular stomatitis
  – Brittle hair
  – Plummer Vilson Syndrome
    • dysphagia and glossitis
Iron Deficiency Anemia - koilonychia
Hypochromic Microcytic RBC

Normal red blood cells  Microcytic anemia
CLINICAL FEATURES

• Megaloblastic Anemia
  – Glositis & Angular stomatitis
  – Neurological changes
    • Polyneuropathy & Paraesthesia
    • Depression /Delusion/Hallucination

• Specific Signs in hemolytic anemia
  – Jaundice

• Specific Signs in sickle cell disease
  – Leg ulcer, Family History, Acute Abdomen & Joint Pain

• Specific Signs in thalassaemia
  – Bone deformities – Thalassaemic face
  – Hepato-Splenomegaly

• Specific Signs in Sideroblastic Anemia
  – Iron can not incorporate to form haemoglobin
  – May be drug induced = Isoniazide, Alcohol, Lead toxicity
EXAMINATION OF ANEMIC PATIENT

• Pallor
• Jaundice
• Glositis/stomatitis
• Shape of skull
• Lymph nodes palpable
• Hepatomegaly
• Splenomegaly
• Leg ulcers
INVESTIGATIONS

**Complete blood count (CBC)**
- RBC count
- Pack Cell Volume (PCV)
- Mean corpuscular volume (MCV)
- Mean Corpuscular Haemoglobin Concentrtaion (MCHC)
- Reticulocyte count
- Blast Cell
- WBC count
- WBC differential Count
- Platelet Count
- Peripheral smear examination
Investigation For Iron deficiency anemia

- CBC
- Peripheral Smear = Microcytosis, Hypochromia
- Serum Iron
  - Circulatory Iron = Free Iron + Transferrin bound iron
- Serum Transferrin
  - Iron + Apo-transferrin
  - Transport form of Iron bound protein
- Serum Ferritin
  - Iron + Apo-ferritin
  - Store form of Iron bound protein
- TIBC = Total (Transferrin) iron binding capacity
- UIBC = Unsaturated (Transferrin) Iron binding capacity
Specific Investigation for Other Cause of Anaemia

- Serum Vitamin B12
- Serum G-6-PD
- Antinuclear Antibody Test (ANA)
- Serum Billirubin Level
- Renal Function Test
- Stool Examination
- Urine Examination
- Ultra-Sonography of Abdomen
- Gastro-Intestinal Endoscopy
- X-ray Chest or CT-Scan Chest
- Bone Marrow Biopsy
- Haemoglobin electrophoresis
- HPLC (High Performance Liquid Chromatography)
Treatment of iron Deficiency Anaemia

• **Oral Iron Therapy**
• Treat the underlying cause
• Prescribe to Mild to Moderate
• Ferrous sulphate 200mg TDS
  • Equivalent to 60 mg of elemental iron
• Ferrous gluconate 300mg BD
• Iron with Vitamin C increase absorption
• Commonest Side Effect
  • Gastritis
• Total Period
  • 2 months + 4 months (to make iron store) therapy
Treatment of iron Deficiency Anaemia

Parental Iron Therapy if

- Oral Iron intolerance
- Severe mal-absorption syndrome
- Inflammatory Bowel Disease
- Non-compliance
- Iron Dextran or Iron Sorbitol
- Side effect
- Anaphylactic reaction

**Calculation of Iron Requirement**

\[ = (14 - \text{Patient Hb}) \times \text{Weight} (\text{kg}) \times 2.21 + 1000 \text{ mg} \]

[1000 mg for replacement of iron store]