



ANAEMIA

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**Reduction of RBC volume or Hb
concentration below normal range**

MORPHOLOGICAL CLASSIFICATION

☐ Microcytic hypochromic anaemia

1. Nutritional – iron deficiency anaemia

- **Post haemorrhagic**

2. Ineffective erythropoiesis

- **Thalassemia**
- **Lead poisoning**

☐ Normocytic normochromic anaemia

1. Impaired red cell production

- **Pure red cell aplasia**

2. Haemolysis

- **Hereditary spherocytosis**
- **Sickle cell disease**

☐ Macrocytic anaemia

Nutritional - vitamin b12 , folate deficiency

Iron deficiency anaemia

- Most common cause of nutritional anaemia**
- Sources of iron in diet:-**
 - Green leafy veg , pulses, dates/nuts, jaggery**
- Absorption of iron :-**
 - meat , liver , kidney , egg yolk , fish ferrous salts better absorbed than ferric salts**
 - PHOSPHATES , PHYTATES , OXALATES, MILK INHIBIT fe ABSORPTION**
 - LACTOSE , VIT C AND ACIDS – CYSTEINE, LYSINE ↑ fe ABSORPTION**

SITE OF IRON ABSORPTION

- **From duodenum and upper jejunum**



**In mucosal cells , iron binds – apoferritin –
ferritin**

In plasma – iron binds with transferrin

**Each molecule of transferrin binds 2 atoms of
iron**



Total iron binding capacity

NUTRITIONAL ANAEMIAS OF **INFANCY**

- **Hb < 11gm% - 6 MONTHS – 6 YRS 40 – 50 %**
< 12 gm% 6 – 12 YRS
<12 gm% FEMALE ADULTS
<13 gm% MALE ADULTS

MILD hb > 10gm%

MODERATE 7-10 gm%

SEVERE <7 gm%

- **Substances required for erythropoiesis**

Iron

Vit b12

Folic acid

Proteins

Trace elements

IRON DEFICIENCY ANAEMIA

- **Interference (absorption) plus**
PHYTATES LOW
ph
Polyphenols ascorbic acid
Calcium haeme sources

CLINICAL FEATURES

- **Age group : 6month – 3 yrs and 11 yrs – 17yrs**
- **Pallor – c/o ccf ; cardiomegaly; systolic murmur**
- **Blue sclera – c/o pica -? ↓ resistance to infections**
- **C/o splenomegaly , koilonychia, tongue papillary atrophy developmental disadvantage**
- **Behavioural disturbances**
 - **Irritability**
 - **Lack of interest in surroundings**
 - **Scholastic backwardness**
 - **Breath holding spells**

AETIOLOGY OF IRON DEFICIENCY ANAEMIA

A. Iron loss

Hookworm infestation

Cow's milk allergy

Dysentery – bacillary and amoebic

Rectal diverticular and polyps

Bleeding disorders

B. Decreased iron intake

Faulty feeding practices- consumption of large amounts of milk and carbohydrates only. Less intake of iron rich foods like fish, meat, beetroot, raddish, jaggery,ragi.

C. IMPAIRED IRON ABSORPTION

PICA

ACHLOROHYDRIA

COELIAC DISEASE

D. DECREASED IRON STORES

PRETERMS

LBW

TWINS

E. INCREASED IRON REQUIREMENT

PRETERMS AND LBW

LAB DIAGNOSIS

- **Bm haemosiderin** ↓
- **Serm ferritin** ↓
- **Si** ↓
- **Tibc** ↑
- **Ts** ↓
- **Fep** ↑

**Pbs – microcytosis , hypochromia,
anisopoikilocytosis**

Rdw ↑ ; mcv ↓, mch ↓, mchc ↓

Thrombocytosis

**BM – ERYTHROID HYPERPLASIA , ↓ fe ON
STAINING WITH PRUSSIAN BLUE**

DIFFERENTIAL DIAGNOSIS

RESPONSE TO IRON THERAPY –

6mg/kg(therapeutical)

**12-24 hrs replacement of intracellular
enzymes , irritability decreases**

**36-48 hrs initial bm response/erythroid
hyperplasia**

48-72 hrs reticulocytosis(peak at 5-7 days)

4-30 ↑ IN hb (0.3g/dl/day)

1-30 MO REPLETION OF STORES

- **Parenteral vs oral iron**
- **Blood transfusion**
- **Iron preparation with elemental iron**

Ferrous sulfate (37%) - ferrous fumarate (33%)

Ferrous succinate (23%) - ferrous carbonate (26%)

Ferrous gluconate (12%) - ferric ammonium citrate (15%)

FOLIC ACID DEFICIENCY

- **Sources** –fruits, glv, animal organs(liver/kidney)
goats milk to deficient
- **Absorption** – throughout small intestine
- **DAILY REQUIREMENT** – 100µg/day

Increased in pregnancy, rapid growth, infection

- **Clinical features** –

Those of anemia

4-7 month of age

Irritability, chronic diarrhoea, failure to gain weight

Heamorrhages due to thrombocytopenia

LAB DIAGNOSIS

- **MACROCYTIC (MCV >100fl)**
- **Rectic ↓**
- **Megaloblasts on pbs- hypersegmented nuclei**
- **Neutropenia**
- **Thrombocytopenia**
- **Arneth index - >75% neutrophils have 5 % more nuclear segments.**
- **Ldh ↑**
- **Bm- erythroid hyperplasia with megaloblastic changes**
- **FA LEVEL – NORMAL - 5 – 20ng/ml <3 – DEFICIENT**
- **RBC FOLATE LEVELS – 150 – 600 ng/ml OF PACKED CELLS**

TREATMENT

- **1-5 mg/day FOR 3-4 WEEKS**
- **Haematological response within 72 hrs**
- **Also associated with pregnancy, malabsorption , anticonvulsants , methotrexate , pyrimethamine , trimethoprim.**

VITAMIN B12(COBALAMINE)

DEFICIENCY

- **Sources :- cobalamine in food(mainly of animal origin)**
- **Absorption :- combine with r proteins and if in the acidity of stomach - absorbed in distal ileum via specific receptors**
- **DAILY REQUIREMENT :- 1-5 μ g/day(not COMMON IN PEM)**
- **Clinical features :-**
 - Those of anaemias 9months - 11 yrs**
 - Weakness, irritability , anorexia, glossitis**
 - Neurologic – ataxia, parasthesias, hyporeflexia, clonus**

LAB DIAGNOSIS

- **Macrocytosis**
- **Megaloblasts on pbs- hypersegmented neutrophils**
- **Neutropenia**
- **Thrombocytopenia**
- **Ldh ↑**
- **Moderate elevations of s.BILIRUBIN (2-3mg/dl)**
- **VIT B12 LEVELS <100pg/ml**
- **Schilling test**

TREATMENT

- **1mg/day IM 2WEEKS**
- **MAINTENANCE - 1mg IM MONTHLY**
- **Haematologic response in 2-4 days**
- **Also associated with tc deficiency , malabsorption(receptor defect surgical resection)**