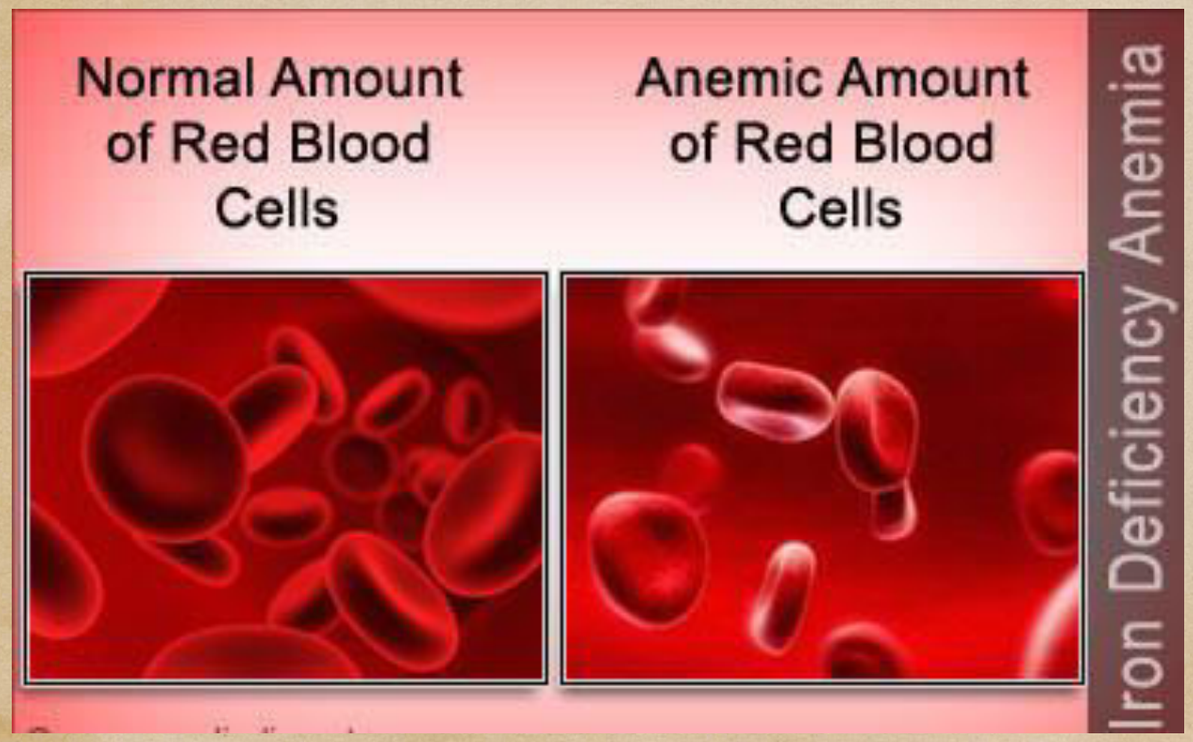
INVESTIGATIONS FOR IRON-DEFICIENCY ANEMIA IN PREGNANCY



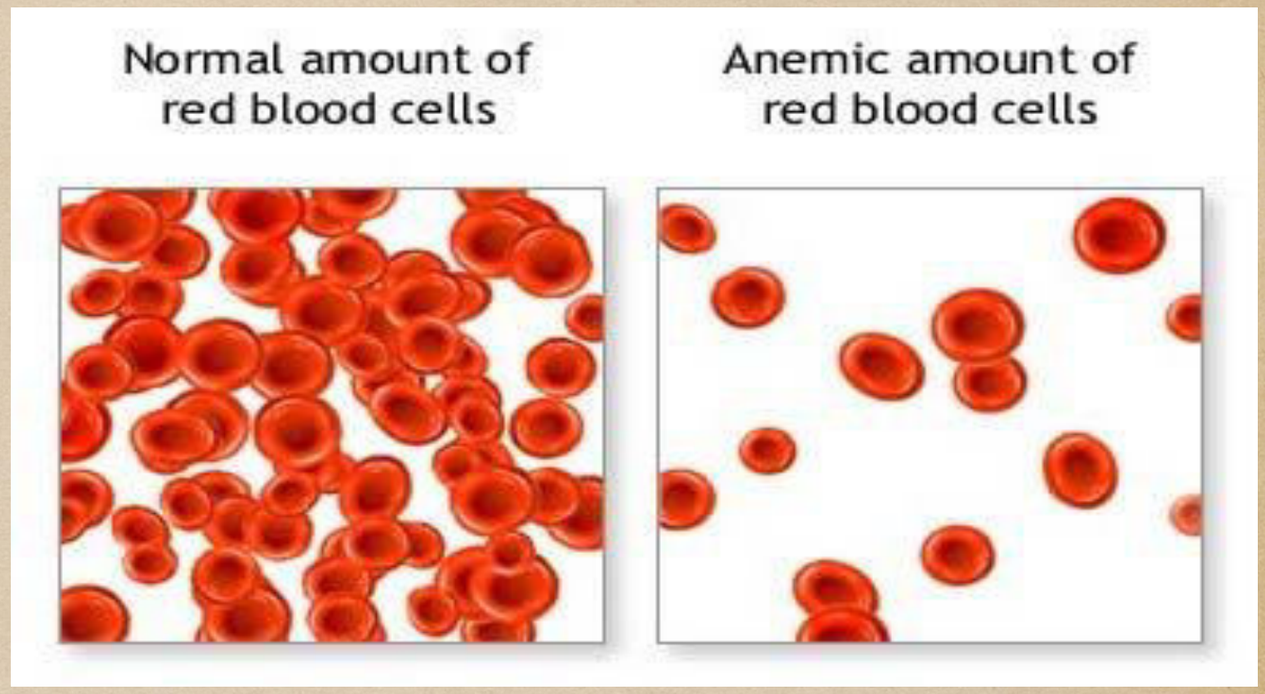
M.NAGA JYOTHI
8th SEMESTER

1. Hemoglobin and hematocrit :

- Hemoglobin - <10g% (NORMAL : 11-14g%)

WHO Grading:

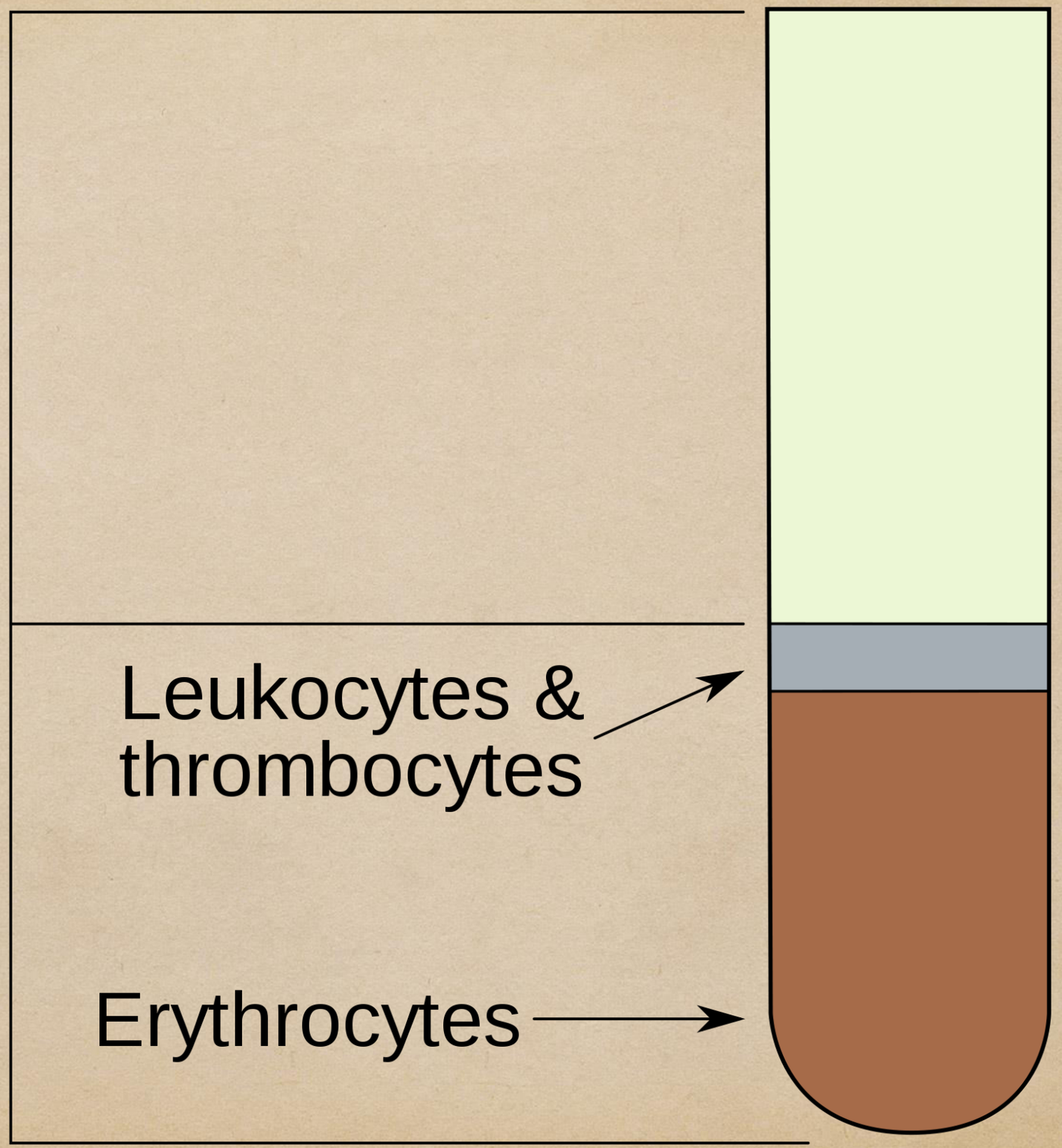
MILD	8-10g%
MODERATE	7-8g%
SEVERE	4-7g%
VERY SEVERE	<4g%



- PCV - <32% (NORMAL : 32%-36%)
- RBC Count - <3.2million (NORMAL : 4-4.5million/cubic millimetre)

Plasma

Formed elements



2. Peripheral Smear :

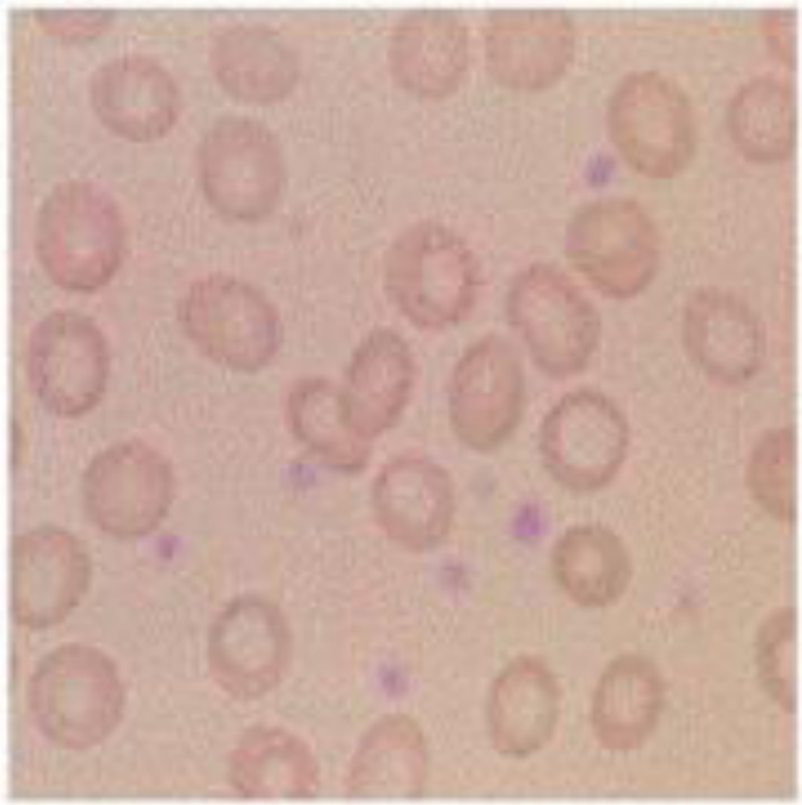
- Thin smear -

RBC Morphology - Microcytic hypochromic RBC's , anisocytosis , poikilocytosis and target cells.

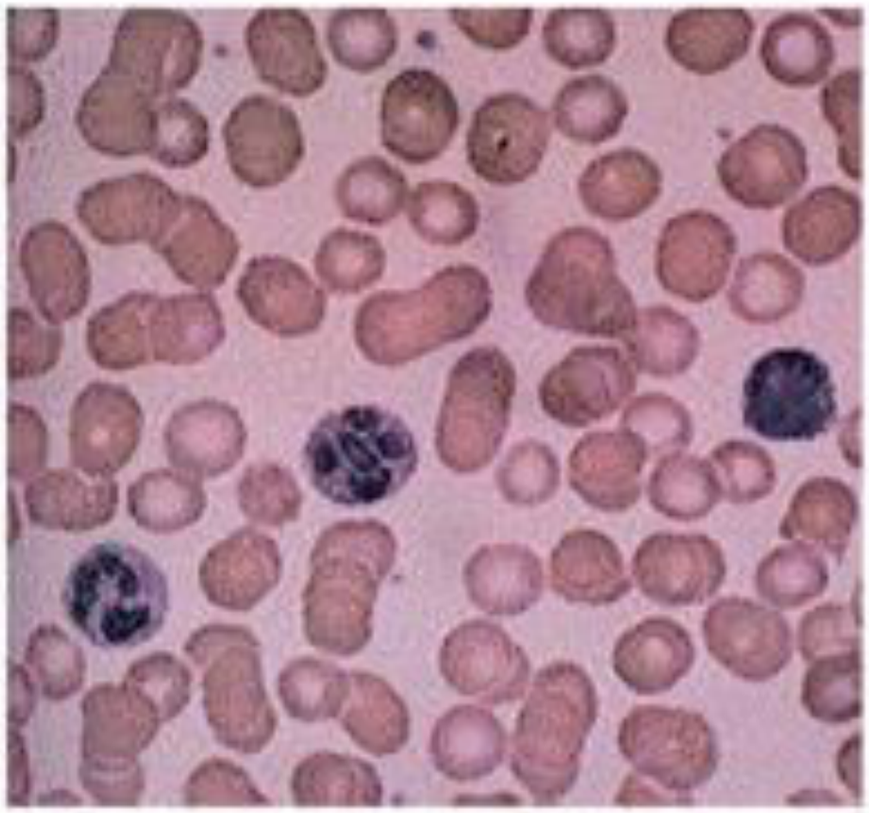
- Thick smear -

Useful in identifying parasites - malaria , leishmania

Iron Deficiency Anemia



anemia



normal blood

3. Red cell indices :

- Mean corpuscular volume (MCV =Hct/RBC*10) - decreased(<80fl) (NORMAL : 80-100fl)
- Mean corpuscular haemoglobin (MCH =Hb/RBC*10) - decreased(<25pg) (NORMAL : 27-31pg)
- Mean cell hemoglobin concentration(MCHC = Hb/Hct*100)- reduced(<30% is sensitive indicator) (NORMAL : 32-36g/dl)
- Red cell distribution width (RDW) - increased(>14%)[helps to differentiate from thalassemia.] (NORMAL : 11.5-14.5%)

4. Special tests :

A.ferrokinetic studies

- Serum iron and Total iron binding capacity: <30mg/dl and >400mg/dl (NORMAL: 65-165mg/dl and 300-400mg/dl) respectively
- Transferin % saturation : <16% (NORMAL : 20-50%)
- Serum ferritin : <12ng/ml (NORMAL : 15-300ng/ml)
- Serum transferrin receptor(TfR) : increased (>2.8mg/L) (NORMAL: 1-2mg/dl)
- Zinc protoporphyrin : increased (NORMAL : 0-35microgram/dl)

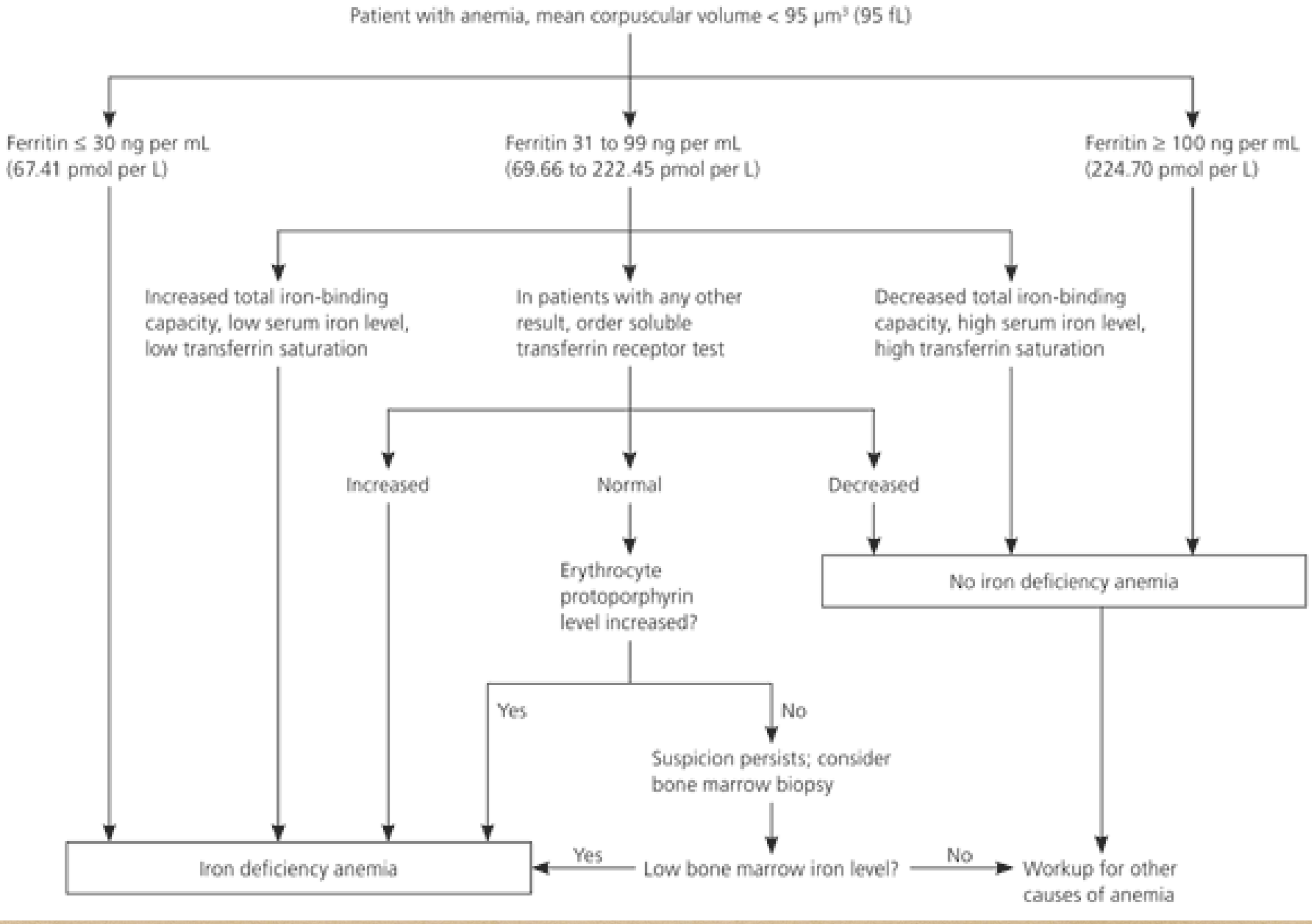
B.Bone marrow(prussian blue stain)studies:

<10% hemosideroblasts

- not done routinely.

5. Investigations to determine the aetiology :

- Urine for hematuria and pyuria(culture & sensitivity)
- Stool examination for occult blood , ova and cysts.
- Renal function tests for chronic renal disease.
- Tests for tuberculosis(x-ray chest)
- Fractional test meal analysis of gastric juice.
- Serum protien.
- Osmotic fragility.


Patient with anemia, mean corpuscular volume < 95 μm³ (95 fL)
Ferritin ≤ 30 ng per mL (67.41 pmol per L)
Ferritin 31 to 99 ng per mL (69.66 to 222.45 pmol per L)
Ferritin ≥ 100 ng per mL (224.70 pmol per L)
Increased total iron-binding capacity, low serum iron level, low transferrin saturation
In patients with any other result, order soluble transferrin receptor test
Decreased total iron-binding capacity, high serum iron level, high transferrin saturation
Increased
Normal
Decreased
Erythrocyte protoporphyrin level increased?
No iron deficiency anemia
Yes
No
Suspicion persists; consider bone marrow biopsy
Iron deficiency anemia
Yes
Low bone marrow iron level?
No
Workup for other causes of anemia

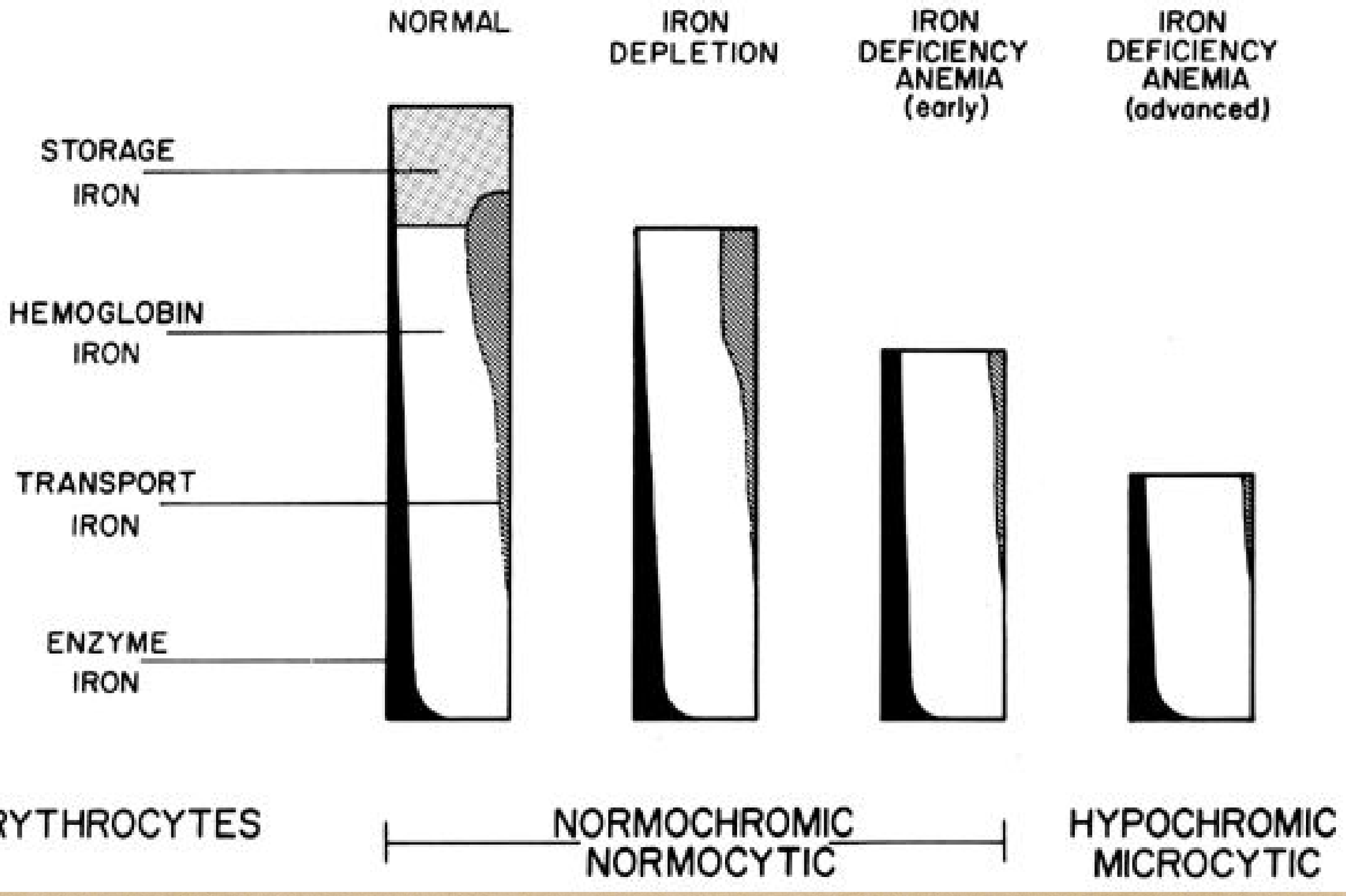
PHASES OF IRON-DEFICIENCY ANEMIA

1. Decreased iron stores(tissue iron only): decreased ferritin levels

2. Decrease in iron for erythropoiesis:(no clinical anemia)- serum transferrin receptors increases , decreased ferritin & %saturation of iron, increased FEP, decreased hemoglobin & hematocrit

3. Decrease in peripheral blood haemoglobin : decreased ferritin, %saturation of iron, haemoglobin , hematocrit , increased FEP and microcytic hypo chromic anemia.

4. Decrease in tissue oxygen delivery : clinical signs and symptoms.


NORMAL
IRON DEPLETION
IRON DEFICIENCY ANEMIA (early)
IRON DEFICIENCY ANEMIA (advanced)
STORAGE IRON
HEMOGLOBIN IRON
TRANSPORT IRON
ENZYME IRON
ERYTHROCYTES
NORMOCHROMIC NORMOCYTIC
HYPOCHROMIC MICROCYTIC

DIFFERENTIAL DIAGNOSIS

. Anemia due to chronic disease or an inflammatory process

. Thalassemia trait

. Sideroblastic anemia

. Anemia due to lead poisoning

. Infection

. Nephritis & pre-eclampsia

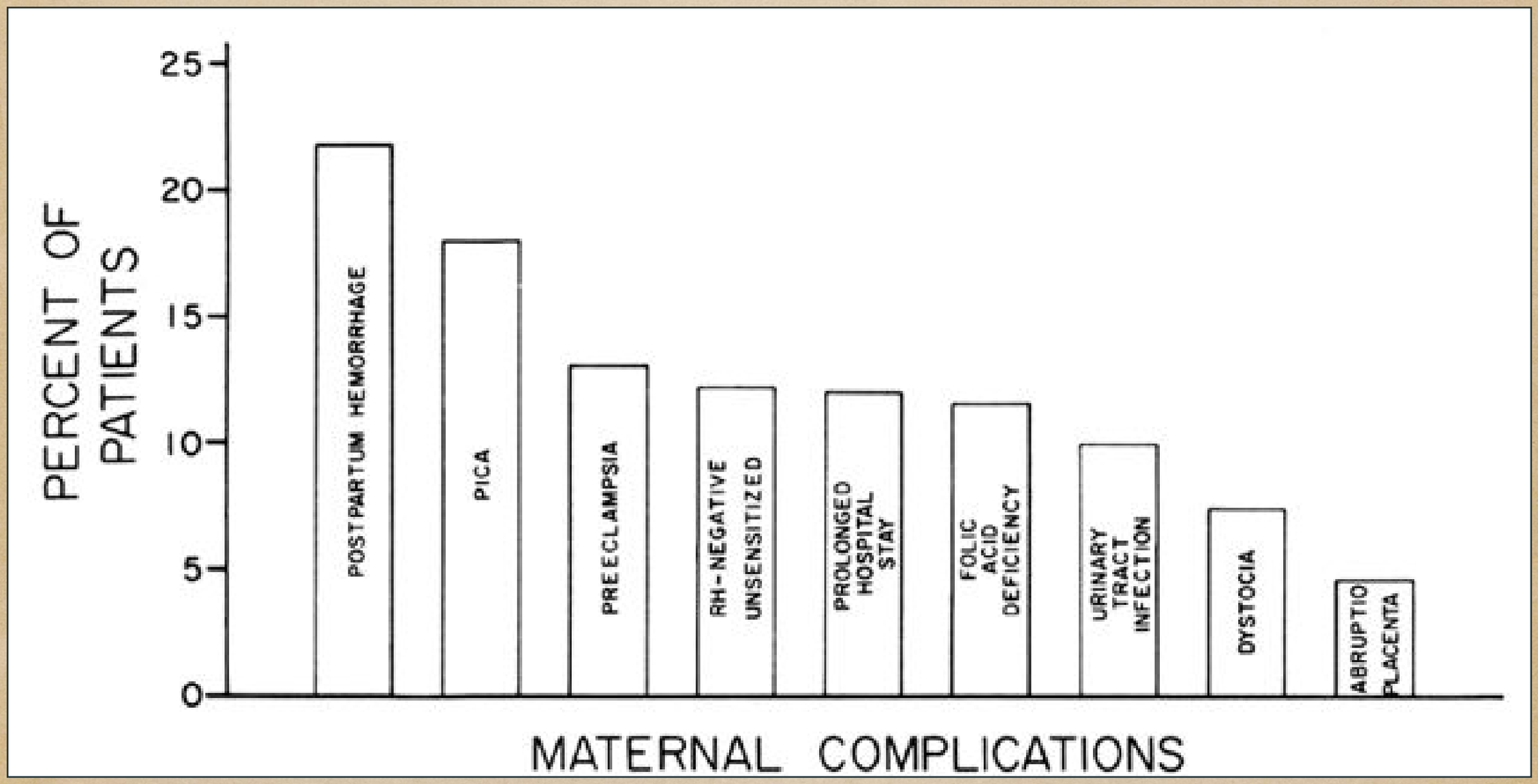
. Hemoglobinopathies

	Serum Ferritin (mcg/ml)	Serum Iron	Transferrin Saturation (%)	Hemoglobin
Anemia of Chronic Disease	normal or increased	decreased	normal or decreased	decreased
Iron Deficiency Anemia	decreased	decreased	decreased	decreased

COMPLICATIONS

1. Maternal :

- Spontaneous abortion
- Susceptibility to infections
- Preterm labour
- Pre-eclampsia
- Inability to withstand postpartum hemorrhage
- Puerperal sepsis
- Congestive cardiac failure
- Sideropenic dysphagia(paterson-kelly syndrome,plummer-vinson syndrome[rare])


PERCENT OF PATIENTS
25
20
15
10
5
0
POSTPARTUM HEMORRHAGE
PICA
PREECLAMPSIA
RH-NEGATIVE UNSENSITIZED
PROLONGED HOSPITAL STAY
FOLIC ACID DEFICIENCY
URINARY TRACT INFECTION
DYSTOCIA
ABRUPTIO PLACENTA
MATERNAL COMPLICATIONS

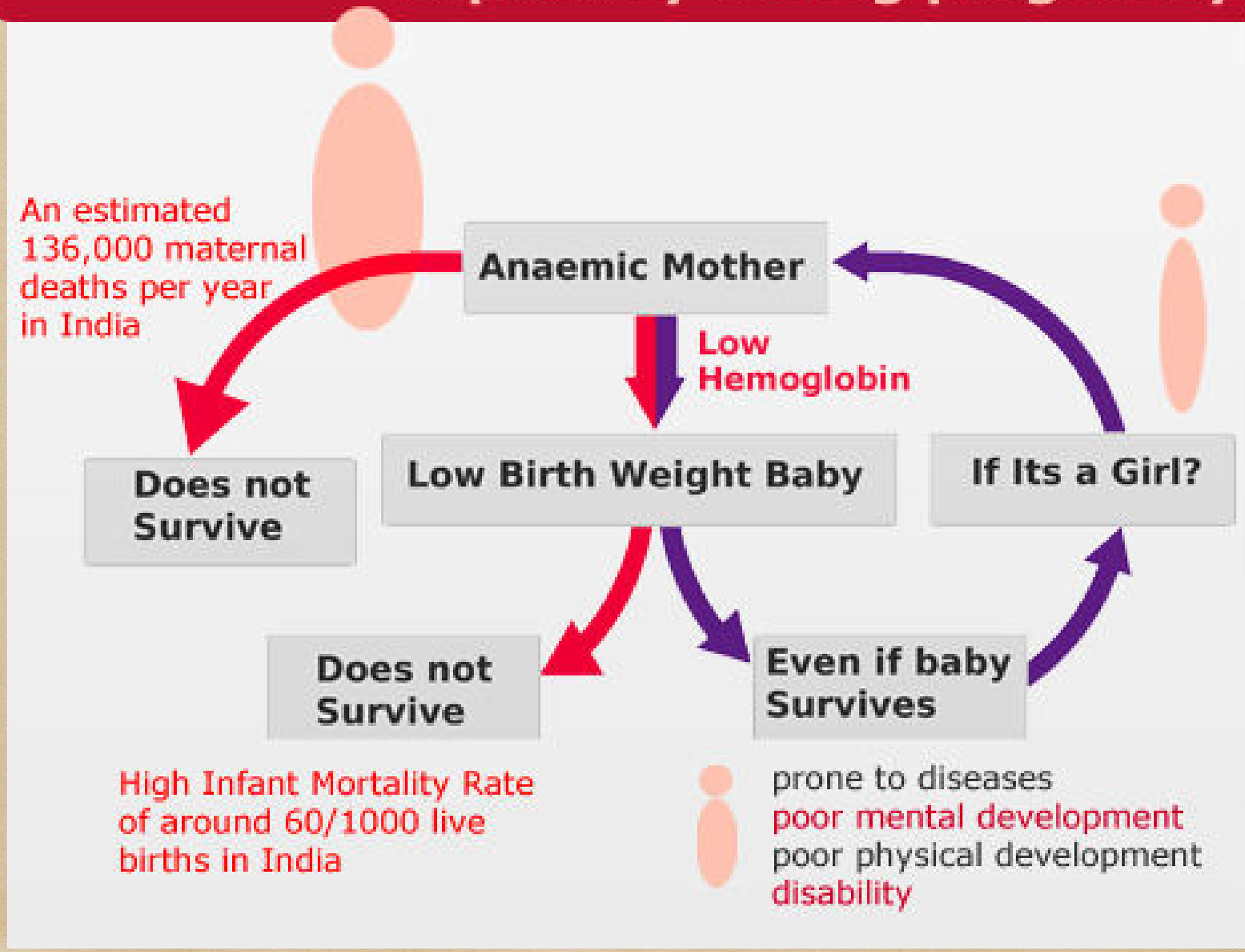
2. Fetal :

- Intrauterine growth restriction
- Prematurity
- Intrauterine fetal death (severe cases)
- Non-immune hydrops
- Increased morbidity and mortality
- Neonatal anemia
- Behavioural abnormalities in children

3. Puerperium :

- Subinvolution
- Poor lactation
- Puerperal venous thrombosis
- Pulmonary embolism

Anaemia is a **serious problem**
especially during pregnancy



PROGNOSIS

MATERNAL -

- If detected early and proper treatment is instituted,anemia improves promptly.
- At times, recurrence in subsequent pregnancy is seen.
- Anemia directly or indirectly contributes to about 20% of the maternal deaths.

. FETAL:

- In severe cases fetal prognosis is adversely affected by prematurity with its hazards.
- Baby born at term, to severely anaemic mother will not be anaemic at birth, but as there is little or no reserve iron, anaemia develops in neonatal periods.
- Mean cord blood levels of serum iron, ferritin, B12 and folate are higher than that of mother.
- However, total iron binding capacity and serum levels of vitamin E are lower than that of mother.


Thank You!