Anemia in Pregnancy

Learning Objectives

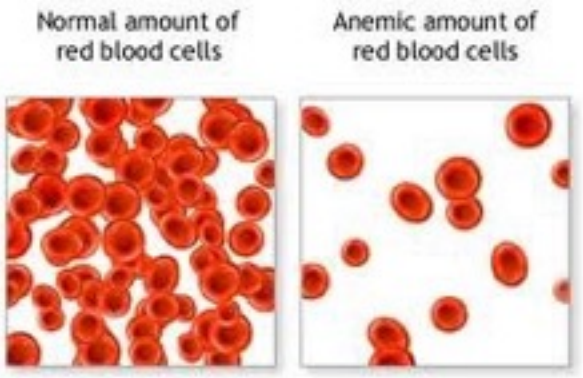
- Diagnose anemia in pregnancy
- Learn the effect on mother & fetus
- Learn S/S in pregnancy
- Learn prevention of anemia
- Learn supplementation of oral iron during pregnancy
- Management of anemia during pregnancy
- Labor & Delivery management
- National anemia control program
- Post partum contraception

Background Information

- Commonest medical disorder in pregnancy
- Prevalence varies based on population studied (between 50-70% in developing countries)
- Prevalence in USA is 2-4%
- Nutritional anemia (Fe deficiency) is commonest
- It is important contributor to maternal & perinatal morbidity & mortality as a direct or indirect cause

Definition - Anemia

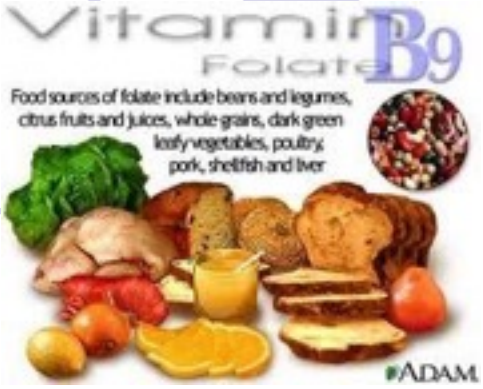
- A condition where circulating levels of Hb are quantitatively or qualitatively lower than normal
- Non pregnant women — Hb < 12gm%
- Pregnant women (WHO) — Hb < 11 gm%
  Haematocrit — < 33%
- Pregnant women (CDC) — Hb <11 gm%
  1st&3rd Trimester
  2nd trimester — Hb < 10.5 gm%



ICMR Anemia Severity Classification Hb values

- Mild 10.0-10.9 gm%
- Moderate 7-9.9
- Severe <7
- Very Severe <4

Causes of Anemia in Pregnancy



- Nutritional / Iron deficiency anemia
- Pre-pregnancy poor nutrition very important
- Besides Iron, folate and B12 deficiency also important
- Chronic blood loss due to parasitic infections – Hookworm & malaria
- Multiparity
- Multiple pregnancy
- Acute blood loss in APH, PPH
- Recurrent infections (UTI) - anemia due to impaired erythropoiesis
- Hemolytic anemia in PIH
- Hemoglobinopathies like Thalassemia, sickle cell anemia
- Aplastic anemia is rare

Patho-physiology of Nutritional Anemia in Pregnancy

- Augmented erythropoiesis in pregnancy

- Blood volume increases 40-45% in pregnancy
- Increase in plasma is more as compared to red cell mass leading to hemodilution & decrease in Hb level

- Iron stores are depleted with each pregnancy
- Too soon & too many pregnancies result in higher prevalence of iron deficiency anemia

Extra Iron Requirement & Loss During Pregnancy

During pregnancy Total 800-1000 mg extra iron is required		
300 mg for Fetus & 50 mg for Placenta	400-500 mg for increased red cell mass	250 mg iron lost during delivery 220 mg basal losses

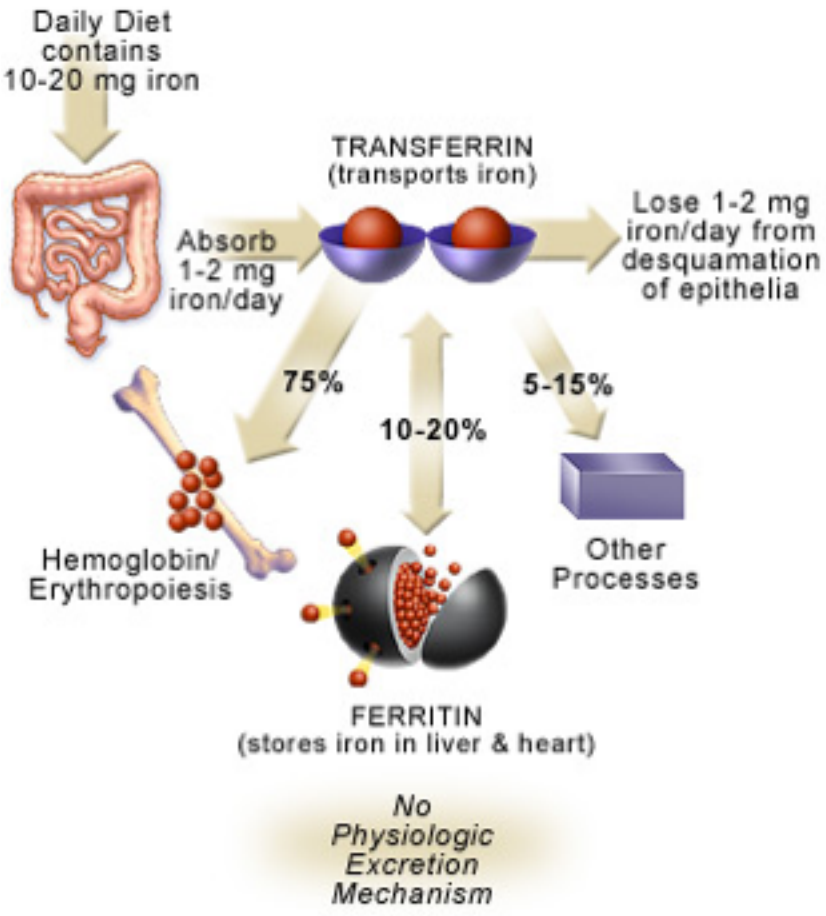
Due to cessation of menses & contraction of blood volume after delivery conservation of iron is around 400 mg

Factors Required for Erythropoiesis

- Proteins for synthesis of Globin
- Mineral – Iron for synthesis of heme
- Hormones – Erythropoietin (produced from Kidney, stimulates stem cells in Bone Marrow), Thyroxine, Androgens
- Trace elements – Zinc (also important for protein synthesis & Nucleic acid metabolism), Cobalt, Copper
- Vitamins –
  - Vit B12 required for synthesis of RNA in early stage,
  - Folic acid (Vitamin 9) required in later stage for DNA synthesis
  - Vitamin C necessary for conversion of folic acid to folinic acid, it enhances absorption of iron from small intestine
  - Pyrodoxine B6 useful adjuvant in erythropoeisis
  - Vitamin A required for cell growth, differentiation & maintenance of integrity of epithelium, immune function

Pharmaco-kinetics of Iron / daily requirement

- Normal diet contain about 14 mg of iron
- Absorption of iron is 5-10% (1-2 mg) & 3-4% in pure veg diet
- Additional daily iron demand in early pregnancy 2-3 mg/day
- In late pregnancy 6-7 mg/day
- So daily supplement of 40-60 mg of elemental iron is required during pregnancy
- Folic acid requirement is also increased 400-600 ug/day
- In strict veg Vit B 12 is also deficient



Clinical Presentation

- Depends on severity of anemia
- High risk women – adolescent, multiparous, multiple pregnancy, lower socio economic status
- Mild anemic - asymptomatic
- Symptoms – pallor, weakness, fatigue, dyspnoea, palpitation, swelling over feet & body
- Signs – pallor, facial puffiness, raised JVP, tachycardia, tachypnea, crepts in lung bases, hepato-splenomegaly, pitting oedema over abdominal wall & legs
- Haemic murmur, cardiac failure
- Glossitis, stomatitis, chelosis, brittle hair

Effect of Anemia on Pregnancy & Mother

- Higher incidence of pregnancy complications
  - PET, abruptio placentae, preterm labor
- Predisposed to infections like – UTI, puerperal sepsis
- Increased risk to PPH
- Subinvolution of uterus
- Lactation failure
- Maternal mortality – due to
  - CHF,
  - Cerebral anoxia,
  - Sepsis,
  - Thrombo-embolism

Effect of Anemia on Fetus & Neonate

- Higher incidence of abortions, preterm birth, IUGR
- IUFD
- Low APGAR at birth
- Neonate more susceptible for anemia & infections
- Higher Perinatal morbidity & mortality
- Anemic infant with cognitive & affective dysfunction

Most Critical Period

- 28-30 weeks of pregnancy
- In labor
- Immediately after delivery
- Early Puerperium

- CHF

  (Failure to cope up with pregnancy induced cardiac load)

Work Up of Pregnancy with Anemia

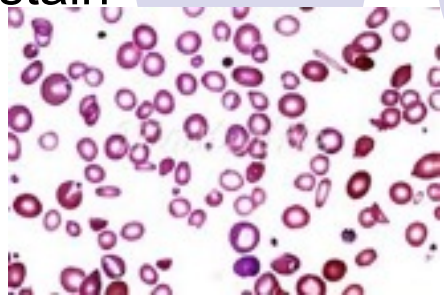
- Detailed H/o – age, parity, diet, chronic bleeding, worm infestation, malaria, race etc
- Examination
  - Pallor
  - Glossitis
  - Splenomegaly – hemolytic anemia
  - Jaundice – hemolytic anemia
  - Purpura – bleeding disorder
  - Evidence of chronic disease – Renal , TB
  - Anasarca & signs of cardiac failure in severe cases

Investigation

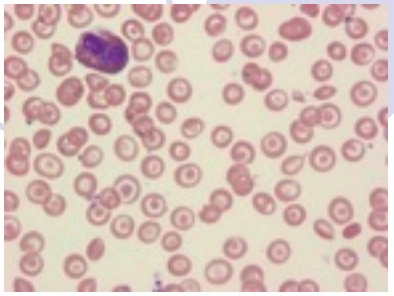
- Severity of anemia – Hb & Haematocrit, at first visit, 28-30 weeks & 36 weeks
- Type of anemia – GBP microcytic, macrocytic, dimorphic, normocytic, hemolytic, pancytopenia
- Bone marrow activity – reticulocyte count (N .2-2%), higher bone marrow activity is seen in
  - hemolytic anemia
  - following acute blood loss
  - iron def anemia on treatment
- Cause of anemia – by various investigations

GBP - Stained with Leishman stain

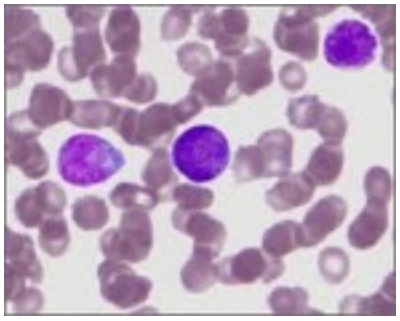
- Normal smear – Normocytic (Normal size RBC), normochromic (Normal colour RBC)
- Iron deficiency – Microcytic (small RBC), hypochromic (pale RBC), anisocytosis (variation in size), poikilocytosis (variation in shape), with or without target cells
- Malarial parasites can be seen
- Aplastic anemia shows low/no counts
- Sickle cells can be demonstrated
- Toxic granules can be seen
- Abnormal Blast cells seen in Leukemia
- Target cells in Thalassemia



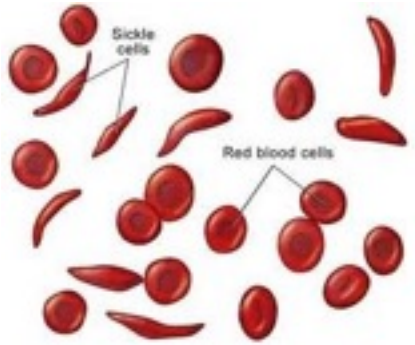
Fe def anemia



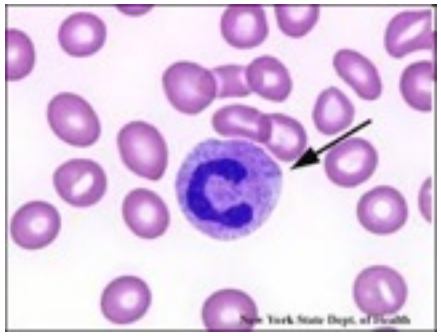
Target cells Thalassemia

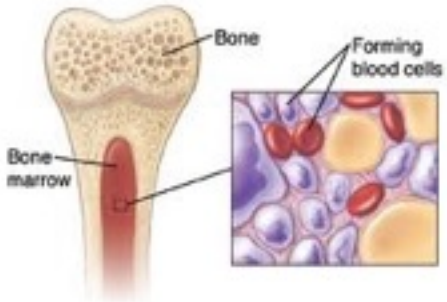


Blast cells

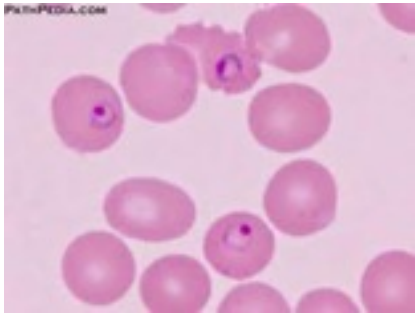


Toxic granules





Bone marrow aplastic anemia



Malarial parasite

Red Cell Indices

- RBC count – decreases in anemia (N 3.2 million/cu mm)
- PCV - < 32%, (N37-47%)
- MCV – low in Fe def anemia, microcytic
- MCH - decreases
- MCHC – decreases, one of the most sensitive indices (N26-30%)

Special Investigations

- Serum Ferritin – abnormal if < 20 ng/ml (N 40-160 ng/dl), assess iron stores
- Serum Iron – N 65-165 ug/dl, decreases in Fe def anemia
- Serum Iron binding capacity – 300-360 ug/dl, increases with severity of anemia
- Percentage saturation of transferrin – 35-50%, decreases to less than 20% in fe def anemia
- RBC Protoporphyrin – 30ug/dl, it doubles or triples in Fe def anemia (substrate to bind with Fe, can not be converted into Hb in Fe def))

Differentiation between iron deficiency anemia & Thalassemia 9diminished synthesis of Hb b chains in Thalassemia)

Investigations	Normal values	Fe Def Anemia	Thalassemia
MCV	75-96 fl	reduced	V reduced
MCH	27-33pg	reduced	V reduced
MCHC	32-35 gm/dl	reduced	N or reduced
HbF	<2 %	normal	Raised
HbA2	2-3%	N or reduced	Raised >3.5%
Serum Iron	60-120 ug/dl	reduced	Normal
Serum Ferritin	15-300 ug/L	reduced	Normal
TIBC	300-350 ug/dl	Raised	Normal
Bone iron stores		reduced	Normal
Free erythrocyte protoporphyrin (FEP)	<35 ug/dl	>50	Normal

Other Investigations

- Urine examination – RBC & Casts
- Stool examination – occult blood, ova
- Bone marrow examination – refractory anemia
- X-Ray chest – Pulmonary TB
- BUN/Serum creatinine – Renal disease

Treatment for Iron Deficiency Anemia

- Improving diet rich in iron & fruits & leafy vegetables
- Treat worm infections, maintain general hygiene
- Food fortification with iron & genetic modification of food
- Iron & folic acid supplementation in young girls & during pregnancy
- Heme iron better, present in animal food & is better absorbed
- Iron absorption enhanced by citrous fruits, Vit C
- Avoid tea, coffee, Ca, phytates, phosphates, oxalates, egg, cereals with iron

Iron Rich Foods

- Green leafy vegetables-chana sag, sarson ka sag, chauli. Sowa, salgam
- Cereals - wheat, ragi, jowar, bajra
- Pulses-sprouted pulses
- Jaggery
- Animal flesh food - meat, liver
- Vit C - lemon, orange, guava, amla, green mango etc.

Iron supplementation in Pregnancy

- 60 mg elemental iron & 400 ug of folic acid daily during pregnancy and 3 months there after
- In anemia therapeutic doses are 180-200 mg /d
- Route of administration depends on, severity of anemia, Gest age, compliance & tolerability of iron
- Various preparations – fumarate, gluconate, succinate, sulfate, ascorbate
- Carbonyl iron better tolerated
- Oral iron can have side effects like nausea, vomiting, gastritis, diarrhoea, constipation

- Iron supplementation not recommended in first trimester
  - Higher incidence of miscarriage
  - Birth defects
  - Bacterial infection (bacteria grow after taking iron from supplementation)

Oral Iron

- Hb 8-11 gm%, early preg
- Contraindication to Oral Iron Therapy
  - Intolerance to oral iron
  - Severe anemia in advanced pregnancy
  - Non compliant
- Failure to Respond
  - Inaccurate diagnosis
  - Faulty absorption
  - Continuous blood loss
  - Co-existant infection
  - Concomitant folate deficiency
- Indicators of response to therapy
  - Feeling of well being
  - Improved look of patient
  - Better appetite
  - Rise in Hb .5-.7 gm/dl per week (starts after 3 weeks)
  - Reticulocytosis in 7-10 days

Parenteral Iron Transfusion

- Iron sucrose for parenteral use
- Dose calculated - Wt in Kg x iron deficit x 2.2 + 1000 mg for iron stores
- Response - by increase in Hb level 1g/week
- Increase in Reticulocyte count with in 5-10 days
- Clinical symptoms improve

Indications for Blood Transfusion

- Severe anemia first seen after 36 weeks of pregnancy
- Anemia due to acute blood Loss – APH & PPH
- Associated Infection
- Patient not responding to oral or parenteral therapy
- Anemic & symptomatic pregnant women (dyspneic, with heart failure etc) irrespective of gestational age

Pregnant woman is considered anemic when her Hb is below (unit gm/dl)

- A. 12
- B. 11
- C. 10
- D. 9

Most common cause of anemia in pregnancy in India is

- A. Nutritional anemia
- B. Parasitic anemia
- C. Aplastic anemia
- D. Thalassemia

Iron deficiency anemia can be diagnosed earliest by which laboratory test

- A. Hb%
- B. Serum ferritin
- C. Serum iron
- D. RBC protoporphyrin

Response to anemia management by oral Fe therapy in pregnancy can be assessed earliest by

- A. Increase in Hb%
- B. Increase in reticulocyte count
- C. GBP
- D. Increase in S ferritin

Which complication is not common in Pregnancy with anemia

- A. PIH
- B. Preterm labour
- C. GDM
- D. Puerperal sepsis