ANEMIA IN PREGNANCY

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- Intended Learning Objectives (ILOs)

  -Definition of anemia during pregnancy
  -Classification and clinical types of anemia
  -Treatment of common types of anemia during pregnancy

Introduction

- Anemia is the commonest medical disorder in pregnancy.
- Nutritional anemia is the commonest type of anemia.
- Iron deficiency is the commonest type of nutritional anemia.

Introduction

- WHO reported that 56% of women in developing countries are anemic.
- 50-90% of pregnant women are anemic.

Definition of Anemia during Pregnancy

- Hemoglobin below 11 gm/dl in 1st and 3rd trimester and below 10.5 gm/dl in second trimester
- Hemoglobin below 11 gm/dl (WHO)
- HB below 7 gm/dl = severe anemia
- Serum ferritrin of 15 ug/dl
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Incidence

- Anemia may affect 10% of pregnancies in developed countries and is considerably commoner in developing countries, where it is a major source of maternal morbidity and a contributor to mortality.
- Up to 56% of all women living in developing countries are anaemic (Hb < 11 g/dl) due to infestations

Effect of anemia on pregnancy

- **16 % of maternal deaths in India are due to anemia.**
- **Early onset anemia =more and severe complications**

Effect of anemia on pregnancy

- MATERNAL
  - Inertia
  - PPH
  - Heart failure

- FETAL
  - IUGR-LBW
  - Abortion -pre-term labor
  - low APGAR score
  - Neurological and mental impairment

Effects of pregnancy on anemia

- Increased iron demands
- Hemodilution
- Aggravated pre existing anemia

Types of anemia

- **Physiologic anemia**
- **Pathologic anemia**

Physiologic anemia

- Disproportionate increase in plasma volume, RBC vol. and hemoglobin mass during pregnancy (Dilutional or physiologic Anemia)
- Marked demand of extra iron during pregnancy especially in second trimester

Criteria for Physiologic Anemia

- Hb: 10gm%
- RBC: 3.2 million/mm3
- Peripheral smear showing normal morphology of RBC with central pallor
- Plasma volume increased more than RBCs

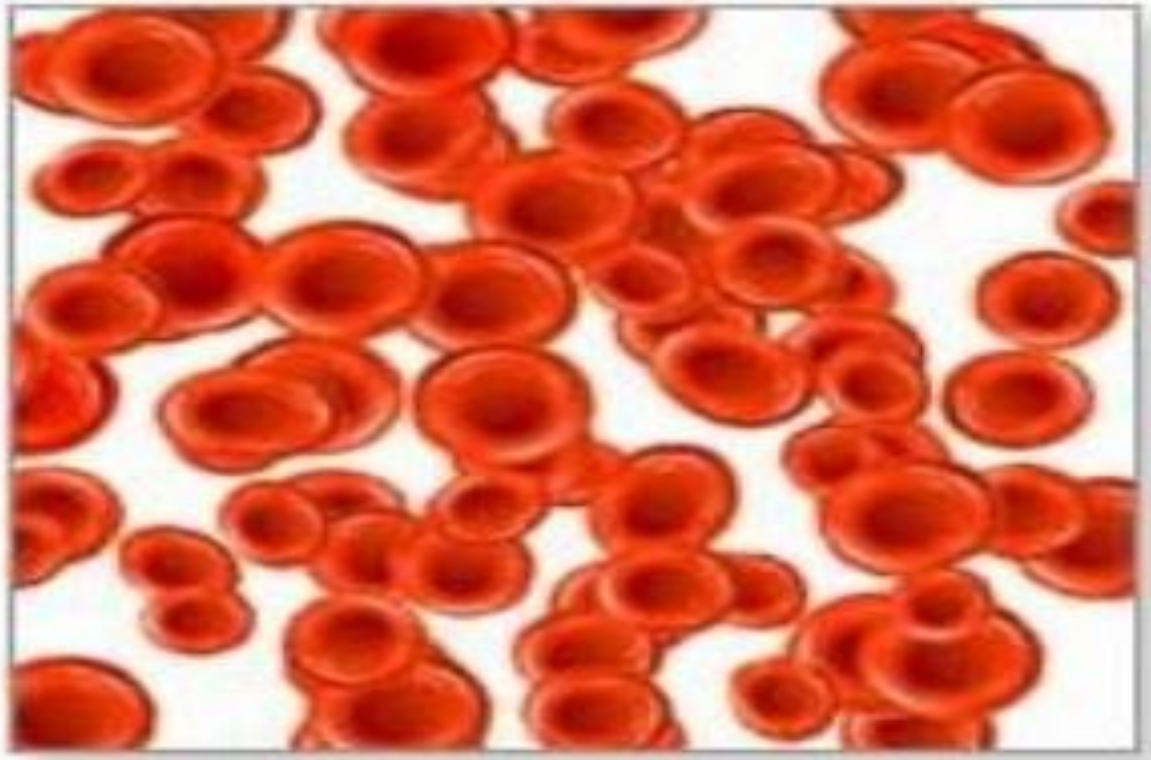
(HEMODILUTION)

- Normal hemoglobin by gestational age in pregnant women taking iron supplement

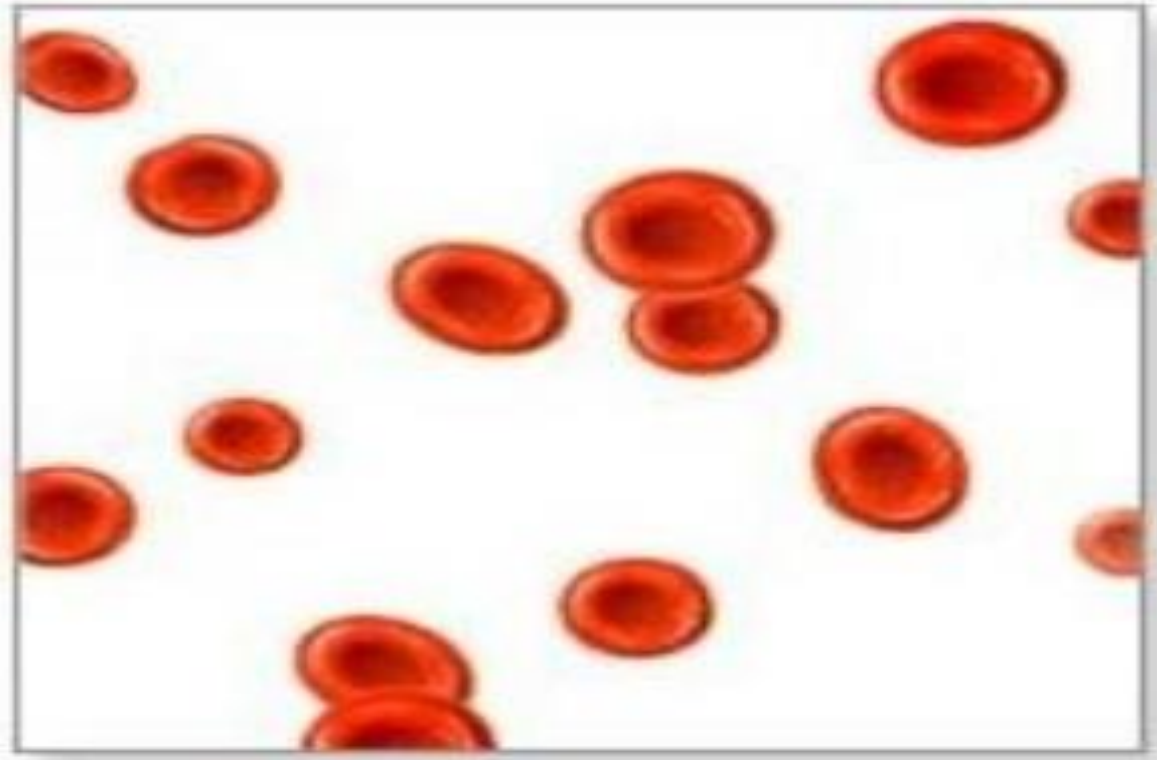
- 12 wks 12.2 [11.0-13.4]
- 24wks 11.6 [10.6-12.8]
- 40 wks 12.6 [11.2-13.6]

Physiologic anemia

Normal amount of red blood cells



Anemic amount of red blood cells



Physiologic anemia

- **Pregnancy-induced hypervolemia has several important functions:**
  1. To meet the demands of the enlarged uterus with its greatly hypertrophied vascular system.
  2. To protect the mother, and in turn the fetus, against the deleterious effects of impaired venous return in the supine and erect positions.
  3. To safeguard the mother against the adverse effects of blood loss associated with parturition.

Pathologic anemia

Types of anemia

- Nutritional anemia

✓ Iron deficiency anemia

✓ Megaloplastic anemia

➢ Folic acid defiency

➢ Vit B12 deficiency (pernicious anemia)

- Hemolytic anemia

➢ Hemoglobinopathies as thalassemia, sickle cell anemia

➢ HELLP syndrome

Types of anemia

- Hemorrhagic anemia due to blood loss.
- Due to chronic diseases Renal diseases
- Bone Marrow Insufficiency: Aplastic Anemia
- Infection Hookworm infections -TB - Malaria

Iron deficiency anemia

- The commonest type
- Causes

✓ Increased demands

✓ Decreased intake

✓ Deficient absorbion

Diagnosis Blood picture

hypochromic microcystic anemia

Iron deficiency anemia

- Causes

1-Increased demands

- 1000 mg 500 RBCs expansion
  300 fetus and placenta
  200 growing uterus

150gm saved by amenorrhea so the need is ------850mg

Iron deficiency anemia

- **Increased demands**
  - Normal pregnancy
  - Short spaced pregnancies
  - Multiple pregnancy

Iron deficiency anemia

2-Decreased intake .poverty ----

3-Iron stores DEPLETION

4-Deficient absorption Malabsorption syndromes

Iron deficiency anemia

The amount of iron absorbed from diet, together with that mobilized from stores, is usually insufficient to meet the maternal demands imposed by pregnancy

Diagnosis

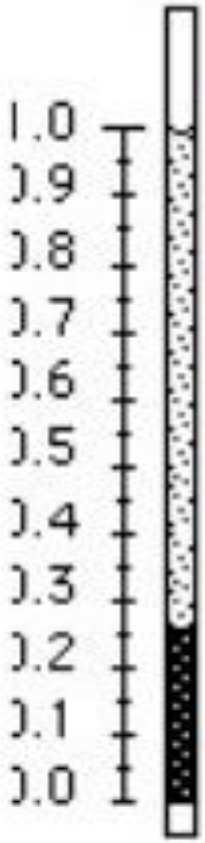
- Clinical

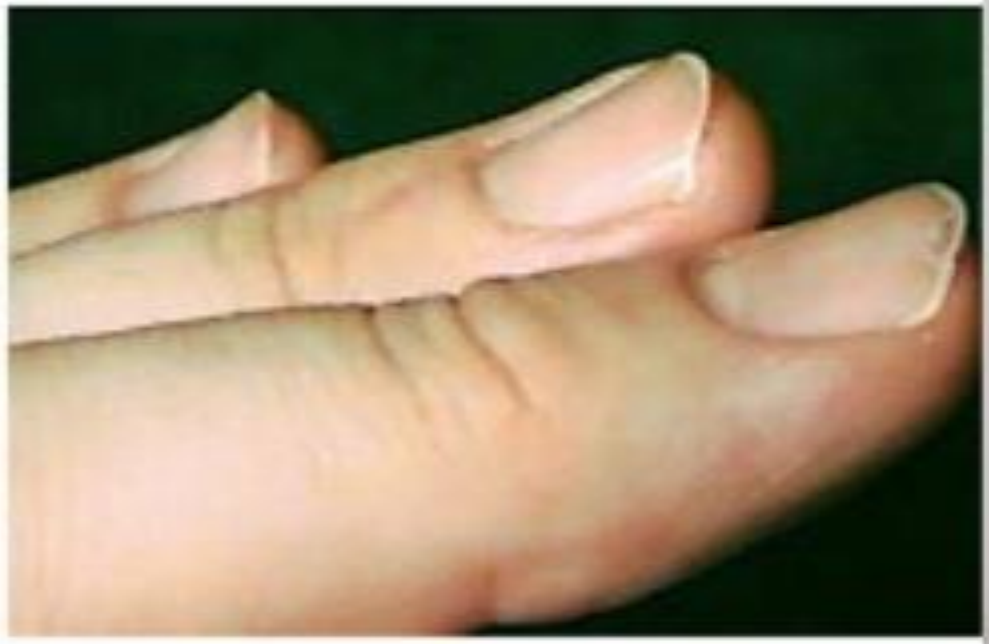
❑ History

lassitude, weakness, anorexia, palpitation, dyspnea

❑ examination

Pallor, glossitis, soft systolic murmur in mitral area due to physiologic mitral incompetence





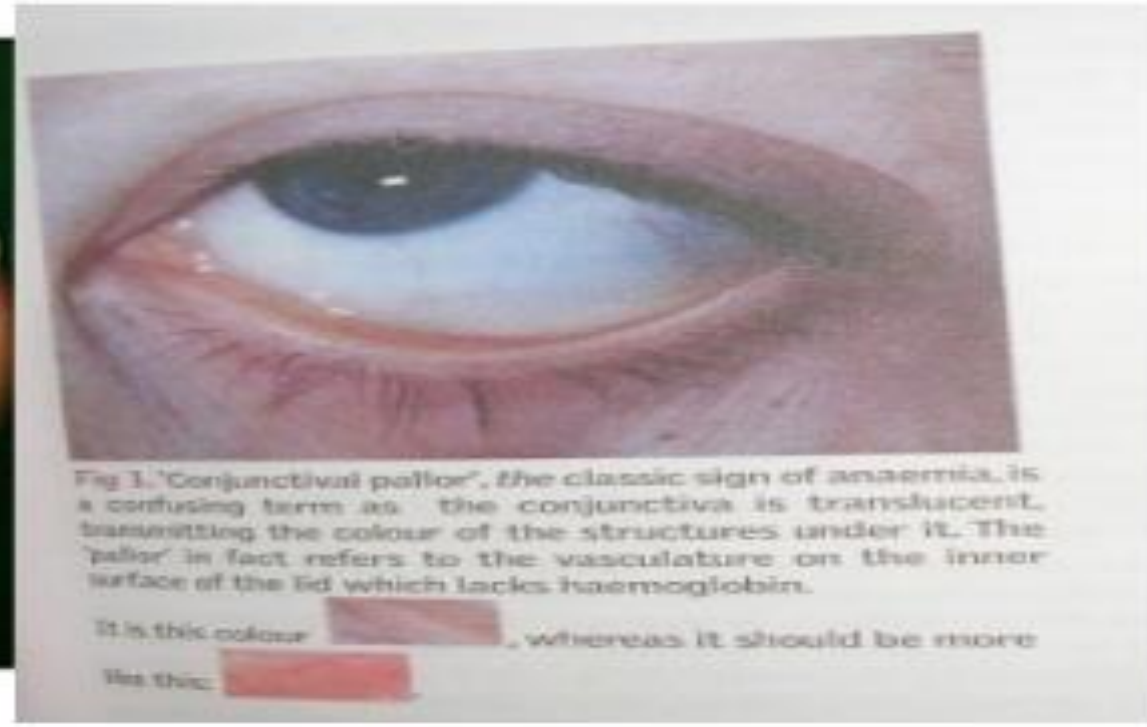


Fig 1. 'Conjunctival pallor', the classic sign of anaemia, is a confusing term as the conjunctiva is translucent, transmitting the colour of the structures under it. The 'pallor' in fact refers to the vasculature on the inner surface of the lid which lacks haemoglobin.

It is this colour , whereas it should be more

like this:

pallor

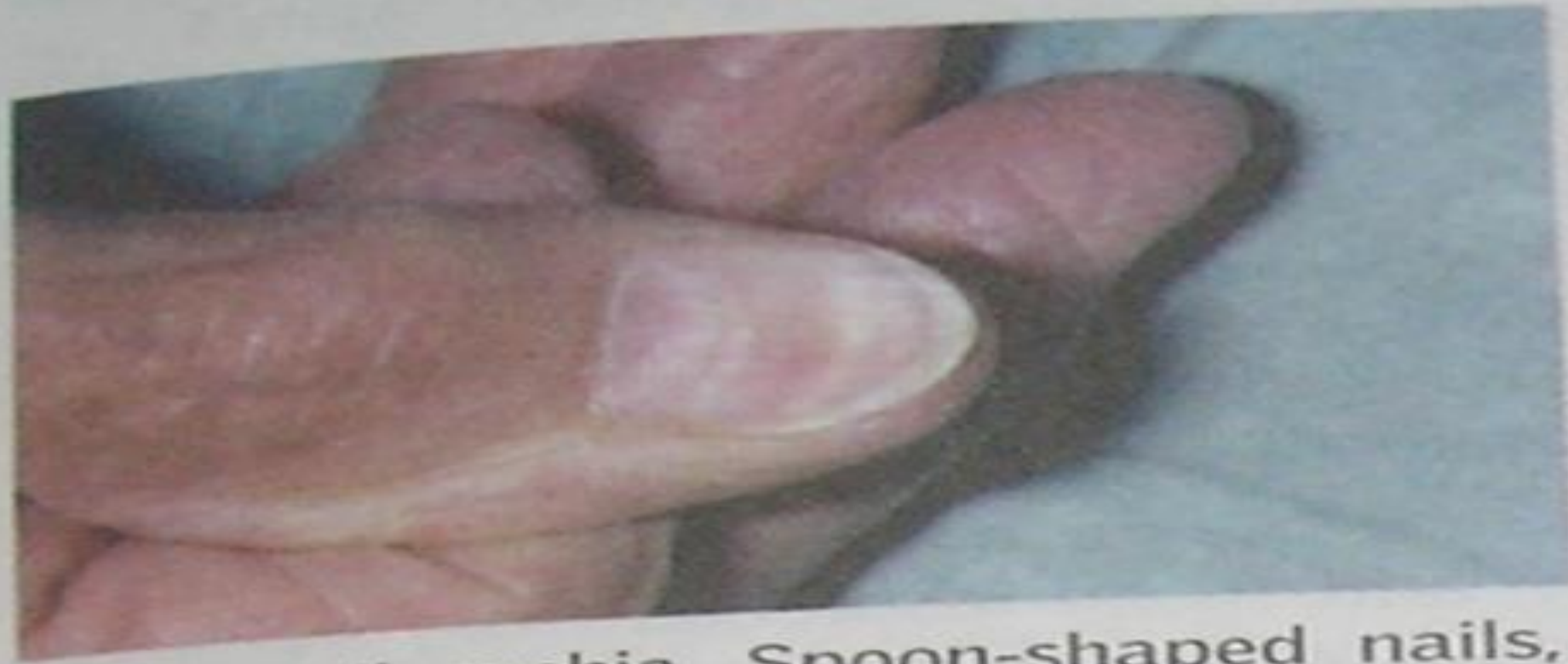
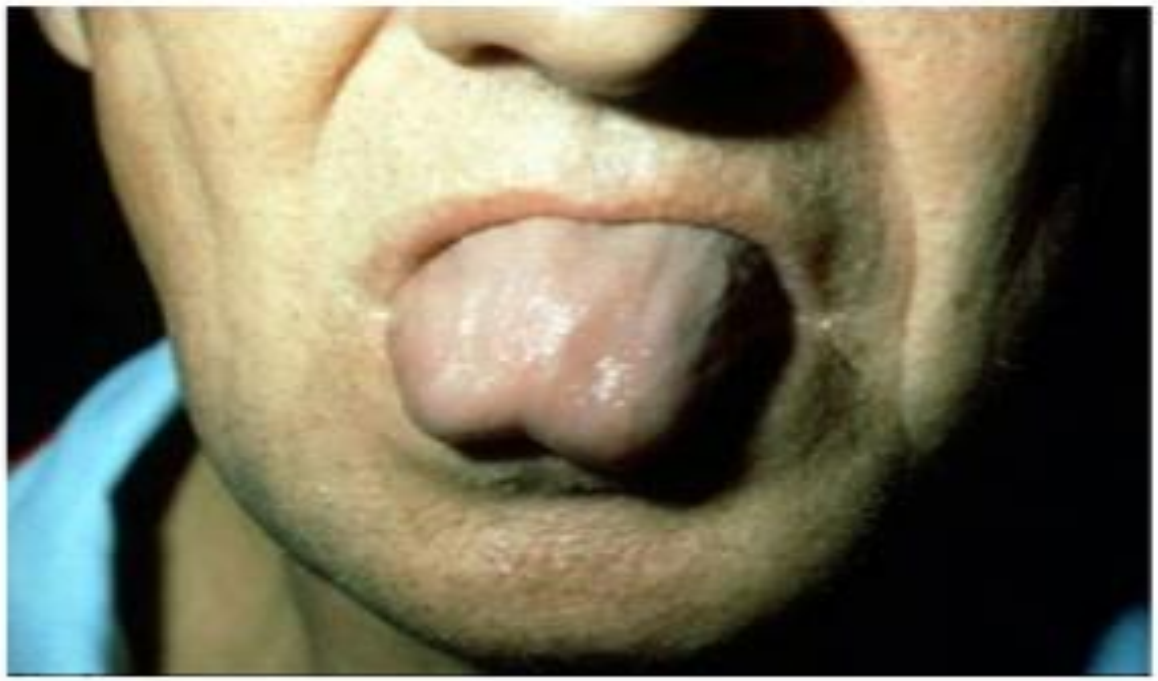
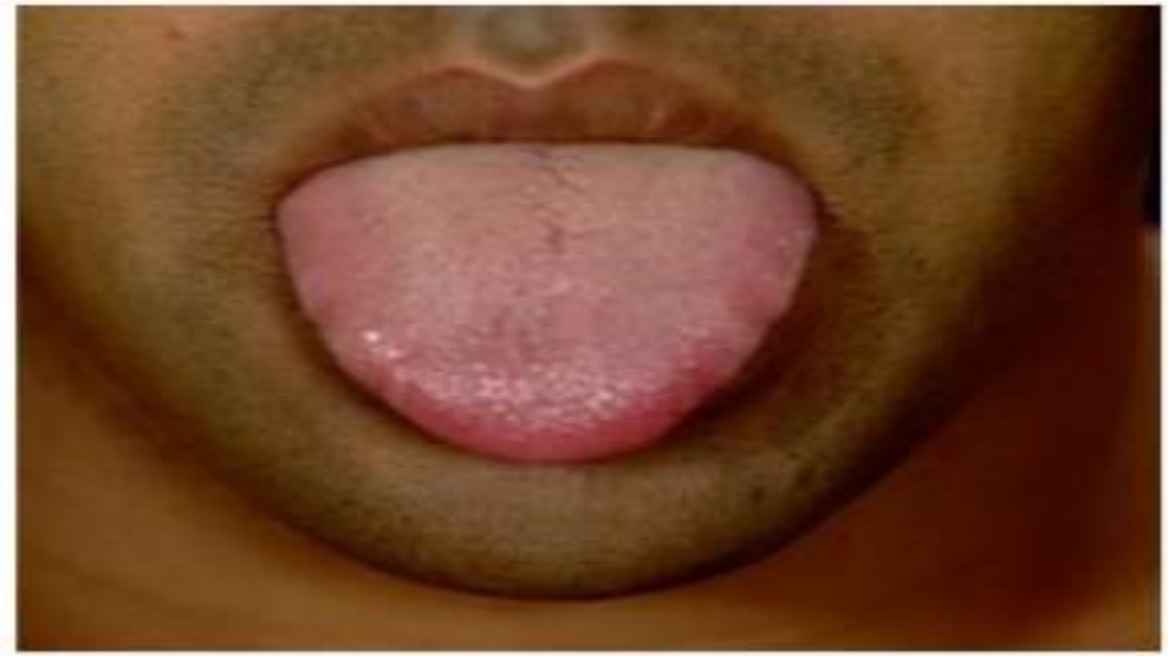


Fig 1. Koilonychia. Spoon-shaped nails, found in iron deficiency anaemia.

Smooth Tongue





- Laboratory _

CBC red cell indices HB HT

Serum ferritrin serum iron

Serum ferritrin is the best indicator of bonr marrow stores

Degree of anemia

Mild: 8-10gm%
Moderate: 7-8gm%
Severe: <7gm%

Normal Iron Requirements

- **Iron requirement for normal pregnancy is 1gm**

  200 mg is excreted
  300 mg is transferred to fetus
  500 mg is need for mother

- **Total volume of RBC inc is 450 ml**

  1 ml of RBCs contains 1.1 mg of iron
  450 ml X 1.1 mg/ml = 500 mg

- **Daily average is 6-7 mg/day**

Treatment of iron deficiency anemia

PROPHYLAXIS

- Ferous gluconate 300mg orally/day
- Supplement Fe – 60 mg elemental Fe with Folic Acid
- DIET rich iron green vegetables

TREATMENT (Curative)

Iron Therapy

- ORAL Ferrous Gluconate 300mg 3 times /day
  Ferrous sulfate 325 bid-tid
- PARENTRAL IV OR IM

Iron deficiency anemia

Blood transfusion In severe anemia
(HB<7gm/DL

NB Restore iron stores

Target is tissues

Nutritional anemia

- ✓ Iron deficiency anemia
- ✓ **Megaloplastic anemia**
  - ➢ Folic acid defiency
  - ➢ Vit B12 deficiency (pernicious anemia)

Megaloblastic Anemia

- Due to impaired DNA synthesis, derangement in Red Cell maturation
- It may be due to Def. of VitB12 or Folic Acid or both.
- Megaloblastic anemia in pregnancy is almost always due to Folic Acid def.
- Vit B12 def is rare in Pregnancy because the needs are less and the amount is met with any diet that contains animal products.

Blood values

- Hb<10gm%
- Hypersegmentation of neutrophils
- Megaloblast
- MCV>100micrometer3
- MCH>33pg, but MCHC is Normal
- Serum Fe is Normal or high; TIBC is low

Treatment

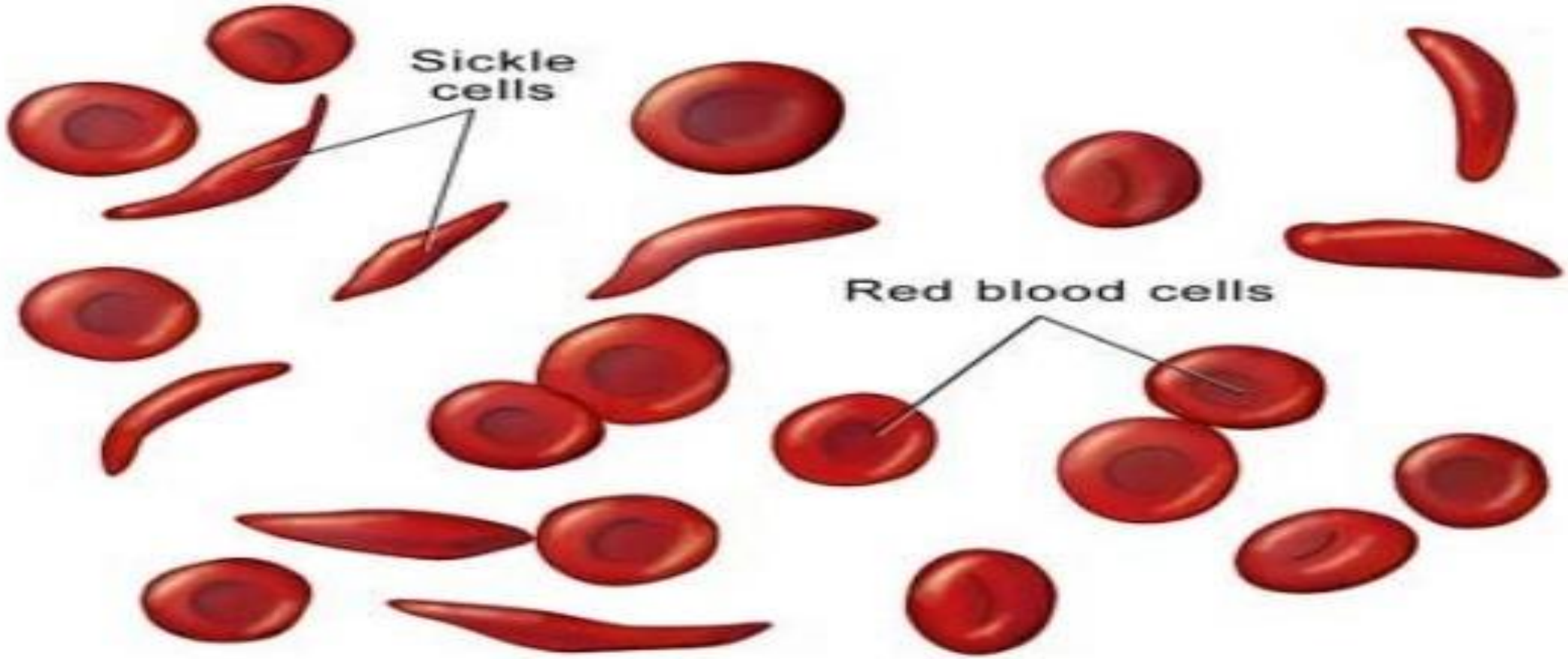
- Prophylactic
  - all woman of reproductive age should be given 400mcg of folic acid daily
- Curative
  -daily administration of Folic acid 4mg orally for at least 4 wks following delivery

- Nutritional anemia

• Hemolytic anemia

- Hemoglobinopathies as thalassemia, sickle cell anemia
- HELLP syndrome

Sickle cell Hemoglobinopathy



Sickle cell Hemoglobinopathy

- Hbs comprises 30-40% total Hb
- There is substitution of Lysine for glutamic acid at the sixth position of B chain of Hb
- Red cells in oxygenated state behave normally, but in deoxygenated state they aggregate, polymerise and distort red cells to sickle.
- These cells are more fragile and increased destruction leads to hemolysis, anemia and jaundice.

Clinically significant variants of haemoglobin

- Sickle cell trait (HbAS).
- Sickle cell disease (HbSS).
- Sickle cell/haemoglobin C disease (HbSC).
- Sickle cell/beta thalassaemia.

Sickle cell disease

- Inheritance is autosomal recessive. Most commonly seen in people of Afro-Caribbean origin, but also occurs in those from the Middle East, Mediterranean, and Indian subcontinent.
- As diagnosis has usually been made in childhood, it is rare to make a new diagnosis in pregnancy.

Pathophysiology

Results in distortion of the shape of red cells into a rigid sickle shape. This leads to microvascular blockage, stasis, and infarction in any organ in the body.

- Crises can be precipitated by infection, dehydration, hypoxia, and cold.

Risks in pregnancy

- Crises are more common during pregnancy.
- increase Risk of pre-eclampsia.
- increase Risk of delivery by CS s to fetal distress.

Clinical features of sickle cell disease

- Haemolytic anaemia.
- Painful crises.
- Hyposplenism (chronic damage to the spleen results in atrophy).
- Increased risk of infection (UTI , pyelonephritis, pneumonia, puerperal sepsis).
- Avascular necrosis of bone.
- Increased risk of thromboembolic disease (pulmonary embolism (PE), stroke).
- Acute chest syndrome (fever, chest pain, tachypnoea, increase WCC, pulmonary infiltrates).
- Iron overload: leads to cardiomyopathy.
- Maternal mortality 2%.

Management

Multidisciplinary care with an obstetrician and haematologist.

- Prepregnancy counselling should involve screening of the partner (if the partner is a carrier, consider prenatal diagnosis).

Stop iron-chelating agents before pregnancy.

- If there is a history of iron overload, arrange a maternal echo.
- Give folic acid 5mg/day and penicillin prophylaxis for hyposplenism.
- Monitor Hb and HbS percentage and arrange transfusion if necessary

(may have red cell antibodies from multiple transfusions).

- Screen for urine infection each visit.
- Treatment of a crisis involves adequate analgesia, oxygen, rehydration, and antibiotics if infection suspected (exchange transfusion may be required in severe crises).
- Regular assessment of fetal growth with ultrasound, including Doppler.

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Management of sickle cell crisis in pregnancy

- Prompt treatment.
- Adequate hydration.
- Oxygen.
- Analgesia.
- Screen for infection (urinary, respiratory).
- Antibiotics.
- Blood transfusion (leucocyte depleted and phenotype specific).
- Exchange transfusion.
- Prophylaxis against thrombosis (heparin).
- Fetal monitoring.

Aim for vaginal delivery ensuring adequate hydration and avoiding hypoxia (continuous fetal monitoring as increased risk of fetal distress).

- Consider antenatal and postnatal thromboprophylaxis.
- The use of prophylactic antibiotics is controversial

Fetal risks in sickle cell disease

- Miscarriage.
- IUGR.
- Prematurity.
- Stillbirth.
- Perinatal mortality is increased 4–6-fold compared to the general population.

Thalassaemia

Adult haemoglobin is made up from two alpha and two B -globin chains associated with a haem complex.

There are four genes for α -globin and two for β -globin chain production.

An adult's blood is normally made up of HbA (α 2 β 2 , 97%), HbA 2 (α 2 δ 2 , 1.5–3.5%), and HbF (α 2 γ 2 , <1%).

Thalassaemia is a group of genetic conditions leading to impaired production of the globin chains and resulting in red cells with inadequate haemoglobin content.

Fetal haemoglobin consists of 2 α and 2 γ chains, so a fetus cannot be affected by β -thalassaemia.

α -Thalassaemia

Caused by defects in 1–4 of theα -globin genes.

- Most common in individuals from South-east Asia.
- α-Thalassaemia trait has two (α 0) or three (α +) normal genes: women are usually asymptomatic, but may become anaemic in pregnancy.
- In HbH there are three defective genes: unstable haemoglobin is formed by tetramers of the β chain
- chronic haemolysis results and iron overload is common
- offspring will have either α 0 or α + thalassaemia.
- α-Thalassaemia major (Hb Barts) has no functional α genes and is incompatible with life
- fetuses are often hydropic and born prematurely
- severe early-onset pre-eclampsia often complicates the pregnancy

β -Thalassaemia

- β-Thalassaemia trait has one defective gene and women are asymptomatic but may become anaemic in pregnancy.
- It is most common in individuals from Cyprus and Asia.
- Incidence of β -thalassaemia minor is 1:10 000 in the UK compared with 1:7 in Cyprus: offspring have a 1:4 chance of β -thalassaemia major.
- β -Thalassaemia major has two defective genes and women are often transfusion dependent:
- iron overload can occur
- puberty is often delayed
- there is subfertility and only very few pregnancies have been reported.

- Repeated transfusions cause iron overload, leading to endocrine, hepatic, and cardiac dysfunction: heart failure is the most common cause of death
- iron-chelating therapy can reduce the incidence of iron overload the condition can be cured by bone marrow transplant.

Management of pregnancy with thalassaemia

Check ferritin in early pregnancy give iron supplements only if iron deficient.

Women need folic acid 5mg daily:

if failure to respond to folate PO, then IM); A blood transfusion may be required parenteral iron should be avoided.

- If the woman has thalassaemia, the partner needs screening: if positive, the couple need counselling on the risk of pregnancy with thalassaemia major prenatal diagnosis should be offered

Screening for thalassaemia in pregnancy

- Screen all women of Mediterranean, Middle Eastern, Indian, Asian, • African, or West Indian ethnic origin by haemoglobin electrophoresis at booking.
- In α 0 and α + thalassaemia no abnormal haemoglobin is made and there is no excess in HbA 2 or HbF:
- Hb electrophoresis is normal the diagnosis can be confirmed by globin chain synthesis studies or DNA analysis of nucleated cells.

In α -thalassaemia there is a raised concentration of HbA 2 and/or HbF.

- Suspect the diagnosis of thalassaemia in the presence of:
- low MCV
- low MCHC
- microcytic anaemia with normal MCHC (which differs from iron deficiency where the MCHC is also low).