Determination of hemoglobin consentration

2 stage

Msc . Ghufran mershoud

Hemoglobin

- Found in the RBC.
- Responsible for carrying oxygen to all cells in the body.
- Also binds to carbon dioxide and carries it to the lungs from the cells to be released.
- Buffer against change in $[H^+]$
- Hemoglobin detection can also gives the health care worker an idea about:-
  - Patient's oxygen carrying capacity
  - Current blood loss and recovery from blood loss
  - Treatment of RBC disorders, like anemia.

Hemoglobin

- Makes up 98% of the protein found in the RBC and Gives blood its red color.
- Composed of two parts….
  - ✓ Heme , 4 iron atoms in the ferrous state (Fe2+) and porphyrin ring
  - ✓ Globin , 4 protein chains
- The most common globin forms are alpha and beta chains.

Variant forms of hemoglobin

Oxyhemoglobin: hemoglobin combined with oxygen.

Carbaminohemoglobin: hemoglobin combined with CO2.

Methemoglobin: Ferrous iron in converted into ferric iron.

Normal value

Male 13.5-17.5 gm/dl

Female 11.5-15.5 gm/dl

Newborn 21 gm/dl

Medical application

The body will respond for the decrease in haemoglobin level (for slightly lower than normal haemoglobin levels) as a compensatory mechanism:-

- The heart will beat faster and more forcefully.
- The lungs breath rate will increase.

when the level drops too low for us, we start to feel **tired, breathless** and may start to run into problems with too little oxygen getting to important organs like the **heart and brain.**

This can cause **palpitations, angina (chest pains), headache or dizzy spells.**

Medical conditions

Anemia :- is a decrease of hemoglobin concentration.

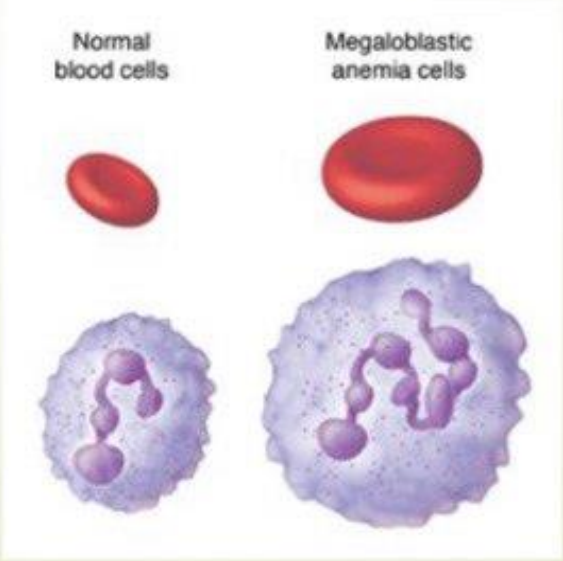
Polycythemia :- is an increase of Hb concentration.

Types of anemia:

Iron deficiency anemia: commonest cause of anemia in most parts of the world cause either due to loss of iron due to bleeding or an inadequate diet or mal-absorption.

Megaloblastic anemia: caused by deficiency of vitamin B12 or folate deficiency or both of them.

Pernicious anemia :- an autoimmune destruction of gastric parietal cells leading to a lack of intrinsic factor which important for vitamin B_{12} absorption in the gut.



Hemolytic anemia includes

1- Hereditary spherocytosis:-

2- Glucose 6 Phosphate dehydrogenase deficiency
Favism (hemolytic anemia from the ingestion of the broad beans)

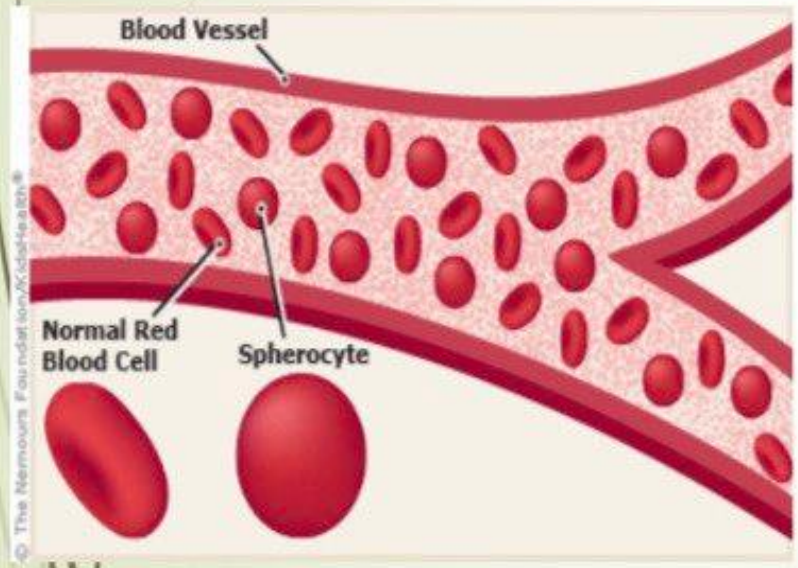
3- Hemoglobinopathies :

Sickle cell anemia:

Thalassaemia:

4-Acquired hemolytic anemia
Autoimmune hemolytic anemia
Hemolytic disease of newborn
ABO incompatibility
Rhesus (Rh) incompatibility

5-Anemia of chronic disease.


Blood Vessel
Normal Red Blood Cell
Spherocyte
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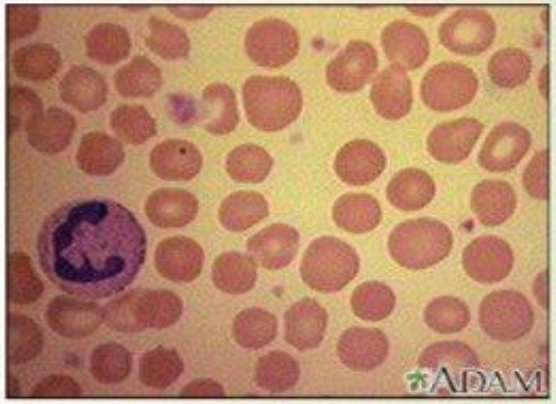
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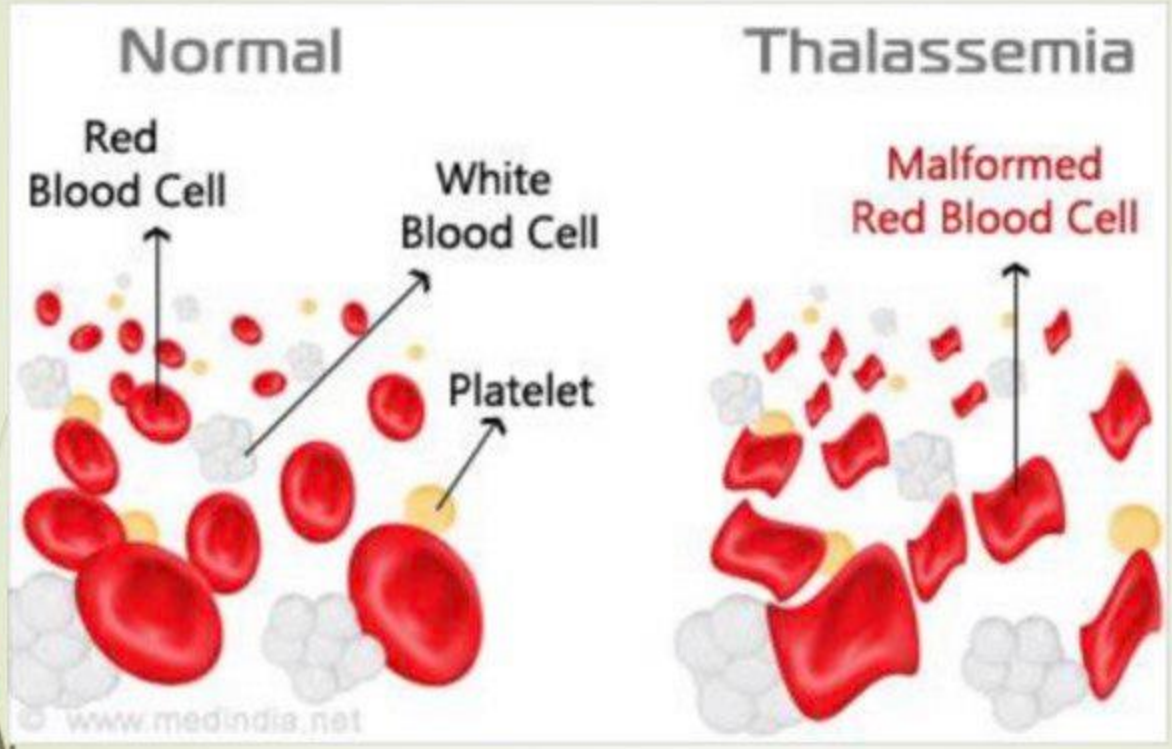
Normal
Red
Blood Cell
White
Blood Cell
Platelet
Thalassemia
Malformed
Red Blood Cell
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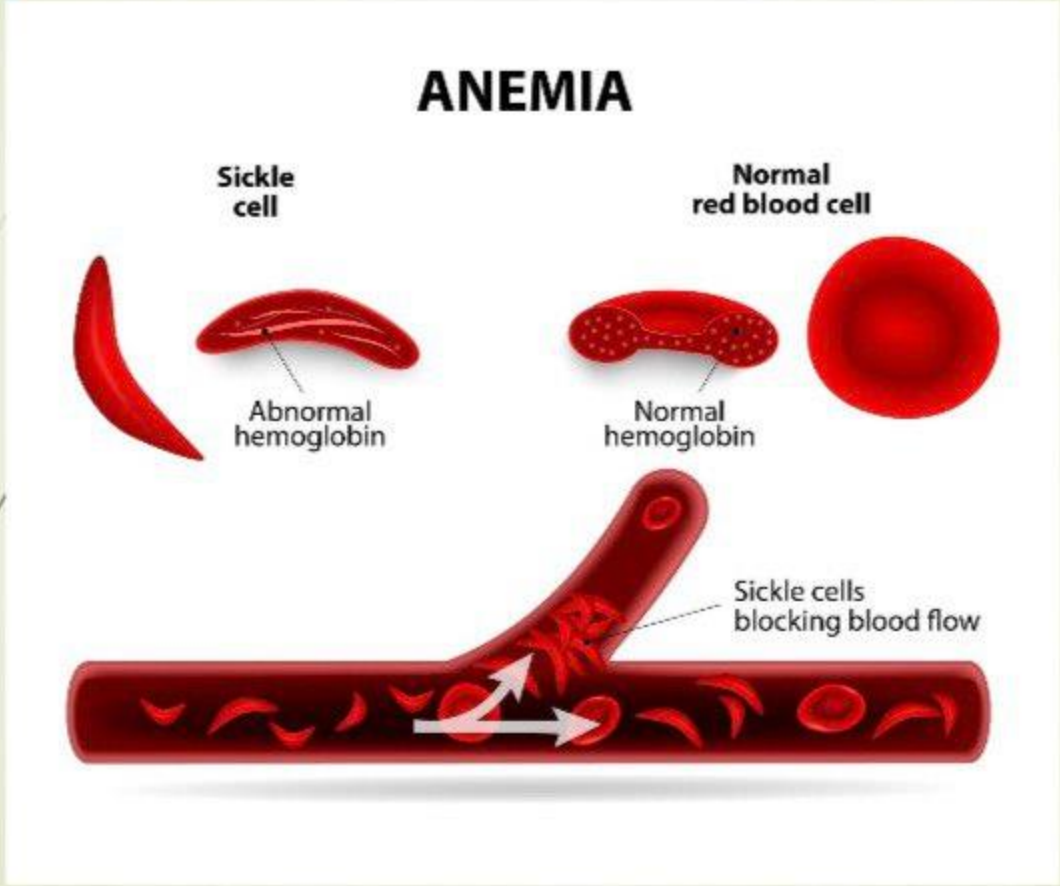
ANEMIA
Sickle cell
Normal red blood cell
Abnormal hemoglobin
Normal hemoglobin
Sickle cells blocking blood flow

Materials and Instruments

SAHLI'S METHOD

All Hb is converted into acid hematine and the intensity of the color is measured by comparing it with the standered

Sahli Haemometer consists of

- A color standard
- Pipette marked to contain 20 microliter of blood.
- Graduated tube
- Distilled water (D.W.)
- 0.1 normal HCl
- Anticoagulated whole blood or capillary blood can be used.

Sahli Pipette

Procedure

- ✓ Fill the graduated tube to mark (2 or 10) with 0.1 normal HCl.
- ✓ Draw blood by hemoglobin pipette to mark 20Ml
- ✓ Dip the tip of the pipette in the graduated tube to blow the blood into the tube, mix content with stirrer.
- ✓ Place the tube in the hemoglobinometer for 10 minutes for complete reaction
- ✓ Add drop by drop D.W. until the color in the graduated tube is identical to the color of the standard.
- ✓ Read the result in gm/dl.