

Complete blood count(CBC)

We can define the CBC as many tests which determine the different component of blood (cells or Hb) . A major portion of CBC is the measure of numbers of White blood cells, red blood cells and platelets in the blood. The CBC can provide important Inf. On the types of blood cells, their condition and numbers, this can help in diagnosis many condition and disease, such as anemia, leukemia and inflammation

The CBC includes many tests:

- 1- Hemoglobin determination (HB)
- 2- Hematocrite or packed cell volume (P.C.V)
- 3-Erythrocyte Sedimentation Rate (E.S.R)
- 4_ Red Blood Cells Count (R.B.C count)
- 5_ White blood cell count (W.B.C count) or leukocyte
- 6_ Differential W.B.C count
- 7_platelet count.

Hemoglobin (Hb) determination

Hemoglobin also spelled haemoglobin and abbreviated Hb or Hgb, is the iron-containing oxygen-transport metalloprotein in the red blood cells of all vertebrates. Is a respiratory pigment of RBC that carries O₂ and CO₂. Each RBC contain 250 million Hemoglobin molecules. There are many normal types of Hb such as fetal hemoglobin (HbF) which is gradually replace by adult hemoglobin(HbA) .Hb value effected by age, sex disease , pregnancy During pregnancy increase in blood fluid lead to red blood cell become less concentrated , causing the red cell count to fall. Since the Hb inside the RBC also falls.

The are several methods of Hb estimation; two of them :

1. Sahli`s method (acid hematin method)
2. Drakin`s method.

Sahli`s method (acid hematin method):**Principal:-**

This method is based upon conversions of Hb to acid hematin compound (brown color) by using acid.

Reagent and equipment:-

The sahli`s hemoglobinometer consist of :

1. Hb pipette.
2. Stirrer (glass rode).
3. Standard Hb comparative.
4. Graduated Tube (Hb tube) 140%.

Specimen:-

Specimen to be use is capillary blood or EDTA- anticoagulated blood.

Procedure:-

1. Fill Hb tube with (0.1 N) HCL till 20 Marks .
2. Withdraw the blood sample by Hb pipette to 0.02 ml. mark(20 μ l).
3. Add the blood sample to Hb quickly and mix well be stirrer.
4. Use the Acid to dilute the mixture of Hb until a match is seen with brown glass Hb standard.
5. Read the lower level of the fluid on % report Hb in g / 100 ml. or (g / dl.) of blood unit.

Normal Range:

Male Adult	(14.0 – 18.0) g / dl.
Female Adult	(11.5 – 16.5) g / dl.
Newborn	(13.5 – 19.5) g / dl.

Determination of Hematocrite (Packed Cell Volume, P.C.V)

P.C.V defined as the percentage of the packed red cell volume to the total amount of blood. there are two methods use in determining the hematocrite volume are :-

1. Macrohematocrite method.
2. Microhematocrite method.

The method of choice is the second, because of its advantage requires less blood and less time.

Microhematocrite method:-

Principle:-

Anticoagulant whole blood is centrifuged, and the total volume of the red blood cells mass is expressed as a percentage of the total blood volume or decimal fraction, ex (42% or 0.42).

Reagents & Equipment's:

- 1- Heparinized capillary tubes coated with either heparin or EDTA.
- 2- Microhematocrite centrifuge speed 10,000 r.p.m
- 3- Hematocrite reader (%)
- 4- Artificial clay

Specimen

The specimen is heparinized capillary blood or venous blood which adds to EDTA –tube (Whole blood)

Procedure

- 1- If capillary blood sample is used then we must use the heparinized capillary tube (prevent clot) (venous blood add to anticoagulant capillary tube) , the excess anticoagulant cause the cell shrinkage and produce false value

Ensure that is no air bubbles , leave at least 15 mm of capillary tube is empty.

2-Sealed the tube by artificial clay

3-Put the tubes in centrifuge with the sealed ends toward the outside of the holder for 5 min at 10.000 r.p.m

4-Read with reader and report the result as percentage or decimal fraction.

Now the blood is separated into 3 layers:

1-column of R.B.Cs at bottom

2-Narrow middle zone of buffy coat consist of W.B.Cs and platelets

3-Fluid of plasma at the top

Normal range

_Male adult 36-52%

_Female adult 33-47%

When P.C.V is above normal range this indicate many medical condition such as polycythemia (increase R. B Cs numbers) and dehydration occur in sever diarrhea , sever burn , vomiting or drinking too little amount of water and use of diuretics, because the loose of fluid lead to decrease the volume of plasma compared with R.B.Cs.

Below normal range occur in anemia and leukemia because the disorders in bone marrow function that leads to low number of R.B. C.s or in sever bleeding and in pregnancy