**\_ *Lecture five* : Haematocrit (Packed Cell Volume – PCV) Determination**

****

**The haematocrit (PCV)** : is the percent of the packed red cells in a volume of whole blood. The hematocrit may also be referred to as Packed Cell Volume (PCV) or erythrocyte volume fraction (EVF). It reflects the combination of total number of RBCS , and the volume that they occupy in plasma . When accurate measurements of Red cell count and Hb concentration are available, the absolute values can be calculated

**Note:** **Remember the Hematocrit is a reflection of the RBC concentration, not the RBC mass.**

It is a screening test for anemia or polycythemia. In comparison, hemoglobin estimation is less accurate, and RBC count far less accurate.

**Principle:**

A volume of anticoagulated blood is placed in a glass tube which is centrifuged so the blood will be separated into three layers: Red cells, Buffy coat (WBC and platelets) and plasma. Ideally there should be complete separation of the three layers.

Haematocrit is the ratio of the height of red cells column to that of the whole blood in the tube.

**The two methods of direct measurement of the PCV which are in current use are:**

**1. Macro-method using Wintrobe tubes.**

**2. Micro-method using capillary tubes.**

The more popular one is the micro-method, as it has the advantage of short time of centrifugation and better packing of the red cells.

**Micro-Haematocrit Method:**

**Test sample:**

Heparin or EDTA venous or capillary blood.

**Equipments*:***

- Micro-haematocrite centrifuge.

- Plastic sealer or Bunsen burner.

**Disposable materials:**

- Capillary tubes 75 mm long and internal diameter of 1 mm.

**Method*:***

1. The blood sample should be used as fresh as possible, and well mixed.

2. Using the capillary action, allow blood to enter the tube stopping at 10-15 mm from one end. Wipe the outside of the tube.

3. Seal the dry end by pushing into the plasticine two or three times.

4. If heat sealing is used rotate the dry end of the tube in a fine Bunsen Burner flame.

5. Place the tube into one of the centrifuge plate slots, with the sealed end against the rubber gasket of the centrifuge plate.

6. Keep a record of the patient number against centrifuge plate number.

7. Centrifuge for five minutes.

8. Read the PCV in the micro haematocrit reader.

9. Unit: the haematocrit result is expressed in percentage.

**Note:** It is preferable to perform the test in duplicate.

**Normal ranges:** The normal values of PCV vary according to the age and sex of the individuals. The normal ranges are

* Adult males = 40% - 52%.
* Adult females = 37% - 47%.
* Pregnant =30%–46%
* Neonates = 40%–68%
* 3 months = 29%–54%
* 1–2 years = 35%–44%



Microhaematocrit reader. Microhematocrite Centrifuge



**Importance of the PCV :** It is so important for the following reasons

* Simple , Accurate Reliable
* Screening for large clinic population

**PCV-Low**

1. **in pregnancy** Cause is a hemodilution the RBCs are "diluted

2. Low RBC production from the bone marrow **(**Toxins, cancer, lowEPO)

3. IDA, aplastic anemia. Hemolytic anemia etc

**PCV-High**  :

 A high hematocrit value may **truly** reflect an increase in the fraction of RBCs

1. polycythemia vera
2. secondary polycythemia (smoking, kidney cancer, high attitude living

3-reactive polycythemia (vomiting and diarrhea, **Burn)**