

# Blood Biochemistry

## BCH 471

### Red Blood Indices



h a e m a t o l o g y

## Red blood cell (RBC) indices:

- A part of a routine blood test (calculated RBC parameters) called the complete blood count (CBC).
- Assist with the differentiation of anemias and serve as quality control checks.

## Mean corpuscular hemoglobin (MCH):

- Amount of hemoglobin in average red cell or average amount of Hb in all the red cell.
- It is directly proportional to the amount of hemoglobin and the size of the erythrocyte.

$$\text{MCH} = \frac{\text{Hb}(\text{gm/dl})}{\text{RBC in million}} \times 10$$

Normal range = 27-32pg

1pg= 10-12g

## Interpretation of MCH values:

**Low MCH values:** Found in microcytic hypochromic anemias and also when red cells are microcytic and normochromic. In thalassaemia minor the MCH is low even when anemia is mild (MCHC is often normal).

**Raised MCH values:** Found in macrocytic normochromic anemia.

## Mean Corpuscular Volume (MCV):

- It is defined as the average volume of red cell.
- It Provides information on red cell size.
- It is measured in femtolitres.

$$MCV = \frac{PCV}{RBC \text{ in million}} \times 10$$

- Normal range=  $87 \pm 5$ fl
- $1\text{fL} = 10^{-15}\text{L}$

## Interpretation of MCV values:

**Low MCV values:** Found in microcytic anemias particularly iron deficiency, anemia of chronic disease and thalassaemia.

**Raised MCV values:** Found in macrocytic anemias, marked reticulocytosis, and chronic alcoholism.

## Mean corpuscular hemoglobin concentration (MCHC):

- The MCHC expresses the average concentration of hemoglobin per unit volume of erythrocytes.
- It is expressed in percentage.
- Normal value= 32-36%

$$MCHC = \frac{Hb(gm/dl)}{PCV} \times 100$$

or

$$MCHC = \frac{MCH}{MCV} \times 100$$

## Interpretation of MCHC values:

**Low MCHC values:** Found in iron deficiency anemia and other conditions in which the red cells are microcytic and hypochromic.

**Increased MCHC values:** Occur in marked spherocytosis.

## Summary of red cell indices in common anemias:

Anemia	MCV	MCH	MCHC
Normocytic normochromic	N	N	N
Microcytic hypochromic	D	D	D
Macrocytic normochromic	I	I	N

## Red cell distribution width (RDW):

- Degree of red cell size variability in a blood sample Coefficient of variation of the size of the RBCs
- Expressed as %
- Derived from automated instruments that can directly measure the MCV.
- Normal: 11-15 %

## Complete Blood Count:

- White Blood Count (WBC)
- Red Blood Cell Count (RBC)
- Platelet Count (Plt)
- Hemoglobin (Hb or Hgb)
- Hematocrit (Hct)
- Red Cell Indices (MCV,MCHC,MCH)
- Red Cell Distribution Width (RDW)
- Differential Count (Diff)