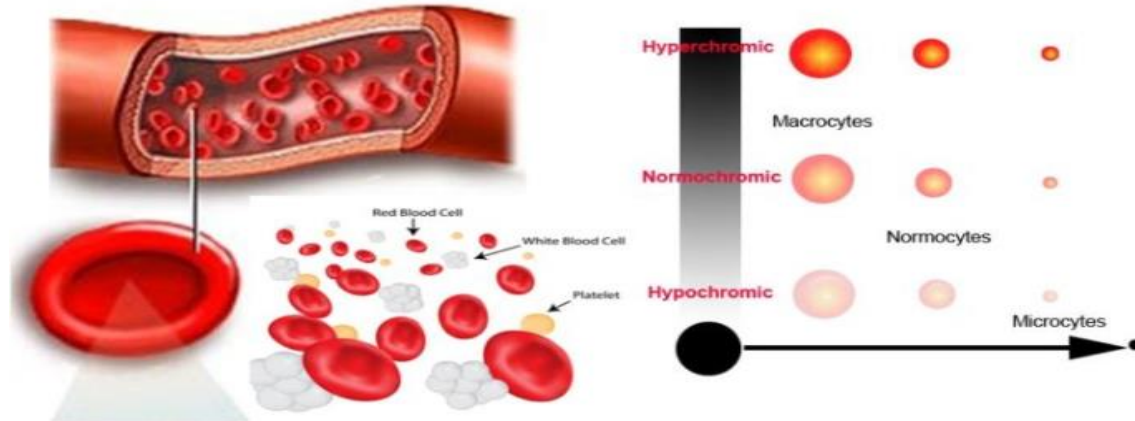


Red Cell Indices



It measures the size, shape, and quality of red blood cells, which includes; three most used indices are the MCV, MCH, MCMH and RDW blood test is part of the panel.

It can determine by automated hematology analyzer in CBC test or manual.

Propose of RBC indices: it used to help diagnose the cause of anemia.

1-Mean corpuscular volume (MCV), which measures the average size of **single** red blood cell.

$$MCV = \frac{PCV\%}{RBCc} \times 10$$

Normal value: 76-96 fl. (normocytic).

Low MCV	High MCV
1-Iron deficiency	1-Hemolytic anemia
2-Vitamin A deficiency	2-Vitamin B12 deficiency
3-Copper deficiency	3-Folate deficiency
4-Lead poisoning	4-Liver disease
5-Iron malabsorption	5-Alcoholism
6-Thalassemia	6-Hypothyroidism
7-Anemia of chronic disease	7-Leukemia
	8-Chemotherapy

2-Mean corpuscular hemoglobin (MCH), which measures the average weight of hemoglobin inside a **single** red blood cell, or (average weight, in picograms of Hb. in one red cell).



$$MCH = \frac{Hb \frac{g}{dl}}{RBCc} \times 10 = \text{result (pg per RBC)}$$

Normal value: 27-32 pg

3-Mean corpuscular hemoglobin concentration (MCHC), which measures the average of hemoglobin concentration inside all red blood cells.

$$MCHC = \frac{Hb \text{ g/dl}}{PCV} \times 100$$

Normal value: 30-35 g/dl.

If mchc more than normal value, Rbc called **hyperchromic**.

If mchc less than normal value, Rbc called **hypochromic**.

And when mchc in normal range, Rbc called **normochromic**.

Low MCHC	High MCHC
1-Iron deficiency anemia	1-Hemolytic anemia
2-Aplastic anemia	2-Vitamin B-12 deficiency
3-Pernicious anemia	3-Folate deficiency
4-Anemia of chronic disease	4-Spherocytosis
5-Thalassemia	
6-Iron malabsorption (celiac disease or Crohn's disease)	
7-Pregnancy	

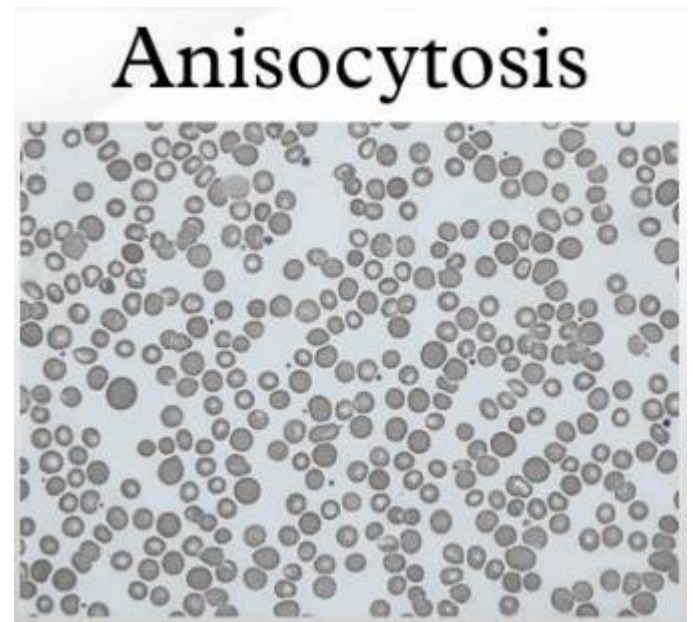
4-Red cell distribution width (RDW), which measures differences in the volume and size of red blood cells. A normal RDW would mean red blood cells are all similar in size, whereas a higher RDW means that there is more variability in the size of the red blood cells.

Red cell distribution width (RDW) is calculated by automatic counters or by automated hematology analyzer and reflects the variability in red cell size. The term “width” in RDW is **misleading**; it is a measure of the coefficient of variation of the volume of the red cells, and **not the diameter**. It is expressed as a **percent%**.

$$\text{RDW} = (\text{Standard deviation of MCV} \div \text{mean MCV}) \times 100$$

Normal value: 11% to 14%.

The presence of **Anisocytosis** may be inferred from an elevated RDW value. **Anisocytosis** is a medical term meaning that a patient's red blood cells are of **unequal size**. This is commonly found in **anemia** and other blood conditions.



References

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