Red Blood Cells Indices (Absolute Blood Values)

RBCs are normally all the same color, size, and shape. However, certain conditions can cause variations that impair their ability to function properly. The RBC indices measure the size, shape, and physical characteristics of the RBCs. RBC indices used to help diagnose the cause of anemia. Anemia is a common blood disorder in which there are too few, misshapen, or poorly functional RBCs.

Anemia has many different causes, it can be inherited Anemia can also develop sometime during your life. Anemia can be acute, meaning it develops over a short period of time. Anemia can also be chronic, meaning it develops and persists over months to years.

Possible causes of anemia include:

- diets lacking in iron, vitamin B-12, folate, or folic acid
- chronic diseases like cancer, diabetes, inflammatory bowel disease, kidney disease, or thyroiditis, which is an inflammation of your thyroid gland
- significant blood loss or hemorrhage, pregnancy
- diseases affecting your bone marrow, such as leukemia, lymphoma, or multiple myeloma
- chemotherapy, lead poisoning
- certain genetic diseases, such as thalassemia, which is an inherited form of anemia, or sickle cell anemia.

The RBC indices has three parts:

Mean Cell volume (**MCV**), which is the average red blood cell size.

(**80 to 96** femtoliters, or μm^3)

Mean Cell hemoglobin (**MCH**), which is the amount of hemoglobin per RBC.

(**27 to 32** picograms)

Mean Cell hemoglobin concentration (**MCHC**), which is the amount of hemoglobin relative to the size of the cell or hemoglobin concentration per red blood cell.

(**32 to 38** grams per deciliter, or %)

Calculations:

$$\text{MEAN CELL VOLUME (MCV) (femtoliters)} = \frac{\text{Hematocrit} \times 10}{\text{RBC}}$$

$$\text{MEAN CELL HEMOGLOBIN (MCH) (pg per RBC)} = \frac{\text{Hemoglobin} \times 10}{\text{RBC}}$$

$$\text{MEAN CELL HEMOGLOBIN CONC (MCHC) (g/dL of erythrocytes)} = \frac{\text{Hemoglobin} \times 100}{\text{HCT}}$$

RBCs number substituted in Millions (for example RBCs number = 5,000,000 put 5 only)

Normal MCV

If you have a normal MCV, it means that your red blood cells are normal in size. You can have a normal MCV and still be anemic if there are too few RBCs. This is called **normocytic anemia**. Normocytic anemia occurs when the red blood cells are normal in size and hemoglobin content, but there are too few of them. This can be caused by:

- a sudden and significant blood loss
- a prosthetic heart valve
- a tumor
- a chronic disease, such as a kidney disorder or endocrine disorder
- aplastic anemia

High MCV

The MCV is higher than normal when RBCs are larger than normal (macrocytic anemia), causes:

- Vitamin B-12 deficiency, Folate deficiency, Chemotherapy, leukemia

Low MCV

The MCV will be lower than normal when RBCs are too small (microcytic anemia). Causes:

Iron deficiency, which can be caused by poor dietary intake of iron, menstrual bleeding, or gastrointestinal bleeding, Thalassemia, Lead poisoning, Chronic diseases

High MCHC

If you have a high MCHC, this means that the relative hemoglobin concentration per red blood cell is high. MCHC can be elevated in diseases such as: Hereditary spherocytosis, Sickle cell disease

Low MCHC

- If you have a low MCHC, it means that the relative hemoglobin concentration per red blood cell is low. The red blood cells will take on a lighter color when viewed under the microscope. Individuals with anemia and a corresponding low MCHC are said to be **hypochromic**. Conditions that can cause low MCHC include the same conditions that cause low MCV, including: iron deficiency, chronic diseases, thalassemia, lead poisoning

Generally, a low MCV and a MCHC will be found together. Anemias in which both MCV and MCHC are low are called microcytic, hypochromic anemia.