Anemia:

Anemia is defined as a reduction in the hemoglobin concentration in the peripheral blood below that expected for a healthy person of the same age, gender and physiological status.

It may be due to:

(i) Defective production of red cells.

(ii) Reduced red cell survival in the circulation due to hemolysis or blood loss.

(iii) Increased pooling or sequestration of red cells in the spleen.

Anemia may be an isolated abnormality or it may be part of pancytopenia.

Anemia is not a complete diagnosis by itself, unless the cause for it is identified.

Classification of anemia:

Anemia can be classified generally into three major categories:

Normochromic, normocytic anemia (normal MCV and MCH) include:

1. Anemias of chronic disease.
2. Hemolytic anemias.
3. Anemia of acute hemorrhage.
4. Aplastic anemias.

Hypochromic, microcytic anemia (low MCV and MCH), include:

1. Iron deficiency anemia.
2. Thalassemias.
3. Advanced anemia of chronic disease.

Normochromic, macrocytic anemia (high MCV and normal MCH), include:

1. Megaloblastic anemia (Folate or B12 deficiency).
2. Non-megaloblastic anemia (as in alcoholism, liver disease, hypothyroidism, drugs, aplastic anemia, pregnancy, neonate and smoking).

Red cell indices:

The main red cell indices are MCV, MCH, MCHC and red cell distribution width (RDW).

These indices are the basis for classifying anemias, and in various combinations they have been used to aid in the distinction between different

types of anemia. Their use provides a guide to the most likely diagnosis, but they are not definitive tests.

Mean Cell Volume (MCV): In automated systems, MCV is measured directly, but in semi-automated counters MCV is calculated by dividing the PCV by RBC count. It can not be measured manually (because manual RBC count is invalid). MCV normal reference range is 78-95 fl.

Mean Cell Hemoglobin (MCH) is derived from the Hb divided by RBC count. It also can not be measured manually (because manual RBC count is invalid). MCH normal reference range is 27-32 pg.

Mean Cell Hemoglobin Concentration (MCHC) is derived from the Hb (in g/dl) divided by the PCV (in l/l). It can be measured manually. MCHC normal reference range is 31-35 g/dl.

Red cell distribution width (RDW): Automated instruments produce volume distribution histograms that allow the presence of more than one population of cells to be appreciated. Instruments may also assess the percentage of cells falling above and below given MCV thresholds and "flag" the presence of an increased number of microcytes or macrocytes. Such measurements may indicate the presence of a small but significant increase in the percentage of either microcytes or macrocytes before there has been any change in the MCV. Most instruments also produce a quantitative measurement of the variation in cell volume, an equivalent of the microscopic assessment of the degree of anisocytosis (change in size).

The normal reference range of RDW is 11.5-15 %.

The RDW is of value in distinguishing between iron deficiency (RDW usually increased) and thalassemia trait (RDW usually normal); and between megaloblastic anemia (RDW often increased) and other causes of nonmegaloblastic macrocytosis (RDW more often normal).

Percentage of hypochromic red cells (%HRC) is the best-established variable for the diagnosis of functional iron deficiency (FID). A value of ≥6% differentiate between iron-deficient and iron-sufficient patients.

Reticulocyte Hb content (CHr) is the 2nd-best option, with value <29 pg predicts FID in patients.

%HRC & CHr are superior to measurements of serum ferritin and serum iron, TIBC and Transferrin saturation % in differentiating between iron-deficient and iron-sufficient patients in patients with anemia of chronic disease.