

Serum Iron

About 0.1% of total body iron is present in plasma, the plasma iron is transported mainly by protein(transferrin). The binding sites on transferrin are normally only one third saturated (30-35%). If we measure all the binding sites available on transferrin then this is called the total iron binding capacity (TIBC) and from the values of serum iron and TIBC we can calculate the percentage saturation.

Approximate distribution of body iron:

1. Haemoglobin:67% of the total body iron for oxygen transport.
2. Myoglobin :3% in muscles for oxygen storage
3. Ferritin and haemocidren:30% as iron storages present in liver, spleen, bone marrow and other reticuloendothelial tissues.
4. Haem enzymes in different body cells like cytochromes, catalases and peroxidases(0.2%).
5. Transferring in plasma:0.1%

Normal range:

Males:80-180 $\mu\text{g}/\text{dl}$

Females:60-160 $\mu\text{g}/\text{dl}$

Physiological factors affecting iron level:

Sex: serum iron is higher in males.

Age: is lower in infancy than in adolescence and child bearing age.

Diurnal variation: lower values are found in the evening , therefore it is best to take specimens for serum iron between 9-10 a.m .

Menstruation: lower values are found just before and during menstrual period.

Pregnancy: tends to cause higher values but is commonly complicated by iron deficiency that lowers serum iron.

Contraceptive pills: cause an increase in serum iron level.

Clinical significance:

Low serum iron:

This is found in iron deficiency anemia which in children is frequently due to dietary deficiency because milk has a low iron content. In adults it almost always indicates chronic blood loss such as heavy menses or hookworm infestation or peptic ulcer. In chronic disease such as rheumatoid arthritis, tuberculosis and some malignancies the low serum iron is due to defective iron utilization and metabolism.

High serum iron:

This is found in acute iron poisoning in children or after iron medication in adult and also in acute liver disease due to release of iron stores. In the hereditary disorder known as hemochromatosis it is due to increased intestinal absorption. In thalassemia, idiopathic and chronic hemolytic anemia and after numerous blood transfusions the increase in serum iron level is due to chronic iron overload.

TIBC (Total Iron Binding Capacity)

Maximum conc. Of iron that serum proteins principally transferrin can bind .

An estimate of serum transferrin

% Transferrin Saturation

Ratio of serum iron to TIBC

Concomitant determination of serum iron & transferrin (TIBC) allows the computation of transferrin saturation as follows:

$$\text{Transferrin saturation (\%)} = \text{Serum iron } (\mu\text{g/ dl}) / \text{TIBC}(\mu\text{g/ dl}) * 100$$

Serum ferritin

Sensitive indicator of iron deficiency

Free erythrocyte protoporphyrin

One of the most sensitive early detectors of iron deficiency . Also used to diagnose iron deficiency anemia even after administration of iron is started