



ERYTHROCYTE SEDIMENTATION RATE (ESR)

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ABSTRACT:

Erythrocyte sedimentation rate (ESR) is the rate at which the erythrocytes settle down. Generally, in the circulation erythrocytes remain suspended at a uniform level only. This is also termed as suspension stability of erythrocytes. In western's tube (vertical tube) the erythrocytes settle to the bottom of the tube because of gravity only with a supernatant layer of clear fluid known as plasma.

ESR is also called sed rate or Biernacki reaction. First of all, Edmund Biernacki demonstrated this experiment.



KEYWORDS: Erythrocyte sedimentation rate (ESR), erythrocytes settle down , vertical tube , supernatant layer.

Estimation of ESR:-

ESR is estimated by two methods

- Westergren's method
- Wintrobe's method

Westergren's Method:

Westergren's tube is essential to estimate ESR. This tube has 300 mm long with an opening on both sides. It is marked 0 to 200 mm from the top towards down. 1mL of blood is mixed with 0.4 mL of 3.8% sodium citrate (anticoagulant) and this blood should be loaded in the Westergren tube. The ratio of blood and anticoagulant is 4:1. The tube is fixed to the stand in a vertical direction without disturbance. Normally, the value is to be taken at the end of 1 hour

b) Wintrobe's method: In this method, Wintrobe's tube is essential for estimation ESR.

Wintrobe's Tube:

Wintrobe tube is a short tube opening only one end. It is a long tube with a length of 110 mm and with a bore of 3 mm. Wintrobe's tube is marked both sides. On one side the marking is from 0 to 100 (for ESR) whereas on opposite side from 100 to 0 (for PCV). 1 mL of blood with EDTA type of anticoagulant is loaded in the tube up to 0 mark and the tube fixed to the wintrobe's stand. Then, the reading must be noted after one hour.

Normal values of ESR:-

By Westergren Method:

In males : 3 to 7 Mm in 1 hour

In females: 5 to 9 mm in 1 hour

Infants: 0 to 2 mm in 1 hour

By Wintrobe Method:

In males: 0 to 9 mm in 1 hour

In females: 0 to 15 Mm in 1 hour

Infants: 0 to 5 mm in 1 hour

Variations of ESR:-

Discrepancies in physiology:

1. **Age:** ESR is less in children and infants due to the presence of more number of erythrocytes.
2. **Sex:** ESR is more in females compared to males due to less number of erythrocytes.
3. **Menstruation:** More ESR is observed during menstruation due to more loss of blood and erythrocytes.
4. **Pregnancy:** From 3rd month to parturition, ESR enhanced up to 35 mm in 1 hour due to hemodilution only

Discrepancies in Pathological Aspects:

An augmentation of ESR takes place in:

1. Tuberculosis
2. Most anemia's except sickle cell anemia
3. Malignant tumors
4. Rheumatoid arthritis
5. Rheumatic fever
6. Liver diseases.

The reduction of ESR occurs in the following diseases:

1. Sickle cell anemia
2. Peptone shock
3. Allergies
4. Polycythemia
5. Severe leukocytosis.

Significance of ESR:-

Erythrocyte sedimentation rate (ESR) is an easy, inexpensive as well as non-specific test. ESR assists in diagnosis and prognosis also. ESR cannot give an idea about the exact location as well as the cause of disease. So ESR is a non specific test. But, ESR assists in confirming the diagnosis. Prognosis is nothing but the monitoring the course of disease as well as response of the patient to therapy. Estimation of ESR is primarily useful in estimating the progress of patients treated for few chronic inflammatory disorders namely:

1. Pulmonary tuberculosis
2. Rheumatoid arthritis

3. Polymyalgia rheumatica (inflammatory disease characterized by pain in shoulder as well as hip)
4. Temporal arteritis (inflammatory disease of arteries of head).

Factors influencing ESR:-

A) Enchantment in size of RBC: ESR is increased due to more size of erythrocytes.

B) RBC count:- If RBC count enhances, the viscosity of blood also enhances proportionately. Enhanced viscosity exhibits resistance to settling down of erythrocytes. So ESR is reduced. If RBC count reduces, then ESR enhances.

C) Rouleaux formation:- It enhances ESR. Globulin and fibrinogen also enhances Rouleaux formation.

D) Specific gravity of RBC:- The sedimentation is rapid because of the enhancement of more specific gravity of erythrocytes (heavier RBC's). So ESR is enhanced.

E) Plasma volume:- Low plasma volume leads to reduced ESR.

F) Plasma proteins:- Low concentration of plasma proteins (fibrinogen and para protein) results in reduction of ESR.

G) Viscosity of blood:- Viscosity exhibits more resistance for settling of RBCs. So, ESR is reduced because of the enhancement of the viscosity of the blood.

H) A very few drugs such as dextran, methyl dopa, oral contraceptives, pencillamine, procainamide and vitamin A enhances ESR, whereas Aspirin, cortisone and Quinine reduces ESR.

I) ESR is enhanced in anemia, more fibrinogen as well as cholesterol level, carcinoma, old age and pregnancy, tuberculosis and tissue destruction.

J) ESR is reduced in abnormalities or irregular shape of RBC's, spherocytosis, congest heart failure (CHF).

Differential Diagnosis:-

ESR and C-Reactive Protein(CRP) levels are very significantly related with less extent regarding clinical measures of disorders such as osteoarthritis, rheumatoid arthritis and systemic lupus erythematosus (SLE).

ESR predicts early release as well as survival in early stages Hodgkin disease. ESR acts as a marker for coronary artery disease.



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