**Erythrocyte Sedimentation Rate  
(E.S.R.)**

***Introduction and principle***

**When anticoagulant whole blood is allowed to stand for a period of time, the red blood cells settle down from the plasma. The distance the red blood cells fall after a specific time period (1hour) is known as the erythrocytes sedimentation rate (ESR). The red blood cells settle down as a result of rouleaux formation.**

**The sedimentation occures in three phases:-**

**In the first phase the red cells aggregates together and form rouleaux and fall slightly.**

**In the second phase the speed of the fall is increased.**

**And as the cells pack this speed is decreased during the third phase.**

**Not**

**The red blood cells settle because their density is greater than that of the plasma.**

**Clinical application**

**The E.S.R. Is of great value to the clinician and is commonly used as a screening test at the initial examination of the patients .**

**E.S.R. Increased in :-**

1. **Chronic conditions such as Rheumatoid Arthritis and Tuberculosis.**
2. **Acute and chronic infections .**
3. **Malignant diseases such as Myeloma;where the plasma proteins are abnormal .**

**E.S.R. Increased in certain physical conditions also like pregnancy and eldery people .**

**E.S.R.decreased in :**

**1.Polycythemia .**

**2.Congestive heart failure .**

**Factor affecting E.S.R.**

**1.Specific gravity of blood .  
2.Red cell volume:-  
A-size of R.B.Cs.:In vit.B12 deficiency R.B.Cs. are large in size (Macrocytes),and the sedimentation rate incrased,while in iron deficiency R.B.Cs. are small in size (Microcyte),and the sedimentation rate decreased .  
B-Number of R.B.Cs:In anemia,E.S.R. Increased,while in polycythemia,E.S.R. Decreased .  
3. Hb content.  
4. Blood viscosity .  
5. Rouleaux formation .**

**Methods   
1-Westergren method.  
2-Wintrobe method.  
  
 (Westergren Method)   
Material and Instruments   
1-Westergren pipette is a straight glass 30 cm in length and 2.55 mm diameter. It is graduated and open at both ends. The graduation is from zero to 200 mm •  
2 -Westergren pipette rack. All racks should be equipped with level screws and a spirt level  
3-Pipettes 2 mL and 0.5 mL.  
4-Sodium chloride 0.85 % (w/v) for diluting the blood.  
5- Whole blood, 3 mL, using sodium citrate as the anticoagulant.   
6-Plain test tubes 13 X 100 mm.   
7- Applicator sticks**

**Procedure**

**1-Mix the whole blood for at least 2 minutes on a rotator at room temperature. Check the tube for clots using two applicator sticks.**

**2- Place 0.5 mL of 0.85% of sodium chloride in a plain test tube.**

**3- Add 2 mL of well mixed whole blood to the test tube.**

**4- Mix the tube for 2 minutes.**

**5- Fill the Westergren pipette to exactly the 0 mark, making certain that there are no air bubbles in the blood.**

**6- Place the tube exactly vertical and leave undisturbed for 60 minutes, free from vibrations and draughts, and not exposed to direct sunlight.**

**7-At the end of 60 minutes, read the number of millimeters the RBC's have fallen (i.e. the height of the clear plasma above the upper limit of the column of the sediment cells.)**

**8- The result is the ESR in mm / 1 hour.**

**Normal value**

**In adult men In adult women**

**0-10 mm / 1 hour 0-15 mm / 1 hour**

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