Complete Blood Count

- Platelets Tests -

Platelets, also called thrombocytes, are the smallest type of blood cells, about 2-3 µm in diameter, produced in bone marrow by megakaryocytes *(large precursor cells)*. Platelets are minute discs fragments of cells consisting of a small amount of cytoplasm without nucleus surrounded by a cell membrane. Life spine of circulating platelets is 5 - 9 days. The principal function of platelets is to prevent bleeding by clumping and initiating a blood clot.

Platelets Count

The normal platelet count is 150,000 - 400,000 per (mm3) of blood. Important to monitor platelets count in order to diagnose or screen various medical conditions that may affected the process of blood clotting, leading to bleeding.

Principle:

Blood sample is diluted in proportion 1:20 in solution of *ammonium oxalate* reagent, which dilute high number of platelets and make it to be countable, prevents clumping of platelets, and lysis the red blood cell.

Procedure:

1. Put 950 µl from dilution fluid (1% ammonium oxalate) and 50 µl from blood sample in tube and mix gently.

2. Wait for 10 min to complete hemolysis.

3. Take one drop of diluted sample to the slide chamber and leave for 2-3 minutes

for platelets to settle down in the counting chamber.

4. Exam the chamber under the microscope. Use the X40 objective lens to count the platelets in the same squares as used for RBC counting (four medium corner squares and one medium central square).

Platelets will appear as shiny objects that darken when the fine adjustment knob is rotated.

6. Any platelet lies on upper and left lines of a square is count, platelet lies on lower and right lines of a square are uncounted.

A- Dilution Factor = $\frac{\text{Volume of solution (1000)}}{\text{Volume of sample (50)}} = 20$

B- Volume of sample = squares area (0.2 mm^2) X chamber depth (0.1 mm) = 0.02 mm^3

C- Total platelets count = $\frac{\text{N X Dilution factor (20)}}{\text{Volume of sample (0.02)}}$ = N X 1000

N is the number of platelets found in five squares

Disorders:

 Thrombocytopenia: Decreased platelets count, is due to either decreased production or increased destruction. Occur in several cases such as:

 Aplastic anemia

 Pernicious anemia

 Immune thrombocytopenia (ITP)

 Thrombopoietin deficiency

 Chemotherapy or radiation therapy

 Drug-induced thrombocytopenia (heparin, aspirin)

 Thrombocytosis: Increase in platelets count, is either congenital or due to unregulated production that occur in several cases such as:

- Hemolytic anemia
- Myeloid neoplasms
- Chronic infection
- After splenectomy
- Autoimmune disease

Mean Platelet Volume

Mean platelet volume (MPV) is a measure of the average size of platelets, its normal range is 7.5 - 12 fL. It's closely related to a platelet count test. Usually, younger platelets are larger in size than older platelets. MPV is often considered a reflection of the average age of your platelets, and can be used to inference about platelet production in bone marrow or platelet destruction problems.

Causes of high MPV

A high MPV is usually a sign that there are more young platelets in bloodstream.

- Immune thrombocytopenia
- Megaloblastic anemia
- Diabetes mellitus
- Hyperthyroidism
- Bernard-Soulier Disease (giant platelet syndrome)
- Genetic abnormalities in platelets
- Heart disease or artificial heart valves
- Post-splenectomy and liver disease
- Bone marrow stimulating drugs, such as erythropoietin or thrombopoietin

Causes of low MPV

A low MPV generally suggests that most of platelets are older and that bone marrow has slowed down production of platelets.

- Bone marrow failure
- Iron deficiency anemia
- Aplastic anemia
- Hypothyroidism
- Splenomegaly (enlargement of the spleen)
- Chemotherapy
- Acquired Immunodeficiency Syndrome (AIDS)

Cases about MPV and platelet count

A high MPV with the following platelet counts can suggest conditions:

- ***Low platelet count along with high MPV*** occurs when platelets are destroyed, usually by antibodies, an infection, or toxins, as immune thrombocytopenic purpura (ITP).
- ***High platelet count along with high MPV*** can occur when the bone marrow produces too many platelets, typically due to a genetic mutation or cancer.
- ***Normal platelet count along with high MPV*** suggests conditions such as hyperthyroidism.

A low MPV with the following platelet counts can suggest conditions:

- ***Low platelet count along with low MPV*** refer to bone marrow disorders that slow down or decrease the production of platelets, such as aplastic anemia.
- ***High platelet count along with low MPV*** often signifies an infection, inflammation, or cancer.
- ***Normal platelet count along with low MPV*** is common with chronic kidney failure.