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Diploma in Pharmacy 2nd Year
Biochemistry & Clinical Pathology
Chapter 13 : Introduction to Pathology of Blood and Urine

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Chapter 13

Introduction to Pathology of Blood and Urine

Pathology of Blood

→ The study of blood related to diseases, causes and progression is called Pathology of blood. The tests performed for pathology of blood are called "Haematological Tests"

Lymphocytes and platelets - Role in health in diseases

Lymphocytes

- Lymphocytes are a type of WBC and a part of immune system. They are found in lymph that is why they are called lymphocytes,
- They are 20 - 30 % of WBCs.
- There are two main types of lymphocytes B lymphocytes (B-Cells) and t - lymphocytes (T - Cells)
 - B- lymphocytes produce antibodies that attack invading bacteria, viruses and toxins
 - t- cells destroy infected body's cells (host cells) destroy tumor cells and activate other immune cells
- Count of lymphocytes
 - B- lymphocytes : 100-600 cells / μ L of blood.
 - T- lymphocytes : 500-1200 cells / mm^3 (Cubic milliliter)

Functions

- ✚ They Help immune system
- ✚ They produce antibodies
- ✚ They fight against foreign substances (bacteria, viruses etc.)
- ✚ They destroy infected cells
- ✚ They kill tumor cells

Abnormal Lymphocyte

- ▲ Count an increase in lymphocyte count more than (4000 / μ L) in an adult, it is called lymphocytosis.
- ▲ High Lymphocyte count indicates any of following condition :
 - Infection
 - Cancer of lymphocytes (Lymphocytic leukemia)
 - Autoimmune disorder

Platelets

→ Platelets or thrombocytes are small and colourless blood cells. They are formed by bone marrow, They mainly promote blood clotting and stop bleeding.

Role of platelets

- ◇ **Vasoconstriction** : They secrete serotonin which causes constriction of blood vessels.
- ◇ **Blood Coagulation** : It plays an important role in blood clotting.
- ◇ **Fibrinolysis** : Platelets help in breakdown of the clot and healing of damage blood vessels.

Abnormal Platelets Count

- Blood Platelet count below normal range is called Thrombocytopenia when high level is called Thrombocythemia .
- Low level leads to
 - Improper blood clotting
 - Prolonged bleeding from cuts
 - Usually heavy menstrual flows
 - Blood in urine or stools
 - Fatigue
 - Bleeding from gums or nose
- High level of platelets can cause dangerous clots in blood vessels , increasing risk of stroke or heart attack.

Erythrocytes Abnormal Cells and their Significance

- Normal RBCs are round , disc-shaped , biconcave cells which don't have nucleus.
- Different type of abnormalities occurs in RBCs,
- Some of them are :
 - Variation in size
 - Variation in Shape
 - Alteration in colour

Variation in size

- A normal erythrocyte has an average diameter of $7.2 \mu\text{m}$ ($6.8 - 7.5 \mu\text{m}$) . the normal size cells are called normocyte . anisocytosis a common term is used for an increased RBCs cells size.

Variation in Shape

- Variation in Shape of a mature RBC have the shape other than normal Round , Disc shape and biconcave appearance . it is termed Poikilocytosis . Poikilocytosis may be different types like Acanthocytes , Blister Cells etc.

Alteration in colour

- The normal RBCs have a red color , which is provided by haemoglobin , the alteration in colour is occurs with the change in concentration of Heamoglobin . Note : any type of abnormality disturb the function of Erythrocytes.

Significance of Erythrocytes

- ◇ Transport of Oxygen from lungs to tissues.
- ◇ Transport of carbon dioxide from tissues to lungs.
- ◇ Transport of wastes from tissues to kidney.
- ◇ Dilation of blood vessels : It release the ATP which cause relaxation of vessels
- ◇ Immunity : when bacteria break the haemoglobin it release free radicals that rupture the bacterial cell wall and membrane which causes death of bacteria.

Disorder of Erythrocytes and their significance

- ▲ **Anaemia** : Deficiency of RBCs or Haemaglobin in blood.
 - Iron deficiency anaemia
 - magaloblastic anaemia (Vit. B 12 and B 9 deficiency)
 - pernicious anaemia (vit. B 12 deficiency)
 - Haemolytic anaemia
- ▲ Polycythemia (increased RBCs count)
- ▲ Hemoglobinopathies (sickle cell means misshape of RBCs)
- ▲ Red cell enzyme deficiency (G6PD)
- ▲ Hemochromatosis (iron overload , it can poison organs and lead to cancer)

Introduction to Pathology of Urine.

- The pathology of urine involves the analysis of the chemical and physical properties of urine and their relationship to disease.
- Urine is a waste product that is produced by the kidneys and excreted from the body through the urinary system. It contains a variety of components that can provide valuable diagnostic information when analyzed

Normal Constituents of Urine

- Urine is an aqueous solution, a by-product of the body, formed by the kidneys and excreted out through urethra by a process called micturition.
- Normal urine have 95% of water and 5% of other constituents.
- Normal constituents of Urine
 - urea (9.3 gm / lt)
 - Chloride (1.87 gm /L)
 - Sodium (1.17 gm /L)
 - Potassium (0.750 gm /L)
 - Creatinine (0.670 gm / L)
 - Some dissolved ions and other compounds (hormones , oxalic acid , hippuric acid etc.)

Abnormal constituents of urine and their significance

Abnormal Constituents	Significance diseases
Proteins	Proteinuria
Sugar	Glycosuria
Ketone bodies	Ketonuria
Bile pigments and salts	Jaundice
Blood	Haematuria

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