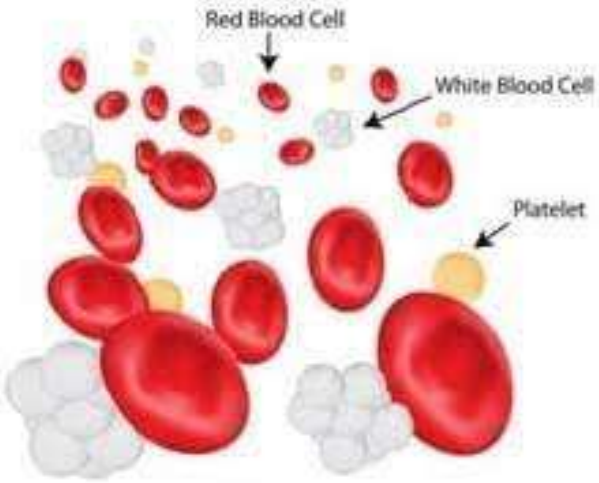
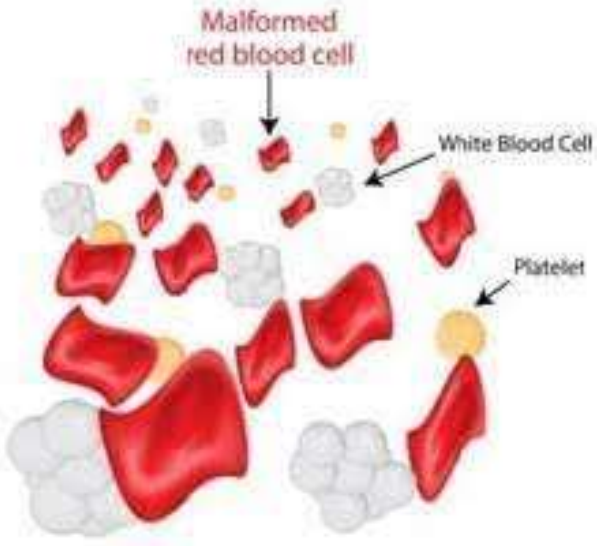
Thalassemia

Normal



Thalassemia



INTRODUCTION

- A blood disorder involving lower than normal amounts of an oxygen carrying protein.
- Thalassemias are inherited blood disorders characterised by decreased Haemoglobin production.
- Thalassemias are also called as Mediterranean anemia.

SYMPTOMS

- Anemia
- Feeling tired
- Pallor
- Enlarged spleen
- Yellowish skin

TYPES

- Alpha thalassemia
- Beta thalassemia

ALPHA thalassemia

- Alpha thalassemia is a genetic disorder involving a deficiency in alpha globin chains of Haemoglobin which is the oxygen carrying protein in RBC.
- Normally, Haemoglobin is made up of 4 globin chains each bound to heme group.
- There are 4 types of globin chains;
- Alpha, beta, gamma, Delta chains.
- In which alpha thalassemia is a defective condition in alpha chains of Haemoglobin.

- Mainly defective in Haemoglobin A found in large fractions of Haemoglobin in blood.

ETIOLOGY

Normally, alpha chains synthesis are controlled by four alpha genes on chromosome 16.

- In alpha thalassemia, there is defective factor in alpha genes on chromosome 16.
- Main cause is genetic inheritance
- Caused by mutations in genes (involves Gene deletion)
- Which is a autosomal recessive disorder

Alpha thalassemia may occur due to;

- Defect in 1 alpha gene
- Defect in 2 alpha genes
- Defect in 3 alpha genes
- Defect in 4 alpha genes

PATHOGENESIS

Defect in 1 alpha gene:

- There is defect in 1 alpha gene.
- It is called as silent carrier, because they don't have any symptoms but can pass a gene to children.
- Also called as alpha thalassemia triat.

Defect in 2 alpha genes

- There in defect in 2 alpha genes.
- It is called as alpha thalassemia minor.
- They have mild symptoms.

Defect in 3 alpha genes

- There is a defect in 3 alpha genes
- It is called as Haemoglobin H (HbH).
- It occurs due to excess beta chain when less alpha chain production.
- Excess beta chain leads to precipitation molecules in RBC.
- Due to precipitation molecules it produces Haemoglobin H (HbH).

- HbH leads to destruction of RBC in Bone marrow which is called as intramedullary haemolysis.
- Destruction of RBC by macrophages in spleen called as extravascular haemolysis.
- Due to hypoxia, there is over production of RBC in liver and spleen that leads to hepatosplenomegaly.

Defect in 4 alpha genes

- There is a complete deletion of 4 alpha genes.
- It is called as Hb Bart's hydrops fetalis.
- This develops some complications in fetal life.
- Total reduced RBC leads to severe hypoxia, this severe hypoxia causes;
- High output cardiac failure

- Hepatosplenomegaly which leads to edema called as Hydrops fetalis.

SYMPTOMS

- Anemia
- Pallor
- Shortness of breath
- Hepatosplenomegaly
- Skeletal deformities.

DIAGNOSIS

Blood test

- Decreased Haemoglobin
- Decreased MCV
- Decreased MCH

Blood smear

- Microcytic
- Hypochromic
- Golf ball like RBC (precipitated HbH molecules).

Haemoglobin electrophoresis

Increased HbH in case of alpha thalassemia

TREATMENT

- Blood transfusions in severe cases
- Intrauterine transfusions in Hb Bart's hydrops fetalis

BETA Thalassemia

- Beta Thalassemia is a genetic disorder involving there is a deficiency in production of beta globin chains of Haemoglobin which are oxygen carrying protein in RBC.
- Beta Thalassemia is most commonly found in Mediterranean and African population.
- In beta Thalassemia, there is a partial or complete beta globin chain deficiency due to point mutations on chromosome 11.
- It is a autosomal recessive Disease.

ETIOLOGY

Beta Thalassemia minor- 1 mutated gene

Beta Thalassemia intermedia- 2 mutated genes and less production of beta globin chains

Beta Thalassemia major- 2 mutated genes and no production of beta globin chains.

PATHOGENESIS

- In beta Thalassemia, due to less production of beta globin chains there is a intracellular accumulation of alpha globin chains.
- This leads to: intramedullary haemolysis of RBC in bone marrow.
- Extra vascular Haemolysis in spleen by macrophages.

- Haemolysis leads to hypoxia which causes increased production of RBC in bone marrow.
- Haemolysis cause direct entry of heme into plasma as a free heme.
- Heme gets recycled to product of iron and bilirubin.
- When this process takes place continuously, increased amount of iron leads to secondary haemochromatosis.
- Increased bilirubin level leads to hyperbilirubinemia causes jaundice.

SYMPTOMS

Beta thalassemia minor is asymptomatic.

Beta thalassemia major: it doesn't show any symptoms in first 3-6 months. It develops later.

Symptoms are:

- Anemia
- Hepatosplenomegaly
- Jaundice
- Swollen abdomen
- Chipmunk facies
- Pallor
- Shortness of breath

COMPLICATIONS

- Arrythmias
- Pericarditis
- Cirrhosis
- Diabetes mellitus
- Hypothyroidism

DIAGNOSIS

- Decreased Haemoglobin level
- Decreased MCV
- Increased RDW
- Microcytic
- Hypochromic


Thank You