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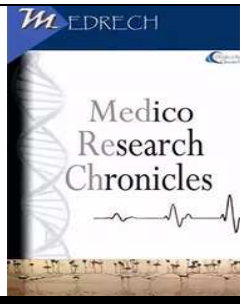

REVIEW ARTICLE ON THALASSEMIA

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ABSTRACT

Thalassemia is a hereditary blood disorder which is passed down through families in which the body makes an abnormal form of hemoglobin. This disorder results in the destruction of red blood cell in large number, which leads to anemia. It is caused by mutation in the DNA of cells that make hemoglobin. Thalassemia should be prevented by premarital screening and prenatal diagnosis which is helpful in decreasing prevalence and future incidence of thalassemia. The most important problem in thalassemia patients are iron overload, cardiac arrhythmia, hepatitis, osteoporosis and endocrine disorder however there are typical signs and symptoms of anemia. People with thalassemia can get treatment as indicated by the degree of seriousness of their condition. Blood transfusion is the common treatment for thalassemia. This review presents the types, diagnosis, prevalence, complications and treatment of thalassemia.

REVIEW ARTICLE

INTRODUCTION:

Thalassemia is one of the common hereditary autosomal recessive disorder which is caused by mutation in genes that are responsible in production of hemoglobin. It is hemolytic disorder that is characterized by impairment in the synthesis of globin chain of hemoglobin. Thalassemia is a Greek word taken from two words, Thalassa means Sea and Emia means blood, thus called Mediterranean anemia or Cooley's anemia, after the name of Prof. Cooley Thomas, a pediatrician in the USA [1,4]. Thalassemia occur due to a variety of molecular defects which are gene deletion or substitution, instability or underproduction of mRNA, defects in the initiation of chain synthesis, and the premature chain termination [9,5]. Thalassemia is divided into two types that are α-Thalassemia and β-thalassemia (Minor, Intermediate and Major). If beta chain is defective, then that type is called beta thalassemia and if alpha chain is defective, then that type is called alpha thalassemia [27,6].

α-THALASSEMIA:

This type of thalassemia is caused by a decreased synthesis or total absence of α-globin chain of Hb. There are four copies of α-globin genes and there are two α-globin genes which are present on each one of the chromosome 16 [34,13]. Depending on the number of missing α-globin genes α-Thalassemias is divided into four types:

silent carrier: when one of the α-globin genes is lost with no physical manifestations than that state is referred as silent carrier.

α-Thalassemia trait: it is caused by the loss two genes either from the same gene pair or one from each gene pair. In this case minor anemia is observed [9].

Hemoglobin H disease: it occurs due to the missing of three genes and it is associated with moderate anemia [3].

Hydropsfetalis: it is the most severe form of α-Thalassemias which is caused due to lack of all four genes. The fetus usually survives until birth and then dies [16].

β-THALASSEMIA:

This type of thalassemia is caused by decreased synthesis or total lack of the formation of β-globin chain [25,29]. The production of α-globin chain continues and is normal which leads to the formation of globin tetramer α_4 that precipitates. There are two main types of β-thalassemia:

β-thalassemia minor: this is a heterozygous state with a defect in only one of the two β-globin gene pairs on chromosome 11. This disorder is also known as β-thalassemia trait and it is usually asymptomatic [15,20].

β-thalassemia major: this is homozygous state with a defect in both the genes which is responsible for β-globin synthesis. This type is severe and the infants with this disorder may die within 1-2 years. Frequent blood transfusion is required for these children [17,28].

SIGNS AND SYMPTOMS OF THALASSEMIA:

Iron overload: Regular blood transfusion results in the iron overload in the patient's body and it is the most common complications related to thalassemia and the excess of iron can damage liver, heart and endocrine system [18].

Infection: Individuals with thalassemia have high risk of infection and this is harmful for body organs.

Bone deformities: In this disease, development of body is influenced. Subsequently, it might be seen in patients with thalassemia. In most of the cases, skull bone is seen. The bones of the face and the skull become thicker, and also results in skeletal abnormalities [24].

Enlarged spleen: Spleen enlargement has many infectious, viral and bacterial causes, and is incidental due to bugs in the blood flow and liver failures. When liver becomes inflamed, it will squeeze the spleen. Thalassemia is one of the diseases that lead to spleen enlargement.

Symptoms like anemia: For example, Shortness of breath, Cold hands and feet, pale skin, Irritability, Dark urine and Fatigue [32].

PREVALENCE:

In Pakistan, prevalence of thalassemia is increasing each year. About 5,000 child births are affected with β-thalassemia and its prevalence is about 6% and about 50,000 patients are registered all over the country. According to WHO (world health organization) around 8000 pregnancies are at risk each year in Iran and is most prevalent in the region of Mediterranean basin, Greek, Italian, Middle Eastern, Africa and Asia. The significant Mediterranean islands are heavily influenced specifically [16]. Other Mediterranean individuals, just as those in the region of the Mediterranean, additionally have high rates of thalassemia, including the people of West Asia and North Africa. A long way from the Mediterranean, South Asian are additionally influenced with World's most elevated groupings of the transporters (30% of the population) being in the Maldives [14].

DIAGNOSIS:

For diagnosis of thalassemia, different modalities are being used at different stages. In prenatal life diagnosis could be made with the help of Chorionic Villous Sampling at 10-12 weeks of gestation, to decide accordingly and on parent's wish to continue pregnancy or to abort pregnancy of a

thalassemic child [31]. Most of the patient's shows signs and symptoms after birth like anemia e.g. fatigue, paleness, weakness, slowness in growth, dark urine, abdominal swelling, and facial bone deformities within first 2 years of life. Laboratory test like complete peripheral film and blood count is very helpful in diagnosis of thalassemia but Hb-electrophoresis and genetic test could also be done for diagnosis [34].

COMPLICATIONS:

Possible complications that occur in thalassemic patients are iron overload which is due to frequent blood transfusions which may also damage heart, liver and glands. Bone deformities also occur due to marrow hyperplasia, especially face and skull bones which in result make bones thin and brittle [11]. Splenomegaly may also occur due to the excess destruction of RBCs which results in the removal of spleen. Slow growth is due to affected endocrine glands and hormones. In many examinations, bone density is notably diminished (cause osteoporosis) in patients with β-thalassemia, especially those with hypogonadism [7].

PREVENTION:

Thalassemia should be prevented by premarital screening and prenatal diagnosis which is helpful in decreasing prevalence and future incidence of thalassemia. Prenatal diagnosis includes Chorionic villus sampling, this test is usually done around the 11th week of pregnancy and involves removing a tiny piece of the placenta for evaluation [24]. Health education awareness is the only way to reduce the rate of hereditary disorders in our society like in European Countries.

TREATMENT:

Beta thalassemia major includes following Treatments:

Blood transfusions: during this procedure, blood will be given to a patient intravenously. The type of thalassemia will determine the frequency of the blood transfusions. More-severe forms of thalassemia often require frequent blood transfusions, possibly every 3-4 weeks [22].

Bone marrow transplant: is the curative treatment for this disease. If a patient is young and has a suitable donor, he may be recommended bone marrow transplant. During the treatment, high-dose chemotherapy is given to the patient to eliminate the defective thalassemia-producing cells in the marrow and replace them with healthy donor cells [27,31].

CONCLUSION:

Thalassemia is an inherited blood disorder that reduces the production of functional hemoglobin (the protein in red blood cells that carries oxygen). This causes a shortage of red blood cells and low levels of oxygen in the bloodstream, leading to a variety of health problems. Signs and symptoms vary but may include mild to severe anemia, paleness, fatigue, yellow discoloration of skin (jaundice), and bone problems. Treatment depends on the type and severity of the condition but may include blood transfusions and/or folic acid supplements.

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