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Haemogloin Level, Blood Group, Chest X Ray Findings and Consanguinity in Thalassemic Children in AL Muthana Governorate

ARTICLE INFORMATION

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ABSTRACT

Background: Thalassemia is characterized by the decrease or absence of the synthesis of one or more globin chains of hemoglobin. Thalassemia is distributed worldwide and is characterized by; regular blood transfusion which is creating alloimmunization to erythrocyte antigens is one of the major complications of regular blood transfusions in thalassemia, particularly in patients who are chronically transfused.
Objectives: The aims of this study are to understand the immune system profile as the triggering factor for thalassemia.
Methods: Thirty patients aging between one year and four months and twenty two years, twenty two of them were boys and eight were girls. Twenty nine patients, their parents are relative except one and studied in the maternity and Children teaching Hospital of Al Samawa city. Belonging to Blood groups O+, B+, A+, O- and B- , showed,12,8,7,2 and 1 patients respectively compared to control group 30 persons with no relation to blood groups. High percentages of relative marriages as seen in my study (96.66%), from all Al muthana population how were visiting the hospital during 2010, in thalassemic center.
Results: twenty six patients out of thirty patients studied suffer from cardiomegaly (86.66%) due to iron over load because of frequent blood transfusion and immune system disorder. Results also showed eight patients suffer also from Bronchopneumia (26.66%) and all patients had hepatomegaly, splenomegaly and hemoglobin were low in all patients compared to hemoglobin control average which was 10.72-14.76 g/dl. Facial and teeth deformities were recognized in twenty six patients (86.66%).
Conclusions: hepatomegaly and splenomegaly, followed by cardiomegaly, facial and teeth deformities were the most persistently recognized features in thalassemic patients. Bronchopneumia is less frequent but not uncommon.

Introduction:

Thalassemia is divided into alpha and beta Thalassemia. Beta-thalassemia is a group of hereditary blood disorders and explained by the hemoglobinopathies which are the most common monogenic diseases in the world, as a result of the heterozygote advantage in front of malaria [(1)].

The hemoglobinopathies fall into two main categories: the structural hemoglobin variants and the thalassemia. According to the World Health Organization nearly 7% of the world population carries a hemoglobinopathies [(2)].

Thalassemia are distributed worldwide and are characterized by the decrease (+) or absence (-) of the synthesis of one or more globin chains. Depending on which globin chain is ineffectively synthesized, thalassemia is classified into alpha and beta. Alpha thalassemia is found in Africa, Asia and the Mediterranean, whereas Beta thalassemia is found mainly in Asia and the Mediterranean [(1)]. Both Beta-thalassemia alleles found among patients in Uruguay similar and are characterized as of Mediterranean populations [(3)].

Regular transfusion therapy leads to iron overload related complications, including endocrine complications such as growth retardation, failure of sexual maturation, diabetes mellitus, and insufficiency of the parathyroid, thyroid, pituitary, and less commonly adrenal glands, dilated cardiomyopathy, liver fibrosis and cirrhosis, [(4)].

Alloimmunization to erythrocyte antigens is one of the major complications of regular blood transfusions, particularly in patients who are chronically transfused. The factors for alloimmunization are complex and involve three main contributing elements: the RBC antigenic difference between the donor and the recipient, the recipient's immune status, and the immunomodulatory effect of the allogenic blood transfusions on the recipient's immune system [(5,6)].

The development of anti-RBC antibodies (alloantibodies or autoantibodies) can significantly complicate transfusion therapy. Some alloantibodies are hemolytic and may cause various hemolytic transfusion reactions and limit the availability of further safe transfusion. Others are clinically insignificant. Erythrocyte autoantibodies appear less frequently, but they can result in clinical hemolysis and in

difficulty in cross-matching blood. Patients with autoantibodies may have a higher transfusion rate and often require immunosuppressive drugs, or alternative treatments as splenoectomy [8,9]. Alloimmunization is often a less significant problem in patients whose transfusion is initiated before the age of three years and four months. A centralized system of RBC alloantibody records is available, which provides a valuable opportunity to evaluate the frequency of alloimmunization and autoimmunization to RBC antigens in multi-transfused thalassemia major patients [7].

Since the disease is genetically predisposed disorder, relative marriages, can be at high risk to express this devastating syndrome. To detect the high prevalence of Hemoglobinopathies in Al Muthana governorate.

Methods:

Thalassemia major patients, where studied in Maternity and children Hospital in Al-Muthana city during 2010. Twenty nine out of thirty patients were belonged to closely relative parents. Diagnosing Thalassemia by Hemoglobin-Electrophoresis which is one of the methods used to diagnose Thalassemia. The system were used was (BioRad-D-10-France), ModelDB7D12006.

Three milliliters of fresh blood placed in test tube, then the rest materials are followed as indicated in the directions came with the system. Hepatomegaly and splenomegaly were detected by palpation (Clinical examination),

Chest X Ray model used is a Shimadzu, Japan/Model 06/1.2P164/DK-85, to investigate cardiomegaly and bronchopneumonia. Also blood grouping and Rh system used in this study was anti-A monoclonal and Anti-B monoclonal and Anti-D monoclonal IgG+ IgM (Spanish Spinreact reagent).

Patients had face and teeth deformities due to Bone Marrow expansion of the facial bones due to erythroid hyperplasia; all thalassemic patients had a Class II skeletal base relationship. The average ANB angle (any facial maxillary and mandibular bone deformities) was significantly larger than the controls in dental stages 2 and 3 ($P < 0.05$). Mandibular base length (Ar-Gn) was significantly less in thalassemic patients than in controls, with the greatest differences ($P < 0.001$) found in the younger age group

Results:

Thirty patients were studied in Al Muthana Maternity and Children Teaching Hospital. Twenty nine patients were belonging to cousin parents. Twenty six patients of them were expressed low level of hemoglobin, ranging over 7 g/dl. Two patients were expressing very low hemoglobin level ranging between 6.1-6.7g/dl. Four patients showed markedly low hemoglobin level which is 6 and below 6 g/dl compared to control group which was 10.72-16.0 g/dl as average (Table 1).

The study (Table 2 and 3) showed twelve patients with blood group O^+, two were O^-, seven with A^+, eight with B^+ and one with B^-. Those blood groups are segregated on O^+, A^+ and B^+ groups in the patients. The chest X ray showed four patients were normal findings, but twenty six patients had cardiomegaly and eight patients with bronchopneumonia[8].

The study showed. Twenty nine patients and their parents are relative (96.66%). All patients showed Hepatomegaly and splenomegaly (100%) and twenty six patients showed facial and teeth deformities (86.66%) during the examination. The treatment was use as the following, Desferal 0.5 gram/week injection with Vitamin-C tablet 100mg and daily folic acid tablet 5mg.

Table1: Hemoglobin level in thirty thalassemia patients related to the sex and age.

Patients	Sex	Age (years)	Hb (g/dl)	Control Hb (g/dl)
1	F	1.4	7.8	10.7-13.1
2	M	2.5	8.3	10.7-13.1
3	M	4.0	8.0	11.1-14.7
4	M	4.0	9.8	11.1-14.7
5	M	5.0	7.7	11.1-14.7
6	F	6.0	6.0	11.1-14.7
7	F	7.4	7.4	11.1-14.7
8	M	8.0	5.6	11.1-14.7
9	F	8.0	9.8	11.1-14.7
10	M	8.0	7.8	11.1-14.7
11	M	10.0	6.7	11.1-14.7
12	M	10.0	7.9	11.1-14.7
13	M	11.0	10.1	11.1-14.7
14	M	11.0	6.1	11.1-14.7
15	M	11.0	7.0	11.1-14.7
16	F	11.0	10.4	11.1-14.7
17	M	12.0	9.1	12.0-16.0
18	M	12.0	7.0	12.0-16.0
19	M	12.0	8.0	12.0-16.0
20	M	12.0	5.0	12.0-16.0
21	M	13.0	8.3	12.0-16.0
22	M	15.0	7.0	12.0-16.0
23	M	16.0	8.0	12.0-16.0
24	M	17.0	8.0	12.0-16.0
25	F	17.0	8.0	12.0-16.0
26	M	17.0	5.7	12.0-16.0
27	M	18.0	8.7	12.0-16.0
28	M	21.0	10.4	12.0-16.0
29	F	22.0	7.4	12.0-16.0
30	F	22.0	10.0	12.0-16.0

Table 2: Blood groups and Chest X Ray findings in relation to the sex and age.

Blood group	Patients	CXR Findings		
		Normal	Cardiomegaly	Cardiomegaly & Bronchopneumonia
O^+	12	3	6	3
O^-	2	0	1	1
A^+	7	0	5	2
B^+	8	1	5	2
B^-	1	0	1	0
Total	30	4	18	8

Table 3: Blood groups, and Chest X Ray findings in thirty thalassemia patients related to the sex and age.

Patients	Sex	Age (years)	Blood group	CXR Findings
1	M	2.5	O^+	Normal
2	F	6.0	O^+	Normal
3	M	15.0	O^+	Normal
4	F	8.0	O^+	Cardiomegaly
5	M	10.0	O^+	Cardiomegaly
6	M	12.0	O^+	Cardiomegaly
7	M	17.0	O^+	Cardiomegaly
8	M	18.0	O^+	Cardiomegaly
9	F	22.0	O^+	Cardiomegaly
10	M	4.0	O^+	Cardiomegaly & bronchopneumonia
11	M	13.0	O^+	Cardiomegaly & bronchopneumonia
12	M	17.0	O^+	Cardiomegaly & bronchopneumonia
13	M	16.0	O^-	Cardiomegaly
14	M	12.0	O^-	Cardiomegaly & bronchopneumonia
15	M	4.0	A^+	Cardiomegaly
16	M	5.0	A^+	Cardiomegaly
17	F	7.4	A^+	Cardiomegaly
18	F	11.0	A^+	Cardiomegaly
19	M	12.0	A^+	Cardiomegaly
20	M	11.0	A^+	Cardiomegaly & bronchopneumonia
21	F	17.0	A^+	Cardiomegaly & bronchopneumonia
22	F	1.4	B^+	Normal
23	M	11.0	B^+	Cardiomegaly
24	M	11.0	B^+	Cardiomegaly
25	F	12.0	B^+	Cardiomegaly
26	M	21.0	B^+	Cardiomegaly
27	F	22.0	B^+	Cardiomegaly
28	M	8.0	B^+	Cardiomegaly & bronchopneumonia
29	M	10.0	B^+	Cardiomegaly & bronchopneumonia
30	M	8	B^-	Cardiomegaly

Discussion:

Couples related marriage as a second cousins, account for an estimated 10.4% of the global population. The highest rates of consanguineous marriage occur in north and sub-Saharan Africa, the Middle East, and west, central, and south Asia[9].

Because marriage within clan, tribe, caste, has been a long-established tradition in the third world to give a problem in this type of marriage

In the following disorders such as thalassemia, AIDS, heart disease, smoking addiction, premarital carrier is a form of genetic counseling ,

The genetic counseling is offered to consanguineous counseling procedures for better life during marriage. Bedouin community characterized by high prevalence of genetic diseases and a religious ban on abortion in other parts of the world considered as a harmful practice. Even though this method is not used in Iraq but, so many genetic diseases are common.

The above are explained why the custom is still extremely prevalent, particularly in Arab countries, Here in Al Muthana population due to the people vesting the hospital came from different parts of the governorate, I found that high percentage of relative marriages as seen in my study (96.66%) from all Al Muthana population.

Twenty nine cases out of thirty patients resembling (96.66%) were a generation of relative marriages is established in those thalassemic patients. With the diseases prevalence is close to 100% are suffering from Hepato-splenomegaly. Also few patients had high blood pressure, jaundice and anemia and the chest X ray showed that most of them had cardiomegaly [8].

In order to identify specific genes by counseling marriage we will enable more conditions to limit relative marriage [8].

Hemoglobin level was found abnormally low in all patients. Twenty five patients were low, two patients were very low and three patients were markedly low level comparing to the control level showed in Table1. All patients in the study were received frequent blood transfusion throughout their suffering time from thalassemia.

Table 1, twenty five patients of thirty were expressing low level of hemoglobin, ranging 7 g/dl or more. Two patients were expressing very low hemoglobin level ranging between 6.1-6.7g/dl. Three patients showed very and very low hemoglobin level which is less than 6 g/dl. The chest X ray showed four patients were normal but twenty six patients had cardiomegaly and eight patients with bronchopneumonia.

The result showed that blood group was segregated on O^+ with twelve patients and then B^+ were eight patients but A^+ were seven patients. The exception were two patients in O^- and one in B^-.Since blood groups are genetically determinant, those result showed that since thalassemia is genetic all parameters studied were controlled by patients genetics also.

Conclusions:

Thalassemia is one of a group of genetic blood disorders referred to as hemoglobinopathies. These disorders, which mainly include thalassemia and sickle cell anemia, are among the most common hereditary diseases worldwide: global population carry an abnormal hemoglobin gene, and more than half a million affected children are born each year (Thalassemia International Federation 2012 Activity Plan).

Patients with β-thalassemia major is the most severe type of thalassemia, cannot make normal red blood cells and do not produce enough hemoglobin. This leads to severe anemia with consequences such as retarded growth, bone deformities, reduced energy and ultimately death at a young age if β-thalassemia are inherited defects in the rate of synthesis of β globin chains of hemoglobin, that are widely distributed throughout the world, with considerable frequencies in the Eastern Mediterranean countries, including Iraq [11]. The two most northern provinces of Iraq are Dohuk and Erbil which cover together an area of around 20000 square kilometers, bordering Iran and Turkey, with a population of around 2.2 million of mostly ethnic Kurds. Thalassemia major is an important problem in these two provinces as well as other parts of the country,

In conclusion, twenty six patients out of thirty patients studied suffer from cardiomegaly (86.66%) due to iron over load due to frequent blood transfusion and immune system disorder. Results also showed eight patients suffer also from Bronchopneumia (26.66%) and all patients had hepatomegaly, splenomegaly and hemoglobin were low in all patients compared to hemoglobin control average which was 10.72-16 g/dl. Facial and teeth deformities were recognized in twenty six patients (86.66%).

References:

1. Julio A. da Luz, Mónica Sans, Elza Miyuki Kimura, Dulcinéia Martins Albuquerque, Maria de Fatima Sonati, Fernando Ferreira Costa.2006. a-thalassemia, HbS, and b-globin gene cluster haplotypes in two Afro-Uruguayan sub-populations from northern and southern Uruguay. Genetics and Molecular Biology, 29(4):595-600.
2. Weatherall DJ and Clegg JB (2001) Inherited haemoglobin disorders: An increasing global health problem. Bull WHO 79:704-712.
3. Ferrara M, Matarese S, Francese M, Borrelli B, Coppola L, Coppola A and Esposito L (2001) Hematological and molecular analysis of -thalassemia and Hb-Lepore in Campania, Italy. Hemoglobin 25:29-34.
4. Renzo Galanello and Raffaella Origa, 2010.Beta-thalassemia. .Orphanet J Rare Dis. 5: 11.
5. Shamsian BS, , Arzanian MT, , Shamshiri AR, et al.Frequency of red cell alloimmunization in patients with β-major thalassemia in an Iranian referral hospital. Iran J Pediatr. 2008;18:149-153.
6. Singer ST, ,Wu V, , Mignacca R, et al.Alloimmunization and erythrocyte autoimmunization in transfusion-dependent thalassemia patients of predominantly Asian descent. Blood. 2000;96:3369-3373.
7. Ameen R, Al-Shemmari S, Al-Humood S, et al. RBC alloimmunization and autoimmunization among transfusion-dependent Arab thalassemia patients.Transfusion. 2003;43:1604-1610.
8. Middib 2011. Cardiac deformities in thalassemia major could be an immune system disorder. Babil university journal.nomber 1521. 23/11/2010.Ministry of Higher education and scientific research. http://labmed.ascpjournals.org/cgi/ijlink?linkType=ABST&journalCode=bloodjournal&resid=96/10/3369
9. Bittles A. H. and M. L. Black, 2010. Consanguinity, human evolution, and complex diseases.PNAS.107 (1):1779-1786
10. Jaber L, Halpern GJ. 2006. Consanguinity among the Arab and Jewish populations in Israel. Pediatr Endocrinol Rev.3 Suppl 3:437-46.
11. Nasir A. S. Al-Allawi,1 Kawa M. A. Hassan,2 Anwar K. Sheikha,2 Farida F. Nerweiy, 2010. β-Thalassemia Mutations among Transfusion-Dependent Thalassemia Major Patients in Northern Iraq.