Original Article

Frequency and Type of Red Cell Alloimmunization in Blood Transfusion Dependent Patients of β – Thalassaemia Major

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ABSTRACT

Objective: To determine red cell alloimmunization in blood transfusion dependent patients of β – thalassaemia major by measuring it's frequency and type.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at the blood bank of Benazir Bhutto Hospital, Rawalpindi from December 2010 to December 2011

Materials and Methods: 150 patients of beta thalassaemia major, according to inclusion criteria were enrolled in the study. Indirect Coombs' test (ICT) was performed on serum of all these patients for antibody detection. Patients with positive ICT were subjected to panel test to detect the type of alloantibody.

Results: All the statistical analysis was done using SPSS version 10.0.Out of 150 patients, 90 were males (60%) and 60 were females (40%).The age of patients ranged between 4 and 18 years with mean age of 8.78 years(±4.15).ICT was positive in 8 (5.3%) patients. Panel test showed six alloantibodies. one patient had two antibodies while all other patients had single antibody. Alloantibodies detected were anti E in 3 patients(37.5%) while one patient each had anti C(12.5%), anti D(12.5%),anti e(12.5%) and anti D(12.5%).One patient had anti E + anti K(12.5%).

Conclusion: The study showed that alloimmunization to red cell antigens is an important complication of blood transfusion. Most of the alloantibodies were against Rh antigens. Hence it is recommended that blood should be matched at least for Rh antigens from the start of transfusion.

Key Words: Thalassaemia major, Alloimmunization, Blood Transfusion

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INTRODUCTION

Thalassaemias are inherited disorders characterized by reduced synthesis of one or more globin chains.[1,2] In world ,the birth rate for symptomatic thalassaemia is 0.44/ 1000 births and about 1-2 million people with thalassaemia major worldwide would require blood transfusion.[3] The carrier frequency of beta thalassaemia in Pakistan is approximately 6% but awareness of thalassaemia among general public is very low.[4,5] Thalassaemia major is the homozygous form of disease in which there is severe anaemia and associated with significant mortality and morbidity.[6]

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Bone marrow transplant is the only curative treatment for thalassaemia major but associated with different complications and high cost[7] so the main stay of treatment for thalassaemia major is regular blood transfusion[8]. Multiple blood transfusions lead to different complications. Alloimmunization is among the most common risk of blood transfusion[9,10] which means the formation of antibodies in an individual when there is exposure to non self-antigen.[11,12] Alloantibodies produced in response to multiple transfusions due to immune system activation leads to difficulty in cross matching moreover some alloantibodies cause hemolytic transfusion reaction and increased and frequent need of transfusion thus further complicate the therapy[13,10]. The rate of alloimmunization is variable in different parts of the world.[14] Hence to avoid alloimmunization especially in patients on regular transfusions , blood should be cross matched for major as well as minor blood groups.[15] This study aims at determining the frequency and type of different alloantibodies in blood transfusion dependent patients of β thalassaemia major in our setup so that blood could be cross matched against those minor blood group which are responsible for development of alloantibodies, hence different alloantibody associated

problems could be minimized and quality of life in these chronic patients could be improved.

MATERIALS AND METHODS

This Cross sectional study was carried out in 12 months from December 2010 to December 2011.Samples of the patients were taken from Pakistan Thalassaemia Walfare Society (Regd.) and were processed in blood bank of Benazir Bhutto hospital Rawalpindi. A total of 150 beta thalassaemia major patients diagnosed on haemoglobin electrophoresis were enrolled in the study by Non probability, Consecutive sampling.Inclusion Criteria include cases of β thalassaemia major patients diagnosed on Haemoglobin electrophoresis with HbF level 30 – 90 % from the age of 3 years upto 20 years of both genders .Exclusion Criteria includes β thalassaemia minor and intermedia. Patients newly diagnosed and had not received any blood transfusions and Patients receiving blood transfusions for other medical problems. After approval from the ethical committee of RMC allied hospitals and Thalaasaemia welfare society, patients of β thalassaemia major fulfilling the inclusion criteria were selected. After receiving an informed written consent from parents/guardian, relevant details were noted in Proforma.10ml of clotted blood was taken and was immediately shifted to blood bank of Benazir Bhutto Hospital Rawalpindi and indirect coombs' test was performed to detect the presence of alloanti bodies. In patients with positive indirect Coombs' test a standard Panel test was performed to detect type of alloantibodies. All data collected was entered and analyzed in Statistical Package for Social Sciences (SPSS) version 10.0. Means and standard deviation was calculated for continuous variables e.g. age. Frequency and percentages were calculated for categorical variables: gender,, indirect Coombs' test, and Panel test in transfusion dependent patients of β thalassaemia major.

RESULTS

A total of 150 beta thalassaemia major patients ,selected according to inclusion criteria were enrolled in the study. Out of 150 patients , 90 were males (60%) and 60 were female (40%) . Gender distribution is represented by a bar chart. (figure 1)

The age of patients ranged between 4 to 18 years. The mean age of the patient was 8.78 years (±4.15 years). Summary of age statistics is shown in table 1

The catchment area include Rawalpindi 61.33% (92 patients), Chakwal 9.33%(14 patients),Islamabad 8.67% (13 patients), Gujar khan 8.67% (13 patients),Azad Khasmir 4% (6 patients),Attock 2.67% (4 patients), Wah Cantt 2% (3 patients),Taxila 1.33%(2 patients) ,Talagang 1.33% (2 patients), and Jehlum 0.67% (1 patient)

Table No.1: Summary of age statistics

Minimum age (years)	Maximum age (years)	Mean age (years)	Standard Deviation
4	18	8.78	±4.15

Table No.2: Catechment area distribution

Catechment Area	No. of cases	Percentage
Rawalpindi	92	61.33%
Chakwal	14	9.33%
Islamabad	13	8.67%
Gujar khan	13	8.67%
Azad Kashmir	06	04%
Attock	04	2.67%
Wah Cantt	03	02%
Taxila	02	1.33%
Talagang	02	1.33%
Jehlum	01	0.67%

Table No.3: Frequency of different types ofalloantibodies

Alloantibody	No. of cases	Percentage
ANTI E	03	37.5%
ANTI D	01	12.5%
ANTI e	01	12.5%
ANTI C	01	12.5%
ANTI c	01	12.5%
ANTI E +ANTI K	01	12.5%

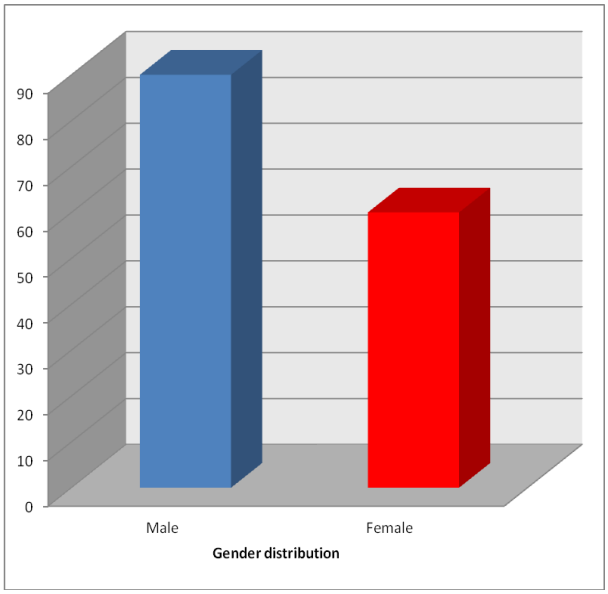

Figure 1: Gender distribution in the study

Catchment area distribution is represented in table 2. ICT was performed on serum of all the patients and was found to be positive in 8 patients (5.3%) . Antibody identification by panel test was performed on serum of those 8 patients in which indirect coombs' test was positive.six antibodies were detected in these 8 patients. one patient had two antibodies while all other patients

had single antibody. Alloantibodies detected were anti E in 3 patients (37.5%) while one patient each had anti C (12.5%), anti c(12.5%),anti e(12.5%) and anti D(12.5%).one patient had anti E + anti K(12.5%) shown in table 3

DISCUSSION

Beta thalassaemias are inherited disorders due to reduced or absent production of beta globin chains [1.] It is a common condition particularly in Mediterranean region and South east Asia. In Pakistan around 6% population is carrier of Beta thalassemia.[4]

BMT is the curative treatment for these patients but associated with different complications and high cost [7] so lifelong regular blood transfusion is the main stay of treatment for these patients.[8] Usually they require 2-3 units every 4-6 weeks, however the frequency of transfusion is variable in each patient.[6] Various complications arise as a result of transfusion therapy. One of the major complication is development of alloantibodies against red cell antigens which complicates the selection of compatable blood for subsequent transfusions and results in increased and frequent need of transfusion hence adding into the miseries of these chronic patients. [9,13]

My study aimed at determining the frequency and type of alloantibodies in patients of Beta thalassemia major in our setup so that blood could be cross matched against those minor blood groups which are responsible for development of alloantibodies.

The frequency of allo immunization in my study is relatively low (5.3 %) percent and is similar to many previous studies

Shahin et al analysed the frequency of alloimmunization in 121 beta thalassaemia major patients in Iran. The frequency of alloimmunization in their study was also low. They reported alloantibodies in 9 (7.4%) patients. Alloantibodies detected were anti K and anti D type. They also concluded that age at first transfusion and splenectomy were not statistically significant as a risk factor for alloimmunization.[16]

Similarly another study was conducted by Sadeghian and colleagues, which also supported our results. The study was done on 313 thalassaemic patients in north east of Iran. Antibody screening was positive in 9 (2.87%) patients. The most common alloantibody detected was anti D(88.88%) followed by anti C and anti E [13]

Pahuria et al observed red cell alloimmunization and autoimmunization in 211 multitransfused thalassaemic patients of indian origin. The frequency of alloimmunization in their research was found to be 3.79% and that of autoimmunization to be 0.47%.Alloantibody detected were anti E, Anti K, Anti D, anti Kp(a),anti C(w), anti c and JK(a) [17]

In another study in Iran.Autoantibody was found in 1.7% and alloantibody in 5.3%.then a standard panel test was performed to find the type of alloantibody. Alloantibody detected were anti Kell(50%), anti Rh D(15.8%) and anti Rh E (10.5%) [15]

Noor Haslina and colleagues performed screening and identification of alloantibodies on 58 multitransfused Malay patients. 46(79.3%) patients were with Hb E/Beta thalassaemia, 8(13.8%) with beta thalassaemia major ,3(5.2%) with HbH Constant spring and 1 (1.7%) patient with HbH disease. Alloantibodies were detected in 8.6% patients and alloantibodies identified were anti E, anti c, anti K, anti JKa, anti N and anti S.[18]

Joudi et al observed the prevalence of alloantibodies in Malaysia. they enrolled 5719 Patients in their study . Alloantibodies were detected in 65(1.13%)patients which also support our result s. Anti E was most common (24.6%) followed by anti lewis (a) in 18.5% and anti M In 13.8% [14]

In Pakistan a study was conducted in Karachi by Bilwani and colleagues on 97 thalassaemic patients. The rate of alloimmunization was found to be 9.2%.three patients had anti K, two had nonspecific antibodies, one patient each developed anti D and anti E, two patients had anti D+ anti C and one had anti E + anti K [19]

Some international studies showed different results and have higher frequencies of alloimmunization. Wang Ly and colleagues performed a study on 30 thalasemic patients in Taiwan. 28 patients had thalassaemia major while 2 had HbH disease. Alloantibodies were found in 11 (37%) of patients alloantibodies detected were anti E , anti E + c , anti Mi (a), anti Mi (a) +E, anti D and anti S [.20]

Chaudhari SCN conducted a cross sectional study on 32 thalassaemia patients and detected alloantibodies in 6 (18.8%) patients. All these patients had received > 20 units of transfusion. the commonest antibodies detected were against Rh antigens, anti E and anti c .[21]

Thompson and colleagues enrolled 697 participants in their study who had ever received blood transfusion the rate of alloantibody and autoantibody production was measured and compared with respect to spleenectomy. Alloantibody was see in 115(16.5%) and autoantibodies in 34(4.9%) participants. In their study they also concluded that alloantibodies mostly develop in spleenectimoized patients. [22]

Gader and colleagues performed a retrospective study in Saudi Arabia on 68 multi transfused patients of thalassemia and sickle cell anaemia. They detected alloantibodies in 22.06% patients.[23]

We have done an effort to find the frequency and type of alloantibodies in multi transfused patients of beta thalasemia major in our setup. The results are similar to many previous studies. The specificity of RBC alloantibodies were against Rh blood group system. So, If blood is matched for at least Rh blood group antigens, it can lead to a much lower rate of

alloimmunization and decreasing the miseries of these chronically transfused patients.

CONCLUSION

Alloimmunization to red cell antigens is an important complication in transfusion dependent thallasemic patients in our setup. Mostly antibodies are produced against Rh blood group antigens. Hence it is recommended that to decrease the rate of alloimunization, blood should be matched at least for Rh antigens from the start of the transfusion.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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