



Distribution of ABO Blood Groups and Rhesus Factor In β -Thalassemia Patients at Thalassemia Care Center NawabShah, Pakistan

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Abstract: Beta Thalassemia is a genetic disorder affecting millions around the world including Pakistan. Thalassemia is a major problem of concern causing high mortality rate in children, adolescents and adults. Thalassemia patients need repeated transfusion, which might result into number of complications. Many studies have reported association of ABO blood groups with diseases. The associations of ABO blood group with thalassemia have not been extensively studied. In order to find out the prevalence of thalassemia according to age, gender and frequency of blood groups, a retrospective study was carried out in 810 thalassemia patients. Our finding suggests the prevalence of thalassemia was higher in male patients than female patients. Higher number of patients was found in the lower age group ≤ 5 years old. The pattern of ABO blood groups was O > B > A > AB. Rh negative factor was significantly ($P < 0.05$) higher in female patients than male patients. In conclusion higher prevalence of thalassemia patients was found in male patients and females were found to have higher prevalence of Rh-negative group.

Keyword: Thalassemia, ABO and Rhesus factor, Survival rate.

1. INTRODUCTION

Beta thalassemia is the major problem of concern for public health in Pakistan. Beta thalassemia is the most common inherited genetic blood disorder affecting millions both in developed and under developed countries (Weatherall 2010, Bejaoui and Guirat 2013). About 80 to 90 million of the world population carry the gene for β -Thalassemia (Vichinsky 2005). β -Thalassemia is prevalent in 60 countries however it is highly prevalent in Cyprus, Sardinia, South East Asia (Flint, et al. 1998, Galanello and Origa 2010), including India (Purohit, et al. 2014) and Pakistan (Black, et al. 2010, Asif and Hassan 2014, Ahmed Kiani, 2016). It is estimated that 60,000 thalassemia individuals are borne annually all over the world, the great majority in the developing world (Galanello and Origa 2010).

Pakistan has 9 million carriers population of β -Thalassemia gene producing 5000 births, which are affected with blood transfusion dependent thalassemia (Black, et al. 2010). This number is increasing annually due to consanguine marriages, lack of awareness, low literacy rates, low income status and high birth rates in Pakistani population (Khattak and Saleem 1992, Khan and Riazuddin 1998, Baig, 2006, Arif, . 2008, Ghafoor, 2016). Thalassemia is prevalent in both genders; however, it is more prevalent in male gender (Yagnik 1997, Asadi-Pooya and Doroudchi 2004, Qurat-ul-Ain, 2011). Thalassemia patients need repeated blood transfusion to avoid anemia, to maintain growth and

development and to sustain quality of life, however these repeated transfusion also cause complications which might reduce survival average age of thalassemia patients (Borgna-Pignatti, 2005, Mastoi, 2014).

Number of studies suggests the correlation of ABO blood groups with various diseases (Franchini and Lippi 2015). In these studies frequency of ABO blood groups are observed, which is an indicative of possible link between ABO blood groups and diseases. Correlation of ABO blood groups with malaria has been documented, where it has been hypothesized that mutations in hemoglobin was a survival advantage in P falciparum infections (Mangano and Modiano 2014). Among other mutations produced by selection of P falciparum malaria, thalassemia is one of the mutation selection by malarial infections, this is the reason that thalassemia is prevalent in countries where malaria is also prevalent (Mangano and Modiano 2014). Several studies indicate the different frequencies of ABO blood groups in various diseases suggesting the possible association of ABO blood groups with diseases (Franchini and Liumbruno 2013). Very few studies have been carried out to find the frequencies of ABO blood groups with thalassemia. However, the association of ABO blood groups with thalassemia has largely been under studied subject (Nazir, 2014, Mohssin, 2015).

The purpose of this study is to find out the frequency of ABO blood groups in blood transfusion

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dependent β -Thalassemia patients registered at Thalassemia Care Center, Nawabshah. This study was aimed at investigating the relationship of ABO blood groups with β -Thalassemia to predict the type of population at risk of suffering from thalassemia. This study also analyzed the specific age groups and gender having β -Thalassemia in connection with ABO blood groups.

2. METHODOLOGY

Data Collection

This was a retrospective survey based study conducted at Thalassemia Care Center Nawabshah, District Shaheed Benazirabad, Sindh Pakistan. The study was conducted on 810 registered β -thalassemia patients during 2016. These patients attended the Thalassemia Care Center for the repeated blood transfusions. Out of 810 patients 320 were females and 490 were male patients. The data was collected through structured questionnaire and through the Thalassemia Care Center records. All ethical considerations were taken into considerations.

Statistical Analysis

The data regarding gender, age groups, and the types of ABO blood groups was collected and analyzed for statistical analysis using SPSS 16.0 software. Descriptive statistics are expressed as means \pm standard deviation (SD) or percentages where appropriate. The Chi-Square test for the categorical variable was used for the significant associations. Statistical tests were conducted at the $P < 0.05$ significance level.

3. RESULTS

The data of total 810 β -thalassemia patients was enrolled for the study. The age of patients ranged from less than 1 year to 31 year old; with the overall mean age 4.82 ± 4.30 years. According to (Table 1), number of male patients was higher than female patients. Out of total 810, 59.49% (n=490) were male patients with the mean age of 4.77 ± 4.42 years and 39.51% (n=320) were female patients with the mean age of 4.91 ± 4.10 years. This study showed that the age group ≤ 5 years, which included 528 thalassemia patients, was the largest group. The older age groups included less number of patients than younger age groups, 23.95% (n=194) patients were in age group of 5.1-10 years, 8.15% (n=66) patients were in age group of 10.1-15 years,

2.10% (n=17) were in age group of 15.1-20 years only 0.62% (n=5) in the oldest age group ≥ 20 years of age.

Table 1 also shows that pattern of ABO blood groups and Rhesus factor in thalassemia patients. The prevalence of O blood group was highest 39.50 (n=320), the prevalence of blood group B was 29.88% (n=242), and blood group A was 23.83% (n=193), the least prevalent blood group was AB 6.79% (n=55). The

prevalence of Rh Positive was at 92.96% (n=753) and Rh negative was 7.04% (n=57). The pattern of ABO blood group according to frequency was O > B > A > AB, and the frequency of Rh factor was Rh+ve > Rh -ve.

Table 1. Distribution of thalassemia patients according to gender, age and frequency of blood groups.

Variables	(n = 810)	%
Gender		
Male	490	59.49
Female	320	39.51
Age(Years)		
≤ 5	528	65.18
6-10	194	23.95
11-15	66	8.15
16-20	17	2.10
≥ 20	5	0.62
Blood Groups		%
A	193	23.83
B	242	29.88
AB	55	6.79
O	320	39.50
Rh Group		
Rh +ve	753	92.96
Rh -ve	57	7.04

(Table 2) shows the distribution of ABO blood groups with Rhesus factor in thalassemia patients according to gender. The similar pattern was observed in both male and female patients. O > B > A > AB. Overall frequency of A blood group was higher in male patients 25.31% than in female patients 21.56%. In contrast, the frequency of O blood group was higher in female patients 41.56% than in male patients 38.16%. The frequency of B blood group in male was 29.39% and in female 30.63%. The frequency of AB blood group in male was 7.14% and in female patients it was 6.25%. Frequency of Rh +ve factor was higher in male patients 94.49% than female 90.62% and the frequency of Rh negative was higher in female patients 9.37% than in male patients 5.51%.

Table 2 Gender and blood group wise distribution of thalassemia patients

Blood group	Male						Female					
	Rh +ve		Rh -ve		Overall		Rh +ve		Rh -ve		Overall	
A	118	24.08	6	1.23	124	25.31	64	20.00	5	1.56	69	21.56
B	135	27.55	9	1.84	144	29.39	89	27.81	9	2.81	98	30.63
AB	35	7.14	0	0	35	7.14	19	5.94	1	0.31	20	6.25
O	175	35.71	12	2.45	187	38.16	118	36.87	15	4.69	133	41.56
Total	463	94.49	27	5.51	490	100	290	90.62	30	9.37	320	100

According to table 3, no significant difference ($P > 0.05$) of frequency of ABO blood group was found between male and female patients, however significant difference ($P < 0.05$) was found between male and female patients regarding Rh factor. According to gender wise distribution significant difference ($P < 0.05$) was observed only between the age group of 10.1 to 15 years, and no significant difference ($P > 0.05$) was observed in other age groups (**Table 3**).

Table 3 Distribution of ABO blood groups in β -thalassemia patients according to gender.

Blood group	Male	Female	Chi	P-value
A	124 (25.31)	69 (21.56)	1.5	0.2
B	144 (29.39)	98 (30.62)	0.14	0.7
AB	35 (7.14)	20 (6.25)	0.24	0.6
O	187 (38.16)	133 (41.56)	0.93	0.3
Rhesus Factor				
Positive	463 (94.49)	290 (90.62)	4.42	0.035
Negative	27 (5.51)	30 (9.38)		
Age (year)				
≤ 5	324 (66.12)	204 (63.75)	0.48	0.4
5.1-10	117 (23.88)	77 (24.06)	0.003	0.9
10.1-15	32 (6.53)	34 (10.62)	4.32	0.037
15.1-20	12 (2.45)	5 (1.56)	0.74	0.3
≥ 20	5	0	-----	-----

4.

DISCUSSION

The β -thalassemia is a genetic inherited disorder and is the major problem of public health concern in Pakistan. Consanguineous marriages are common in Pakistan resulting into the high prevalence of thalassemia in Pakistan. The thalassemia patients receive repeated blood transfusion to avoid anemia, however, the repeated disorders might cause the complications. These complications result into the high mortality rate.

In our study, the mean age of thalassemia patients was low 4.82 ± 4.30 , this might be due to decreased survival rate at the older age, since an average age of β -thalassemia patients in Pakistan is believed to be around 10 (Rahman and Lodhi 2004). The possible interpretation of higher percentage of lower age group patients might be due to the fact that complications arise at the older age due to repeated transfusions Borgna-Pignatti, 2005), several studies suggest the lowest mean age of thalassemia patients ranging from 8.5 ± 6.4 years (Ansari, 2012), 9.1 ± 5.2 years (Sanei, 2004) 10.1 ± 6.4 years (Ahmed 2016) to 11.5 ± 5.2 years (Alvai, 2005). The maximum age of survival in our data is 31 years, which is lower than the study conducted in Iran and Germany this is due to the fact that there is lack of awareness about blood related transfusion complications, patients belong to low economic background and lack of health facilities in the region. The data we have collected indicate that highest number of thalassemia children were from 1-5 year old, this is consistent with already published data found that younger children up to 12 year old were higher 60.3% than older children 13 to 39 years old 39.7% (Ahmed 2016). The study conducted at Faisalabad also indicated that higher number of patients were between 3-5 years of age than older age group (Baig, 2006). Pakistan is under developed country with the lesser developed facilities therefore the number of older age group β -

thalassemia patients number was comparatively lower than previously published studies in developed countries, this is due to high mortality rate of patients during repeated transfusion related complications.

The data we have collected suggest that the frequency of male thalassemia patients were higher 59.49% than female thalassemia patients 39.51%. Our study is in agreement with previous studies which suggest that the percentage of male patients were higher 56.8% than female children 43.2%. The study conducted at Faisalabad revealed number affected males were significantly higher 65.66% than female 34.33% (Bejaoui and Guirat 2013). The study conducted at Banu, Pakistan found higher number of male patients 56.95% than female patients 43.05% (Khan, 2015). Several other studies have also found the higher percentage of in male thalassemia patients, these range from 53.5% male patients than 46.5% female patients (Asadi-Pooya and Doroudchi 2004), 56% (Yagnik 1997) 62% male patients than 38% female patients (Balgir 1996) 65.5% male patients than 34.5% female patients (Wasi, 1985) 65.66% male patients than 34.36% female patients (Qurat-ul-Ain, 2011). Our data and other studies indicate the higher prevalence of β -thalassemia in male patients; this needs further investigation since thalassemia is inherited as autosomal recessive manner with a single β -globin gene mutation.

Thalassemia patients need repeated transfusion so it is necessary to determine the frequency of ABO blood groups and any complication related with transfusion of blood with each blood group type. Blood group is an important tool to determine the direction of recruitment of voluntary donors as required for every part of the country. In our study, the ABO blood groups and Rh positive factor in male and female patients showed the pattern of ABO blood group O > B > A > AB. Association of ABO blood groups with diseases have previously been studied. The study showed that patients have higher prevalence in A blood group 33.93% blood group followed by B blood group 29.46%, O blood group 25.89% and AB blood group 9.82% contrary the controls have highest frequency of O > B > A > AB (Verma, 2013). Our data is consistent with previous studies showing the same pattern of ABO blood groups with slightly different prevalence in Iran (Roudbari, Soltani-Rad 2008). The Rh negative our data also suggest that Rh negative prevalence was significantly higher ($P < 0.05$) in female than male patients, this need to be investigated in the future.

5. CONCLUSION

The study we present here is suggestive of higher prevalence of male patients than female patients. No significant difference was found in the distribution of

ABO blood groups between male and female patients. Female patients have significantly higher frequency of Rh negative, particularly O negative. This study will help in making public health policies.

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