

DISTRIBUTION OF BLOOD TYPE AND Rh FACTOR AMONG BLOOD DONORS OF LAHORE

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ABSTRACT

Objective: Present study was designed to provide baseline data about distribution frequency of blood type and Rh factor among blood donors of Lahore.

Study Design: Cross sectional study.

Place and Duration of Study: Department of Transfusion Medicine Jinnah Hospital Lahore from January 2012 to December 2014.

Patients and Methods: A retrospective data of ABO/Rh typing done by manual hema-agglutination techniques of total 17994 blood samples were collected by non probability consecutive sampling technique and analyzed for ABO/Rh typing. Demographic characteristics age and gender were noted and cross tabulation for gender and ABO/Rh typing was done. Chi-square test was used to assess any statistical association.

Results: Out of total 17994 donors, 90.83% (16344) were Rh positive and 9.16% (1650) were Rh negative. Blood group "B" was found to be most prevalent, with the frequency of 6127 (34.05%), followed by "O" 5980 (33.2%), and "A" 4210 (23.39%) respectively. "AB" group was least common with a frequency of 1677 (9.31 %). 23.9% of male donors were of blood group type "A", 34.5% were type "B", 33.3% were type "O" and 8.3% had "AB". 6.2% of female donor were of blood group type "A", 18.6% were of type "B", 32.0% were having type "O" and 43.2% had "AB". ($p=.000$).

Conclusion: We conclude that the over all frequency distribution of ABO blood groups in study population of Lahore is "B" > "O" > "A" > "AB". Blood group "B" was most prevalent and AB the least prevalent. Rh positive phenotype is predominant (90.8%) with distribution of "B"+ve > "o"+ve > "A"+ve > "AB"+ve. In group of Rh negative phenotype (9.2%) "o"-ve > "B"-ve > "A"-ve > "AB"-ve.

Keywords: ABO, Gender, Lahore, Rh.

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INTRODUCTION

In human beings blood is considered as lifeline for the existence. The deficiency of this precious body fluid in different situations of emergency and accidents leads to irreplaceable loss of human life. Till the 19th century the blood transfusion procedure was unsafe, but the mystery of blood transfusion was solved in 29th century with the discovery of ABO and Rh blood group antigens¹. Karl Landsteiner, who was an Austrian, he was awarded by Nobel Prize for the incredible discovery of ABO blood group system². This discovery brought a great breakthrough in the field of transfusion medicine; later on in 1941,

Landsteiner and Wiener defined the Rhesus (Rh) blood group system³.

Since 1901, around 700 red blood cells (RBCs) antigens have been discovered, organized into 30 different blood group systems by International Society of Blood Transfusion (ISBT)⁴. The ABO blood group antigens due to their immunogenic nature took the primary importance in transfusion system. The ABO incompatibility is reported as the most common reason of death during blood transfusion. Therefore success of blood transfusion requires compatibility of two main blood group antigen systems, ABO and Rh.

ABO blood group system is comprised of two RBC antigens (A & B) and 6 different genotypes i.e. OO, OA, OB, AA, BB, AB, and four phenotypes "A", "B", "AB" and "O", which are expressed by three different alleles "A", "B" and "O" located on

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chromosome no 9 and two antibodies Anti-A and Anti-B⁵. Blood group "A" contains A antigen and Anti-B antibodies while individuals having blood group "O" possess both antibodies (A & B) without any antigen⁶. Antibodies are not present at the time of birth but they are produced later on after exposure to environmental antigens.

The presence or absence of Rh antigens in blood is determined by a set of two alleles at another locus on chromosome no 1 of RBCs⁷. Six different types of Rh antigen are present in the form of 3 groups "Cc", "Dd" and "Ee", every person acquires one from each group. Antigen "D" is the strongest among these groups and a person with "D" antigen will be Rh positive and Rh negative in the absence of "D" antigen respectively. There might be possibility of cross transfusion reaction between antibodies and "D" antigen in humans. There is no spontaneous production of antibodies against Rh antigens like in ABO blood groups and they need repeated exposure for the formation of significant amount of antibodies so that, transfusion reaction would occur⁸.

The distribution of ABO and Rh blood groups are highly influenced by the type of race, regional area, both populations both and the category of sub population. In Pakistan studies reported the variation among blood donors in different regions and populations because of racial differences⁹. The collection of data related to frequency of blood groups and incidence rate are multipurpose and useful in the field of genetic research, evolution, blood transfusion and organ transplantation¹⁰.

Therefore, this study was designed to provide baseline data about distribution of ABO and Rh blood groups in blood donors attending Jinnah hospital Lahore, and provided to planners, hospital administration and healthcare centers to make the transfusion services efficient and safe.

MATERIAL AND METHODS

This cross sectional study was conducted at the Transfusion medicine department Allama Iqbal Medical College & Jinnah Hospital Lahore (AIMC & JHL) from January 2012 to December 2014. A retrospective data of ABO/Rh typing done by manual Heam-agglutination techniques of total 17994 blood samples were collected by non-probability consecutive sampling technique and analyzed for ABO/Rh typing. Donor included in this study were those from whom 1.5 ml of blood samples was drawn following the

guidelines of standard venipuncture by National Committee for Clinical Laboratory Standards (NCCLS) and transferred to tube containing ethylene diamine tetra acetic acid (EDTA) anti-coagulant. Antigen, antibody agglutination test using anti-sera of Bio-laboratory USA was performed by classical slide method for the determination of ABO blood grouping and Rh-D factor. The ABO blood grouping monoclonal reagents contained hybridized immunoglobulin's secreting mouse cell-line. Rh-D factor is determined by using IgM and IgG monoclonal reagents.

Blood donors those positive for hepatitis B, C and HIV were excluded from the study. Mean and standard deviation was calculated for nominal variable e.g. age, frequency tabulation was done for categorical variable like gender, ABO and Rh grouping. Cross tabulation was done for gender and ABO and Rh grouping. Chi-square test was used to assess any statistical significance among gender and ABO and Rh grouping with $p < 0.05$ as statistical significance.

RESULTS

Total 17,994 blood samples were screened for the determination of ABO and Rh-D groups. Out of total 17,994 blood donors 97.03% (17,460) were males and only 2.96% (534) were females. This finding showed that blood donation practices are very less among female gender (table-1).

Numbers of blood donation practices at different ages, in the given population were studied. (Table-1). Table-1 shows the gender and age distribution of study group. Blood donation practices are found higher at the younger age group of less than 40 years.

Out of total male donors 23.9% of male donors were of blood group type "A", 34.5% were of type "B", 33.3% were having type "O" and 8.3% had "AB". 6.2% of female donors were of blood group type "A", 18.6% were of type "B", 32.0% were having type "O" and 43.2% had "AB". ($p = .000$). (Table-2).

Table-3 Shows the results of Rh negative and positive with respect to gender of donors. According to results Rh negative group is more prevalent (13.8%) in females as compared to males (9.0%) (Table-3).

Table-3 Out of total 17994 donors, 90.8% (16344) was Rh positive and 9.2% (1650) were Rh negative. 90.9% of males were Rh +ve and 9.1% were Rh -ve.

86.1% of females were Rh +ve and 13.9% were Rh -ve. ($p=0.000$)

The distribution of ABO phenotypes in the Rh positive donors showed that, 4021 (24.6%) were "A", 5504 (33.6%) were "B", 1499 (9.1%) "AB", and 5320 (32.5%) were "O". In case of Rh negative donors, 189 (11.4%) were group "A" 623 (37.7%) were "B", 178 (10.7%) were "AB" and 660 (40.0%) were "O".

DISCUSSION

The frequency of ABO and Rh-D blood group is different from one population to another all over the

In present study frequencies of the blood donors from population of Lahore, admitted presenting in a tertiary care hospital were studied and according to results, among ABO blood groups, blood group " B" was most prevalent 6127 (34.05%), followed by "O" 5980 (33.20%), "A" 4210 (23.39%) respectively. "AB" group was least common with a frequency of 1677 (9.31 %). In the Rh positive donors, 4021 (24.6%) were "A", 5504 (33.6%) were "B" 1499 (9.1%) were "AB" and 5320 (32.5%) were "O". In Rh negative donors, 189 (11.4%) were "A" 623(37.7%) were "B", 178 (10.7%) were "AB" and 660 (40.0%) were "O".

Table-1: Demographic characteristic of blood donors.

Factors	Distribution in study population (n=17,994)	
	Number of donors	Percentages
Gender		
Male	17,460	97.03 %
Female	534	2.96 %
Age groups		
< 40 years	16014	88.99%
> 41 years	1980	11.00%

Mean age = 37.5 SD = 7.54 year

Table-2: Frequency of ABO blood groups among blood donors in Lahore (n=17,994).

S No.	Blood Groups	Male Donors	Female Donors	Total Donors	X2 , p-value
1	A	4177 23.9%	33 6.2%	4210 23.4%	X2= 789.007 p=0.000
2	B	6028 34.5%	99 18.6%	6127 34.1%	
3	O	5809 33.3%	171 32.0%	5980 33.2%	
4	AB	1446 8.3%	231 43.2%	1677 9.3%	
Total		17460 100.0%	534 100.0%	17994 100.0%	

Table-3: Comparison of Rh+ve and Rh-ve in donors gender group.

Gender	Rh+ve Donors	Rh-ve Donors	Total	X2 , p-value
Male	15884 90.9%	1576 9.1%	17460 100.0%	X2= 14.521 p=0.000
Female	460 86.1 %	74 13.9%	534 100.0%	
Total	16344 90.8%	1650 9.2%	17994 100.0%	

world. Blood group frequency and prevalence studies are multipurpose and play a role in genetic research, evolution, blood transfusion and organ transplantation. It is also important in determining the migration of races and in hereditary diseases⁹. Some diseases like ischemic heart disease, gastric cancer, are more common to develop in certain blood groups; hence relationship of different blood groups with diseases is important¹¹.

Multiple studies have been reported from different geographical areas of Pakistan about the distribution of ABO and Rh-D blood groups in Pakistani population^{12,13}. According to these studies there is great diversity in the distribution of blood groups different areas of Pakistan.

A study from Sindh region of reported that blood group "O" (36%) is most prevalent group followed by

group "B" (30%), group "A" (25%) and blood group "AB" (9%) is least frequent respectively¹⁴.

Another study from "Baluchistan" reported the frequency of different blood groups in following order "O" (37.07%) > "B" (34.32%) > and "AB" (7.57%) respectively¹⁵. Similar results were also reported from Mandibahud din, WahCantt and Gujarat which showed that blood group "O" is very common in those areas of Punjab¹⁶. The studies from the province other than Punjab (Sindh and Baluchistan) also reported blood group "O" as a most dominant blood group which is contrary to the results of our study^{14,15,17}.

In Hameed et al and Chisti et al, they reported "B" group as most common and "AB" as least common in Faisalabad and Azad Kashmir respectively^{18,19}. In another study from Rawalpindi by Khan et al showed the percentages of various groups among female subjects, "B" (32.87%), "O" (31.91%), "A" (24.02%) and "AB" (11.20%) respectively were shown. Distribution of Rh positive was 92.45% and Rh negative was 7.55% in the considered population²⁰.

A study from Swat reported by Khattak et al showed that blood group "B" female subjects were found to be dominant (28.06%) followed by "O" (25.5%), "A" (24.50%) and group "AB" (9.43%) being least common respectively²¹.

Another study from Bannu by Khan et al showed that the distribution of ABO groups is in the order of 36.23% "B", 31.03% "A", 25.07% "O" and 7.67% "AB". The Rh-D positive was 89.23% and Rh-D negative 10.77%²².

As in our study we found that in the population of Lahore the "B" blood group is found in high frequency as compared to other groups among donor. The results of Rahim Yar Khan, Mardan, Islamabad, Rawalpindi and Khyber Pakhtunkhwa (KPK) Province were also similar to our study.

In our study 92.8% were Rh-D positive. Out of total 17994 donors 90.9% (males) and 86.1% (females) were Rh-D positive. These results were quite similar to the results of Saudia Arabia (Rh+ve 93%), USA (Rh+ve 85%) and British (Rh+ve 95%)²³⁻²⁵. According to our study in community of Lahore Rh-D positive is predominant and its frequency is quite near to other regions of Pakistan.

CONCLUSION

We conclude that the over all frequency distribution of ABO blood groups in study population of Lahore is "B" > "O" > "A" > "AB". Blood group "B" was most prevalent and AB the least prevalent. Rh positive phenotype is predominant (90.8%) with distribution of "B"+ve >, "O"+ve > "A"+ve > "AB"+ve. in Rh negative phenotype (9.2%) "O"-ve > "B"-ve > "A"-ve > "AB"-ve.

CONFLICT OF INTEREST

All authors declare no conflict of interest and financial support from any company or organization Ethical Study protocol was approved by ethical review board AIMC.

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