

The ABO and Rhesus (Rh) Blood Groups Distribution among the Female Blood Donors in Tertiary Care Hospital, Karachi

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ABSTRACT

OBJECTIVE: To find out the prevalence of ABO (A, B, AB, O) blood group and Rhesus (Rh) blood group among the female blood donors.

METHODOLOGY: The study was carried out at Jinnah Postgraduate Medical Centre, Karachi, in the blood bank department, from January 2016 to December 2018. A total of 394 female blood donors were eligible and enrolled for blood donation. For the determination of blood grouping (ABO and Rh), an antigen-antibody agglutination test using a slide method was performed. Both forward (cell grouping) and reserve (serum) grouping were performed. The data were evaluated through statistical software; SPSS version 23.0.

RESULTS: A total of 394 female blood donors were presented during the study, the ABO blood group distribution was 118 (29.9%), 132 (33.5%), 94 (23.9%), and 50 (12.7%) for blood groups A, B, O, and AB respectively. Rh positive blood group was found in 364(92.4%) and in 30(7.6%) was Rh negative.

CONCLUSION: The present study concludes that the most prevalent ABO blood group among female donors in Karachi is "B" whereas "AB" is the least prevalent. In the Rh system, Rh positive is more common than Rh negative.

KEYWORDS: Blood grouping, ABO blood group, Rhesus (Rh) blood group.

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INTRODUCTION

Blood group antigens are genetically determined and have the most crucial role in clinical and safe transfusion practice^{1,2}. Blood group patterns are distinctive as fingerprints. Karl Landsteiner, in 1901, had developed the ABO (A, B, O) blood group system and hence opened the new era in transfusion medicine, transplantation services, immune-haematology, forensic medicine, and anthropology³. It also has a role in understanding the pattern of inheritance, medico-legal cases (issues of disputed paternity and crime detection), and migration patterns of a population⁴. In blood banking history, the blood group discovery was regarded as a great revelation or the start of a new era. Later on, Landsteiner and Wiener discovered the Rhesus (Rh) antigen and after that Rh testing became mandatory in pretransfusion testing in blood banks because of its immunogenicity⁵. In 1902, Alfred Von Decastello and Adriano Sturli who were working under the supervision of Landsteiner discovered the fourth type AB⁴. According to the International Society of Blood Transfusion (ISBT), there are 346 human blood group antigens and 308 are clustered within 36 group systems are recognized⁶. The ABO system comprises

A, B, O, and AB blood groups. The red cells that possess Rh antigen on their membrane are labeled as Rh positive. The genes for the Rh and ABO blood systems are positioned at chromosome 1 and 9 respectively⁷. Among all blood groups, the ABO and Rh have the utmost importance. The incompatible transfusions of Rh and ABO blood groups are potentially fatal. These blood groups are risk factors for certain diseases and are associated with RhD incompatibility, ABO incompatibility of newborn, duodenal ulcer, coronary artery disease, diabetes mellitus, infectious diseases and malignancy⁸⁻¹¹. In blood banking and transfusion practice, the blood group testing has a vital role so that every individual must receive safe blood of group to group matched. Statistics about ABO and Rh blood group in a certain population plays a pivotal role in the maintenance of the inventory of blood bank and also helps in the recruitment of right voluntary donors. There are differences in the distribution of ABO and Rh blood groups among different regions and ethnic groups². According to literature, in United States of America the prevalence of A, B, O, AB and Rh positive is 41.0%, 9.0%, 46.0%, 4.0% and 85.0% respectively¹². Whereas a study conducted in Pakistan showed A, B, O, AB and Rh positive is 20.9%, 37.4%, 33.9%, 7.65%

and 93.6.0% respectively³.

In the past, many studies have been conducted to find out the prevalence of Rh and ABO distribution among the general population in different regions of Pakistan. Although previous studies showed the distribution of blood groups in general but the data regarding the prevalence of different blood groups in female donors specifically is sparse^{3,12}. Females are neglected part of our society and have minimal participation in blood donation, this article has a special focus on female blood donor's existence. Knowledge of blood groups helps in the prevention of not only transfusion reactions but also helps in taking preventive measures against certain diseases even malignancies like ovarian cancers. Therefore, data regarding the distribution of Rh and ABO blood groups among female blood donors is necessary to establish evidence-based strategies for the blood donor registry.

The objective of this study is to determine the prevalence of ABO and Rh blood groups among female blood donors and to generate data for utility in the future. Awareness of ABO and Rh blood group distribution at regional as well as the local level is necessary for efficient blood bank inventory management and safe transfusion practices. Information about the blood group will play an important role in having information about disease predisposition (especially coronary artery disease and gynecological malignancies in females) in a particular population. The study is also significant for gynecologists to get information about blood group prevalence so patients can be managed at the time of ABO incompatibility, Rh incompatibility, excessive postpartum haemorrhages and emergency especially in complicated pregnancy during cesarean section.

METHODOLOGY

This study was carried out in the blood bank, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from January 2016 to December 2018. The standard procedure in JPMC blood bank recommends the collection of demographic data and determination of blood pressure, pulse, height and weight, and pre-donation health questionnaire. A total of 394 female blood donors were eligible and enrolled for blood donation. The donor eligibility criteria include age 17- 60 years; body weight > 50 kg; hemoglobin level at least 12g/dl; Pregnant and lactating women were excluded.

The blood samples were taken by vein puncture in Ethylene Diamine Tetracetic Acid (EDTA) tube for red cell antigen detection and serum separator tube for serum antibody detection. For testing of blood groups (Rh and ABO), an antigen-antibody agglutination test using a slide method was done and in case of any

discrepancy, then repeated by tube method as described by Judd Ray & Dreclu^{3,7}. For forward ABO blood group testing (cell grouping/ antigen testing) we took test tubes labeled as anti-A tube, anti B tube, anti -AB, and anti-D tube then a single drop of commercially prepared antisera (Diagast, France) anti -A, anti-B, anti-AB and anti D was placed in each tube respectively. A drop of 5% red cell suspension with saline was added in each tube. For reverse grouping (serum grouping/ antibody testing) clean tube labeled as A Cell, B Cell, O Cells were used. Two drops of serum and a single drop of commercially prepared A, B, and O cells were mixed gently. The samples were centrifuged at 2500rpm for 20 seconds. The cell buttons were again suspended and red cells agglutination were noted for each tube. The presence of cell button showed the tube contains antigen and/ or antibody in the respective tube. The absence of agglutination showed no antigen and/or antibody in that tube⁷.

Data were stored and analyzed using IBM –SPSS version 23.0. Count with percentages was given for qualitative characteristics of data. Pearson Chi-Square test was used to check the association of studied parameters with Rh cases. A P-value of less than 0.05 was considered statistically significant. Pie diagram was also used to give a graphical presentation of data.

RESULTS

Table I reports the baseline characteristics of the studied samples. In the present study, there were 394 samples. 92.4% found with Rh positive, 33.5% found with blood group B, 31.5% having B+ blood group. Pie chart - I showing most of the samples have B+ blood group.

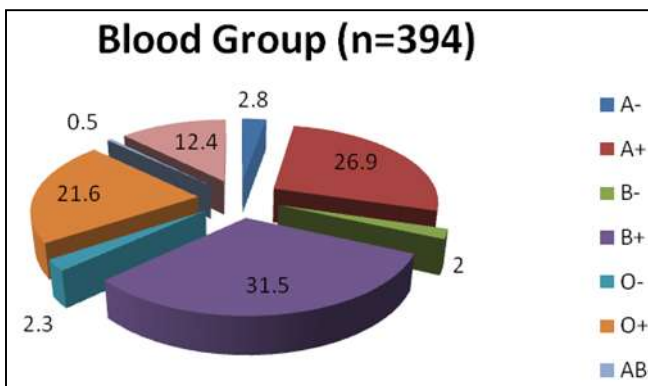
Table II reports the association of Rh with studied variables using the Pearson Chi-Square test. Among Rh positive samples, 34.1% found with blood group B, 29.1% having A+ blood group. There was a significant association observed between Rh and ABO Blood group of Samples with p<0.01.

TABLE I: BASELINE CHARACTERISTICS OF STUDIED SAMPLES (n= 394)

Characteristics		N	%
Rh	Negative	30	7.6
	Positive	364	92.4
ABO Group	A	118	29.9
	B	132	33.5
	AB	50	12.7
	O	94	23.9

Blood Group	A-	11	2.8
	A+	106	26.9
	B-	8	2.0
	B+	124	31.5
	O-	9	2.3
	O+	85	21.6
	AB-	2	0.5
	AB+	49	12.4

PIE CHART I: SHOWING BLOOD GROUP DISTRIBUTION



donors was noted and compared with other studies conducted within and outside Pakistan. The study showed the most frequent blood group is “B” whereas “AB” is the least frequent blood group; these findings are similar to studies conducted at Swat, Rawalpindi, and Islamabad^{12,13}. In our study, the ABO distribution is B>A>O>AB. The present study is in contrast to previous studies which was done in Karachi that showed that the most frequent blood group is O¹⁴. The prevalence of the AB blood group is relatively higher than other studies done in other provinces as shown in table 3. The finding shows that there is a need for updated data of a particular population and such types of studies should be done from time to time.

The study conducted at Islamabad and Rawalpindi showed prevalence of different blood groups among females as 24.02%, 32.87%, 31.91% and 11.20 for blood groups A, B, O and AB respectively¹³. The study conducted in Baluchistan showed the commonest blood group is “O” and frequencies as follows A is 21.12%, B is 34.32%, O is 37.07% and AB is 7.57%¹⁵. On the contrary, as we see in literature, in the western world most prevalent blood group is “O”^{16,17}. Therefore, this shows that there are differences in blood group distribution in different regions of the world.

An interesting finding of our study is that the second

TABLE II: ASSOCIATION OF RH WITH STUDIED PARAMETERS USING PEARSON CHI SQUARE TEST

Characteristics		Rh				p-value
		Negative		Positive		
		n	%	n	%	
ABO Group	A	11	36.7	107	29.4	0.49
	B	8	26.7	124	34.1	
	AB	2	6.7	48	13.2	
	O	9	30.0	85	23.4	
Blood Group	A-	11	36.7	0	0.0	<0.01*
	A+	0	0.0	106	29.1	
	B-	8	26.7	0	0.0	
	B+	0	0.0	124	34.1	
	O-	9	30.0	0	0.0	
	O+	0	0.0	85	23.4	
	AB-	2	6.7	0	0.0	
	AB+	0	0.0	49	13.5	

*p<0.05 was considered significant using Pearson Chi Square test

DISCUSSION

Our study was carried out at JPMC, which is one of the largest tertiary care units of Sindh. In our study prevalence of ABO and Rh group among female blood

most common blood group is “A” (29.9%) not “O” as shown in other studies conducted in Pakistan¹³. Nazli R 2015¹⁸ endorsed the findings who also revealed that in females second most prevalent group is “A”, not the

TABLE III: COMPARISON OF FREQUENCY (%) OF ABO AND RH BLOOD GROUPS IN DIFFERENT PROVINCES OF PAKISTAN

Province	A(%)	B(%)	AB(%)	O(%)	Rh +ve(%)	Rh -ve(%)
Khyber Pukhtunkha ¹²	28.07	32.3	10.35	29.23	87.56	12.44
Punjab ¹³	24.02	32.87	11.20	31.91	92.45	7.55
Balochistan ¹⁵	21.12	34.32	7.59	37.07	94.83	5.25
Sindh ¹⁴ (previous study)	24.01	32.03	11.24	32.72	97.22	2.78
Sindh (present study)	29.9	33.5	12.7	23.9	92.4	7.6

“O” and the results are in the order of 31.2%, 31.7%, 27%, 10.1% for blood groups A, B, O, and AB respectively.

In terms of Rh positivity, the present study revealed that 92.4% of females are Rh positive whereas 7.6% of females are Rh negative. A study conducted by Nazli R 2015¹⁸ revealed the same findings, according to their study, 92.5% of their females have Rh positive and 7.5% have Rh negative. In Islamabad, District lower Dir, and Rahim Yar Khan the Rh-positive distribution among females was in the order of 87.56, 92.45% and 93.64% respectively^{12,19,3}. These results are indistinguishable to studies conducted in different cities of Pakistan. These findings are in contrast to western studies, in Britain 95% and in the US 85% of individuals are Rh positive^{19,20}. The interesting finding of the study showed that there is a significant association of Rh blood group and ABO groups p-value <0.01.

Studies carried out in various provinces of Pakistan revealed differences in the pattern of blood group distribution and is summarised in Table III.

Information about the blood group plays an important role in having information about disease predisposition in a particular population. It is already mentioned in the previous studies that people with blood group B and A are more frequently associated with ovarian cancer and coronary artery diseases respectively^{8,9}. Our study showed these are the most prevalent blood groups in females. These diseases can be prevented in the female population by taking early preventive measures. The great significance of the study is for practitioners especially gynecologists to get information about blood group prevalence so patients can be managed at the time of trauma, ABO incompatibility, Rh incompatibility, excessive postpartum haemorrhages and emergency especially in complicated pregnancy during cesarean section. Information regarding ABO and Rh blood group is also beneficial in genetic studies, resolving medicolegal issues (including disputed paternity). Information about blood group distribution in a population is also

crucial for authentic geographical information, clinical and forensic trials in population.

CONCLUSION

This study shows the commonest blood group among female donors in Karachi is “B” whereas “AB” is infrequent. The blood group “A” is also frequent. In the Rh system, Rh positive is more common than Rh negative. This study will be beneficial for the management of blood banks especially under crises, especially in Karachi. The diseases can be prevented in high risk patients. The great significance of the study is for practitioners especially gynecologists to get information about blood group prevalence so patients can be managed at the time of trauma, ABO incompatibility, Rh incompatibility, excessive postpartum haemorrhages and emergency especially in complicated pregnancy during cesarean section.

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