

Frequency Distribution of ABO and RhD Blood Groups amongst Blood Donors: A single center study

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ABSTRACT

Background: The knowledge of frequency distribution of ABO and Rh groups is important to manage the blood bank inventory and also to plan the requirements of blood components in any emergency situation. This study was carried out with the rationale to determine ABO and Rh frequencies in blood donors to know and compare the distribution of blood groups in different regions of Pakistan and some other countries as well.

Methods: This descriptive study was conducted in a large transfusion centre from Jan 2015 to Dec 2016. The EDTA sample of each donor was subjected to forward and reverse grouping. Findings were reported in simple percentages and compared with similar local and international studies.

Results: A total 105,520 blood donors of both genders were included in the study. Blood group B being the most prevalent (33.91%) followed by O (31.82%), A (24.76%), and AB (9.51%) respectively. 89.03% donors were found to be RhD positive and 10.97% were RhD negative.

Conclusions: Our present study confirms the findings of other studies regarding frequencies of ABO and RhD groups in northern Pakistan.

Keywords: ABO blood group, Rh blood group, Blood group frequencies, Donor blood groups

INTRODUCTION

Blood group antigens are polymorphic structural characteristics located on outer surface of red cell membrane¹. Production of these antigens is controlled by genes². Up till now a vast number of blood group antigens have been discovered and ISBT (International Society of Blood Transfusion) has organized these antigens in 36 blood group systems³. Among all, ABO and Rh systems are recognized as most significant blood group systems clinically⁴.

Three polymorphic alleles (A,B,O) of ABO system give rise to four phenotypes A,B,AB and O⁵. Rh blood group system comprises of many antigens, of which 'D' is most immunogenic⁶ and RhD typing is the part of routine blood grouping procedures. Cells are RhD positive and RhD negative depending upon the presence or absence of D antigen respectively⁷.

The knowledge of frequency distribution patterns of ABO and Rh groups in a population is imperative for effective management of blood bank inventory⁸ and to manage the needs of emergencies with highest requirements of blood components. In addition, this knowledge can be utilized in certain studies of correlation between blood group antigens and health issues^{4,9,10}, genetic research, forensic medicine and anthropology¹¹.

The large number of blood donations (more than 52,000 per year) mainly from northern Pakistan makes our centre most relevant for this study which was carried out to determine ABO and Rh frequencies in donors who donated

blood and to compare the results with similar other studies from Pakistan and other countries.

MATERIALS AND METHOD

This descriptive cross-sectional study was conducted at AFIT Rawalpindi from Jan 2015 to Dec 2016. Blood donors of both gender were included in the study. Donors were selected according to the WHO/ JPAC eligibility criteria and samples were drawn for screening and grouping. The EDTA sample of each donor was subjected to forward and reverse grouping using commercial anti sera and cell suspensions. Grouping was performed on semi automated grouping machine (HTZ QASAR IV) by micro plate method. Positive and negative controls were run in each batch as per manufacturer's instructions. Data was compiled and analyzed using Microsoft excel.

RESULTS

Total 105,520 donors, belonging to different cities of Northern Pakistan, donated blood at AFIT from Jan 2015 to Dec 2016. Blood group B was the most prevalent blood group, found in 35784 (33.91%) donors. 33576 (31.82%) donors had blood group O followed by A 26126 (24.76%) and AB 10034 (9.51%) respectively. With regard to Rh system 93942 (89.03%) donors were found to be RhD positive and 11578 (10.97%) were RhD negative (Fig-1).

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Fig-1: Frequency distribution of ABO and RhD blood groups

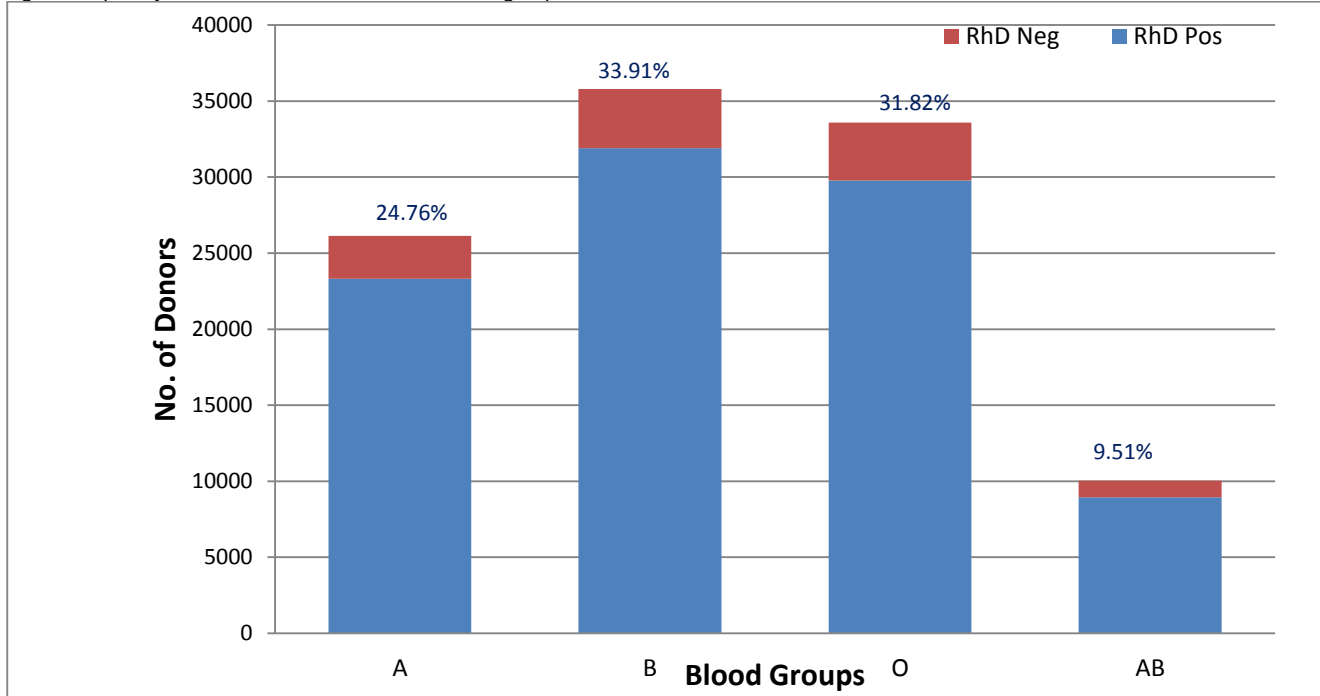


Table-1: Frequency distribution of ABO and Rh groups in different regions of Pakistan

	A(%)	B(%)	O(%)	AB(%)	RhD Positive (%)	RhD Negative (%)
Present study	24.76	33.91	31.82	9.51	89.03	10.97
Ilyas M et al ⁴	22.90	35.36	32.41	9.32	92.03	7.97
Anees M et al ⁹	22.00	36.90	31.30	9.90	87.10	12.90
Ilyas M et al ¹⁰	22.30	36.50	31.30	9.70	91.30	8.70
Khan M.U et al ¹¹	24.20	37.80	28.80	9.10	93.00	7.00
Khalid M et al ¹²	26.40	32.50	31.70	9.50	91.04	8.96
Shakir M et al ¹³	24.20	34.30	31.30	10.10	91.10	8.90
Khattak I.D et al ¹⁶	27.92	32.40	29.10	10.38	90.13	9.87
Babar M et al ¹⁷	27.10	32.00	29.80	11.00	92.90	7.10
Ahmad S et al ¹⁸	20.90	37.40	33.90	7.70	93.60	6.40
Hameed A et al ¹⁹	23.30	38.00	28.80	9.90	89.10	10.90
Rehman FU et al ²⁰	26.57	34.15	29.67	9.61	90.72	9.28
Malik S et al ²¹	22.50	35.90	35.70	6.30	94.80	5.20

Table-2: Frequency distribution of ABO and Rh groups in different countries

	A(%)	B(%)	O(%)	AB(%)	RhD Positive (%)	RhD Negative (%)
Present study	24.76	33.91	31.82	9.51	89.03	10.97
Amin MR et al ⁵	24.60	26.90	40.10	8.40	92.00	8.00
Raja KA et al ⁸	24.35	34.43	32.26	8.94	95.12	4.87
Sarhan et al ²²	33.40	6.00	56.80	3.80	92.80	7.20
Talukder SI et al ²³	26.60	23.20	40.60	9.60	96.80	3.20
Garratty G et al ²⁴	40.00	11.00	45.00	4.00	83.00	17.00

DISCUSSION

Blood group distribution is extensively investigated throughout the world. These studies exhibit marked variations of ABO and Rh distributions. Reason for this diversity may include genetic drift, migration, allele selection and random effects¹².

Present study shows that most prevalent ABO group in the study population of Northern Pakistan is 'B' while 'AB' is least prevalent. Overall trend of distribution is B>O>A>AB in Northern Pakistan. 89.03% of population found to be

RhD positive. The results are consistent with other studies from Rawalpindi, Islamabad^{2,13-15}, Sialkot¹⁰, Lahore¹¹, Gujranwala⁴, Sahiwal⁹, Azad Jammu Kashmir¹², Swat¹⁶, Nowshera¹⁷, Rahim Yar Khan¹⁸, Faisalabad¹⁹ and Multan²⁰. These studies showed almost similar trends of prevalence as B>O>A>AB but with some variations in frequencies (Table-1). Similar results are seen in a study from Gujrat India⁸, where almost similar frequency distributions of these blood groups are reported except for RhD with higher prevalence of 95.12%.

Our study also showed a contrast with study from southern Punjab²¹, where group 'O' is slightly more frequent than 'B' with Overall trend of O, B, A, AB, while RhD prevalence is 94.78%.

In different races of Malaysia⁵ 'O' is the most prevalent ABO blood group and 'A' ranks second in frequency followed by B and AB respectively. RhD frequency in Malaysia is 92%. So the trend of ABO group prevalence is different from our region.

In Saudi Arabia²², Bangladesh²³ and USA²⁴ similar trends of blood group distribution has been observed that is 'O' being the most prevalent followed by A, B and AB. RhD prevalence in these regions is 92.8%, 96.8% and 83% respectively (Table-2).

CONCLUSION

With a large scale study population, our study confirms the findings of other studies regarding prevalence of ABO and RhD groups in northern Pakistan. Blood group B is the most and AB the least prevalent. This data is helpful for predicting and understanding the future demands of blood and management of blood bank inventory accordingly.

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