DISTRIBUTION OF ABO AND RH (D) BLOOD GROUPS AMONG BLOOD DONORS IN DISTRICT MARDAN, PAKISTAN

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ABSTRACT

OBJECTIVE: To find out the distribution of ABO and Rh (D) blood groups among blood donors in district Mardan and to help transfusion services in the area.

STUDY DESIGN: Cross sectional descriptive study.

MATERIALS AND METHODS: The study was conducted in DHQ Hospital Mardan from 1st January 2012 to 31st December 2012. A total of 2893 healthy adult, blood donors (both volunteer and directed) from district Mardan were included. Two ml of blood anti-coagulated with EDTA was taken and both ABO and Rh (D) blood groups were determined using commercially available anti-sera of Biolaboratories. The distribution of ABO and Rh blood groups in the local community were then calculated.

RESULTS: Among ABO blood groups "B" (27.97%) was the most prevalent, followed by "O" (27.93%), "A" (24.75%) and "AB" (19.36%). Group Rh positive (94.30%) was more prevalent than Rh negative (5.70%). Similarly O⁺ (26.65%) was most frequent followed by B⁺ (26.17%), A⁺ (23.16%), AB⁺ (18.32%), B⁻ (1.80%), A⁻ (1.59%), O⁻ (1.28%) and AB⁻ (1.04%).

CONCLUSION: Blood group 'B' was most frequent among the ABO blood groups and Rh (D) positive among Rh blood groups while O⁺ was the most frequent blood group in the study population.

KEYWORDS: ABO Blood grouping, Rh (D) blood grouping, Mardan.

INTRODUCTION

Blood is the lifeline for our existence. In many diseases, emergencies and accidents qualitative and quantitative deficiency of this precious fluid warrant replacement. Whole Blood transfusion however remained unsafe and risky till the end of the 19th century. In early 20th century the mystery was ultimately solved with the discovery of ABO and Rh blood group antigens. In 1901 Karl Landsteiner, an Austrian discovered 'A', 'B', and 'O' blood group antigens for which he earned the Nobel prize in 1930 while group 'AB' was discovered in 1902 by Landsteiner's pupils von Decastello and Sturli.¹ Sill later in 1940 Rh blood group was discovered by Karl Landsteiner and weinbrener.² Since then more than 30 blood group systems with more than 600 antigens have been discovered.³ but ABO and Rh still remain the only clinically important antigens in human blood transfusion.

The success of human blood transfusion requires compatibility for the two major blood group antigen systems, namely ABO and Rh. The ABO system is determined by two red blood cell antigens A and B, 6 genotypes OO, OA, OB, AA, BB, AB, four phenotypes A,B, AB and O expressed by three alleles A,B and O on chromosome 9 and two antibodies Anti-A and Anti-B.⁴ A person with A blood group will have A antigen and Anti-B antibodies while a person with B blood group will have B antigen and Anti-A antibodies. Similarly a person with AB group will have both A and B antigens and none of both Anti-A or Anti-B antibodies contrary to a person with blood group O who will have none of A or B antigens but will have both Anti-A and Anti-B antibodies.⁵ Antibodies are of IgM type and are absent at birth. They appears in the blood after exposure to environmental antigens similar in structure to blood group antigens.

The presence or absence of Rh antigens on red

blood cells is determined by two alleles at another locus, Rh on chromosome 1.⁶ There are 6 types of Rh antigens in 3 groups Cc, Dd, and Ee, Every person acquire one from each group. Antigen D is the strongest and a person with this antigen will be Rh positive while a person with no D antigen will be Rh negative. Antibodies to D can cause transfusion reactions. Unlike ABO blood group spontaneous antibodies are never formed against Rh antigens and repeated exposure is needed to make significant amount of antibodies to cause a transfusion reaction.⁷

The aim of this study was to provide baseline data to planners, hospital managers and health care providers to manage transfusion services in the most efficient way.

MATERIAL AND METHODS:

This study was conducted at the District Head Quarter Hospital Mardan, from 1st January 2012 to 31st December 2012. A total number of 2893 healthy, adult donors, volunteer as well as directed belonging to District Mardan, between the ages 18-50 years were included. Two ml blood was drawn from the ante-cubital vein of each donor in a disposable syringe, and transferred immediately to a tube containing ethylene diamine tetra acetic acid (EDTA).

ABO and Rh (D) blood grouping was done by the classical slide method (direct) using ABO Antisera and Rhesus monoclonal Antisera of Biolaboratories. The data was compiled and then analyzed for frequency of ABO and Rh (D) blood grouping by using MS Office 2007.

RESULTS

Table 1: Frequency of ABO Blood Groups among Blood Donors in Mardan

	A	B	O	AB	Total
Frequency	716	809	808	560	2893
Percentage	24.75%	27.97%	27.93%	19.36%	100%

Table 1 shows the frequency of blood ABO group, indicating that among ABO blood groups "B" was most prevalent with a frequency of 27.97% (809),

followed by "O" with a frequency of 27.93 % (808), "A" with a frequency of 24.75 % (716), and "AB" with a frequency of 19.36 % (560).

Table II: Frequency of Rh blood groups among blood donors in Mardan

	A	B	O	AB	Total
Rh Positive	670	757	771	530	2728 (94.30%)
Rh Negative	46	52	37	30	165 (5.70%)

Table II shows the frequency of blood Rh group, indicating that among Rh (D) blood groups the frequency of Rh positive was 94.30 % (2728) and Rh negative was 5.70 % (165).

Table III: Frequency of blood (ABO+Rh) Groups among blood donors in Mardan

Blood Group	A ⁺ ve	B ⁺ ve	O ⁺ ve	AB ⁺ ve	A ⁻ ve	B ⁻ ve	O ⁻ ve	AB ⁻ ve	Total
Frequency	670	757	771	530	46	52	37	30	2893
%age	23.16 %	26.17 %	26.65 %	18.32%	1.59 %	1.80 %	1.28 %	1.04%	

Table III shows the frequency ABO-Rh grouping pattern, indicating that O⁺ve was most frequent (26.65%) followed by B⁺ve (26.17%), A⁺ve (23.16%), AB⁺ve (18.32%), B⁻ve (1.80%), A⁻ve (1.59%), O⁻ve (1.28%) and AB⁻ve (1.04%).

It is apparent that both blood groups B and O had almost the same frequency (809 VS 808) although B was more common. Blood group A followed with 670 subjects and AB with 560 subjects. The distribution in this study also gives a mixed ABO blood groups picture with a high prevalence of Rh positive phenotype.

DISCUSSION

Since the discovery of ABO and Rh blood groups antigens in 1901 by Karl Landsteiner, numerous studies all around the globe have given the distribution of ABO blood groups antigens in different population groups. In Pakistan many researchers have shown almost similar results for different ethnic and geographical populations. A summary is given in Table 4 below.

Table:4 Distribution of ABO and Rhesus blood groups in Pakistan

Area	A	B	O	AB	Rh +ve	Rh -ve	Reference
Bannu (KPK)	31.03%	36.23%	25.07%	7.67%	89.23%	10.77%	(8)
Swat (KPK)	27.92%	32.40%	29.10%	10.58%	90.00%	10.00%	(9)
Nowshera (KPK)	27.12%	32.40%	29.80%	11.04%	92.88%	7.12%	(10)
Faisalabad	23.26%	38.00%	28.76%	9.98%	89.09%	10.91%	(11)
Rawalpindi Islamabad	25.53%	33.33%	31.10%	10.04%	92.45%	7.55%	(12)
Mirpur (AJK)	25.93%	32.59%	24.20%	17.26%	83.60%	16.40%	(17)
This study	24.75%	27.97%	27.93%	19.36%	94.30%	5.70%	

From these studies it is evident that the relative frequency of ABO and Rhesus blood groups does not seem to deviate from the typical pattern of B>O>A>AB in the country. Only studies in Bannu by Khan et al.⁸ and Mirpur (AJK) by Chishti and associates⁷ have given a slightly different pattern with phenotype A being more prevalent than phenotype O in these areas. The results obtained in the present study are similar to the results obtained by studies conducted in populations of Swat,⁹ Nowshera,¹⁰ Faisalabad,¹¹ Rawalpindi Islamabad,¹² Gujranwala,¹³ Sahiwal,¹⁴ Gujrat,¹⁵ Punjab,¹⁶ and Poonch (AJK),¹⁸ in which the most prevalent blood group was B, followed by O, A and AB. However this study has shown a higher percentage of "AB" blood group (19.36%) as compared to other studies but similar to the study in Mirpur (AJK)¹⁷ which has also shown a high frequency of "AB" blood group. Reasons may be cultural, genetic or high percentage of marriages within the families. Analyzing the different studies in Khyberpakhtunkhwa (including this study) it is evident that blood groups in this part of Khyberpakhtunkhwa have a B>O>A>AB pattern as evident from studies in Swat⁹ and Nowshera¹⁰ and this study. The reason may be that majority of the people in these three districts belong to Yousufzai tribe and marriages within the families and tribes is very common.

Rh (D) positive was the predominant Rh phenotype throughout Pakistan (as well as internationally) with a prevalence ranging between 79.58 % to 94.30 %.⁸⁻¹⁸

Table: 5 Global distributions of ABO and Rhsus blood groups

Country	A	B	O	AB	Rh +ve	Rh -ve	Reference
Bangladesh	23.5%	39.8%	27.6%	9.2%	97.4%	2.6%	(19)
Turkey (Istanbul)	43.4%	16.0%	33.3%	7.4%	89.5%	10.5%	(21)
Saudi Arabia	33.4%	6.0%	56.8%	3.8%	92.8%	7.2%	(22)
India (Western Rajasthan)	22.2%	36.4%	31.7%	9.4%	91.75%	8.25%	(25)
Sudan	23.3%	13.2%	52.7%	10.8	98.0%	2.0%	(27)
USA	42.0%	10%	44.0%	4.0%	85.0%	15.0%	(29)
Sweden	44.0%	12.0%	38.0%	6.0%	84.0%	16.0%	(30)

As evident from table: 5 international studies have shown wide variation of ABO blood groups in different populations around the globe. In Bangladesh¹⁹ and India^{24, 25} most studies have shown the typical Asian pattern of B>O>A>AB distribution while a study from Bagalkot India²³ has given O.> B > A > AB to be predominant. Similarly a study from Rize province of Turkey has shown phenotypes O (44.07%) and A (44.07%) to be far more common than B (9.26%) and AB (2.60%) phenotypes but another study from Istanbul²¹ has shown phenotype A to be more prevalent (43.4%) as compared to O (33.3%) and B (16%). From Saudi Arabia Sarhan and his colleagues²² have reported blood group O (56.8%) to be more common than A (33.4%), B (6.0%) and AB (3.4%) blood groups.

In the African subcontinent studies from Sudan²⁷ and Nigeria²⁸ have reported O > A > B > AB distribution of blood groups with O blood group being the most common among native Africans. Similar distribution has also been reported from USA²⁷, Australia and UK³⁰ where blood group O is more common than other blood groups followed by A > B > AB. Contrary to Africa, USA, Australia and UK the central European (Swedish) studies have revealed type A blood group to be more common than O or B blood groups³⁰.

As far as Rh phenotype is concerned the global trend of Rh (D) positive phenotype remains very high as compared to Rh (D) negative phenotype⁸⁻³⁰. All the above national and International studies

have shown that majority of Asians have a typical B>O>A>AB pattern while most Africans, Americans, Australians and English exhibit an O>A>B>AB pattern of ABO phenotypes. Some European nations on the other hand show an A>O>B>AB pattern.

CONCLUSION

In the current study 'B' was the most frequent among the ABO blood groups and Rh (D) positive among Rh blood groups while O⁺ was the most frequent blood group in the study population.

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