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ORIGINAL ARTICLE

Frequency of ABO and Rhesus (D) blood group among blood donors and blood requisition and utilization patterns: An insight towards optimal blood usage in a tertiary care hospital.

Sehar Khaliq[1]

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ABSTRACT… Objective: To determine the distribution and frequency of blood groups among the blood donors and assess the blood requisition and utilization patterns in order to strategize optimal blood utilization. **Study Design:** Cross-sectional Descriptive study. **Setting:** Fauji Foundation Hospital, Rawalpindi. **Period:** January 2021 to January 2024. **Methods:** Blood bank data including blood donor name, gender, blood groups, blood requisitions, blood issuance and blood utilization was retrieved from Fauji Foundation hospital's management information system and blood requisition and collection forms. The quality indicators of blood utilization i.e. crossmatch/transfusion ratio and transfusion probability was calculated and analyzed using SPSS 21. **Results:** 22483 blood donors donated blood at our blood bank facility from January 2021-january 2024. Mean age 31±10.2 years (range: 18–56 years). Majority of the blood donors were males 96.4% (n=21682) while 3.5% (n=801) were females. A total of 21733 were replacement donors while 750 were voluntary donors. The highest blood requests were from obstetrics/gynecology department while the highest blood utilization was by the medicine department. The overall cross match to transfusion ratio was 1.3. The highest cross match to transfusion ratio of 2.5 was from obstetrics/gynecology department while the lowest was from pediatrics and oncology departments. **Conclusion:** The blood group O positive was the commonest blood group. Although, blood transfusion quality indicators show effective utilization however the pattern varies among different departments. Evidence-based blood utilization strategies need to be implemented for optimal utilization of blood.

Key words: Cross Match to Transfusion Ratio, Blood Utilization, Blood Requisition, Frequency of Blood Groups.

INTRODUCTION

Blood is a very precious commodity, each second someone is in need of blood. The knowledge of distribution of blood group among our community and population is of crucial significance as it helps in maintaining blood stocks, managing demand uncertainty issues and to conserve blood in cases of low reserves of blood stocks.

The blood group identification depends on the expression of distinct carbohydrate sugars on the surface of the red blood cells.[1]

The Rhesus (Rh) blood group system is considered the most polymorphic of the blood group systems as it constitutes approximately 45 independent antigens.[2,3]

Very few studies have been done on the frequency and distribution of blood groups and blood requisition against these blood groups both nationally and internationally.

A review of literature from Pakistan and neighboring countries show blood group B positive to be the commonest[4,5] while in some international studies blood group O positive was the commonest.[6] The frequency of Rh type also varies among various geographical regions. In Europe and USA the frequency of Rh negative blood group is higher compared to Asia and Africa.[6] Blood requisition and utilization patterns

1. FCPS, Associate Professor Pathology, Foundation University Islamabad, Pakistan

Correspondence Address:
Dr. Sehar Khaliq
House No: 566, Street 29 Sector F,
DHA 1, Defence Villas, Islamabad.
sehar.khaliq@fui.edu.pk

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also varied among different countries.[7,8,9]

The blood transfusion services in developing countries like Pakistan has many challenges as voluntary donation is alarmingly low with very few female donors, there is a non-adherence to transfusion guidelines with shortage of trained blood bank personnel. Analyzing the patterns of blood requisitions and utilization will help in identifying areas for improvement and devising strategies to optimize blood usage.

This cross-sectional study was carried to determine prevalence of ABO and Rh blood groups and pattern of blood requisition and utilization of red cell concentrates. The findings of distribution of various blood groups and patterns of blood requisition will certainly assist in management of blood bank inventory and will play a pivotal role in implementing evidence-based strategies to conserve this precious resource.

METHODS

It was a retrospective cross-sectional study carried in Fauji Foundation Hospital from January 2021 till January 2024 after approval from ethical committee (809/RC/FFH/RWP). Medical Records of the blood donors were retrieved from Medix which is an management information system (MIS). Blood requisitions forms were analyzed including gender, age, blood groups, the request type, the total units requested from different departments, total units cross-matched, issued and transfused.

Blood donors selection was done after taking thorough history, physical examination, complete blood counts and screening of blood for transfusion transmitted infections i.e. hepatitis B, hepatitis C, HIV, malaria and syphilis. For blood grouping 2 ml of blood was taken into an ethylene diamine tetra acetic acid tube and ABO and Rhesus monoclonal antiseras were used. The cross-match to transfusion ratio (CTR) is calculated as the number of units cross-matched/ number of units transfuse. A CTR of 1 was considered to be ideal while a CTR of 2.5 and below was considered as indicative of significant blood usage. Transfusion probability (%T) was calculated as the number of patients transfused/ number of patients cross-matched × 100. A value of 30% and above was suggestive of effective blood usage. Data was analyzed using SPSS 21 and frequency and distribution of variables were calculated.

RESULTS

Retrospective data from MIS of Fauji Foundation hospital was retrieved. From 01 January 2021 till 01 January 2024, 22483 blood donors donated blood at our blood bank facility. The mean age was 31±10.2 years (range: 16–56 years). Majority of the blood donors were males 96.4% (n=21682) while 3.5% (n=801) were females. Types of blood donors is shown in Figure-1.

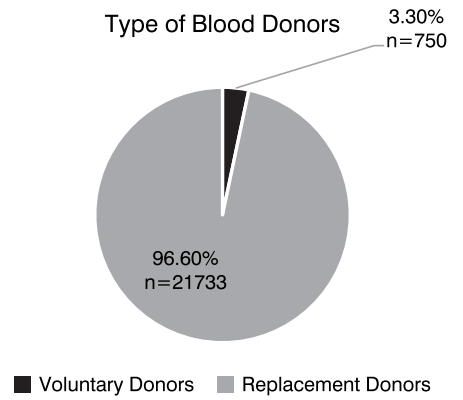

Figure-1. Frequency of type of blood donors (Voluntary Donors = 3.30%; Replacement Donors = 96.60%)

The blood group distribution among blood donors is shown in Figure-2 the commonest blood group was blood group O positive 31% (n=6995) while B negative was the least common blood group 01% (n =255). Distribution of Rh positive and Rh negative blood groups are shown in Figure-3.

The total blood requisitions in these 3 years were for 32603 red cell units, out of which 993 red cell units were discarded due to seropositivity for hepatitis B, hepatitis C, HIV, syphilis or malaria and due to expired red cell units. However, the total RCC issued was 2194. Department wise breakdown for blood issuance is shown in Figure-4. The highest number of blood products issued were for the medicine Department followed by the obstetrics/Gynecology Departments (obs/ gyne).

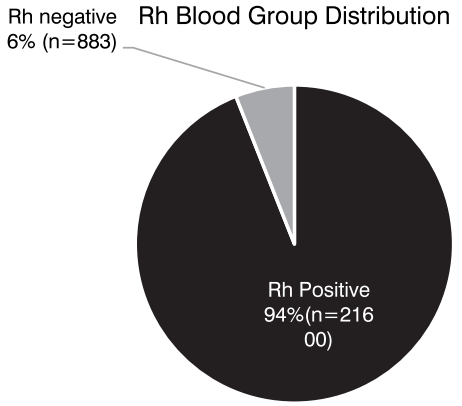

Figure-2. Distribution of rhesus D blood group among blood donors (Rh (D) Positive =94% Rh (D) Negative 06%)

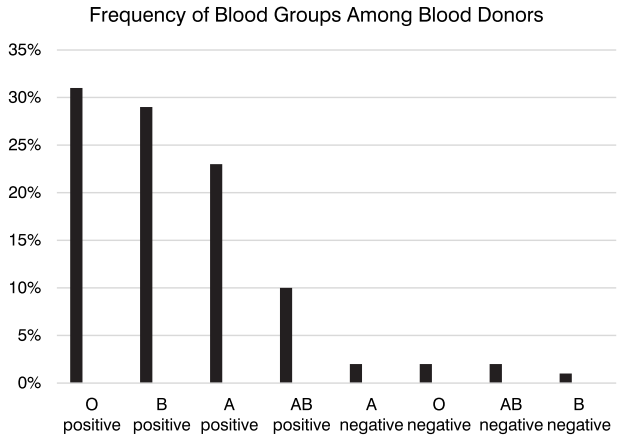

Figure-3. Frequency of blood groups among blood donors

Out of these 22483 red cell units collected over a period of three years, the overall CTR was 1.35 with a total transfusion probability of 79%. Department wise breakdown of CTR and transfusion probability is shown in Table-I.

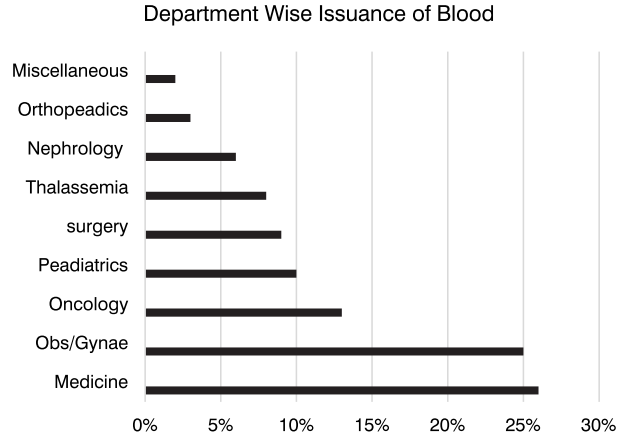

Figure-4. Frequency of department-wise issuance of blood

DISCUSSION

There is a variation of blood group distribution among different populations and continents. The knowledge of blood groups among different ethnic groups and regions is crucial for effective management of blood transfusion establishments to ensure adequate supply of blood. An effective utilization of blood is mandatory to avoid unnecessary blood transfusions in order to reduce wastage of blood.

In our study blood group O positive was the commonest blood group. In another national study from district Dir Upper by Shah H et al the frequency of blood group A was found to be the highest (32.1%) followed by blood group B (29.8%).[10] This study differs from our study as it included general population but our study included blood donors only.

Serial No.	Department	Cross-Matched Units	Transfused Units	Transfusion Probability	Cross Match/ Transfusion Ratio
1	Medicine	6813	5438	79%	1.25
2	Obstetrics/Gynae	13850	5305	38.3%	2.61
3	Oncology	3000	2808	93%	1.06
4	Pediatrics	2194	2102	95.8%	1.04
5	Surgery	2300	1962	85.3%	1.17
6	Thalassemia	1835	1811	98.69%	1.01
7	Nephrology	1511	1376	91.0%	1.09
8	Orthopedics	620	383	61.7%	1.6
9	Miscellaneous	480	305	63.5%	1.47

Table-I. Department-wise data showing cross-matched units, transfused units, transfusion probability and cross match to transfusion ratio

Khan MS et al's study from Rawalpindi/Islamabad showed the highest prevalence was of blood group A followed by B, O and AB blood groups while the percentage of Rh (D) negative blood group was 7.55%.[11] Ilyas M et al's study reported the prevalence of blood group B to be the highest (35.36%).[4] According to Sabir A et al's study, in Pakistan the highest prevalence of blood group was blood group B while in Faisalabad the blood group O was the commonest which concurs with our study.[5] Parveen DN et al reported blood group O positive to be the most prevalent blood group which was in agreement with our study.[12] Mehmood M from Multan reported prevalence of blood group B (36.95%) to be the highest followed by blood group O (33.8%), group A (21.92%) and group AB (7.33%).[13]

In a study done in India by Sidhu et al the blood group B was the most prevalent blood group and the frequency was blood group O (31.22%), A (21.91%) B (37.57%) and AB group was (9.30%) while incidence of Rh (D) negative was (2.7%).[14]

Taluker SI et al's study was in agreement with our study where the prevalence of blood group O was the highest (40%) while percentage of Rh (D) negative blood was (3.2%).[15] In a study done in Iran by Boskabadey et al the prevalence of blood group O was 34.7 % followed by B (23.3%), A (23.1%) and AB (8.9%). This study was in agreement with our study.[16]

In various studies the frequency of Rh (D) positivity was 92.77%[17], 98%[18,19] 98.7%[16] and 95.7%[20] while frequency of Rh (D) negative blood group was 7.23%[17] 2%[18,19] 11.3%[16] 4.3%[20] and 17%.[21] This study differs in the percentage of Rh (D) negative blood group as the frequency of Rh (D) negative was higher compared to our study as this study was done on general population rather than blood donors this could be the underlying reason and also the frequency of blood groups differs among different geographical regions.

The total requests received at our blood bank over the period of 3 years was also reviewed along with patterns of blood utilization. Maximum requests received at our blood bank was from obs/gyne department which was in agreement with Kafle[22], Zewdie and Bansal K[24] studies where the highest requests were received from obs/gyne department followed by internal medicine and surgical units. In our study the highest consumers of blood was the medicine department this was in agreement with Alcantra PR[25] study. In a study done by Riaz et al[26] maximum utilization was by the pediatric department.

The ideal CTR should be 1.0 or at least < 2.5.[22] The CTR from various studies was 1.0[27], 1.5[28] 4.57[29], 1.05[30], 3.6[31], 1.03[32] and 1.5[24]

The blood utilization quality indicator for red cell concentrates from our study showed an effective blood utilization at our hospital with an overall CTR of 1.3 and a transfusion probability of 79% which was in the optimal range. However, CTR showed variation among different departments with obs/gyne department showing a highest CTR of 2.6 indicating suboptimal transfusion practices which could be most likely due to anxiety and fear of patient management[27] as well as non-adherence to transfusion guidelines leading to over-ordering of blood. The most efficient blood utilization in our hospital was from pediatrics and oncology departments followed by surgery, medicine, orthopedics and then other miscellaneous departments.

A higher CTR puts a lot of pressure on blood banks as it results in blood bag being booked for extended period of times resulting in wastage of blood units, secondly workload on the blood bank staff is tremendously increased. A high CTR has serious financial implications on the blood bank resources as well.

Periodic reviews and audits of blood requisition and utilization patterns is crucial in maintaining blood stocks and blood reserves especially in times of critical emergency. Our study will definitely add an insight into the frequency of blood groups among the local population and pattern of blood utilization practices which will assist in implementing and revising standard operating procedures (SOPs) for blood management. Our study also emphasizes

the need for strict adherence to transfusion guidelines. Regular teaching and awareness sessions needs to be conducted involving all the stakeholders i.e. residents, surgeons, physicians, anesthetists, intensivists, hematologist and blood bank staff, they need to have a close liaison regarding effective and safe blood requisitions and utilization practice as it play a pivotal role in achieving optimal blood usage.

The limitation of this study is that it is a single center study.

Future work should focus on nationwide studies on blood groups and blood utilization trends for monitoring and improving transfusion practices.

CONCLUSION

Blood group O positive was the commonest blood group. The highest blood requisitions were from gynae/obstetrics department showing a higher CTR and suboptimal transfusion practices. Evidence-based blood utilization strategies need to be implemented for optimal utilization of blood.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Sehar Khaliq	Concept, Design, Data collection, Data analysis, Proof reading, Manuscript writing, Critical analysis.