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COMPARATIVE STUDY OF BLOOD PROFILE OF VOLUNTARY AND DIRECTED DONORS

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ABSTRACT

Background: Blood transfusion safety relies on healthy donor's blood, but directed donation offers minimal improvement compared to volunteer donation. Patient attendants still choose specific donors for transfusion needs. **Objective:** To compare blood profile of voluntary and directed donors. **Study Design:** Cross-sectional study. **Place and Duration of Study:** Department of Hematology and Transfusion Medicine, the Children's hospital and UCHS Lahore and Sundas Foundation from September 2024 to December 2024. **Material and Method:** Hematological parameters i.e. hemoglobin and platelets were performed through CBC on automated cell counter BECKMAN COULTER(US) of selected blood sample. Data was analyzed with independent sample t test, Pearson's correlation with IBM Statistics 23 software. Chi-Square was applied to compare marker positive rates of directed donations to volunteer donations. **Results:** A total of 150 donors were recruited having mean age of 29.47±6.705. The Pearson correlation analysis showed a weak positive correlation between hb and platelet count in voluntary vs directed donors (r=0.175). The study found that voluntary donors had slightly higher mean hb level than directed donors but a significantly higher mean platelet count than directed donors, indicating a statistically significant difference. There were significant variations in HCV and Malaria responses across donor types. **Conclusion:** Voluntary donations have higher hb and platelet counts but lower viral marker rates, suggesting that patients should be informed about potential risks of directed donations.

KEYWORDS: Blood Donors, Hemoglobin, Platelets, Hepatitis C Virus, Malaria.

INTRODUCTION

Directed donation is defined as when patient chooses its blood donor to donate blood directly to that specific person whereas Voluntary donor donates blood willingly without any personal connection or specific request. Blood donation is an essential component of healthcare, providing a lifeline to patients in need of transfusions. There are approximately 1.5 million transfusions every year in Pakistan. (Sultan et al., 2007) Blood transfusion plays an essential part for the patient's care as it saves life and improves health. Out of the 171 countries surveyed by the WHO, 62 have a 100% voluntary unpaid system for blood donation. (Dorle et al., 2023).

Before donating blood, donors must meet a minimum hemoglobin level to ensure their safety and to prevent potential side effects like anemia. Donating blood with low hemoglobin can lead to i.e. dizziness, fatigue, or other health complications. (National Blood Service, 2013) If the hemoglobin level in donated blood is too low, the donation may not be as effective, as it won't supply the essential oxygen-carrying capacity needed by the patient. Therefore, maintaining adequate hemoglobin levels is crucial for the safety of the donor and the well-being of the recipient.

Platelets (thrombocytes) that derived from megakaryocytes are small, disc-shaped cell fragments in the blood that play a vital role in haemostasis—the body's process for preventing bleeding at injury sites. Maintaining normal platelet levels, typically between 150,000 and 450,000 per microliter of blood, is essential to prevent hemorrhaging in donors. If a donor has a low platelet (thrombocytopenia) donating blood could elevate their risk of complications such as excessive bleeding or bruising, as platelets play a vital role in the process of blood clotting.

Pre-donation screening is important because it can lower the risk of transfusion transmitted infections (TTIs) transmission by determining affected new donors during the pre-donation process. The risk of TTIs remains a big concern in transfusion medicine. All blood donations

should be screened for viral markers i.e. Hepatitis B virus (HBV), Human Immunodeficiency Virus (HIV) and Hepatitis C Virus (HCV). Blood donors should undergo malaria and syphilis screening as well.

By comparative study of voluntary donors and directed donors we can determine whether directed donation is safe for a patient or if a voluntary donor would be a better option by considering various factors such as medical compatibility, screening processes and ethical considerations. It can inform strategy planners to increase volunteer donation, ensuring a stable and sufficient blood supply for transfusions and optimize blood banking practices. The aim of this study is to compare blood profile of voluntary and directed donors.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Hematology and transfusion Medicine in Children Hospital and University of Child Health Sciences and Sundas Foundation Lahore from August 2024 to December 2024. A total of 150 donors aged 17-60 years presenting in Children Hospital and Sundas Foundation, who satisfied the inclusion criteria for blood donation were included in our study. Donors having high risk behaviors, body piercing or tattoo and intravenous drug user were excluded. After getting approval from the IRB (No. 758/SAHS), the blood sample was collected in EDTA (Lavender top) vacutainer for performing CBC to detect pre-transfusion hb and platelet count on automated cell counter (BECKMAN COULTER, US) of selected blood sample and screening was done on ICT for the qualitative detection and differentiation of antibodies to HIV1, HIV2, Treponema pallidum, HCV, HBsAg and plasmodium falciparum antigen and plasmodium vivax antigen in human serum or plasma. All samples were tested within 24 hours of collection. Data included patient demographics (Name, Age, Gender), Hematological parameters (Hemoglobin, platelet count) and Screening parameters (HBV, HCV, HIV, Syphilis, Malaria). In this context a self-designed proforma was used.

Statistical Analysis

The data was entered and analyzed using IBM-SPSS 23.0 software. The continuous variables (Age, hb, platelets) were expressed as Mean ± SD, whereas categorical variables in the form of frequencies and percentages. Pearson Correlation was employed to test association between continuous variables. The comparison of hb and platelets between voluntary and directed donors was done by independent sample t-test. Chi-square test was conducted to evaluate the screening parameters. A p-value <5% was considered as statistically significant.

RESULTS

In this study a total of 150 donors were recruited, consisting of 75 voluntary donors and 75 directed donors. To compare the blood profile of voluntary and directed donors, infectious disease (Hepatitis B, Hepatitis C, HIV, Syphilis and Malaria) positive rates and hematological parameters including: Pre-Donation hemoglobin and platelet count were analyzed. Out of 150 individuals, 139 were males consisting of 93% of the total individuals while 11 females accounting for the remaining 7% with a male to female ratio of 1:13 indicating a male bias donor population as shown in fig 4.1.

The age of the donors was ranged from 18 years to 52 years. The minimum age was taken 18 years and maximum age was taken 52 years. The mean age was 29.47±6.705.

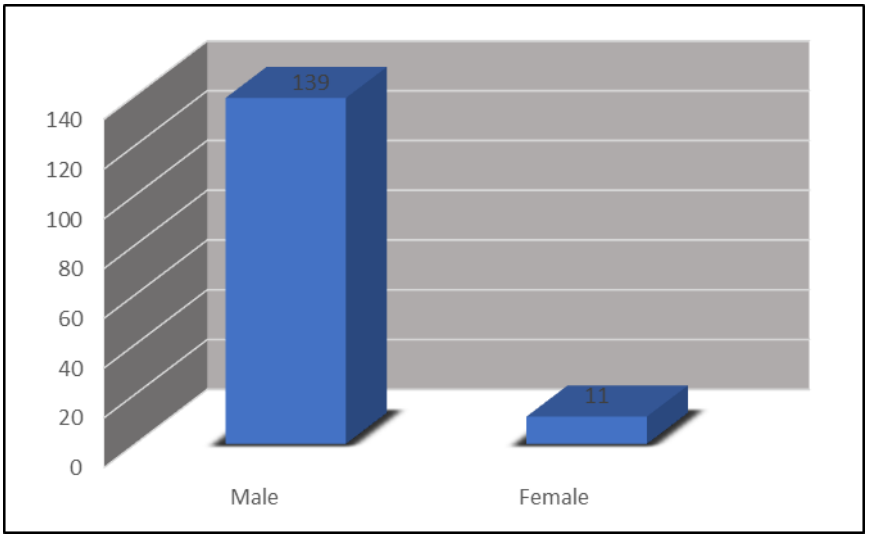

Fig 4.1: Frequency Distribution of Gender.

The hematological parameters i.e. hemoglobin and platelet count of directed and voluntary donors were compared before donation and their comparison was tested using Independent t-test as shown in table 4.1. Voluntary donors have slightly greater mean hemoglobin levels (14.5 ± 1.34), compared to directed donors (14.2 ± 1.38). The p-value (>0.05) shows that the difference is not statistically significant. However, voluntary donors had a substantially

higher mean platelet count (287.1 ± 61.8) than directed donors (245.8 ± 59.01). The p-value (<0.05) indicates that the difference is statistically significant.

Table 4.1: Comparison of Parameters results between Voluntary and Directed Donors.

Parameters	Donors	Mean±SD	P value
HB	Directed	14.2±1.38	0.086*(NS)
	Voluntary	14.5±1.34	
Platelets	Directed	245.8±59.01	**<0.001***
	Voluntary	287.1±61.8	

*P-value <0.05 is significant

A weak positive correlation was found between platelets and hemoglobin in voluntary and directed donors (r = 0.175). When hemoglobin levels rise, platelet counts rise a little; however, (p<0.05) shows a statistically significant correlation.

The screening outcomes of infections (HBV, HCV, HIV, syphilis, and malaria) within voluntary and directed donors, as **w**ell as the statistical significance of the variations are described in table 4.2, which shows that HBV infection rates are slightly larger among directed donors as compared to volunteers, although the difference is not statistically significant. The rate of positive testing for HCV is much higher for directed donors than for voluntary donors. HIV infections are so rare that there is no significant difference between the two donor groups. The frequency of syphilis is slightly higher among directed donors, but this difference is not statistically significant. The rate of a positive malaria test is much higher for directed donors.

Table 4.2: Screening Outcomes of Infectious Disease Markers Between Voluntary and Directed donors

Infectious Agent	Voluntary Total=75		Directed Total=75		P-value
	Positive	Negative	Positive	Negative	
HBV	1	74	3	72	0.311
HCV	1	74	7	68	**0.029***
HIV	0	75	1	74	0.316
Syphilis	0	75	2	73	0.155
Malaria	2	73	10	65	**0.016***

*P-value <0.05 is significant

Both HCV and Malaria (p value<0.05) indicating that there are substantial variations in throughout the categories for both donor types. In contrast, for HBV, HIV, and syphilis (p value>0.05) showing that the variations in responses are not statistically significant.

For HBV, volunteer donors have a very low positive rate of 1.33%, suggesting little HBV infection, whereas directed donors have a slightly larger positive rate of 4%, which is still quite low as shown in table 4.3. In the case of HCV, both donor categories had a low positive rate, with voluntary donors at 1.33% and directed donors at 9.33%, indicating a greater incidence among directed donors.

HIV generally non-existent in both categories, with no positive cases reported by voluntary donors and a very low positive rate of 1.33% among directed donors. Similarly, syphilis is undetectable in voluntary donors (0%), while directed donors have a very low positive percentage of 2.67%.

Table 4.3: Frequency of positive tests for infectious diseases

Donor Type	Total screened	HbsAg positive		Anti-HCV positive		HIV positive		Syphilis positive		Malaria positive	
		number	%	number	%	number	%	number	%	number	%
Voluntary	75	1	1.33	1	1.33	0	1.33	0	0	2	2.67
Directed	75	3	4	7	9.33	1	1.33	2	2.67	10	13.33

For malaria, donors who volunteered had a low positive rate of 2.67%, whereas directed donors have a higher positive rate of 13.33%, indicating that malaria is more common in this group.

DISCUSSION

Blood donation is an essential component of healthcare, providing a lifeline to patients in need of transfusions. The study compares the blood profiles of voluntary and directed donors, highlighting the importance of voluntary blood donation for safe blood supply. Voluntary donors are considered to have a lower risk of transfusion-

transmissible infections (TTIs) due to their lack of familial or social pressure. Directed donors, on the other hand, are often chosen based on familial or social relationships, potentially increasing the risk of TTIs. Differences in hematological parameters between the two groups may reflect underlying health status and lifestyle differences. The study emphasizes the need for promoting voluntary blood donation as a safer and more sustainable approach, emphasizing education, rigorous screening, and fostering a culture of altruism.

In the light of cross-sectional study, it was evaluated the hematological parameters, i.e., hemoglobin and platelet count of directed and volunteer donors before donation using the Independent t-test. Results showed that voluntary donors had slightly higher mean hemoglobin levels than directed donors, but significantly higher mean platelet count than directed donors. The Pearson correlation analysis showed a slight positive correlation between hemoglobin and platelet counts in voluntary and directed donors, with a p-value of <0.05 indicating a statistically significant correlation. A positive r value indicates that when hemoglobin levels rise, platelet counts rise a little; however, this correlation is not strong. Figure 4.3 shows a scatterplot weak positive correlation between hemoglobin levels and platelet counts, with a statistically significant correlation (p value<0.05).

Volunteer donors have a low positive rate for HBV, while directed donors have a slightly larger positive rate showing that HBV infection rates are slightly higher among directed donors compared to volunteers, but not statistically significant. In the case of HCV, both donor categories had a low positive rate, with voluntary donors at 1.33% and directed donors at 9.33%, indicating a greater incidence among directed donors. Both categories of donors have a low positive rate for HIV and syphilis. For malaria, donors who volunteered had a low positive rate, whereas directed donors have a higher positive rate, indicating that malaria is more common in this group. The study found significant variations in HCV and Malaria responses across donor types, with p-values (<0.05) while HBV, HIV, and syphilis responses had p-values more than 0.05, indicating no statistical significance. Overall, these findings highlight the need for increased awareness and treatment for HCV and malaria.

Same results are seen in other studies. In 2012, Kerry A Dorsi and his colleagues presented a report which showed that HIV, HCV and HBV viral markers in directed donations had higher rates of HIV-reactive donations and higher rates of HBV-reactive and HCV-reactive donations compared to volunteer donations. Directed donations were more likely to test positive for certain TTI markers. (Dorsey et al., 2013).

The clinical significance of studying the blood profile of voluntary and directed donors helps assess patient safety and eligibility for blood donation, considering factors including medical compatibility, screening methods, and ethical issues. This can guide strategies for increasing volunteer donation, ensuring stable blood supply, and optimizing blood banking practices.

CONCLUSION

Volunteer donations have slightly higher mean hb and platelet count and lower viral marker rates than directed donations. Therefore, patients considering directed donation should be appropriately counseled about the potential risks. The study can help increase volunteer donations, provide a stable blood supply for transfusions and improve blood banking processes.

LIMITATIONS

The only limitation of this study was that the study population only confined to the donors presenting in Blood Bank of Children Hospital Lahore and Sundas Foundation.

Proforma
Department of Hematology and Transfusion Medicine
University of Child Health Sciences & The Children Hospital Lahore
Serial No._____ Date.

Comparative Study of Blood Profile of Voluntary and Directed Donors
Demographics
Name: _____ **Age: _____**
Gender: _____ **Mr No: _____**

Hematological Parameters

	Voluntary Donor	**Directed Donor**
Hemoglobin		
Platelets		

Screening of Infectious Diseases

Infectious Agent	**Voluntary Donor**	**Directed Donor**
HBV	Positive/ Negative	Positive/ Negative
HCV	Positive/ Negative	Positive/ Negative
HIV	Positive/ Negative	Positive/ Negative
Syphilis	Positive/ Negative	Positive/ Negative
Malaria	Positive/ Negative	Positive/ Negative