JPSIM Journal of Pakistan Society of Internal Medicine

Original Article

Prevalence of Adverse Donor Reactions among Healthy Blood Donors Presenting in a Tertiary Care Hospital Blood Bank

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Abstract

Objective: To determine the incidence and types of adverse donor reactions among healthy blood donors during the blood donation process.

Methods: In this descriptive cross-sectional study, which was carried out at Blood Bank Jinnah Hospital, Lahore, over a period of six months from Aug 2023 to Jan 2024, a total of 550 healthy blood donors aged 18-60 years fulfilling the donation criteria were enrolled. After the informed consent, the study participants were observed during the whole donation process. Collected data were analyzed using SPSS software.

Results: Data from 550 donors consisting of 543 males and 7 females revealed mean age, height and weight of 28 years, 167 cm and 71 kg respectively. 484 (88%) were Rh positive blood groups and 66 (12%) were Rh negative groups. 28 (5.1%) donors experienced some adverse reactions and all were males. 8 (28%) of 28 were donating for the first time. All the reactions were mild to moderate in nature and no medical emergency or life- threatening situation appeared. 8 (28%) had slow pulse and fall in BP, 5 (18%) had nausea, 3 (10%) fainted, 3 (10%) were double pricked, 2 (7%) experienced warmth and head sweating, 2 (7%) had cold extremities, 2 (7%) had pain at the local site, 1 (4%) vomited, 1 (4%) felt fatigue, and 1 (4%) developed a hematoma.

Conclusion: Blood donation is a safe and risk-free procedure as only a few donors have experienced mild to moderate reactions. Proper training of blood bank staff and counselling of blood donors can reduce these adverse events more effectively.

Keywords: Blood Donation, Blood Donor, Adverse reactions, Blood bank, Tertiary care hospital, Lahore.

How to cite this:

Ranjha I, Chaudhary HT, Amin I, Fateen T, Saeed M. Prevalence of Adverse Donor Reactions among Healthy Blood Donors Presenting in a Tertiary Care Hospital Blood Bank. J Pak Soc Intern Med. 2025;6(3): 239-244

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Received: 15-02-2025 **Revised:** 25-02-2025 **Accepted:** 29-07-2025

DOI: https://doi.org/10.70302/jpsim.v6i3.2544

Introduction

Blood transfusion is a critical component of modern healthcare, saving millions of lives globally every single year. Patients undergoing surgeries, trauma victims, cancer patients, and individuals with chronic conditions all rely on timely access to safe and compatible blood products. The success of medical interventions depends on a steady supply of blood, making blood donation a vital public health activity. Approximately 30% of the global population requires blood or its products at some point in their lives 1. Whether for emergency situations like natural disasters, accidents, war situations, major surgeries with high risk of blood loss, or chronic conditions like thalassemia, hemophilia and sickle cell anemia, chemotherapy and radiation therapy for cancer treatment, blood transfusions are a lifeline for patients.[1,2]

In Pakistan, there are around 170 government and 450 private blood banks, with most of them attached to hospitals. Even in large cities, there is a significant blood shortage, with the supply falling short of more than half of the demand. However, many blood donations in Pakistan are made as replacements by family or friends, with only a small contribution from volunteer blood donors. The system is driven by

demand rather than supply, putting an additional burden on the patient's family.[3]

Blood donation, undoubtedly, plays a pivotal role in providing not only whole blood, but also other blood products like PCVs, FFPs, Platelets and Plasma etc. Modern healthcare system demands a steady supply of safe blood and blood products, to save precious lives. It is the blood donation that fuels this system. Although, the donation process is safe and low risk step of blood banking as only 0.1% to 3.0% of donors may experience some adverse reactions during the donation procedure but the risk of these adverse donor reactions cannot be overlooked.

Adverse donor reactions can be categorized into local and systemic reactions. Local reactions include pain at the needle insertion site, double pricks, some sort of bruising, and hematoma formation. Systemic reactions are further classified into vasovagal reactions, allergic reactions, and general discomfort. Vasovagal reaction may arise due to a sudden drop in blood pressure. This includes nausea, dizziness fainting etc. Allergic reactions comprise of itching or development of hives. While the general discomfort may be feeling weak, lightheadedness, fatigue, etc.

Adverse donor reactions are often classified into mild, moderate, and severe on the basis of risk factors and possible life-threatening situations. Mild reactions are those that are relatively minor and typically resolve without significant medical intervention. These reactions may include symptoms such as mild dizziness, lightheadedness, nausea, or mild allergic reactions like itching or localized rash at the prick site. While these reactions may cause discomfort to the donor, they usually do not pose significant risks to their health and can be managed with simple measures such as rest, hydration, or administration of antihistamines. Moderate reactions are more severe than the mild ones and they require proper management to be settled. They include dizziness, fainting, vomiting, etc. They typically do not result in long-term complications or serious health consequences. Severe adverse donor reactions are those that pose immediate threats to the donor's health and require urgent medical attention. These reactions may include symptoms such as severe anaphylaxis, profound hypotension, loss of consciousness, seizures, or cardiac arrest. Severe reactions are rare but can result in life-threatening complications if not promptly recognized and managed. Healthcare providers must be prepared to initiate appropriate resuscitative measures and provide advanced medical care to stabilize the donor's condition and prevent further harm.

Blood donors are the basic component of the whole blood banking system; they are the ones who maintain the continuous supply of blood and blood products to save several lives. In this scenario, there is no other opinion that the safety of blood donors is as important as the safety of patients. Furthermore, any complication faced by the blood donors may limit their subsequent visits for blood donations2. In recent times this fact has drawn the attention of modern researchers, and they are doing studies on this area which was previously less explored as compared to transfusion reactions or other possible reactions. Internationally, much research is being conducted to get elaborate knowledge on this topic in order to make the donation process even safer and lower risk.

At present, this topic is even less explored, only a few studies can be found. A study conducted in tertiary care hospital of Islamabad reports the prevalence of adverse reaction to be 0.7%3. This ratio may vary in different demographics where the donors are comparatively less educated. Several myths and misconceptions prevail in our country related to blood donation which makes the potential blood donors reluctant to donate.

This study will be a valuable addition to the knowledge of adverse donor reactions in our local areas, providing a clear picture of possible risks in the donation procedure and it will motivate potential donors to donate to the noble cause.

Methods

Study Design settings: This prospective descriptive cross-sectional study was conducted in the Blood bank of Jinnah Hospital, Lahore for a duration of 6 months.

Sample size: A sample size of 550 donors was statistically calculated and Non-probability consecutive sampling technique was used to collect the data.

Inclusion & Exclusion criteria: All donors aged 18-60 years of either gende,r fulfilling blood donation criteria by JHL blood bank were included in this study. Donors with the history of hospital associated anxiety were excluded from the study.

Instrument for data collection: A structured proforma was used for data collection. The proforma was particularly designed to record donor demographic and medical information and all the possible adverse donor reactions.

Data Collection Procedure: During the study period, potential blood donors fulfilling the inclusion criteria presented in Jinnah Hospital Blood Bank were identified as the sample population.

Written informed consent was obtained from each blood donor, ensuring that they understood the purpose of the study, their rights as participants, and the confidentiality of their information. Each participant was observed during the whole process of blood donation. The collected data related to the donor's condition during the process was systematically recorded. Appropriate statistical methods and software were utilized to analyze the collected data.

Data Analysis: All data collected were tabulated and analyzed using Statistical Package for Social Sciences (SPSS) software, SPSS 20.0 (SPSSA Inc., Chicago, USA). Quantitative data, i.e., age, was summarized as mean and standard deviation. The categorical value was expressed in the form of frequencies and percentages. Bar charts and pie charts were used to display the data. Appropriate statistical tools were applied to analyze the data.

Results

Among 550 blood donors a significant participation was from male side. About 98.7% (543) were males whereas only 1.3% (07) were females. The numbers reveal higher tendency of blood donation in males as compared to females. As shown in fig. no.1.

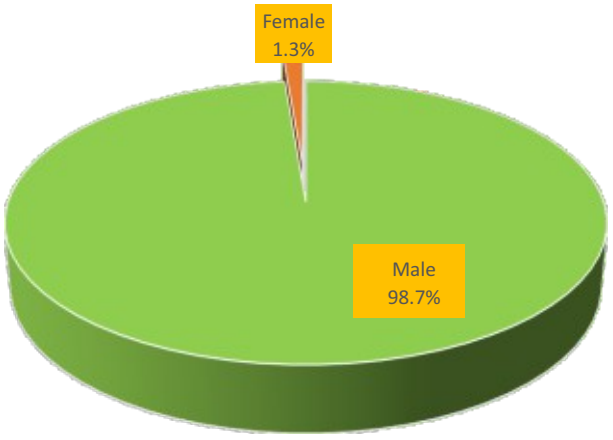

Figure 1: *Gender distribution among study population.*

Data analysis revealed the mean age of 28 years, indicating the trend of blood donation in young donors. The average height was 167cm and the average weight was 71kg.

Evaluation of the data revealed interesting insight of ABO blood group distribution among the donors which is tabulated below in table no.1. With 35.8% and frequency of 197, B blood group was the most prevalent ABO blood group in the study population, followed by O blood group with 29.6% and 163 frequency, then blood group A with 28% and 154 frequency and the AB blood group lagged behind all with 6.5% and frequency of 36 among the given study population.

Table 1: *Distribution of ABO blood group among study population.*

Blood Group	n	%
A	154	28
B	197	35.8
AB	36	6.5
O	163	29.6

Analysis unveiled the predominant percentage of Rh-positive donors which was found to be 88% with the number of 484 while the Rh-negative donors were just 12%, 66 in number. Moving forward to the prevalence of adverse reactions, only 28 out of 550 participants with a percentage of just 5.1% experienced some sort of donor reactions during the donation process as mentioned in Fig. no.2. Interestingly, all were males who had adverse reactions. This may be due to the very low percentage of females in the study population.

Figure 2: *Percentage of donors with some adverse reaction and without any reaction.*

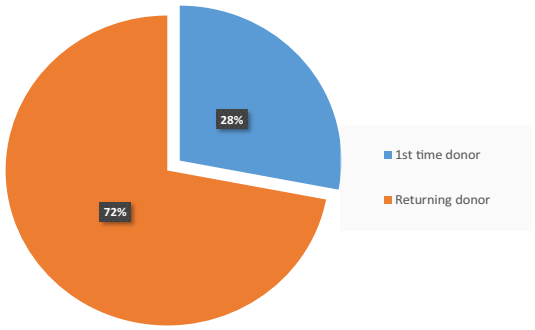

Figure 3: *Adverse donor reactions; 1st time donor Vs returning donor.*

Among the donors who experienced the adverse reactions, 8 with the percentage of 28% were donating for the first time whereas 20 donors with the percentage of 72% were returning donors as shown in Fig. no.3 .

Detailed analysis of donor reactions observed clarifies that all reactions were mild to moderate in nature and no medical emergency was required. Most of them were hypotension and bradycardia. The details are tabulated below in Table No. 2 and in graphical form in Fig No. 4.

Table 2: *Adverse donor reactions with their frequencies and percentages.*

Reaction	n	%
Bradycardia & Hypotension	8	28.5
Nausea	5	17.8
Fainting	3	10.7
Double pricks	3	10.7
Feeling warmth	2	7.1
Cold extremities	2	7.1
Local site pain	2	7.1
Vomiting	1	3.5
Fatigue	1	3.5
Hematoma formation	1	3.5

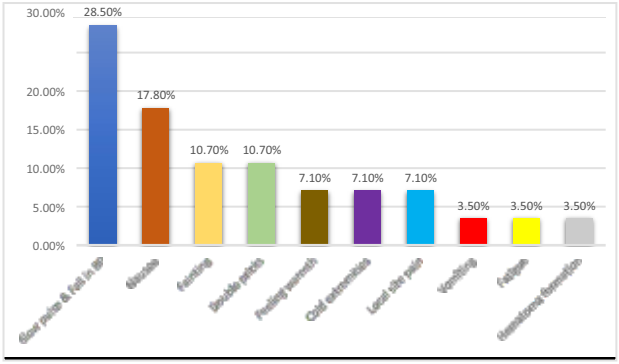

Figure 4: *Adverse donor reactions with their percentages.*

Considering the observed reactions, they are divided into two categories: vasovagal systemic reactions and local site reactions. Vasovagal reactions with a frequency of 22 accounted for 78.5% of total reactions while local site reactions were only 21.5% with a frequency of 6 as mentioned in Table 3.

Table 3: *Distribution of vasovagal and local site reactions among reactions observed.*

Reaction type	n	%
Systemic vasovagal reaction	22	78.5
Local site reaction	6	21.5

Discussion

A systematic surveillance of adverse donor reactions is critical to ensure blood safety and donor health. An effective management system enhances donor satisfaction and encourages other potential donors to donate blood. The system includes proper encounter with the donor from his entry into the blood bank to his exit. The donor is communicated with all the relevant information regarding the donation process which includes the donation time, his body position during the procedure, and is advised to ask for help if any unwanted event occurs. The donors are monitored during the entire procedure and in case of any complication, relevant staff provides the due medical assistance to maintain donor safety from any possible side effects. This study aimed to calculate the frequency of different adverse events to get more knowledge about donor reactions.

The gender distribution in our study aligns with previous research, highlighting a significant male predominance in blood donation. Our findings show males accounted for 98.7% of donors, while females comprised only 2.3%. This mirrors similar distributions (97.5% males, 2.4% females) reported in previous studies4 3. However, Malhotra & Negi in 2023 noted a less pronounced gap (80.9% males, 19.1% females) 5. While some studies underscore substantial male dominance, others, like Malhotra & Negi indicate a smaller gap. This variation underscores the need for targeted campaigns to increase female participation, addressing barriers such as logistical issues and misconceptions. Implementing tailored initiatives can foster gender equity and a more diverse donor pool.

In this study, we found the rate of adverse donor reactions about 5.1%, which is higher than the studies conducted in some developed countries. A study conducted in Oman in 2016 reported the rate of 1.3% of the study population that has some adverse reactions6. A study conducted in 2012 found adverse donor reactions occurred at a rate of 2.8%7. A study also reported 1.6% of blood donors with adverse donor reactions8. A single-center study of vasovagal reaction in blood donors calculated a vasovagal reaction rate of 1.23% 9. A study conducted in Islamabad, Pakistan, collected information from more than 40 thousand donations and reported a reaction rate of 0.7%3. In our study, the reaction is a bit higher which may be an indication of less educated donors. The higher frequency of replacement donors may also be a cause for this higher rate, as the relative of the patient undergoes stress related to the treatment and other financial issues as well. The higher rate may also be indicative of a less comfortable environment in donation areas and less trained blood bank staff.

Making donor-friendly, comfortable donation areas and providing blood bank staff with appropriate training may reduce the reaction rate.

In our study, vasovagal reactions were predominantly at a higher rate with 78.5% of total reactions observed while the remaining reactions were local site reactions accounting 21.5% of total reactions. These findings can be seen in previous studies as well. A study found 82.2% of vasovagal reactions with the highest presence of slow pulse rate reaction3 which can be seen in our study also, where we found 28% of all donor reactions with a slow pulse rate. A study also reported similar findings with the highest rate of vasovagal reactions among all the observed reactions10. A five-year Italian research also reported that the vasovagal reactions are amongst the highest rate of all reactions observed11. A study on vasovagal reactions found a reaction rate of 1.23% of the study population9. So, the vasovagal reactions are the most prevalent reactions of all. These reactions usually are mild in severity and can easily be managed with some medical interventions.

Our study found all the reactions were observed in male donors, the same findings can be seen in an international study 12. This is definitely due to the very low frequency of female donors. The studies with higher percentages of female donors reported females at a higher risk of adverse reactions[9,13]. A higher percentage of female donors is needed to get a clearer picture of donor reactions in female donors.

In this study, we found 72% of adverse reactions were in returning donors while 28% of reactions were in 1st time donors. This again is due to the very low frequency of 1st time donors in our study population. Studies with higher frequencies of 1st-time donors reported them at a higher risk of adverse reactions.10[9] Majority of participants were replacement donors and returning donors, so this study gives less clarity about the donor reactions in voluntary and 1st time donors.

Our study found the donation process a safe and risk-free procedure with no life-threatening situation occurrence, the same findings have been reported by previous studies. A study reported all the reactions were mild in intensity with no medical emergency3. A study found the donation process safe and risk-free as all the observed reactions were pre-syncopal with no life-threatening situation 14. A study conducted in 2016 also declared it a risk-free and safe procedure6. Further studies also found blood donation and apheresis donation are both risk-free procedures11.

This was a study with a sample size of 550 which may not be representative of the entire population. A study with a relatively larger sample size will provide more accurate and reliable results.

There was unequal representation of females in this study due to which we could not get enough information regarding the prevalence of the adverse reactions in females. Studies with an equal representation of both males and females will provide reliable results.

Conclusion

Blood donation proves to be a safe and risk-free procedure as only a small number of donors had to face some sort of reaction. Most of the reactions were vasovagal systemic reactions followed by local site reactions. All the reactions were mild to moderate in severity, which did not last long and could easily be managed with the help of some medical intervention. No life-threatening or medical emergency occurred which emphasizes the fact that there is no major side effect of donating blood. Eligible donors should contribute enthusiastically to this noble cause of blood donation saving hundreds of lives.

Moreover, data analysis revealed the predominant frequency of males with 98.7% in blood donation whereas females accounted for only 1.3%. Adequate steps are needed to be taken to enhance and encourage potential female donors.

Recommendations

The adverse reactions can be reduced by taking some steps at the donation area of the blood banks. The blood bank staff dealing with the donors should be trained and capable of proper counseling and management of the donors. For this multiple training sessions and seminars should be arranged for the Blood Bank professionals.

The donation areas should be comfortable and donor friendly. The installation of television and artwork will provide a more comfortable environment. Any disturbance or excessive involvement of either patients or other blood bank staff will increase the risk of adverse reactions. Lastly, the relevant staff should be capable of coping with any possible complication with adequate and timely medical intervention, this will minimize the risk of any adverse reaction.

Ethical Approval: The IRB/EC approved this study via letter no. ERB150/3/14-09-2023/S1 ERB Dated September 14, 2023.

Conflict of Interest: *None*

Funding Source: *None*

Authors' Contribution

IR: Conception

TF,MS: Design of the work

HTC,IA: Data acquisition, analysis, or interpretation

IR,HTC,IA,MS: Draft the work

IR: Review critically for important intellectual content

All authors approve the version to be published

All authors agree to be accountable for all aspects of the work

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