*Original Article*

# Analysis of Immediate Adverse Reactions After Blood Donation: A Descriptive Study

*Tamanna Afroz[1], Farabi Ahmed[2], Abu Jafar Mohammed Saleh[3]*

1. Associate Consultant, Transfusion Medicine, Evercare Hospital Dhaka.
2. Registrar, Transfusion Medicine, Evercare Hospital Dhaka.
3. Senior Consultant and Coordinator, Hematology and Stem cell Transplant, Evercare Hospital Dhaka.

**** Address for Correspondence:***
Dr. Tamanna Afroz,
Associate Consultant,
Transfusion Medicine,
Evercare Hospital Dhaka.
E-mail: tamanna.afroz@evercarebd.com

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ABSTRACT

**Introduction:** Whole blood donation is generally considered to be a safe procedure, but occasionally adverse reactions of varying severity may occur during or at the end of the collection. The aim of this study is to analyze the frequency and type of immediate adverse reactions occurring in whole blood donation.

**Material and methods:** This was a record-based study conducted on all immediate adverse reactions related to whole blood donation performed over 36 months, from January 2019 to December 2021. After obtaining consent, donors were asked to complete a pre-donation questionnaire that gathered information on demographics and blood donation history. All donations were performed using 16-gauge needles from veins in the antecubital area after maintaining strict asepsis of venipuncture site. Blood collection was performed by trained technologists. Each donor was observed before, during and after donation for the occurrence of any adverse reactions. All reactions observed immediately after donation were recorded.

**Results:** Overall, 168 adverse reactions were reported in relation to the 32,002 donations, resulting in an overall adverse reaction rate of 0.52%, that is, an incidence of 1 in every 191 donations. Majority of donors who experienced adverse effects were in age group of 18-25 years (66, 39.3%). First time donors had higher frequency (61, 36.30%) for reactions. Vasovagal reaction of mild intensity was the most observed adverse reaction and accounted for approximately 72% of all adverse reactions noted. None of the donors with adverse reactions necessitated hospitalization.

**Conclusion:** The risk of complications related to blood donation is low. Analysis of blood donation-related adverse events enables identification of at-risk donors and supports the implementation of targeted motivational strategies, effective predication counseling and optimized care during and after blood donation.

**Key words:** *Blood, Blood donors, vasovagal reactions.*

## INTRODUCTION

Blood is a vital component in resuscitation. Worldwide, blood transfusion saves millions of lives every year. The demand for blood increases by 2-3% annually[1]. Blood centers must rely on healthy, selfless donors who are prepared to donate blood without anticipating any benefit in order to maintain a safe and sufficient blood supply due to the ongoing need[2].

Although whole blood donation is typically regarded as a simple and safe process, unpleasant responses of varied degrees of severity can occasionally occur during or after collection. It is impossible to know for sure which donors will react or not. Although there are environmental, psychological, physical, and demographic risks for a reaction, these factors are generally not very predictive. So even when present, the donor is still unlikely to have a reaction[3]. Symptoms range from a mild vasovagal reaction, nausea, vomiting and hyperventilation to hematoma, nerve injury, arterial prick and may culminate in delayed syncope, cardiac arrest and seizures[4]. Donor reactions are associated with lower donor return. It is important to react swiftly to initial complaints of giddiness, lightheadedness, pallor by stopping the donation immediately. Serious adverse reactions lead to loss of consciousness encountered in only 0.008-0.3% of the donor population[5,6] .

Depending on the onset time, the adverse reactions are categorized as immediate and delayed. Immediate adverse reaction occurs during or immediately after blood donation, usually within 15 minutes of blood donation[3]. These are mild symptoms such as dizziness, , lightheadedness or phlebotomy related

bruises and hematoma that resolve promptly but are still unpleasant for the donor. Adverse reaction occurring after 15 minutes of removal of phlebotomy needle or after the donor has left the blood bank is delayed adverse reactions[3]. Although blood centers cannot completely eliminate all risks associated with blood donation, the systematic analysis of adverse reactions had led to changes in collection procedures and policies that have significantly improved safety for the most susceptible groups[2].

Hemovigilance is a system of surveillance designed to monitor, report and improve safety of blood transfusion. The goal is to identify and prevent occurrence/recurrence of transfusion related unwanted events in order to increase the safety, efficacy and efficiency of blood transfusion. In recent years, blood centers have focused on the practical application of donor hemovigilance, which is an effort to monitor, track and trend reactions after blood donation, in order to design and implement preventive measures[7]. The Association for Advancement of Blood and Biotherapies (AABB) has proposed the establishment of a national hemovigilance program that would include a donor adverse reaction[8]. A nationwide hemovigilance system has not yet been established in Bangladesh. While a few tertiary care centers have initiated monitoring of donor reactions, there is currently no systematic analysis or utilization of the collected data. However, the implementation of a structured hemovigilance system is imperative to enhance transfusion safety and ensure evidence-based improvements and quality nationwide.

The aim of this study is to analyze the frequency and type of immediate adverse reaction occurring in whole blood donation so that appropriate actions can be taken through proper educational processes to prevent occurrence and recurrence of these reactions.

## MATERIAL AND METHODS

This was a record-based study conducted on all immediate adverse reactions related to whole blood donation performed over 36 months, from January 2019 to December 2021at Transfusion Medicine Department of Evercare Hospital Dhaka. The criteria for the selection of eligible blood donors used by the department were adapted from WHO blood donor selection criteria. Informed consents were collected from all donors. After obtaining consent, donors were asked to complete a pre-donation questionnaire that gathered information on demographics and blood donation history. A warm, friendly and comfortable atmosphere for donors was provided. All donations were performed using 16-gauge needles from veins in the antecubital area after maintaining strict asepsis of venipuncture site. Blood collection was performed by trained technologists. Each donor was observed before, during and after donation for the occurrence of any adverse reactions. All reactions observed immediately after donation were recorded. The department has a protocol for managing adverse donor reactions. Donors were given refreshment and retained in the recovery room for at least 15 minutes before leaving. They were advised to communicate with the transfusion medicine department if they feel any complaints afterwards. Once the donor recovered, a detailed report was filled by a technologist. Other adverse reactions that were reported later were not included.

## RESULTS

Overall, 168 adverse reactions were reported in relation to the 32,002 Donations, resulting in an overall adverse reaction rate of 0.52%, that is, an incidence of 1 in every 191 donations. There was a male dominated donor pool (97.6%) who consisted mainly of young adults (Table 1). Directed donations have been shown to be more popular (70.3%) than replacement donations (29.7%).

Majority of donors who experienced adverse effects were in age group of 18-25 years (66, 39.3%) (Table 2). First time donors had higher frequency (61, 36.30%) for reactions. Vasovagal reaction of mild intensity was the most observed adverse reaction and accounted for approximately 72% of all adverse reactions noted (Table 3). The mean weight of blood donors who experienced adverse reactions was 52 kg. Most of the adverse reactions occurred in the blood donation room. No instances of faint-

ing/loss of consciousness or other more serious reaction types were observed. None of the donors with adverse reactions necessitated hospitalization.

We tried to analyze the incidence of adverse events among different blood groups and found that 'O' positive blood donors had the highest reaction (29.16%) among other blood group donors and lowest in 'AB' negative (1.2%) (Table 4). There were no adverse events in 'O' negative donors.

**Table 1:** Distribution of donors by gender

| Gender | Total number (n) | Percentage (Among regular donations) |
|---|---|---|
| Male | 31,230 | 97.6 |
| Female | 772 | 2.4 |

**Table 2:** Distribution of adverse reactions according to age group

| Age Range | Total number (n) | Percentage (%) |
|---|---|---|
| 18 - 25 years | 66 | 39.3 |
| 26 - 40 years | 59 | 35.1 |
| 41 - 60 years | 43 | 25.6 |

**Table 3:** Distribution of donors according to adverse reaction

| Adverse reactions | Total number (n) | Percentage (%) |
|---|---|---|
| Vasovagal reaction | 121 | 72 |
| Nausea | 23 | 13.7 |
| Vomiting | 2 | 1.2 |
| Dizziness | 15 | 8.9 |
| Hematoma | 2 | 1.2 |
| Extravasation | 5 | 3 |

## DISCUSSION

Various factors like age, sex, height and weight as well as other factors such as proper nutrition, adequate sleep, first time donation status, stress, lack of drinking before donation, fear of donation and finally the volume of donated blood can cause the occurrence of adverse reactions[9]. Also behavior of collection staff, use of donor chairs versus flat bed and methodology used to obtain information impact the donation process. Published international data indicate a board range of reported reaction rates (<1% to >20%), reflecting significant variability in the classification of complications and methods used to quantify severity[2]. Therefore, direct comparison of blood donation complication data between countries is difficult. This difference even exists in the studies conducted in the same country. We recorded only adverse reactions during the donation period and stay in the recovery room. We found the overall rate of complications related to blood donation to be low, even when considering all mild complications. Our reaction rate is in accordance with various studies conducted all over the world[4,7,10,11].

**Table 4:** Distribution of adverse events according to blood group

| Blood group | Frequency (n=168) | Percentage (%) |
|---|---|---|
| 'A' positive | 48 | 28.6 |
| 'B' positive | 32 | 19.4 |
| 'AB' positive | 21 | 12.6 |
| 'O' positive | 49 | 29.2 |
| 'A' negative | 9 | 5.4 |
| 'B' negative | 6 | 3.6 |
| 'AB' negative | 3 | 1.2 |

In our study, majority donors who experienced adverse reactions were young (18-25 years). Young donors have 3-fold more likely to experience adverse reactions than older. In 2008, the AABB Task Force recommended that blood centers implement one or more strategies to reduce adverse reactions among young donors and establish monitoring programs to continuously assess donation safety[2]. Our study also revealed that first time donors had higher frequency of reactions. A Greek study found first-time donors (1.7 vs 0.68%) had a significant greater possibility to have a reaction[12]. Repeated donation status lowered the chance of adverse reactions. In one study, 9% of donors who had adverse reactions at their first donation did not return for the subsequent donation[13].

Vasovagal reactions are most frequently reported adverse events associated with whole blood donation and are generally attributed to physiological responses to acute intravascular volume changes and autonomic dysregulation occurring during or shortly after phlebotomy. It is worth noting that the maximum volume of blood withdraw during the donation (450+- 10%) represents only about 10% of the total blood volume in a subject weighing 70kg. Since at least 800-1,500ml of blood ie 15-20% of the total blood volume would have to be lost in order to be in at least class I risk of hypovolemia, blood donors are unlikely to experience severe vaso vagal reactions[10]. In the present study, vasovagal reactions accounted for 72% of all donation related adverse events, highlighting their predominance within our donor population. This observation is consistent with previous epidemiological studies identifying vasovagal reactions as the leading cause of donor complications[7,10]. Vasovagal reactions in our study were significantly associated with younger age, female sex and first-time donation status. The higher incidence observed among younger donors may reflect increased autonomic responsiveness and reduced hemodynamic tolerance to blood volume shifts. In contrast, age-related improvements in cardiovascular and autonomic stability may contribute to the lower frequency of reactions among older donors. Published data indicate that vasovagal symptoms occur approximately 2-5% of blood donors, with syncope reported in 0.34-0.8%[14]. Although most reactions are transient and self-limiting, their high relative contribution to overall adverse events particularly among first time and younger donors has important implications for donor safety and retention. These findings support AABB recommendations for targeted preventive measures and continuous monitoring to reduce donation-related reactions and enhance overall donor safety. Preventable measures could be addressing fear in potential donors, improving donor attitude, water fluid preloading and application of muscle tension and decrease blood donation duration.

South east Asia account for 25% of world's population and collects only 9% of the world's blood supply. Bangladesh annual demand is 2,00,000 -2,50,000/year but hardly met[15]. In US 2016, 30,868 blood donations were investigated, of which 0.34% had caused systemic reactions in donors[16]. Blood centers should have an effective and comprehensive program to monitor donor complications as the keystone of a donor safety program. A supportive hospital-based donation environment is essential to ensure donor safety and promote donor satisfaction, both of which are critical for encouraging repeat blood donation. Provision of a friendly, comfortable and reassuring atmosphere has been shown to reduce donor anxiety and improve overall donation experience. Engaging donors in calm conversation, particularly those who are anxious, during phlebotomy may serve as a distraction and help mitigate stress related reactions. Whole blood collections utilize large-bore (16 gauge needles) for phlebotomy, which achieve rapid blood flow and minimize clotting and hemolysis but also introduce a risk of injury. Established phlebotomy guidelines highlight the importance of staff training and technical competence. History of past donor reaction places the donor at higher risk for another reaction.

Adequate hydration before donation along with nutritional intake is considered an important preventive measure by many. The mechanism is thought to be gastric distention, increasing sympathetic activation[5]. In the current study, reactions were mild and limited to nausea, vomiting, dizziness, hematoma and extravasation. No nerve injury was noticed. Even minor reactions and transient symptoms discourage return donation by 36%, with more severe reactions further decreasing the likelihood by 66% .

Limitations of this study were that delayed adverse reactions were not included which occur after the donor had left the department.

## CONCLUSION

The prevalence of adverse reactions in our study was low. Our study confirms the fact that blood donation is a very safe procedure which can be made even more event-free by designing protective practices. Donor safety is an integral and very

important component of blood transfusion safety which needs to be strengthened through regular appraisal of adverse reactions that occur following blood donation.

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