*Original Article*

# A Two-Year Study of Adverse Donor Reactions Associated with Plateletpheresis in a Tertiary Care Hospital at Dhaka, Bangladesh

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## Abstract

***Background:*** *Plateletpheresis is a process in which healthy donor blood is passed through an apparatus that separates platelets, returning the remaining components to circulation.* ***Objective:*** *To determine the frequency of adverse donor reactions during plateletpheresis procedure.* ***Materials and method:*** *This retrospective study was carried out in Department of Transfusion Medicine of BIRDEM General Hospital at Dhaka, Bangladesh,from January 2020 to December 2021. A total of 275 healthy male blood donors participated after providing informed written consent and were selected according to the national guideline's Standard Operating Procedure (SOP). Data on adverse effects experienced by donors during the plateletpheresis procedure were recorded and analyzed retrospectively.* ***Results:*** *Among the participants, 12(4.36%) donors encountered various reactions. Specifically, 7(2.54%) donors had mild hypocalcemic symptoms, 3(1.09%) donors developed local reactions like hematoma and swelling at the venipuncture site and 2(0.73%) donors reported mild vasovagal reactions. Among those affected 8 (66.6%) donors were undergoing plateletpheresis for the first time, while 4(33.4%) donors were repeat donors.* ***Conclusion****: Effective training for technical personnel and supervision by transfusion specialists are crucial for minimizing donor reactions during apheresis procedures. Close monitoring and*

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*timely interventions improve the donor experience, ensuring safety and comfort throughout the procedure.*

***Keywords:*** *Adverse reaction; BIRDEM; Donor; Plateletpheresis.*

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## Introduction

The term "apheresis" originates from the Greek, meaning "to remove" or "take away."[1] Plateletpheresis is a procedure where whole blood is processed from a donor to separate platelets, known as single donor platelets (SDP), with the remaining blood components returned to the donor.[2] This process involves passing blood through a specialized apparatus under physician guidance and specific area supervision.[3,4] A routine plateletpheresis procedure typically lasts 1-1.5 hours. The product is prepared in a closed automated system and can be stored for up to 5 days. Normally, the number of platelets collected in an apheresis product equals 6-8 units of random donor platelets (RDPs).[5] In recent years, there has been a growing preference for apheresis platelets over the past decade due to several advantages over random donor platelets (RDPs) which include significantly reduced risks of transfusion-transmitted infections, bacterial contamination, and alloimmunization due to reduced donor exposure.[6,7] Platelets obtained via apheresis are used both therapeutically and prophylactically, benefiting patients with thrombocytopenia or platelet functional defects. Therapeutically, platelets are transfused when platelet counts fall below 50x10^9/L in the presence of diffuse microvascular bleeding, while prophylactically, they are used to prevent or stop bleeding.[8] Apheresis procedures are generally well-tolerated, though adverse events of varying severity may occur during or after the procedure. Donor reactions are categorized as local or systemic.[4] Local reactions often involve hematomas due to vein extravasation during venipuncture, leading to pain, redness, and swelling.[4,9] Systemic reactions primarily include vasovagal responses triggered by pain or anxiety, characterized by pallor, sweating, dizziness, nausea, hypotension, and even fainting. Citrate toxicity can also occur due to the use of acid-citrate-dextrose in apheresis.[9] The primary aim of this study was to analyze adverse donor reactions during plateletpheresis procedures conducted at a tertiary medical college hospital in Dhaka, Bangladesh.

## Materials and method

This retrospective record-based study was conducted in the Transfusion Medicine Department at BIRDEM General Hospital at Dhaka, Bangladesh, from January 2020 to December 2021. A total of 275 plateletpheresis procedures were performed using the Haemonetics MCS+ system, following informed written consent from the donors. All donations were collected using a 16-gauge needle inserted into a vein in the antecubital fossa, with strict adherence to aseptic precautions.

Donors were selected after a complete medical history was obtained using a questionnaire, followed by a physical examination and assessment of vital parameters, in accordance with the criteria for Single Donor Platelet (SDP) preparation and pre-donation screening protocols according to standard operating procedure.[10]

- Weight 60 kg or more
- Age between 18 to 60 years
- Hb ≥12.5 g/dl
- Donors who have taken aspirin containing medication within 36 hours are usually deferred
- Interval between procedures should be at least 48 hours. A donor shall not undergo the procedure more than 2 times in a week or 24 times in a year.

- Platelet count >1.5 lakh.
- Absence of any illness
- Negative test for HIV, hepatitis B, HCV, syphilis, malaria

The adverse events during the process of plateletpheresis have been broadly divided intothree main types: vasovagal reactions, vascular injuries, and citrate toxicity.[9,11,12] Vasovagal reactions encompassed symptoms such as nausea, vomiting, syncope, sweating, pallor, dizziness, weakness, hypotension, and vascular injuries such as hematoma formation or bruising at the venipuncture site. Citrate toxicity was classified based on severity into two types: mild and severe. Mild citrate toxicity typically manifested as a tingling sensation starting from the perioral area. Severe citrate toxicity included more serious symptoms such as loss of consciousness, convulsions, tetany, and incontinence. These classifications helped in assessing and managing adverse events during plateletpheresis procedures.

## Results

All 275 donors were male and replacement donors. The majority of donors (52.8%) fell into the age group of 26 to 35 years (Figure 1), minimum age being 19 and maximum being 55 years (Figure 2). Donor weight ranged from 60 kg to 110 kg, with the highest proportion (58.77%) in the 63-75 kg category. Out of the 275 plateletpheresis procedures performed, 12(4.36%) donors experienced adverse reactions, which were mostly mild in nature, as depicted in Figure 2. Specifically, seven donors (2.54%) had mild hypocalcemic symptoms such as tingling sensation around the mouth, three donors (1.09%) developed local reactions like hematoma and swelling at the venipuncture site and two donors (0.72%) reported mild vasovagal reactions characterized by nausea and vomiting. Among those affected 8 donors (66.6%) were undergoing plateletpheresis for the first time, while 4(33.4%) were repeat donors. All adverse events reported during the study period were of mild intensity, and no severe reactions occurred. All donors were managed conservatively, and none required hospitalization.

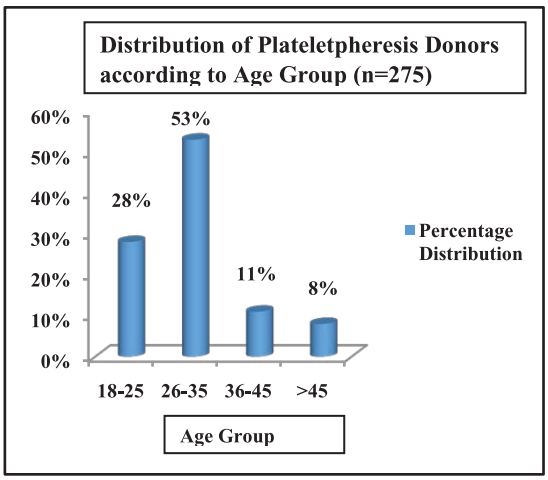


**Fig. 1: Distribution of Plateletpheresis Donors according to Age Group (N=275)**

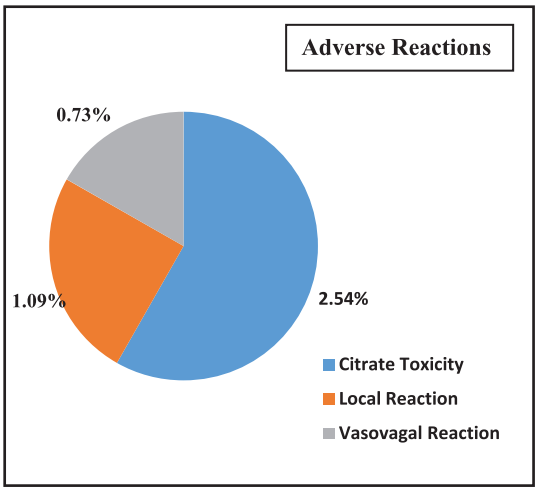


**Fig. 2: Adverse reactions during plateletpheresis procedure (N=12)**

## Discussion

Plateletpheresis donation commonly results in reactions and injuries that can be categorized as either common or uncommon. Unlike whole blood donation, where hypovolemic reactions are more frequent due to the loss of red cells and plasma, plateletpheresis involves replacing the lost volume with intravenous solutions, resulting in lower incidences of such reactions.[13] In the specific

study referenced, only male donors were included, as females did not meet the selection criteria for apheresis donation. Reasons cited included anemia, underweight conditions, poor vein quality, and potential alloimmunization due to multiple pregnancies, which rendered females unsuitable for donation.[14] Research consistently indicates a higher participation of male donors in plateletpheresis programs. Studies have also shown that male donors generally experience lower rates of adverse events compared to females in plateletpheresis procedures.[11,15,16] Body weight and mass play a crucial role in optimizing plateletpheresis donation, as larger donors with higher blood volumes can yield greater amounts of platelets per donation session. This criterion underscores the importance of selecting donors who can maximize platelet yield efficiently.[15] In the present study, the adverse effect on donors during plateletpheresis was 4.36%, which is almost similar with studies by Bonagiri et al.[17] (4.05%) and Dogra et al.[18] (4.59%). This incidence rate in our study is also consistent with findings from studies by Garget al.[19], McLeod et al.[4], and Philip et al.[20] However, the study conducted by Kajalet al.[21] reported adverse effects of 6% during plateletpheresis donation. Citrate-related reactions associated with apheresis are common mild adverse events for donors that are transient and self-limiting.[22] This phenomenon is well-known to result from the chelation of ionized calcium by citrate present in Anticoagulant Citrate Dextrose (ACD).[23] We found that 2.54% of reported citrate reactions, which is nearly comparable to the studies by Bonagiri et al.[17] (2.43%) and Dogra et al.[18] (2.74%), and higher than those reported by Philip et al.[20] (0.96%) and Garg et al.[19] (1%), but lower than that reported by Kajal et al.[21] (3.03%). In our study, we administered mouth-dissolving oral calcium tablets to all donors during the procedure. Bolan et al.[24] reported that the administration of 2 g of calcium carbonate was associated with a statistically significant reduction in the severity of citrate reactions. Donor-related adverse events, such as local reactions, often manifest as hematomas, typically due to faulty phlebotomy techniques resulting in blood extravasation. The present study reported an occurrence rate of 1.09% for vascular injuries among all plateletpheresis procedures, which is comparable to rates reported by Gargetal.[19] (1%), McLeod et al.[4] (1.15%), and Dograet al.[18] (1.2%). Most vascular injuries resulted from improper phlebotomy techniques by inexperienced technical staff, the donor's history of prior apheresis donations, and the anatomical characteristics at the venipuncture site. Unlike citrate reactions, which are more prevalent in repeat donors, the likelihood of bruising decreases with an increasing number of donations.[4,25] Systemic reactions primarily involve vasovagal reactions, which are typically triggered by anxiety associated with the apheresis procedure or fear of needle-pricks.[20] The present study reported a lower incidence (0.72%) of systemic reactions characterized by nausea and vomiting, which is similar to the findings of Dogra et al.[18] This low incidence is also consistent with studies by Bonagiri et al.[17] and McLeod et al.[4]. In comparison with our study, the frequency of vasovagal reactions was lower in the study conducted by Philip et al.[20] (0.096%) and higher in that conducted by Kajal et al.[21] (1.5%). Tomita et al.[11] also observed that the frequency of reactions rose with higher numbers of collection cycles and greater infusion volumes of ACD in donors. Consequently, they hypothesized that hypocalcemia could contribute to the initiation of vasovagal reactions in plateletpheresis donors.

**Conclusion**

Overall, apheresis donations performed on cell separators are considered safe procedures for donors with a lowincidence of adverse reactions. Any adverse reactions that do occur are typically mild and resolve quickly, with rates lower than those observed in whole blood donation. As the demand for apheretic platelets continues to rise in routine medical and surgical practices, it is crucial to maintain efforts in providing advanced training modules for technical personnel and ensuring supervision by experienced transfusion medicine specialists. These measures contribute to a more

positive donor experience. The lower rates of adverse reactions associated with apheresis procedures enhance donor safety and are significant in recruiting new donors. This emphasis on safety reinforces donor confidence and supports the ongoing supply of essential blood components.

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