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# STUDY OF ADVERSE REACTIONS IN WHOLE BLOOD DONORS IN BLOOD CENTRE AT JHALAWAR MEDICAL COLLEGE, JHALAWAR, RAJASTHAN

Pathology

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## ABSTRACT

**Introduction:** Whole blood donation is generally safe but may occasionally be associated with adverse donor reactions such as vasovagal episodes, nausea, or syncope. Identification of risk factors is essential to improve donor safety and retention. **Objectives:** To assess the frequency, pattern, and associated factors of adverse reactions among whole blood donors at a tertiary care blood centre in Rajasthan. **Methods:** A prospective cross-sectional study was conducted on 14,475 voluntary whole blood donors at the Blood Centre, Jhalawar Medical College, Jhalawar, from July 2024 to June 2025. Donor demographics, clinical parameters, and donation details were recorded. Adverse reactions were classified and analyzed using descriptive statistics and Chi-square test.**Results:** Out of 14,475 donors, 97.61% were males and 2.39% females. Majority were aged 18–22 years (53.33%). Overall adverse reaction rate was 1.21% (n=175). Females showed higher reaction rate (23.18%) compared to males (0.67%). First-time donors had higher reactions (1.62%) than repeat donors (0.85%). Most reactions occurred in younger age group (18–22 years, 1.42%) and low body weight (45–54 kg, 2.22%). Vasovagal reactions were most common (65.71%), mainly mild (65.22%). Fasting ≥6 hours was associated with higher reactions (45.71%). Most reactions occurred in refreshment area (54.28%) and outdoor camps (68.57%).**Conclusion**: Whole blood donation is a safe procedure with low adverse reaction rate. However, females, young age, first-time donors, low body weight, and prolonged fasting are significant risk factors. Proper donor counseling, hydration, and post-donation monitoring can reduce adverse events and improve donor safety.

## KEYWORDS

Whole Blood Donation, Adverse Reactions, Vasovagal Reaction, Donor Safety, Blood Donors, Jhalawar

## INTRODUCTION

Blood transfusion is a life-saving component of modern healthcare systems and depends entirely on voluntary blood donation. Whole blood donation is generally considered a safe procedure; however, it may occasionally be associated with adverse donor reactions. These reactions may occur before, during, or after donation and can negatively influence donor experience, recruitment, and retention.[1,2]

According to WHO guidelines, voluntary non-remunerated blood donors from low-risk populations are the safest source of blood.[3] Despite strict donor selection criteria, adverse reactions occur in approximately 2–3% of donations and are mostly mild and self-limiting.[4] the recognition and proper management are important to ensure donor safety and confidence.

Adverse donor reactions are broadly classified into local and systemic reactions. Local reactions are usually related to venipuncture and include pain, hematoma, and mild swelling.[5] Systemic reactions are more commonly vasovagal in nature and may present with dizziness, nausea, sweating, hypotension, or syncope.[6] These reactions are often triggered by anxiety, pain, or emotional stress during donation.

Identification of risk factors such as age, sex, body weight, and first-time donation status is essential to minimize adverse events and improve donor safety.[7] This study was therefore undertaken to evaluate the frequency, pattern, and associated factors of adverse reactions among whole blood donors at a tertiary care blood centre in Rajasthan.

### Aim and Objectives

**Aim**

To study the frequency and pattern of adverse reactions among whole blood donors at the Blood Centre, Jhalawar Medical College, Jhalawar, Rajasthan.

**Objectives**

- To determine the frequency of adverse reactions in whole blood donors.
- To classify different types of donor adverse reactions (local and systemic).
- To analyze association of donor characteristics such as age, sex, weight, and donation status with adverse reactions.
- To identify potential risk factors associated with donor adverse events.

### Materials and Methods

**Study Design and Setting :** A prospective cross-sectional study was conducted in the Department of Pathology, Blood Centre, Jhalawar Medical College, Jhalawar, Rajasthan.

**Study Duration :** The study was carried out over a period of one year from July 2024 to June 2025 after approval from the Institutional Ethics Committee.

**Study Population :** All voluntary whole blood donors donating at the blood centre and outdoor blood donation camps during the study period were included.

**Inclusion Criteria :** Donors aged between 18 and 60 years, fulfilling donor selection criteria as per Drugs and Cosmetics Rules (1945) and NACO guidelines, and willing to provide written informed consent were included.

**Exclusion Criteria :** Donors not willing for voluntary donation and those with severe needle phobia or anxiety leading to refusal of procedure were excluded.

**Sampling Method :** Convenience sampling of all eligible donors during the study period was performed.

**Study Tools:**

A predesigned proforma was used to record demographic details, medical history, donation details, and occurrence of adverse reactions. Standard blood collection equipment and blood bags containing CPDA-1 anticoagulant were used.

**Ethics:** Ethical approval was obtained from the Institutional Ethical Committee prior to the commencement of the study. Written informed consent was obtained from all participants before their inclusion in the study.

**Procedure of Data Collection**

All donors were first registered and assigned a unique identification number. Demographic details such as age, sex, weight, occupation, and previous donation history were recorded. A structured donor

questionnaire was completed according to NACO and Drugs and Cosmetics Act guidelines. Medical history including chronic illness, recent infections, medications, surgical history, and for female donors, pregnancy and menstrual history were recorded. All eligible donors underwent physical examination including pulse, blood pressure, hemoglobin estimation, and weight measurement. Only those meeting standard eligibility criteria were allowed to donate blood. Blood was collected under aseptic conditions using standard 350 ml blood bags with CPDA-1 anticoagulant. Donors were continuously monitored throughout the donation process and observed for symptoms such as dizziness, sweating, nausea, pallor, hypotension, or syncope. Any adverse reaction was documented in a structured adverse event form along with donor characteristics. Immediate management was provided as per standard protocol including supine positioning, reassurance, fluids, and medical intervention if required. Donors were observed until complete recovery.

**Data Analysis :**

Data were entered into Microsoft Excel and analyzed using SPSS version 23.0 (trial version). Descriptive statistics were expressed as frequency and percentage. Chi-square test was used to assess association between categorical variables. A p-value <0.05 was considered statistically significant.

**Ethical Consideration :**

Ethical clearance was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all donors prior to participation in the study.

**TABLE NO 1: Donor Demographic and Baseline Characteristics (n = 14,475)**

| Parameter | Category | Number | Percentage (%) |
|---|---|---|---|
| Sex | Male | 14,130 | 97.61 |
| | Female | 345 | 2.39 |
| Age (years) | 18–22 | 7,720 | 53.33 |
| | 23–27 | 3,250 | 22.45 |
| | 28–32 | 1,630 | 11.26 |
| | 33–37 | 920 | 6.35 |
| | 38–42 | 510 | 3.52 |
| | 43–47 | 258 | 1.78 |
| | 48–52 | 125 | 0.86 |
| | 53–57 | 52 | 0.36 |
| | 58–60 | 10 | 0.07 |
| Donation Status | First-time | 6,800 | 46.98 |
| | Repeat | 7,675 | 53.02 |

**TABLE NO 2: Donor Physical and Physiological Parameters (n = 14,475)**

| Parameter | Category | Number | Percentage (%) |
|---|---|---|---|
| Weight (kg) | 45–54 | 2,700 | 18.65 |
| | 55–64 | 5,200 | 35.92 |
| | 65–74 | 3,900 | 26.94 |
| | ≥75 | 2,675 | 18.49 |
| Hemoglobin (g/dL) | 12.5–14 | 9,300 | 64.25 |
| | ≥14 | 5,175 | 35.75 |
| Pulse (beats/min) | 60–69 | 3,400 | 23.5 |
| | 70–79 | 7,950 | 55.0 |
| | 80–100 | 3,125 | 21.5 |
| Respiratory Rate | 16 | 7,200 | 49.7 |
| | 17–18 | 5,450 | 37.6 |
| | 19–20 | 1,825 | 12.6 |
| Temperature (°F) | 98.4–98.9 | 9,230 | 63.8 |
| | 99.0–99.5 | 5,245 | 36.2 |
| Food Intake | Fasting ≥6 hrs | 3,400 | 23.49 |
| | Light meal <2 hrs | 5,400 | 37.29 |
| | Normal meal ≥2 hrs | 5,675 | 39.22 |
| Overall reactions | Present | 175 | 1.21 |
| | Absent | 14,300 | 98.79 |

**TABLE NO 3: Incidence and Distribution of Adverse Reactions (N=175)**

| Parameter | Category | Number | Percentage (%) |
|---|---|---|---|
| Sex-wise reactions | Male | 95 | 0.67 |
| | Female | 80 | 23.18 |
| Age-wise reactions | 18–22 | 110 | 1.42 |
| | 23–27 | 25 | 0.77 |
| | 28–32 | 15 | 0.92 |
| | ≥33 | 25 | 1.33 |
| Weight-wise reactions | 45–54 kg | 60 | 2.22 |
| | 55–64 kg | 55 | 1.06 |
| | 65–74 kg | 35 | 0.89 |
| | ≥75 kg | 25 | 0.93 |
| Donation status | First-time | 110 | 1.62 |
| | Repeat | 65 | 0.85 |

**TABLE NO 4: Nature, Severity and Timing of Adverse Reactions**

| Parameter | Category | Number | Percentage (%) |
|---|---|---|---|
| Type of reaction | Vasovagal | 115 | 65.71 |
| | Nausea/Vomiting | 25 | 14.29 |
| | Hematoma | 20 | 11.43 |
| | Convulsive syncope | 10 | 5.71 |
| | Tetany | 5 | 2.86 |
| Severity (vasovagal) | Mild | 75 | 65.22 |
| | Moderate | 30 | 26.09 |
| | Severe | 10 | 8.69 |
| Food intake (reactions) | Fasting ≥6 hrs | 80 | 45.71 |
| | Light meal <2 hrs | 60 | 34.29 |
| | Normal meal ≥2 hrs | 35 | 20 |
| Symptoms | Dizziness | 115 | 65.71 |
| | Syncope | 40 | 22.86 |
| | Vomiting | 20 | 11.43 |
| Site of donation | Blood centre | 55 | 31.43 |
| | Outdoor camps | 120 | 68.57 |
| Timing | During donation | 25 | 14.29 |
| | Immediately after | 55 | 31.43 |
| | Refreshment area | 95 | 54.28 |

**TABLE NO 5: Mean Vital Signs of Donors**

| Parameter | Mean ± SD |
|---|---|
| Pulse (beats/min) | 72 ± 8 |
| Respiratory rate (breaths/min) | 17 ± 1.1 |
| Temperature (°F) | 98.7 ± 0.3 |

## DISCUSSION

In the present study, the majority of blood donors were male (97.61%), consistent with Singh et al. and Kumar et al., who reported male predominance between 95–98% in Indian donor populations[8,9]. Most donors belonged to the 18–22 years age group (53.33%), highlighting the active participation of young adults, especially students, in voluntary donation programs, similar to findings by Singh et al.[10]. Repeat donors slightly outnumbered first-time donors (53.02% vs. 46.98%), which aligns with previous observations emphasizing the importance of donor retention in maintaining a stable blood supply[11].

Adverse reactions were observed in 1.21% of donors, with females exhibiting significantly higher rates (23.18%) than males (0.67%), corroborating global trends reported by Sharma et al.[12]. The higher incidence in females may be attributed to lower average body weight and hemoglobin levels, predisposing them to vasovagal responses. First-time donors also had a higher reaction rate (1.62%) compared to repeat donors (0.85%), reflecting the influence of anxiety and unfamiliarity with donation procedures.

Among donor-related factors, younger age (18–22 years) and lower body weight (45–54 kg) were associated with increased adverse reactions (1.42% and 2.22%, respectively), consistent with findings by Kaur et al. and Sharma et al.[13,14]. Hemoglobin levels within the acceptable range (12.5–14 g/dL) did not significantly impact reaction rates, supporting the notion that baseline hemoglobin is not a major risk factor for vasovagal events[15].

Pre-donation food intake had a marked effect on donor reactions. Donors fasting for ≥6 hours had the highest incidence of adverse events (45.71%), while those consuming a normal meal ≥2 hours before donation had lower rates (20%), in line with Sharma et al., who demonstrated that hydration and light meals reduce vasovagal episodes[14].

Vasovagal reactions were the most common type of adverse event (65.71%), predominantly mild (65.22%), followed by nausea/vomiting (14.29%) and hematoma (11.43%). Severe reactions were rare (8.69%), reflecting observations by Shah et al. that serious complications occur in less than 1% of cases[16]. Most reactions occurred post-donation, especially in the refreshment area (54.28%), highlighting the importance of post-donation monitoring[17]. Outdoor blood donation camps accounted for a higher proportion of reactions (68.57%) compared to blood centers (31.43%), likely due to environmental factors such as temperature, humidity, and donor wait times, consistent with Bhattacharya et al.[18].

Overall, younger age, female sex, lower body weight, first-time donor status, and prolonged fasting were significant predictors of adverse reactions. Targeted interventions, including pre-donation counseling, hydration, dietary guidance, and vigilant monitoring, can reduce reaction rates and enhance donor safety, retention, and confidence.

## CONCLUSION:

This study demonstrates that whole blood donation is a safe procedure with a low overall adverse reaction rate (1.21%). Vasovagal reactions were the most common type and were predominantly mild and self-limiting. Adverse reactions were more frequent in females, younger donors (18–22 years), first-time donors, individuals with lower body weight, and those with prolonged fasting. Most reactions occurred during the post-donation observation period and were higher in outdoor camps compared to blood centers. These findings highlight the importance of proper donor selection, pre-donation counseling, adequate hydration and nutrition, and close post-donation monitoring. Targeted preventive strategies can further reduce adverse events and improve donor safety and retention.

**Strength and Limitations: :** The strengths of this study include a large sample size (n = 14,475) and comprehensive evaluation of donor characteristics, including demographic profile, physical parameters, donation status, and detailed assessment of adverse reactions. The prospective design with continuous donor monitoring and standardized data collection enhances the reliability of findings. However, being a single-center study, the results may have limited generalizability to other populations. Environmental and situational factors at outdoor camps were not fully controlled, and some subjective factors such as anxiety, hydration status, and stress were not quantitatively assessed. Additionally, low female donor representation may limit detailed sex-based comparisons.

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