OPEN ACCESS

Saudi Journal of Biomedical Research

Abbreviated Key Title: Saudi J Biomed Res
ISSN 2518-3214 (Print) |ISSN 2518-3222 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Transfusion Related Adverse Effect in Diabetic Subjects in a Tertiary Care Hospital in Dhaka, Bangladesh: A Pilot Study

Afrina Nazmin[1], Nitun Saha Shuvro[1], Md. Asif Eqbal[1], Amrita Bhowmik[1]*

[1]Dept. of Applied Laboratory Sciences, Faculty of Health Engineering and Technology, Bangladesh University of Health Sciences (BUHS), Dhaka, Bangladesh

DOI: https://doi.org/10.36348/sjbr.2026.v11i08.002 | **Received:** 12.06.2026 | **Accepted:** 03.08.2026 | **Published:** 09.09.2026

***Corresponding author:** Amrita Bhowmik
Dept. of Applied Laboratory Sciences, Faculty of Health Engineering and Technology, Bangladesh University of Health Sciences (BUHS), Dhaka, Bangladesh

Abstract

Background: Blood transfusion safety is a major issue in transfusion medicine. Adverse transfusion reactions (ATRs) are necessary to identify to maintain blood transfusion safety. Our study aimed to determine the frequency and different type of ATRs in diabetes subjects reported in a tertiary hospital in Dhaka, Bangladesh. ***Materials and Methods:*** *It* was a retrospective cross-sectional study conducting in a tertiary care hospital in Dhaka in duration on June 2025 and December 2025. ATRs were evaluated by the blood transfusion officer and classified using standard definitions. ***Results:*** A total of 253 units of whole blood were transfused, 190 units transfused in diabetic subjects and 63 units in health subjects respectively. In total subjects 68% ATRs were found, involving allergic (17%), delayed hemolytic reactions and Transfusion-associated circulatory overload (TACO) (17%), Transfusion-Related Acute Lung Injury (TRALI) reaction (3%), bacterial contamination 7%, RBC destruction to foreign antigen (4%) and brady cardiac 3%) were noticed. Among 190 diabetic subjects, 68.4% ATRs were observed including 15.6% delayed Hemolytic reactions, 16.8% allergic reaction, 17.9% TACO, 3.2% TRALI reaction, 7.9% bacterial contamination, 4.7% RBC destruction to foreign antigen reaction and 2.1% brady cardiac reactions which were higher (p=ns) rate than health subjects. ***Conclusion:*** Our study concluded that 68% ATRs were noticed in total subject where as 68.4% ATRs noticed in diabetic subjects that carries high infection rate. Safe blood transfusion services may have decreased these ATRs issues.

Keywords: Whole blood transfusion, Diabetes mellitus, Adverse transfusion reactions.

INTRODUCTION

Diabetes is associated with long-term microvascular and macrovascular complications, which frequently require hospitalization and invasive medical interventions, including blood transfusion (Hendrickson *et al.,*2009; Savage 2016). Blood transfusion is an essential and life-saving therapeutic procedure used in the management of severe anemia, acute hemorrhage, trauma, perioperative or other serious conditions. Despite major improvements in transfusion safety and donor screening, transfusion therapy is still associated with significant risks, particularly non-infectious complications (Bux 2008; Domen *et al.,*2003). Acute transfusion reactions (ATRs) occur during or within 24 hours of transfusion and include febrile non-hemolytic transfusion reactions, allergic reactions, acute hemolytic reactions, transfusion-related acute lung injury (TRALI), transfusion-associated circulatory overload (TACO), and septic reactions. Early detection and prompt management are critical to prevent serious morbidity and mortality (Chapman *et al.,*2009; Toy *et al.,*2012). Hemovigilance systems have significantly improved transfusion safety by continues monitoring and reporting. However, underreporting remains a major challenge, especially in low- and middle-income countries (Bux J, Sachs 2007; Blumberg *et al.,*2010; Kaufman *et al.,*2015). Diabetic patients represent a potentially high-risk population for transfusion-related complications due to chronic inflammation, endothelial dysfunction, oxidative stress, and associated comorbidities such as renal and cardiovascular disease (Springer *et al.,*2009; Semple *et al.,*2019; ISBT 2011). Despite the increasing need for blood transfusion in diabetic patients, limited studies have specifically evaluated transfusion-related adverse reactions in this group (Springer *et al.,*2009). Therefore, this study aims to assess the frequency and different type of acute ATRs in diabetes subjects during the transfusion.

Aim and Objectives:

To evaluate transfusion-related adverse reactions in diabetic patients receiving whole blood transfusion. And the objectives are-

- To determine the frequency of transfusion reactions in diabetic patients
- To evaluate the ATRs of diabetic and nondiabetic subjects during transfusion.

MATERIALS AND METHODS

***Study Design*:** A retrospective cross-sectional study was conducted.

***Study Setting*:** The study was conducted in a tertiary care hospital in Dhaka city, Bangladesh.

***Study Period*:** June 2025 to December 2025.

***Study Population*:** A total number of 253 nondiabetic and diabetic subjects were randomly selected in this study. Subjects are divided into two groups according to diabetic status where about 63 subjects were nondiabetic and 190 were diabetic respectively.

Inclusion Criteria

- Subjects were randomly selected
- Subjects receiving whole blood transfusion
- Subjects having a complete transfusion records

Exclusion Criteria

- Incomplete medical records
- Unverified transfusion data
- Pregnant women

Data Collection

Data were collected from transfusion records and hemovigilance reporting forms. Variables included demographic profile, indication of transfusion, blood group, number of transfused units, and occurrence of adverse reactions. ABO and Rh confirmation, Direct antiglobulin test (DAT), Complete blood count (CBC), hemoglobin were investigated respectively.

Evaluation of Transfusion Reactions

All suspected transfusion reactions like delayed Hemolytic reactions, allergic reaction, Transfusion-associated circulatory overload (TACO), Transfusion-Related Acute Lung Injury (TRALI) reaction, bacterial contamination, RBC destruction to foreign antigen and Brady cardiac, occurring during or within 24 hours of transfusion were evaluated by clinicians and transfusion medicine specialists according to standard protocols.

Statistical Analysis

Data were analyzed using IBM SPSS software 27. Results were expressed as frequency and percentage. Odds ratios (ORs) and 95% confidence intervals were analyzed by chi-square GraphPad Prism Version 6.

Ethical Consideration

Ethical approval was obtained from the institutional review board. Patient confidentiality was strictly maintained.

RESULTS

In this study total of 253 subjects were randomly included, among them 80.6% were male and 19.4% were female (Table 1).

Table 1: Frequency of Sex distribution of the study Subjects

Subjects	Frequency	%
Male	204	80.6
Female	49	19.4
Total Subjects	253	100

Data are expressed as numbers (percentage)

The Mean±SD of age was 36±13 years. The age distribution of the study subjects is presented in Table 2. Most of the study subjects were fall in the group of under 30 years.

Table 2: Frequency of Age distribution of the study Subjects

Age Frequency	Total Subjects N=253	
	Frequency	%
<30 yrs	104	41.5
31-40 yrs	78	30.8
41-50 yrs	38	15.0
51-60 yrs	17	6.7
61> yrs	15	5.9

Data are expressed as numbers (percentage)

Subjects were randomly selected in a specific duration of time. In that period, about 24.9% nondiabetic healthy subjects and 75.1% diabetic subjects were included (Table 3).

Table 3: Frequency distribution of the Study Subjects according to diabetic and nondiabetic status

Total Subjects	Frequency	%
Non-DM (n=63)	63	24.9
DM (n=190)	190	75.1

Data are expressed as numbers (percentage)

Table 4 represented some baseline hematological characteristics of the study subjects according to their diabetes status. There were no any significant differences found in Haemoglobulin, Red blood cell, Platelets, MCV, MCH, MCHC, PCV, WBC levels between nondiabetic and diabetic group respectively. On the other hand, ESR was significantly (p=0.023) higher in diabetic subjects in comparison to nondiabetic subjects.

Table 4: Baseline Hematological characteristics of the study subjects according to diabetes status

Parameters	Non-DM (n=63)	DM (n=190)	p value
Haemoglobulin (%)	13.3±3.3	12.8±3.2	0.361
Red blood cell	4.1±1.5	3.9±1.7	0.460
Platelet (U/L)	92283±94328	114221±127300	0.210
MCV	81.7±19.0	80.9±19.4	0.784
MCH	56.3±89.3	51.2±78.8	0.666
MCHC	33.1±6.2	32.0±4.9	0.144
PCV	35.8±6.9	35.0±6.3	0.393
ESR	15.7±3.6	17.0±4.1	0.023
WBC	7955±4425	8485±4500	0.417

Results are presented as mean ± standard deviation (SD). Data were compared using the Independent Sample t-test. The mean difference is significant at the 0.05 level.

Table 5 represented a frequency distribution of the study subjects according to the blood type. About 3.6% A positive, 4.3% A negative, 66.3% B positive, 5.5% B negative, 5.9% AB positive, 3.6% AB negative, 2.4% O positive and 7.9 O negative blood type were transferred in the total study subjects respectively. Among them B positive blood type was highly transferred.

Table 5: Frequency distribution of the study Subjects according to the blood type

Blood type	Frequency	%
A positive	9	3.6
A negative	11	4.3
B positive	169	66.3
B negative	14	5.5
AB positive	15	5.9
AB negative	9	3.6
O positive	6	2.4
O negative	20	7.9

Data are expressed as numbers (percentage)

Frequency Table 6 presents that the blood transfusion process of the study subjects. blood was transfused by two processes, ie direct transfusion from donor or indirect transfusion reserved from blood bank. About 13% nondiabetic subject received blood from direct way and 87% received from blood bank as indirect transfusion; as well as about 34% diabetic subjects received blood from donor as direct transfusion and 66% received from blood bank as indirect transfusion respectively.

Table 6: Frequency the blood transfusion process of the study Subjects

Transfused process	Non-DM n=63 (%)	DM n=190 (%)
Direct Transfused from Donor	18 (13%)	45 (34%)
Indirect Transfused from blood bank	45 (87%)	145 (66%)

Data are expressed as numbers (percentage)

Of the 253 transfusion reactions reported, 81 (32%) were not found any adverse reactions. Among 172 adverse transfused reactions (ATRs) that were confirmed by blood bank physician, there were Delayed Hemolytic reactions [44 (17%)], allergic reaction [43 (17%)], Transfusion-associated circulatory overload (TACO) [43 (17%)], Transfusion-Related Acute Lung Injury (TRALI) reaction [7 (3%)], bacterial contamination [17 (7%)], RBC destruction to foreign antigen [11 (4%)] and Brady cardiac [7 (3%)] were noticed (Figure 1).

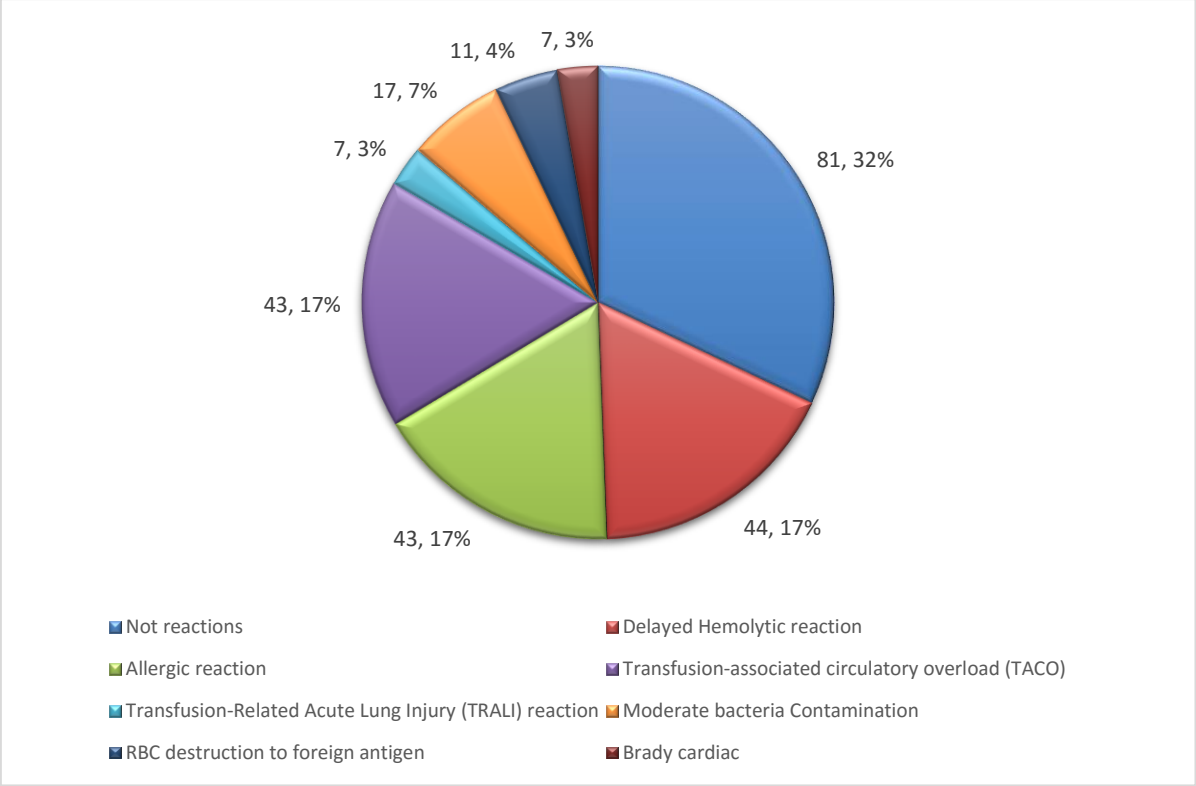

Figure 1: Frequency of adverse effects of the Total Study Subjects
Data are expressed as numbers (percentage)

Table 7 represents the adverse effects frequency of study subjects according to their diabetes status. Among 190 diabetic subjects, 60 (31.6%) were not found any adverse reactions. There were 15.6% delayed hemolytic reactions, 16.8% allergic reaction, 17.9% Transfusion-associated circulatory overload (TACO), 3.2% Transfusion-Related Acute Lung Injury (TRALI) reaction, 7.9% bacterial contamination, 4.7% RBC destruction to foreign antigen reaction and 2.1% brady cardiac reactions were found in diabetic subjects which was non-significantly higher than nondiabetic subjects.

Tables 7: Frequency of adverse effects of the non-diabetic and diabetic study Subjects

Adverse acute effects	Non-DM N=63		DM N=190		P value	OR	95% CI
	Frequency	%	Frequency	%			
Not reactions	21	33.3	60	31.6	-	1	-
Delayed Hemolytic reaction	14	22.2	30	15.8	0.514	1.333	0.596-0.295
Allergic reaction	11	17.5	32	16.8	1.000	0.982	0.421-2.250
TACO reaction	9	14.3	34	17.9	0.661	0.756	0.311-1.834
TRALI reaction	1	1.6	6	3.2	0.675	0.480	0.054-4.200
Bacteria Contamination	2	3.2	15	7.9	0.345	0.380	0.080-1.800
RBC destruction to foreign antigen	2	3.2	9	4.7	0.725	0.635	0.127-3.180
Brady cardiac	3	4.8	4	2.1	0.385	2.143	0.442-10.380

Data are expressed as numbers (percentage). Odds ratios (ORs) and 95% confidence intervals were analyzed by chi-square GraphPad Prism Version 7.

DISCUSSION

Anemia is common in DM and can delay wound healing a critical issue for diabetic (Barbieri *et al.,*2015). DM patients are inherently more susceptible to infections due to impaired immune function and compromised

wound healing (Dasari *et al.,*2021). While transfusions aim to fix this by improving oxygen delivery, the systemic inflammatory response triggered by transfusion reactions can counteract healing. On the other hand, blood transfusions can transiently suppress the immune system, further increasing the risk of post-operative infections (Linda *et al.,*2020). Our study investigated the transfusion complications of diabetes subjects during and after transfusion.

We have collected the subjects in a certain period on June 2025 to December 2025. In the study period we have selected only nondiabetic and diabetic subjects of blood recipient. So that the frequency of study subject's ratio was not equal distributed (Table 3). It was also found (Table 4) the ESR level was significantly high in diabetes subjects; and Haemoglobulin, Red blood cell, Platelets, MCV, MCH, MCHC, PCV, WBC level were as same as both group (p=ns). According to transfusion of blood type (Table 5) it was found that 66.3% of B positive blood was transfused in that 6 months' study periods. We have found that 13% nondiabetic subject received blood in direct transfusion and 87% received indirectly. About 34% and 66% transfusions were performed diabetic subjects in direct and indirect process respectively (Table 6).

The overall frequency of adverse reactions during the present study period was 32 % (Figure 1) out of 253 of total subjects. About 68% subjects showed several types of adverse transfused reactions (ATRs).

Among them 17% delayed hemolytic reactions, 17% allergic reactions, 17% Transfusion-associated circulatory overload (TACO), 3% of transfusion-related acute lung injury (TRALI) reactions, 7% bacterial contamination, 4% RBC destruction to foreign antigen and 3% brady cardiac complications were observed (Figure 1). About 64.2% allergic, 7.2% TACO and TRALI reactions were reported in Anitha *et al.,*2023 study which were highly incidence in compared to our study. They have found 1% Febrile reactions. But we have not found any Febrile reactions during the study periods. On the other hand, Khalid *et al.,* (2010) has been reported that 41.9% febrile non haemolytic reactions, 34.4% allergic reaction, 1.8% haemolytic reaction, 0.9% bacterial contamination were found. They did not observe TRALI reactions. As well as Sinha *et al.,*2016 has been also reported some most common type of transfusion reaction including allergic reaction (0.19%), anaphylactic and isolated hypotension (0.018%) etc. They also not found a single case of bacterial contamination or acute hemolytic reaction.

Our study also presents the adverse effects frequency according to diabetes status which was first attempt to investigate ATRs in DM subjects (Table 7). We have found 15.6% delayed Hemolytic reactions, 16.8% allergic reaction, 17.9% TACO, 3.2% TRALI reaction, 7.9% bacterial contamination, 4.7% RBC destruction to foreign antigen reaction and 2.1% brady cardiac reactions in numbers of 190 diabetic subjects. We have no found any related paper in previous investigations.

CONCLUSION

We have concluded from this study that there was 68% ATRs found in total subjects whereas among diabetic subjects, there were 68.4% subjects showed the transfusion related adverse effects. This can be an underestimation of the true incidence because of underreporting which can be improved by hemovigilance system. Sincerity during the transfusion, appropriate monetarization, improving storage conditions, etc, thus helping to improve transfusion safety. It was a pilot study. Further in-depth study with large population will explain the better outcome.

REFERENCES

- Anitha M, Sindhuja K. A study of transfusion related adverse events at a tertiary care center in southern India. Int J Acad Med Pharm 2023; 5 (4); 1996-2000. DOI: 10.47009/jamp.2023.5.4.400
- Barbieri J, Fontela PC. Winkelmann ER, Zimmermann CE, Sandri YP, Mallet EK, Frizzo MN (2015). Anemia in Patients with Type 2 Diabetes Mellitus. Anemia.2015:354737. doi: 10.1155/2015/354737.
- Blumberg N, Heal JM, Gettings KF, Phipps RP, Masel D, Refaai MA, *et al.,* An association between decreased cardiopulmonary complications (transfusion-related acute lung injury and transfusion-associated circulatory overload) and implementation of universal leukoreduction of blood transfusions. Transfusion. 2010;50(12):2738–44.
- Bux J, Sachs UJH. The pathogenesis of transfusion-related acute lung injury (TRALI). Br J Haematol. 2007;136(6):788–99.
- Bux J. Transfusion reactions. Transfus Med Hemother. 2008;35(5):336.
- Chapman CE, Stainsby D, Jones H, Love E, Massey E, Win N, *et al.,* Ten years of hemovigilance reports of transfusion-related acute lung injury in the United Kingdom and the impact of preferential use of male donor plasma. Transfusion. 2009;49(3):440–52.
- Dasari N, Jiang A, Skochdopole A, Chung J, Reece EM, Vorstenbosch J, Winocour S (2021). Updates in Diabetic Wound Healing, Inflammation, and Scarring. Semin Plast Surg. 35(3):153-158. doi: 10.1055/s-0041-1731460.
- Domen RE, Hoeltge GA. Allergic transfusion reactions: an evaluation of 273 consecutive reactions. Arch Pathol Lab Med. 2003;127(3):316–20.
- Hendrickson JE, Hillyer CD. Noninfectious serious hazards of transfusion. Anesth Analg. 2009;108(3):759–69.
- International Society of Blood Transfusion (ISBT) Working Party on Haemovigilance. Proposed standard definitions for surveillance of non-infectious adverse transfusion reactions [Internet].

Amsterdam: ISBT; 2011. Available from: https://www.isbtweb.org

- Kaufman RM, Djulbegovic B, Gernsheimer T, Kleinman S, Tinmouth AT, Capocelli KE, *et al.,* Platelet transfusion: a clinical practice guideline from the AABB. Ann Intern Med. 2015;162(3):205–13.
- Khalid S, Usman M, Khurshid M (2010). Acute transfusion reactions encountered in patients at a tertiary care center. Journal of Pakistan Medical Association, 60(10), 832-836.
- Linda M, Katrina S, Dale WE, Aaron B, Fiona MW (2020). Increased risk of blood transfusion in patients with diabetes mellitus sustaining non-major burn injury, Burns, 46 (4), 888-896. https://doi.org/10.1016/j.burns.2019.10.016.
- Savage WJ. Transfusion reactions. Hematol Oncol Clin North Am. 2016;30(3):619–34.
- Semple JW, Rebetz J, Kapur R. Transfusion-associated circulatory overload and transfusion-related acute lung injury. Blood. 2019;133(17):1840–53.
- Springer D, Miller J, Spinelli S, Pasa-Tolic L, Purvine SO, Daly DS, *et al.,* Platelet proteome changes associated with diabetes and during platelet storage for transfusion. J Proteome Res. 2009;8(5):2261–72.
- Toy P, Gajic O, Bacchetti P, Looney MR, Gropper MA, Hubmayr R, *et al.,* Transfusion-related acute lung injury: incidence and risk factors. Blood. 2012;119(7):1757–67.