

# Adverse Reactions of Blood Transfusion: A Study in a Tertiary Care Hospital

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## Abstract

**Introduction:** Blood transfusion is a safe and effective way of correcting hematological defects, but adverse effects do occur during or after transfusion, and they are called transfusion reactions. These effects vary from mild to lethal. Early identification of these reactions can help to reduce their incidence and severity.

**Aims and Objective:** The aim of this study is to know the frequency and type of transfusion reactions and various factors predisposing to develop transfusion reaction.

**Materials and Methods:** Retrospective review of all the transfusion reactions reported to the blood bank during August 2011 to July 2013 was done. All the reactions were evaluated in the blood bank according to protocol and classified as per standard definitions.

**Results:** Of 50 cases, 10 (20%) were children (<12 years) and 40 (80%) were adults. The most common reaction was fever with chills noted in 19 cases (38%), followed by allergic reactions in 12 cases (24%). Hemolytic reactions in the form of positive direct antiglobulin test and hemoglobinuria were noted in 9 cases (18%). Maximum patients were from the age group 11-20 years. Of the 50 cases, 12 were of thalassemia of which 6 (12%) were children, and 6 (12%) were adults. Furthermore, there were 2 cases (1 child and 1 adult) who showed both direct and indirect antiglobulin (Coomb's) test positive. Among the 50 cases, 22 (44%) developed transfusion reaction when transfused up to 50 ml of blood.

**Conclusion:** Most common adverse reaction following blood transfusion is fever with chills. Adverse reaction following blood transfusions is a complication to be kept in mind, and hence, transfusions should be given only when necessary.

**Key words:** Adverse reaction, Hemovigilance, Transfusion reaction

## INTRODUCTION

Blood transfusion is a life-saving procedure but not without the risks. Each blood product transfused carries a small risk of early or late adverse effects, and this should always be kept in mind.

Blood transfusion is an important supportive treatment for anemic patients, and it is a critical issue for patients with chronic diseases such as heart failure and chronic kidney

disease. Anemia should be considered as a factor that reduces the quality of life and a risk for early death. The aim of anemia management should be to restore patient functionality and quality of life by restoring effective red cell volume. One of the considerations for decision of blood transfusion is the possibility of adverse reactions.<sup>1</sup>

Transfusion reaction is any untoward effect occurring in a patient during or after receiving blood and blood products. These can be categorized as acute transfusion reactions occurring within 24 h of transfusion and delayed transfusion reactions occurring within days or months of transfusion. Acute and delayed reactions can be further categorized as immune-mediated and non-immune mediated.<sup>2</sup>

Knowledge about various transfusion reactions will help not only in their early identification and management

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but also in taking adequate measures to prevent the same. The true incidence of these reactions is difficult to determine because of lack of proper hemovigilance system throughout the country.<sup>3</sup>

Hemovigilance is defined as set of surveillance procedures covering whole transfusion chain from collection of blood and its components to follow-up of its recipients, intended to collect and access its information on unexpected or undesirable effects resulting from therapeutic use of labile blood products and to prevent their occurrence and recurrence.<sup>4</sup>

Hemovigilance is used to track and reduce the adverse events related to blood donations. It is one of the most important activities of the professionals in the field of blood transfusion.<sup>5</sup>

This study is carried out with an objective to know the most common transfusion reaction in our institute. Other objectives were to know correlation with the amount of blood transfused, to know any age or sex predilection and to know the effect of multiple transfusions and pregnancy as a contributing factor.

## MATERIALS AND METHODS

A retrospective study was carried out of all the transfusion reactions which were reported to blood bank over a period of 2-years. Among the 30,470 blood units issued, 50 transfusion reactions were reported to blood bank over the period of 2-year.

We defined blood transfusion reactions such as objective symptoms, recorded by staff or doctor, fever, chills, shortness of breath, and vomiting within 24 h after packed red blood cells transfusion was administrated.

Vital signs such as blood pressure, pulse, peripheral oxygen saturation, and breaths number were measured 5 min after beginning of blood transfusion and every 15 min during 1<sup>st</sup> h thereafter according to the guidance of blood transfusion.

Protocol is followed in our blood bank whenever a case of transfusion reaction is reported.

- All the documents are rechecked to identify any clerical error
- Post-transfusion blood sample is asked for direct and indirect antiglobulin (Coomb's) test
- Grouping and cross matching are repeated on the post-transfusion sample. At the same time, pre-transfusion sample is rechecked for grouping and cross matching

- Post-transfusion urine sample is sent to test for hemoglobinuria and myoglobinuria
- The concerned blood bag which is received along with the transfusion set is sent to microbiology department for culture
- Following things are documented in the transfusion reaction form and transfusion reaction investigation form.
  1. Details of the patient
  2. Details of the blood unit
  3. Hemoglobin before transfusion
  4. History of previous transfusion
  5. Volume of the blood transfused before transfusion reaction
  6. Time lag between onset of transfusion and onset of reaction
  7. Clinical features in the patient
  8. Results of the investigations done on post-transfusion sample.

The study was conducted on the basis of this work up, and transfusion reactions were studied with respect to above features.

Transfusion reactions were classified as immediate (occurring within 24 h of transfusion) and delayed (occurring after 24 h of transfusion). Febrile reactions were defined as temperature rise more than 1°C of the pre-transfusion temperature. Allergic reactions included rash and urticaria. Hemolytic reactions were classified on the basis of direct antiglobulin (Coomb's) test and indirect antiglobulin (Coomb's) test results, hemoglobinuria, and myoglobinuria.

### Inclusion Criteria

All the transfusion reactions reported to blood bank are included in the study.

## RESULTS

Of the 30,470 units issued over the period of 2 years, 50 transfusion reactions were reported. Thus, incidence of transfusion reactions in our study is 0.16%. There was one female who had transfusion reaction twice thus making 50 episodes. She was a 40 years female admitted in surgery ward for treatment of Pancoast tumor. She showed positive direct antiglobulin (Coomb's) test after the second episode of transfusion reaction. Her indirect antiglobulin (Coomb's) test, hemoglobinuria, and myoglobinuria were negative.

Most common age group noted in our study was pediatric and young adults. Maximum number (28%) was in the

age group of 11-20 years, and almost half of them were thalassemia patients who had a history of repeated transfusions. The second most common group was 21-30 years. In this group majority were pregnant women. Remaining cases were distributed in the rest of the age group.

Very few cases of geriatric age group were noted (Figure 1).

With respect to time almost half of the reactions, i.e., 19 cases (38%) occurred within 15 min of starting the transfusion. Maximum duration of developing the transfusion reaction was observed to be 4-5 h post transfusion. This shows that all the reactions were immediate and not delayed (Figure 2).

8 cases were direct antiglobulin (Coomb's) test positive, and 6 cases were indirect antiglobulin (Coomb's) test positive. Of these, two cases were positive for both direct and indirect antiglobulin (Coomb's) test. Remaining cases were negative. This shows that majority of the cases 38 (76%) were non-immune mediated (Figure 3).

Most common transfusion reaction noted was the febrile reaction in 19 cases (38%), followed by allergic reaction in

12 cases (24%). Other reactions noted were tachycardia or bradycardia, breathlessness, hypotension and pain in abdomen along with nausea, vomiting, and giddiness. Breathlessness was noted in 8 cases (16%) but X-ray chest was not done in these cases post reaction. Thus, diagnosis like TRALI was probably overlooked.

Hematuria was noted in 2 cases (4%). Of these, one case was a 7-month-old child with pallor clinical diagnosis of nutritional anemia versus hemolytic anemia. She developed transfusion reaction after 60 ml of blood was transfused; post-transfusion sample was direct and indirect antiglobulin (Coomb's) test positive. Urine did not show myoglobin. These changes might be suggestive of hemolytic reaction (Figure 4).

Most of the reactions 13 cases (26%) occurred with transfusion of up to 20 ml of blood. 8 reactions were observed after transfusing the whole unit that is 350 ml (Figure 5).

Of the 50 episodes reported, 12 (24%) cases were of thalassemia which had a history of multiple transfusions. 6 cases were pregnant females. This shows that these two factors have a role to play as contributing factor.

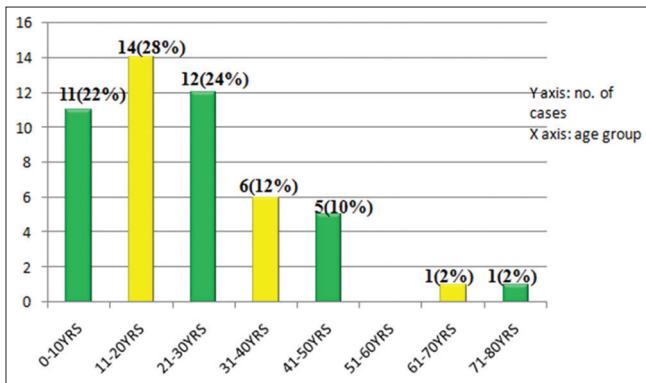


Figure 1: Age wise distribution of the transfusion reactions

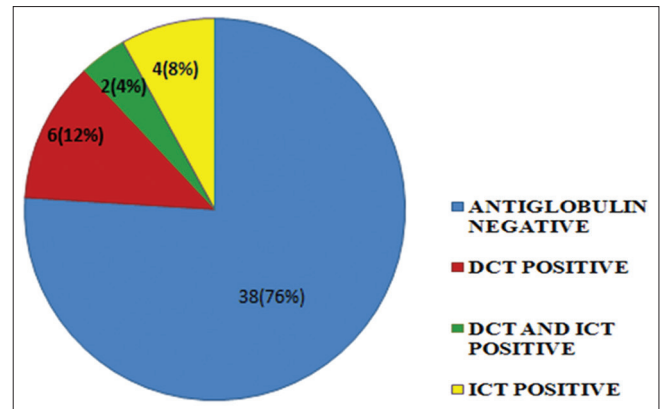


Figure 3: Antigllobulin (Coomb's) test results

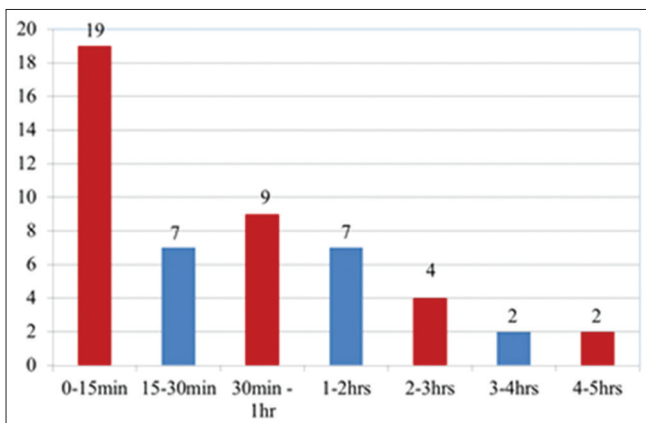


Figure 2: Onset of transfusion reaction after starting the transfusion

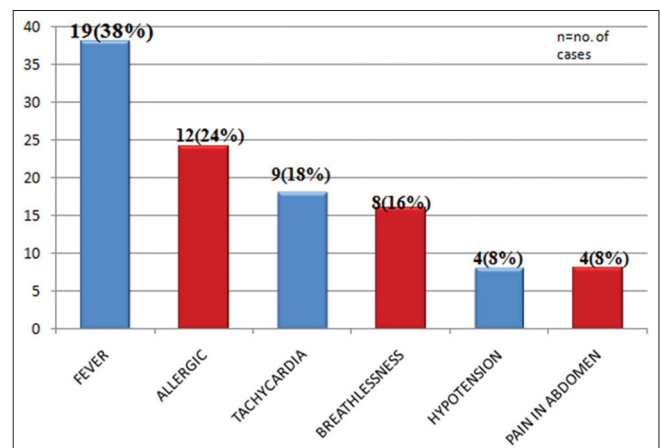
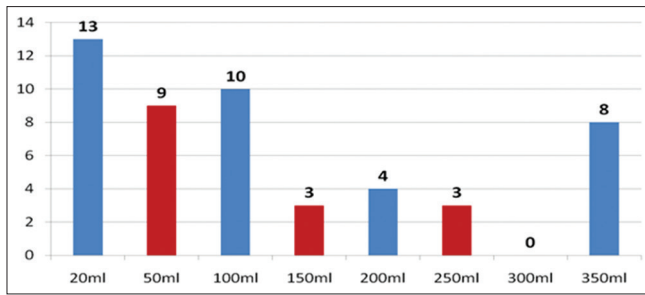


Figure 4: Clinical features of presentation



**Figure 5: Amount of the blood transfused before transfusion reaction**

There was one case each of hemoglobinuria and myoglobinuria positive. All the blood bags were negative for bacterial culture.

## DISCUSSION

The study was conducted for 2 years. 50 cases of transfusion reactions were reported to blood bank among the 30470 units issued during that period. Age range noted was wide from newborn to 75 years.

We came across a similar study conducted by Bhattacharya *et al.* in PGI over a period of 1-year.<sup>6</sup> This study had a 0.18% incidence of transfusion reaction which was comparable to the incidence of 0.16% in our study. A study by Kumar *et al.*<sup>3</sup> found the frequency of transfusion reaction to be 0.05%.

A study was conducted by Lubart *et al.*<sup>1</sup> in elderly patients in a geriatric hospital over a period of 1-year. The incidence of transfusion reaction was higher in their study as compared to present study being 11%.

We reported few cases of elderly age group being 7 (14%). Most elderly patients have a high rate of comorbidities, immobilization, and cognitive impairment. Since many such patients are non-cooperative, they do not report minor reactions such as itching, nausea, dizziness, and others. Therefore, non-complaining initial minor symptoms related to adverse blood transfusion reactions may endanger these patients.<sup>1</sup>

Most common reaction noted in our study was febrile reaction followed by allergic reaction. Percentages of both the reactions were comparable to study by Bhattacharya *et al.*<sup>6</sup> Most common reaction noted by Kumar *et al.*<sup>3</sup> was an allergic reaction (55.1%) followed by febrile non-hemolytic reaction (35.7%). Lubart *et al.*<sup>1</sup> found fever to be most common transfusion reaction (72%) as in the study by Ibrahim *et al.*<sup>7</sup> in pregnant patients (47.7%).

We did not encounter ABO mismatch or bacterial contamination among the cases reported as in the study

by Kumar *et al.*<sup>3</sup> In a study by Bhattacharya *et al.*<sup>6</sup> bacterial contamination was suspected in 4 cases transfused with packed red cells.

Most of the transfusion reactions were noted within 15 min of starting blood transfusion. The attending staff should be more vigilant during this period, and temperature and pulse should be noted after 15 min of starting of transfusion for each unit.

Hypotension can be a manifestation of several transfusion reactions: Acute hemolytic, bacterial contamination, transfusion-related acute lung injury, and anaphylaxis. In rare cases, hypotension is the only manifestation. This was reported in only 4 (8%) cases in our study.

Many studies concluded that underreporting of minor transfusion reactions exist. They suggest that careful evaluation of any suspected event of transfusion reaction should be referred to the transfusion medicine physicians of blood bank who will evaluate each case and discuss it promptly with the attending physician.<sup>1</sup>

Number of pregnant women was 20% of the female cases in our study while it was 75% in study by Bhattacharya *et al.*<sup>6</sup>

A study by Ibrahim *et al.*<sup>7</sup> in pregnant patients noted high rate of acute transfusion reaction to be 26.6%. There is high rate of blood transfusion in obstetric emergencies, particularly in developing countries.

Of 6 pregnant females in the present study who developed the reaction, 5 females were gravida 2 or more. Multigravida is more likely to develop transfusion reaction than primigravida. Similar results were observed by Ibrahim *et al.*<sup>7</sup> Multiparous women were 86% in their study. As per author, multigravidity is a risk factor as against primigravidity, presumably due to sensitization and subsequent formation of antibodies resulting from feto-maternal transfusion that may occur in previous pregnancies.

Multiparous women may form alloantibodies to leukocyte, red cells or platelet antigens as a result of an overt or inapparent fetal-maternal hemorrhage. Women who form leukocyte antibodies following pregnancy are more likely to have febrile non-hemolytic transfusion reactions if subsequently transfused with leukocyte-containing blood components.<sup>7</sup>

Most of the patients, who developed transfusion reaction, were thalassemia children receiving multiple transfusions. This shows that history of multiple transfusions has a role in developing transfusion reaction.<sup>1</sup> The results are in concordance with the study by Pedrosa *et al.*<sup>8</sup> The study

was conducted in children and showed high prevalence of transfusion reaction in children. The author found out some intervening factors such as type of the blood component, age, comorbidities, and multiple transfusions.

We did not encounter any case of transfusion reaction after the transfusion of the component. Thus, this data cannot be included in our study. However, history of multiple transfusions was available in many cases and thus its role in developing transfusion reaction can be defined.

Thalassemia patients are transfused blood on a regular basis to maintain their hemoglobin level. Thus, they are more prone to develop adverse effects such as iron overload and transfusion transmitted infections apart from febrile reaction and allergic reactions. A study by Ragab *et al.* also noted high incidence of transfusion reactions in thalassemia patients.<sup>9</sup>

Use of leukodepleted blood products will be an effective tool to reduce the incidence of adverse reactions like febrile reaction in multiply transfused patients of thalassemia and pregnant patients. These patients can be prophylactically given antihistamines and antipyretics.

Leucocyte depletion by bedside filters has been proved to be very effective in study by Devi *et al.*<sup>10</sup> They compared leukodepletion by bedside filters, leukodepletion by buffy coat method and nonleukoreduced blood in thalassemia patients. Author concluded that considering the cost factor of bedside filters, use of Buffy coat method remains a good alternative to bedside filters in resource-limited setups.<sup>10</sup>

## CONCLUSION

Adverse reaction following blood transfusion is a common complication which should be kept in mind and blood transfusion should be given when necessary.

Most common transfusion reaction noted was febrile reaction followed by allergic reaction. Most of the

reactions were noted in patients with a history of repeated transfusion. This can be reduced by using leukocyte-reduced blood products.

Delayed reactions and transfusion reactions after use of components were not reported, thus, user departments need to be educated about the same. Here, hemovigilance plays an important role. Hemovigilance system should be well coordinated between blood transfusion service, hospital clinical staff and transfusion laboratories, hospital transfusion committee, regulatory agency, and national health authorities.

To have a well-organized hemovigilance system in developing countries like India, a comprehensive approach is required.

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