



The prevalence of allergic reaction in acute complications of injection of packed red blood cell in patients hospitalized in Sina Hospital, Kamyaran City, Iran, during the years 2014-2018

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Short Communication

Abstract

BACKGROUND: Acute complications are among the most common complications in blood transfusion reactions and one of the leading causes of death. The reduction in acute complications as well as blood safety and health of patients should be considered. The aim of this short report study is to determine the prevalence of allergic reactions in acute complications of packed red blood cell (RBC) injections in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018.

METHODS: This was a retrospective cross-sectional study with the statistical population including all patients who required blood transfusion in Sina hospital in Kamyaran City since 2014 to 2018. The standard checklist called "A form of reporting unwanted complications after blood transfusions and its related products" was used in this study. Data were entered into the SPSS statistical software. Descriptive statistics were analyzed as mean and standard deviation (SD) and analytical results were analyzed using Fisher's exact test.

RESULTS: In this study, the prevalence of transfusion complications during this period was 0.016. 5 (29%) and 12 (71%) of the patients were men and women, respectively. The most common sign of blood transfusion included restlessness and tachycardia. The most common acute complication of blood transfusions was allergic reaction (47%). Based on the Fisher's exact test, a statistically significant relationship was found between the blood group, sex, and history of injection with the diagnosis of transfusion ($P < 0.001$).

CONCLUSION: Registering the complications of blood transfusion is always a concern and important for the blood transfusion organization. In this study, it was found that the most common acute complication of blood transfusions was allergic reactions (8 out of 17).

KEYWORDS: Allergy Reaction; Blood Transfusions; Transfusion Reaction; Blood Safety; Iran

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Introduction

Blood transfusion is a process in which the whole blood or blood products such as packed red blood cells (RBCs) (also known as packed cells) are transferred from the donor to another person's circulatory system in order to increase

tissue oxygenation and prevent bleeding and ultimately improve the prognosis of the disease.¹ Blood transfusion is one of the most common processes for hospitalized patients which can dramatically help revive life of the patients.²

Blood transfusion reactions may be acute or delayed, with the acute reaction occurring during or within the first 24 hours of injection, but the delayed reaction may occur days, weeks, or years later.³

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In the past 15 years, the prevention of complications due to the transfer of blood products has gained higher importance than before.⁴ According to the Iranian Blood Transfusion Organization, 3708 cases of blood transfusions across the country were reported to the Blood Transfusion and Hemovigilance Unit during 2009- 2013.⁵ The types of acute complications include febrile non-hemolytic transfusion reactions (FNHTR), allergic reaction, acute hemolytic disorder, septicemia, transfusion-related acute lung injury (TRALI), anaphylaxis shock, and acute pulmonary edema.⁶

Nowadays, patient safety is affected by various factors, so studies show that nurses have a significant impact on patients' outcomes; they play an important role in identifying life-threatening complications.⁷ Registration of blood transfusion complications have always been a concern of blood transfusion organizations, hence it is important to take preventive measures as a first step.

The aim of this short report study is to determine the prevalence of allergic reaction in acute complications of packed RBC injection in patients hospitalized in Sina Hospital in Kamyaran, Iran, since 2014 to 2018.

Materials and Methods

This was a cross-sectional study with the statistical population including all patients requiring blood transfusion (emergency and non-emergency) hospitalized in Sina hospital of Kamyaran City in Kurdistan Province. The city is located in 65 km south of Sanandaj, Iran. The city of Kamyaran has only one treatment center and all patients from the surrounding villages are referred to this center, so it covers a high number of patients. The convenience sampling method was used in this study and included all cases of blood transfusion error in Sina Hospital since 2014 to 2018.

The tool applied in this study was the national standard checklist "Report Form of Possible Side Effects after Transfusion of Blood and its Products" which includes demographic characteristics, clinical status, history of transfusion, patient blood group, blood product characteristics, clinical symptoms, cause of blood administration, and treatment. The study inclusion criteria included all cases of blood transfusion complications over a period of time and the exclusion criteria were unregistered or altered data. Throughout the project, the patient information was emphasized to be protected.

Data were entered into SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA). The descriptive data were analyzed using descriptive statistics [mean and standard deviation (SD)] and analytical results using the Fisher's exact test.

Results

In this study, of about 1200 cases of blood transfusions performed at the center over the period, about 20 cases of undesirable complications were recorded, of which 3 had confidential information and were excluded from the study. The frequency of inpatient variables is shown in table 1.

The prevalence of blood transfusion complications during this period was 0.016. The mean and SD of age of the patients were 45.00 and 20.07, respectively (the age range of 2-76 years old). The most common symptoms after transfusion were restlessness, tachycardia, and chills. The most common side effects diagnosed by the physician were allergic reaction, dyspnea, and FNHTR, respectively.

Moreover, the frequency of clinical symptoms caused by packed cell injections was reported by bar graph in Figure 1.

Based on the Fisher's exact test, there was a significant statistical relationship between blood group and diagnosis of blood transfusion complications ($P < 0.001$).

Table 1. Frequency of variables in patients hospitalized in Sina Hospital in Kamyaran City, Iran, from 2014 to 2018

| Variable | | Frequency | Rate (%) |
|---------------------|--------------------|-----------|----------|
| Sex | Male | 5 | 29.4 |
| | Female | 12 | 70.6 |
| Etiology | Chronic anemia | 8 | 47.0 |
| | Acute anemia | 1 | 5.8 |
| | Hemorrhage | 6 | 35.3 |
| | Surgery | 2 | 11.7 |
| ABO type | A | 4 | 23.5 |
| | B | 4 | 23.5 |
| | O | 9 | 53.0 |
| | AB | 0 | 0.0 |
| Transfusion History | Less than 3 months | 5 | 29.4 |
| | More than 3 months | 3 | 17.6 |
| | No history | 9 | 53.0 |
| Severity | Mild | 11 | 64.7 |
| | Severe | 6 | 35.3 |
| Diagnosis | FNHTR | 3 | 17.6 |
| | Allergic reaction | 8 | 47.0 |
| | TAD | 6 | 35.3 |
| History of disease | Abortion | 3 | 17.6 |
| | Reaction history | 1 | 5.8 |
| | Cardiac disease | 2 | 11.7 |
| | Pulmonary disease | 1 | 5.8 |
| | Immune deficiency | 1 | 5.8 |
| | Renal disease | 5 | 29.4 |
| | None | 4 | |

FNHTR: Febrile non-hemolytic transfusion reactions; TAD: Transfusion-associated dyspnea

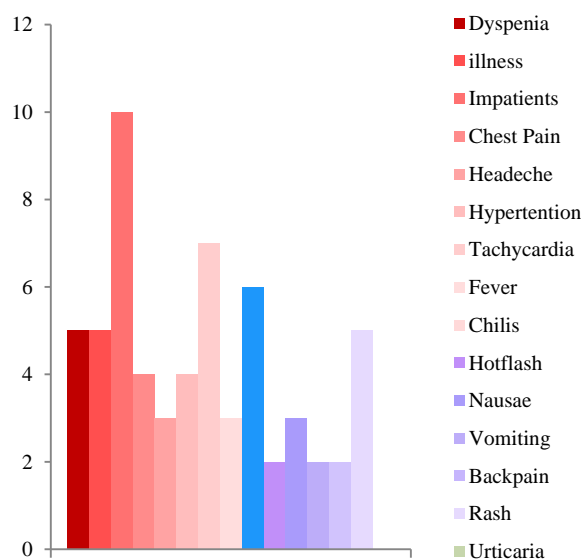


Figure 1. Bar graph of frequency of clinical symptoms caused by packed red blood cell (RBC) injections in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018

The frequency of different blood group types according to the acute complication of blood transfusion in patients hospitalized in Sina Hospital is shown in table 2.

Additionally, given table 3, there was a significant relationship between gender and diagnosis of blood transfusion complication ($P < 0.001$). Besides, as table 4, there was a significant relationship between blood transfusion history and diagnosis of blood transfusion complications ($P = 0.020$).

Furthermore, in accordance with table 5, there was a significant relationship between the history of blood transfusion and the cause of blood transfusion ($P = 0.004$).

In the case of treatment of adverse events, all transfusions were stopped immediately and appropriate supportive treatments were given to relieve the complication.

Table 2. Frequency of different blood group types according to the acute complication of blood transfusion in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018

| Diagnosis | Blood group | ABO-type [n (%)] | | | Total [n (%)] |
|-------------------|-------------|------------------|----------------|----------------|---------------|
| | | A ⁺ | B ⁺ | O ⁺ | |
| FNHTR | | 0 (0) | 1 (25) | 2 (22) | 3 (17.0) |
| Allergic reaction | | 2 (50) | 2 (50) | 4 (44) | 8 (47.1) |
| TAD | | 2 (50) | 1 (25) | 3 (33) | 6 (35.0) |
| Total | | 4 (100) | 4 (100) | 9 (100) | 17 (100) |

FNHTR: Febrile non-hemolytic transfusion reactions; TAD: Transfusion-associated dyspnea

Table 3. Frequency of gender based on type of acute complications of blood transfusion in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018

| Diagnosis | Sex | Male | Female | Total |
|-------------------|-----|---------|---------|----------|
| | | [n (%)] | | |
| FNHTR | | 1 (20) | 2 (16) | 3 (17) |
| Allergic reaction | | 1 (20) | 7 (58) | 8 (47) |
| TAD | | 3 (60) | 3 (26) | 6 (35) |
| Total | | 4 (100) | 5 (100) | 12 (100) |

FNHTR: Febrile non-hemolytic transfusion reactions; TAD: Transfusion-associated dyspnea

Discussion

In this study, which was carried out for the first time at Sina Hospital of Kamyaran City, about 1200 patients underwent blood transfusion, among whom 20 acute post-injection complications were observed. The percentage of acute complications after transfusion was 1.66%, which is comparable to the statistics reported in the studies by Aminiahidashiti *et al.*⁸ as 1.24% and Teimuri *et al.*⁶ acute complications following blood transfusion were high in both studies.⁶ The high rate of the complications in the present study may be attributed to the location of Kamyaran City and the high rate of accidents resulting in high emergency blood consumption. The most common clinical symptoms were

restlessness, tachycardia, and chills as 10 (58.8%), 7 (41.0%), 6 (35.2%), respectively. The complication diagnosed by the physician was also an allergic reaction as 8 (47.0%). Allergic reaction is seen in the injection of cellular products. The results of the study showed that dense RBC injection is responsible for the allergic reaction.⁹

Transfusion-associated dyspnea (TAD) and FNHTR as respectively 6 (35.3%) and 3 (17.6%) patients accounted for the highest rate of acute post-injection complications. It should be noted that in all patients, there was no shock and severe decrease in consciousness. In a study by Tajali *et al.*, the incidence of apnea occurred in 19.82% of patients with high prevalence. This finding is in line with the present study.¹⁰

However, in other studies such as the study by Bodaghkhan *et al.*³ conducted in Namazi Hospital of Shiraz, Iran, the rate of allergic reaction was 28.8% (15 out of 52 cases). Besides, in the study by Teimuri *et al.*⁶ performed in Tehran and Mazandaran hospitals, 45% allergic reaction (9 out of 20 complicating patients) was reported; in our study, it was higher than both studies.^{3,6}

Table 4. Frequency of blood transfusion history by type of acute complication of blood transfusion in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018

| Diagnosis | Transfusion history | Less than 3 months | More than 3 months | None | Total [n (%)] |
|-------------------|---------------------|--------------------|--------------------|---------|---------------|
| | | [n (%)] | | | |
| FNHTR | | 1 (20) | 1 (33) | 1 (11) | 3 (17.0) |
| Allergic reaction | | 1 (20) | 1 (33) | 6 (66) | 8 (47.1) |
| TAD | | 3 (60) | 1 (33) | 2 (22) | 6 (31) |
| Total | | 5 (100) | 3 (100) | 9 (100) | 17 (100) |

FNHTR: Febrile non-hemolytic transfusion reactions; TAD: Transfusion-associated dyspnea

Table 5. Frequency of blood product injection based on blood transfusion in patients hospitalized in Sina Hospital, Kamyaran City, Iran, from 2014 to 2018

| Transfusion history | | Less than 3 months | More than 3 months | None | Total [n (%)] |
|---------------------|----------------|--------------------|--------------------|---------|---------------|
| Diagnosis | | [n (%)] | | | |
| Etiology | chronic Anemia | 4 (80) | 1 (33) | 3 (33) | 8 (47.1) |
| | Acute Anemia | 0 (0) | 1 (33) | 0 (0) | 1 (5.0) |
| | Hemorrhage | 1 (20) | 0 (0) | 5 (55) | 6 (35.0) |
| | Surgery | 0 (0) | 1 (33) | 1 (11) | 2 (11.0) |
| Total | | 5 (100) | 5 (100) | 3 (100) | 9 (100) |

In other countries, the most common type of allergic reaction with a prevalence of 2.51% was reported in the study by Kato et al. in Japan, which is consistent with the present study, in addition, FNHTR had a prevalence of 0.43%.¹¹ Studies have shown that the most common complication of this study has been fever, chills, and allergies.^{8,12}

There was a significant relationship between the blood type of the patient and the type of complication diagnosed by the physician. So O⁺ blood type had the most prevalence [9 (53%) out of 17]. This result was consistent with the results of other studies.¹³

On the other hand, there was a significant relationship between gender and diagnosis of blood transfusion complication ($P < 0.001$).¹² out of 17 (70.5%) blood transfusion responders were female; this was consistent with other studies.¹⁴ Of these, 7 (58%) developed an acute allergic reaction, which it is a high rate.

According to table 4, the subjects who did not have a previous blood transfusion was more likely to have an acute complication of blood transfusion that was in contradiction with previous studies.⁶

Conclusion

One of the most important goals of blood transfusion centers is to consume blood and its products properly. Another important goal of blood transfusion is to establish a consistent system between hospitals and the Blood Transfusion Organization to evaluate and analyze the various side effects of all injectable products. On the other hand, training and updating physicians and developing their

information will be of great efficiency to the accuracy of blood transfusion registration.

Conflict of Interests

Authors have no conflict of interests.

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