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ORIGINAL: Prevalence of Adverse Transfusion Reactions in Hospitalized Patients in Tertiary Heart Center of Sari, Iran in 2014-2020

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ABSTRACT

Introduction: Our study aimed to determine the prevalence of adverse transfusion reactions (ATRs), unexpected or undesirable effects resulting from the therapeutic use of blood products.

Material and Methods: In this cross-sectional study, we assessed the medical records of ATR patients who were referred to Mazandaran Heart Center from March 2014 until July 2020. Patients needed blood transfusions during the operation for various reasons; complications related to blood administration were considered ATR. Age, sex, associated clinical signs, symptoms, and adverse response were composed of a patient's file checklist with ethical points. SPSS 16.0 was used for statistical analysis.

Results: In this study, 23,206 blood products were used in hospitals as treatment, and there were 96 reactions (4%) because of transfusion, and 10 patients had a history of recent reactions. There was not any specific connection between the age of patients and the existence of complications. Most reactions were allergic (44%) and non-hemolytic febrile reactions (42%). It is essential to state that 91% of adverse reactions were slight ones, and only 5% led to the injury. Out of 96 patients with complications, 79 patients received blood products as pack cells; 6 patients received Fresh Frozen Plasma; 3 patients received autologous blood products, while this number was one for Blood Low Leukocytes and platelets (PLT).

Conclusion: Based on this investigation, the risk of adverse transfusion reactions (ATRs) is 4%, and universally 85 million units of blood products are transfused every year. Consequently, investigation to reduce this number is required.

Introduction

According to the American Medical Association (AMA) and the joint commission

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in 2012, blood transfusion was the fifth most common treatment worldwide, and undesirably the risks and complications are increasing (1). This treatment is a kind of organ transplant (2). Blood transfusion is a procedure in which donated blood or blood products are transferred into the recipient's vasculature (3). Blood transfusion is necessary for many health problems like anemic cancer patients, many chronic illnesses such as coronary failures and chronic kidney diseases (4-6). In the United States, 15 million blood units are transfused per year while this number is 85 million units worldwide, and certainly, that is a noticeable number (7). About 4.5 million Americans need blood transfusion each year, and it is necessary for about one in seven people entering a hospital (8-10).

Any unwanted symptoms that occur during 24 hours of blood transfusion are considered as acute complications of blood transfusion. These complications include hemolytic reactions and non-hemolytic reactions (allergies, febrile non-hemolytic transfusion reaction anaphylaxis) (11). Although new molecular and serological methods have lowered the risks of blood transfusion, it is not without risk yet. The risk of transfusion-related death in 2014 was 5.6 per million of blood components, while the transfusion-related significant morbidity was 63.5 per million (12). Acute blood transfusion reactions can result in considerable morbidity and mortality although enhanced blood refinement techniques (11).

Unpredictably in one-third of donors, while transfusion or afterward, adverse transfusion reactions (ATRs) happen mostly minor ones, but they may become severe. The most adverse effects and unwanted reactions after blood donation are bruise (23%), sore arm (10%), fatigue (8%), and vasovagal reaction (7%), whereas rarely happening reactions are nerve irritation (0.9%), syncope (0.1-0.3%), and arterial puncture (0.01%) (13, 14). Moderate and severe vasovagal reactions have the majority effect on donors (by 50% or more), while the existence of both vasovagal and localized reactions increases the impact on donors for next donations. As light vasovagal, which includes 97% of all reactions, reduces the chance of donation by 20% for first-time donors and 33% for experienced donors (15).

There are various techniques to reduce the risks during blood transfusions, one of the essential methods is using autologous blood products, and the application of this technique has been increased within the last decade (16, 17). Another way to reduce the risks of blood transfusions is the hemovigilance program. Hemovigilance means caring for blood or blood products recipients against the complications of blood transfusion like sepsis, hemolytic reactions, acute pulmonary damage, bacterial infection, allergic reaction, etc. It's an effective program for reducing complications of blood transfusion (18).

Therefore, this article focuses on the risks of blood transfusion with an emphasis on variable factors like age, gender, history of transfusion, and other aspects in a review from March 2014 until July 2020 in Fatemeh-Zahra Hospital, Mazandaran, Iran, with the aim of enhancing the use of blood components and reduce the risk of blood transfusion.

Methods

Study design

This retrospective cross-sectional study is based on the information in the accounts of hospitalized patients and extracting the results recorded from the archives of patients mentioned in Fatemeh Al-Zahra's Hospital documentations in Mazandaran province, Iran, between the years 2014-2020.

Patients and data collection

The data collection tools for this study were information stored in documents of hospitalized patients in Fatemeh Al-Zahra Hospital, Mazandaran, Iran. The sampling method is the consecutive census, and all hospitalized patients with post-transfusion complications were included in this study. Patients whose file information was incomplete or whose type of complication and reaction to blood transfusion was not

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specified were excluded from the study. The most vital aim through this study was improving health worldwide and for all human beings, therefore considering various ethical necessities, it was finally authorized by the Ethics Review Committee of Mazandaran University of Medical Sciences because of ethical code IR. MAZUMS.REC. 1399.7286.

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Statistical analysis

At first, the data collected were imported to Microsoft Excel software due to categorization, and Positive results were analyzed using Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, Illinois, USA), which we started working on after obtaining permission from the Ethics Committee of the Deputy Minister of Technology Research. Using this examination, the relationship between variables which includes age, sex, history of the disease, history of blood transfusion, history of reaction, history of underlying disease, type of product, clinical signs, laboratory symptoms, the severity of complication, kind of direct complication coombs test before blood transfusion, screening antibodies after blood transfusion, direct Coombs test after blood transfusion and blood transfusion.

Results

In this study, 23,206 blood and blood-related products were transfused within five years. Out of all patients, 96 patients had reactions due to the transfusion. 36 (37.5%) were male, and 60 (62.5%) were female. The range of age was 40-90. Three patients were excluded due to a lack of specification. Among 93 specified patients with reactions, ten patients had a background of blood transfusion complications; however, 83 patients did not. Out of 10 patients with ATR, seven people (70%) were female, and 3 (30%) were male. The results revealed that the history of complications was not statistically related and significant to examined factors.

Table 1: Evaluation of the relationship ATRs and direct Coombs test before and after blood transfusion

		History of reactions			P-value
		Yes	No	Total	
Date before	Positive	4	33	37	0.000
	Negative	6	50	56	
	Total	10	83	93	
Date after	Positive	1	12	13	0.147
	Negative	9	71	80	
	Total	10	83	93	

Table 1: Evaluation of the relationship ATRs and antibody screening test before and after blood transfusion

		History of reactions			P-value
		Yes	No	Total	
AB SC before	Positive	4	24	28	0.521
	Negative	6	59	65	
	Total	10	83	93	
AB SC after	Positive	3	18	21	0.353
	Negative	7	65	72	
	Total	10	83	93	

Of all 93 patients with complications, 79 patients received blood products as pack cells, six received Fresh Frozen Plasma (FFP), three received autologous blood products and only one of Blood Low Leukocytes and platelets (PLT) was transfused. The entire patient with a history of complications received blood as a packed cell, and there was no patient with recent complications using other products.

77% of patients with reactions had a history of underlying disease, revealing that 23% of patients with complications were healthy and without recent illnesses. 67% of patients with blood transfusion reactions had heart

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disease, while that number was 3% for anemia and 2% for lung disease and allergies.

The results show that clinical signs at the time of transfusion also were statistically noticeable; 43% of reactions occurred to patients with fever, 15% of patients with reactions had a heartbeat, whereas this amount was 10% for hypertension and 8% for lower blood pressure and hematuria.

The majority of adverse reactions that happened to patients were slight ones. Statistically, 91% were slight reactions, 5% caused injury, and among 4% of reactions, there was no severe harm. Reactions were mostly mild allergic and non-hemolytic febrile reactions (by percent: mild allergic 44%, non-hemolytic 42%).

Discussion

This study aimed to investigate the complications of blood transfusion, emphasizing various factors and finding the relationship between them by using statistical tests. The results showed no statistical relationship between the history of complications and examined factors. Also, there was no connection between age and the occurrence of complications. The clinical signs during the transfusion also were statistically noticeable. In this study, most people who needed blood used pack cells, such as Vincent et al. (19). In the study of Rao et al., It was shown that 53% of patients need to use erythrocytes (20). Payandeh et al.'s study demonstrated that in patients requiring blood transfusion in the surgical ward and ICU, such as thalassemia major patients, RBC is injected more into men than women (19).

In a recent study, 0.4137% of patients experienced side effects due to blood transfusion. That figure was more than 7% at Obafemi Awolowo University Teaching Hospital, Nigeria (20). Also, the incidence of acute blood transfusion reactions in Montreal's pediatric intensive care unit and the hemovigilance unit of the University of Brest Hospital in France was 1.6 and 5 in 1000 blood transfusions, respectively (21,22).

In this study, 38 patients (0.3%) had the most common allergies-related complications, and 36 patients had non-hemolytic fever (0.3%). In a study by Payandeh et al., most of the complications of blood transfusions, as in the recent research, were related to allergy complications (19). As in the present study, febrile non-hemolytic transfusion reaction is known as the second allergic reaction. In this study, the role of precise control of blood transfusion procedures is mentioned as one of the key conditions to reduce the likelihood of side effects. Prompt diagnosis and treatment of an acute blood transfusion reaction are important and help reduce complications and mortality from a blood transfusion. Our findings were similar to those of Handerson et al., who reported that most of the symptoms were mild and transient, like fever, stiffness, and a skin rash or urticarial (23).

The most severe potential consequences for erythrocyte transfusion were hemolytic reactions and volume overload, and platelet injections were significant allergic reactions and bacterial contamination (24). Limiting the transfer of random donor platelets to stored three days is a more effective strategy to reduce contamination. More significant amounts of plasma may be associated with more severe reactions (25). One way to reduce the number of adverse reactions is to limit injections to patients who achieve specific clinical goals. Blood should be taken to prevent ABO disorders, and laboratory tests should be performed before blood transfusion (26). During and after the injection, the patient should be monitored for complications (27). Further understanding of the patient's blood components and risk factors for injection reactions will lead to new treatment and preventive strategies to reduce the risk of injection reactions (28). Many blood transfusion complications can be prevented by following well-defined practical guidelines (29).

Conclusion

This study shows that you should be aware of patients' symptoms during care. This study

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showed that hospitals have standard guidelines in departments related to living blood transfusions.

Ethical standards statement

The most vital aim through this study was improving health worldwide and for all human beings, therefore considering various ethical necessities, it was finally authorized by the Ethics Review Committee of Mazandaran University of Medical Sciences because of ethical code IR. MAZUMS.REC. 1399.7286.

Conflicts of interest

The authors declare no conflict of interest.

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