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Research Article

Investigation of the Frequency of Reactions and Consequences of Blood Transfusion in an Academic Center Guilan-Iran

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Abstract

Background: Blood transfusion is a life-saving procedure, but there are always potential risks, such as blood transfusion reactions.

Objectives: Considering the importance of the subject and the lack of a similar study in Guilan province, this research was conducted to analyze blood transfusion reactions.

Methods: This retrospective descriptive study was conducted at Al-Zahra Hospital in Guilan, Iran, between 2020 and 2022. The files of all patients who received blood products at this center and experienced a reaction were reviewed. A checklist was completed, which included details such as the hospital ward, age, blood group, underlying disease, type of surgery, type of injected product, history of transfusion, history of reaction and allergy, type of reaction, and treatment intervention.

Results: During the study period, 4,887 cases received transfusions. Among them, 18 cases (0.36%) showed reactions during transfusion, of which 14 cases (0.35% of total packed cell injections) were related to packed cell injection. Shivering was the most common reaction, occurring in 8 cases (15.38%). The main interventions included the administration of steroids in 10 cases (25%), antihistamines in 7 cases (17.5%), and oxygen therapy in 7 cases (17.5%). Three cases (7.5%) were transferred to the ICU, and in three cases (7.5%), the blood transfusion was stopped. One mortality was reported, and no cases of incompatible blood transfusion were documented.

Conclusions: The incidence of reactions to blood product injections at this center appears to be acceptable. However, it was found that the information recording systems were very inefficient, and forms were incompletely filled, which should be addressed and corrected.

Keywords: Blood Safety, Transfusion Reaction, Treatment Outcome

1. Background

Research has shown that the number of blood transfusion reactions has decreased over the past 30 years. It is necessary to consider any new symptoms that the patient shows within 24 hours after the transfusion as a potential reaction, and a consultation with a hematologist should be done immediately to determine the cause and type of reaction. Studies have shown that the most effective way to reduce transfusion reactions is to avoid unnecessary transfusions and implement strict protocols. Complications have been reported following the transfusion of all blood products. While blood transfusion is a life-saving method, its unnecessary use or improper procedure exposes the recipient to potential risks such as blood transfusion reactions (1, 2). Errors that cause unwanted reactions following transfusion can be due to incompatible blood transfusions, incorrect screening and transmission of HIV, hepatitis B and C infections, incorrect labeling of blood bags, errors in laboratory tests, or keeping blood at inappropriate temperatures. Additionally, excessive

blood transfusion can cause iron overload (3, 4). In Iran, about 3 million blood transfusions are performed annually (5). It is estimated that one reaction occurs in every 13,000 transfusions, mostly due to human error (6). The mortality rate related to transfusion reactions has been reported as 1 per 100,000 units injected (7).

2. Objectives

Considering the importance of the subject and the lack of similar studies in Guilan province, this research was conducted to assess the state of transfusion reactions at Al-Zahra Center. This academic hospital is a referral center for all types of gynecological and obstetric surgeries, especially high-risk maternal cases from all over the province. In addition to the limited number of studies, the significant issue is that the results of other research cannot be generalized and applied. Many factors, including the accuracy of the laboratory (both in terms of equipment and personnel), the importance of reporting medical errors and complications, the level of awareness and knowledge of the treatment team about blood reactions, and the way patients are monitored, all influence outcomes, which obviously differ from one center to another.

3. Methods

After the approval of the Honorable Research Vice, this retrospective descriptive study was conducted at Al-Zahra hospital in Guilan, Iran. The files of all patients who received blood products in this center between 2020 and 2022 and had a reaction were reviewed, and the desired information was entered into a checklist. The information collection form included the file number, hospital ward, patient's age, blood group, underlying disease, type of surgery, type of injected product, history of transfusion, history of reaction, history of allergy, antibiotic use during current hospitalization, type of reaction, and treatment intervention.

4. Results

A total of 4,887 cases received transfusions during the study period, including 3,920 packed cells (80.22%), 532 fresh frozen plasma (FFP) (10.88%), 393 platelets (8.05%), and 42 cryoprecipitates (0.85%). Among them, 18 cases (0.36%) showed reactions: Fourteen were related to packed cell injections (0.35% of total packed cell injections), 3 cases to FFP injections (0.56% of total FFP injections), and 1 case to platelet injections (0.25% of total platelet injections) (Table 1).

Table 1. Transfusion Characteristics Among Women Hospitalized in Al-Zahra Hospital and Frequency of Reactions to Them

Variables	2020	2021	2022	Total	Reactions
RBC	1032	1427	1461	3920 (80.22)	14 (0.35)
FFP	140	194	198	532 (10.88)	3 (0.56)
Cryo	-	-	42	42 (0.85)	-
Platelet	78	176	139	393 (8.05)	1 (0.25)
Total	1250	1797	1840	4887	18

Shivering was the most common reaction, occurring in 8 cases (15.38%), followed by urticaria and itching in 5 cases (9.61%) (Table 2). The main interventions included the administration of steroids in 10 cases (25%), antihistamines in 7 cases (17.5%), and oxygen therapy in 7 cases (17.5%). In 3 cases (7.5%), patients were transferred to the ICU, and in 3 cases (7.5%), only blood transfusion was stopped with no additional intervention (Table 3). Eleven (61.1%) reactions occurred in surgical wards and 2 in the operating room and labor ward (Table 4). During the study period, one mortality was reported, and no incompatible blood transfusions were documented.

Table 2. Type of Reactions to Blood Transfusion and Blood Products

Type of Reaction	No. (%)
Shivering	8 (15.38)
Itching	5 (9.61)
Urticaria	5 (9.61)
Tachycardia	4 (7.69)
Hematuria	4 (7.69)
Nausea	4 (7.69)
Fever	3 (5.76)
Rash	3 (5.76)
Feeling unwell	3 (5.76)
Chest pain	2 (3.84)
Tachypnea	2 (3.84)
Restlessness	2 (3.84)
Back ache	2 (3.84)
Shortness of breath	1 (1.92)
Stomach ache	1 (1.92)
Numbness of the tongue	1 (1.92)
Cyanosis	1 (1.92)
Bradycardia and loss of consciousness	1 (1.92)
Total	52 (100)

Table 3. Frequency of Treatments for Blood and Blood Products Transfusion Reactions

Type of Treatment	No. (%)
Steroid	10 (25)
Antihistamine	7 (17.5)
Oxygen therapy	7 (17.5)
Anti fever	5 (12.5)
Transferring to ICU	3 (7.5)
Stop blood transfusion	3 (7.5)

Type of Treatment	No. (%)
painkiller	2 (5)
Diuretic	2 (5)
Mechanical ventilation	1 (2.5)

Table 4. Frequency of Reactions to Blood and Blood Products Transfusion in Different Wards

Wards	No. (%)
Surgical ward	11 (61.1)
ICU	3 (16.7)
Operation room	2 (11.1)
Labor	2 (11.1)

5. Discussion

The results of this research showed that among the 4,887 injections of blood products performed over these three years, 18 cases (0.36%) of reactions occurred. The results of this research align with several studies in Europe that reported the most common blood reactions were febrile and allergic reactions.

Two cases occurred in the operating room, one of which presented with flushing and urticaria. The other was a 31-year-old woman undergoing a cesarean section. Following packed cell transfusion, she developed severe hypotension and bradycardia, followed by cardiorespiratory arrest. Cardiopulmonary resuscitation was started, and she was transferred to the ICU, but she was arrested again and died. The notable point about this patient was that she had mentioned a history of drug allergies, which indicated the need for special attention, as allergies could be a risk factor for anaphylaxis (8, 9).

Most of the reactions to blood transfusion occurred in the surgical departments, with the fewest in the operating room. The performance of double-checks, standard monitoring (including blood pressure, pulse oximetry, and heart rate), the presence of the anesthesiologist in the operating room, and direct observation of the patient could justify this. Among the patients who developed reactions, one case reported a history of complications in previous transfusions, emphasizing that safe previous transfusions do not guarantee patient safety in subsequent sessions. Therefore, safety and care measures should be fully considered for patients with a history of uncomplicated transfusions.

The results of this research show that despite efforts to maintain the safety of patients while receiving blood products, risks still exist. Therefore, it is necessary to follow strict strategies based on scientific criteria. In Saha et al.'s study from India, the incidence of blood transfusion reactions over a 7-year period at an academic center in India was investigated. They reported that out of 100,569 blood transfusions, a total of 140 (0.14%) patients had a reaction, mainly pruritus and rash, with most reactions related to FFP injection and then packed cells (10).

In a 10-year study, Kwon et al. from Korea investigated the number of hypotension cases following blood transfusion in an academic referral center. They reported 37 cases (0.5 out of 10,000) of blood pressure drop following blood transfusion. More than half of the cases occurred after 15 minutes from the start of the injection. In all cases, the patient returned to a stable condition (11). Kaleemi et al. investigated the status of blood transfusion reactions in a teaching hospital in Pakistan over a period of 4 years. In this research, 9,597 transfusions were performed, of which 72 people showed a reaction (0.75%). The most common reaction was non-hemolytic febrile reactions, and the most common products that led to the reaction were whole blood (12).

In a study in France, the response status following FFP was investigated. In this research, 52 cases of reactions out of every 100,000 units of FFP injected were reported, of which 88.5% were self-limited, 11.3% were life-threatening, and 0.2% were fatal (13). Although the reported results of this research show a better situation than other studies, the possibility of not reporting medical errors and complications should always be kept in mind.

Based on the results of this research, it was found that the rate of adverse effects of injecting blood products in this center was acceptable. Regular participation of the hospital treatment staff in hemovigilance training courses, proper storage conditions of blood products, checking product specifications by two people before the injection, standard monitoring, awareness of the medical staff regarding reaction warning signs and timely measures, efforts to follow strict strategies regarding blood transfusion, and compliance with academic standards in case selection for transfusion are among the reasons justifying these conditions.

In a retrospective study conducted at Shiraz Namazi Hospital over a two-year period, 52,371 patients who received blood transfusions were evaluated for acute reactions. In this study, 52 patients (0.08%) were affected: Twenty-five had fever, 15 had itching, 15 had rash, 9 had back pain, 8 had chills, 5 had low blood pressure, 5 had shortness of breath, 11 had chest pain, 1 had blood in urine, and 1 had cold sweat. The most common acute reaction was fever (0.04%). No case of blood group incompatibility was reported, which was an ideal

situation compared to international statistics (0.004) (14). In a cross-sectional, retrospective study over a two-year period in Hamedan university hospitals, the rate of blood transfusion-related reactions was analyzed. The most common reactions were allergic reactions (53%), followed by non-hemolytic febrile reactions (24%). A significant relationship was observed between receiving the product containing red blood cells and non-hemolytic febrile reaction. 58.6% had a previous history of blood transfusion and its products. Allergic reactions and non-hemolytic febrile reactions were the most common among recipients of blood products (15).

5.1. Limitations

Due to the nature of this retrospective study, the obtained information was limited to what was recorded in the files. More valuable results could have been obtained if more data were analyzed.

5.2. Conclusions

The results of this research showed that the incidence of blood product injection complications in this center was lower compared to other similar studies in the country, and they were quickly diagnosed and the injection process was stopped. The significant and reportable result from an academic and referral center has been that the blood transfusion complication registration system should be more complete and accurate, with detailed records. Based on the findings of this research, the type of reaction is not clear, and only symptomatic treatments have been proposed for the symptoms, which should be reported and corrected.

Footnotes

Authors' Contribution: Study concept and design: M.N. and G.B.; drafting of the manuscript: M.A.; acquisition, analysis, or interpretation of data: M.A. and M.T.; editing & review: M.H. and M.N.; investigation and resources: S.GH.T. and Z.H.; study supervision: G.B.

Conflict of Interests Statement: The authors declare that there was no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: This study is approved under the ethical approval code of IR.GUMS.REC.1402.138 .

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