ORIGINAL ARTICLE

Bali Medical Journal (*Bali MedJ)* 2022, Volume 11, Number 2: 506-509
P-ISSN.2089-1180, E-ISSN: 2302-2914

Overview of transfusion reactions in patients with incompatible crossmatch at Sanglah General Hospital, Denpasar, Bali, Indonesia

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Received: 2022-03-07
Accepted: 2022-05-15
Published: 2022-05-31

ABSTRACT

Background: Transfusion reaction is a side effect of giving complete blood or one ofthe components. They vary in severity, ranging from reactions that can occur during atransfusion (acute transfusion reactions) or reactions occurring days to weeks later (delayed transfusion reactions) and can be immunological and non-immunological. This study investigated the description of transfusion reactions in patients who receivedblood with incompatible crossmatch results at Sanglah General Hospital.

Methods: This research is a descriptive study with a cross-sectional approach. Several parameters were assessed in this study to determine the transfusion reaction in patients who receive blood with incompatible crossmatch. Data were analyzed using SPSS version 20 for Windows.

Results: In this study, from 72 patients who received incompatible blood, 75.0% were found for women and 25.0% for male patients, most of whom were aged 41-65 years (65.0%). Most blood type is blood type O (52.0%). In this study, 6 patients (8.3%) got transfusion reactions such as fever accompanied by chills, urticaria, hypotension, and shortness of breath.

Conclusions: Incompatible crossmatch blood administration can be given. If a reaction is given to a crossmatch transfusion that is not suitable, symptomatic therapy can be given because the response provided is only acute and mild.

Keywords: Transfusion Reaction, Incompatible Crossmatch, Crossmatch.
Cite This Article: Pardosi, B.B.H., Mulyantari, N.K., Wirawati, I.A.P., Lestari, A.A.W., Mahartini, N.N. 2022. Overview of transfusion reactions in patients with incompatible crossmatch at Sanglah General Hospital, Denpasar, Bali, Indonesia. *Bali Medical Journal* 11(2): 506-509. DOI: 10.15562/bmj.v11i2.3605

INTRODUCTION

Crossmatch is a type of examination carried out before implementing a blood transfusion.[1,2] The crossmatch aims to determine if the blood from the donor matches the recipient so that the blood is suitable and beneficial for the patient's recovery, as well as prevent the transfusion reactions so that it can be used to confirm blood type.[2,3] Based on the American Association of Blood Bank (AABB), crossmatch is defined as an examination that uses a method that can show ABO system incompatibility and the presence of significant antibodies to erythrocyte antigens as well as antiglobulin examination.[4] Crossmatch results that are considered safe and can be performed if they are major, minor, auto control negative.[5]

A transfusion reaction is a side effect of giving whole blood or one of its components.[4,5] The severity varies, from mild to life-threatening. The transfusion reactions that occur vary during transfusion (acute transfusion reactions) or occur for days to weeks later (delayed transfusion reactions), it can be the immunological or non-immunological response. Transfusion reactions are sometimes difficult to identify and some reactions may present with non-specific and overlapping symptoms. The most common signs and symptoms are fever, chills, and urticaria (itching). Some symptoms can resolve with or without treatment.[1]

Other transfusion reactions that can also occur are: acute hemolytic, delayed hemolytic, feverless hemolytic, anaphylaxis, allergies, sepsis (due to bacterial infection), Transfusion Related Acute Lung Injury (TRALI), and Transfusion Associated Circulatory Overload (TACO). If a reaction occurs at the time of transfusion, the transfusion must be stopped immediately and reported to health workers.[1,2]

Based on those mentioned above, this study aims to determine the description of the transfusion reaction in patients who received blood with incompatible crossmatch results at Sanglah General Hospital, Bali, Indonesia.

METHODS

The design of this study is a descriptive study with a cross-sectional method (cross-sectional) to determine the transfusion reaction in patients who received blood with incompatible crossmatch. Univariate analysis was used for demographic

data in order to obtain a characteristic distribution of study participants. The study's target population was patients who received blood transfusions with incompatible crossmatch at Sanglah Hospital, Denpasar. The study participants were the affordablepopulation that met the inclusion criteria, selected by consecutive sampling technique. The inclusion criteria were all patients who received transfusions with an incompatiblecrossmatch at least 18 years. The exclusion criteria were patients who had a fever before receiving the transfusion, patients who had complaints of itching before transfusion, and patients diagnosed with respiratory disorders. The patients involved in this study were by demographic characteristics, including adult age, gender (male and female), and kind of blood (A, B, AB, and O). This data is taken from the registered data of the Hospital Blood Bank (HBB) and medical record. Data were analyzed using SPSS version 20 for Windows.

RESULTS

In this study, from 72 patients who received incompatible blood, 54 women (75.0%) were found and 18 men (25.0%). The average age of most patients is in the age range of 41-65 years (62.5%), and the highest blood group is blood type O (52.8%). Patient characteristics can be seen in Table 1 and Table 2. The 41-65 years age group was predominant (62.5%), followed by the female (75.0%) and O blood type (52.8%) (Table 1). In addition, most of the incompatible crossmatch was frequent in the 41-65 years age group, such as male in A (5.6%) and B (8.3%) blood type, but female in AB (2.8%) and O (24.0%) blood type (Table 2).

In the transfusion reaction stage, from 72 samples that received an incompatible crossmatch donor, the results obtained did not react in patients who received an incompatible crossmatch donor as 66 patients (91.6%). In contrast, those who gave a reaction were 6 patients (8.4%). Reactions include fever, urticaria, hypotension, and shortness of breath (Figure 1).

The blood given to the patient based on the crossmatch results was: 1) major (-) minor (+w) AC (+w); 2) major (-) minor (+1) AC (+1); 3) major (-) minor (+w) AC negative; 4) major (-) minor (+2) AC (+2); 5) major (-) minor (+2) AC (+1); 6) major (-) minor (+3) AC (+3); 7) major (-) minor (+1) AC (+w); and 8&9) minor (+w) AC +1 (Figure 2). From the result patients who receive incompatible blood, only a small percentage (8.3%) of them get a transfusion reaction. As many as 3 patients experience urticaria and fever, shortness of breath in 1 patient, hypotension in 1 patient, and urticaria 1 patient.

Table 1. Characteristics of patients who received incompatible crossmatch.

Variable	Total (%)
Age (Years), n (%)	
18-40	16 (22.2)
41-65	45 (62.5)
>65	11 (15.3)
Gender, n (%)	
Male	18 (25.0)
Female	54 (75.0)
Blood Group,n (%)	
A	11 (15.3)
B	15 (20.8)
O	38 (52.8)
AB	8 (11.1)

Table 2. Blood group characteristics, gender, and age of patients incompatible crossmatch.

Blood Group	Age (Year) (N=72)			Total (%)
	18-40 (N=15)	41-65 (N=47)	>65 (N=10)	
A group, n (%)				
Male	0 (0.0)	5 (6.9)	2 (2.8)	7 (9.7)
Female	1 (1.4)	4 (5.6)	0 (0.0)	5 (7.0)
B group, n (%)				
Male	1 (1.4)	6 (8.3)	1 (1.4)	8 (11.1)
Female	2 (2.8)	4 (5.6)	1 (1.3)	7 (9.7)
AB group, n (%)				
Male	1 (1.4)	1 (1.4)	1 (1.4)	3 (4.2)
Female	1 (1.4)	2 (2.8)	1 (1.4)	4 (5.6)
O group, n (%)				
Male	5 (6.9)	8 (11.0)	2 (2.8)	15 (28.0)
Female	4 (5.6)	17 (24.0)	2 (2.8)	23 (16.0)

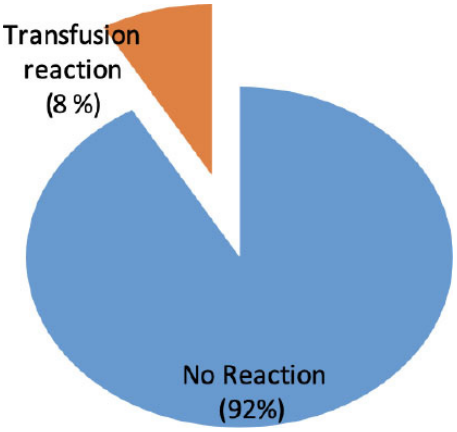

Figure 1. Transfusion reaction diagram in incompatible crossmatch.

DISCUSSION

Transfusion reactions are side effects due to transfusion occurring during or after transfusion.[6,7] Administration of blood products with incompatible crossmatch results can also cause transfusion reactions. Various actions can be taken to reduce the incidence of transfusion reactions, but sometimes not all of these efforts can be applied in multiple situations.[2,3,8] One of the efforts that can be done to reduce the occurrence of transfusion reactions is to check blood groups and crossmatch tests. Checking blood type serves to prevent transfusion reactions that can cause incompatibility between patients and donors due to interactions between antigens and antibodies that cause agglutination.[8,9]

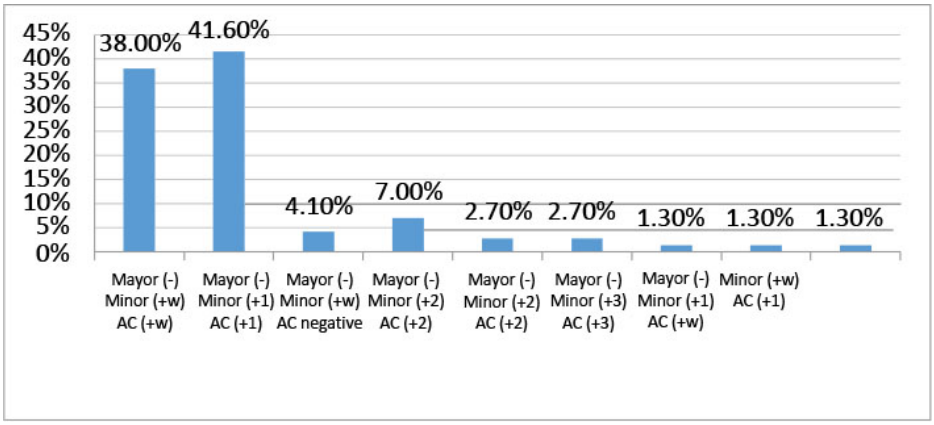

Figure 2. Result of incompatible crossmatch on blood transfusion.

The blood grouping system that is widely known is the ABO system which is a blood grouping system that has both antigens and antibodies, most importantly because it can cause several bleeding reactions during transfusion and can cause hemolytic disease in the newborn. B, blood group B has B antigen and anti-A antibodies. Type AB blood has both A and B antigens but no antibodies in their serum. Type O blood does not have antigens on the surface of its erythrocytes but has anti-A antibodies and anti-B antibodies.[10-12]

Crossmatch is a matching reaction between donor blood and recipient blood, with the antibodies detected in the patient's serum, including anti-A and anti-B, can destroy donor erythrocytes. Crossmatch consists of a major crossmatch to check the presence or absence of recipient agglutinins that may damage the donor erythrocytes that enter during transfusion and a minor crossmatch to check the presence or absence of donor agglutinins that may damage the recipient's erythrocytes.[15]

The method that is often used to perform crossmatch is the gel method. On the gel, it will be seen that the erythrocytes on the surface of the gel are erythrocytes that are experiencing agglutination.[13,14] In contrast, the erythrocytes that settle to the bottom of the gel are erythrocytes that are not agglutinated, then assess the degree of agglutination on the test gel, which is graded from 1+ to 4+.[13,15] The results crossmatch test can be either compatible or incompatible. The results considered compatible or safe for thepatient are if the major, minor, and auto control results are negative.[13,15]

In this study, 72 patients with crossmatch results showed incompatible crossmatch. This result indicatesthat the administration of incompatible crossmatch blood is a major negative, and the degree of Auto-Control (AC) agglutination is the same as minor. More women with an average of 41-65 years old were predominant in this study. The most frequent incompatible crossmatch for the blood group was the O-blood type. This result is different from the previous study where the blood group that showed the most incompatible crossmatch was blood type AB (38.9%), while blood type O was 31%.[15,16]

Transfusion reactions can be divided into several types, namely: based on the time of occurrence, which is divided into acute reactions and delayed transfusion reactions. Acute transfusion reactions occur within 24 hours of transfusion, whereas delayed transfusion reactions occur after 24 hours. Transfusion reactions can also be divided into immune and non-immune as well as infectious and non-infectious based on their pathophysiology.[5,6] A retrospective study at The Blood Bank Unit at University Kebangsaan Malaysia Medical Center reported that the incidence of transfusion reactions was 1 in 187 blood transfusions.[17] A previous study also stated that most of the transfusion reactions were acute transfusion reactions in the form of a febrile non-hemolytic transfusion reaction or fever (55%) associated with the presence of allogenic leukocytes in transfusion blood products.[6] In this study, 8.4% of the reactions that occurred were acute reactions in the form of urticaria (2.7%), hypotension (1.3%), fever accompanied by chills (1.3%) and shortness of breath (2.7%) but 91.6% of blood products were incompatible. This can be taken into consideration that blood products with incompatible results can be given with supervision during transfusion because the reaction given is a mild acute reaction.[1]

Transfusion reactions can occur through several mechanisms, including allergen-related pathways, non-allergen-related pathways, and patient factors.[18] Allergen-related pathways include plasma proteins (IgA and haptoglobin), chemical allergens (methylene blue, which is a reagent for viral activation in the FFP pathway), histamine and mast cell-mediated IgE-linked pathways, basophil-associated IgG-linked pathways and platelet-activating factor. Meanwhile, pathways unrelated to allergens are biological response modifiers (BRMs), such as inflammatory cytokines and chemokines that accumulate in blood components during storage.[18] For patient factors, including Histamine-Releasing Activity (HRA), the presence of a patient's condition that triggers HRA will induce calcium influx into mast cells.[13]

The management that can be done in cases of acute transfusion reactions is the immediate cessation of the transfusion process, administration of normal saline fluids, and administration of drugs that relieve allergic reactions, such as antihistamines; drugs that reduce inflammatory responses such as steroids, intravenous administration of physiological fluids, and administration of drugs that increase bloodpressure such as epinephrine if the drop in blood pressure occurs drastically.[13]

CONCLUSION

Blood products with incompatible crossmatch results can be occurred and must be monitored. The reaction caused by incompatible crossmatch administration is a mild acute reaction, which can be treated symptomatically.

CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

ETHICAL CLEARANCE

This study had been approved by the Research Ethics Commission of Sanglah Hospital,Denpasar (Ethical Clearance No. 1017/UN14.2.2.VII.14/LT/2020).

FUNDING

This research was funded by the author. The authors declare no conflict of interest related to the material presented in this article.

AUTHOR CONTRIBUTION

All authors were equally involved in making concepts and planning the research, data collection, calculating the experimental data, performing analysis, data analysis, and critical revision of the manuscript.

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