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Erythrocyte alloantibodies in chronic kidney disease patients receiving packed red cell transfusions in Sanglah General Hospital, Denpasar

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ABSTRACT

Introduction: In Chronic kidney disease (CKD) patients, as the consequences of the pathogenesis, anemia due to the failure of erythropoietin production requires Packed Red Cell (PRC) transfusion. The presence of alloantibodies in CKD patients who routinely require transfusion in Bali has never been evaluated. This study aims to determine the erythrocyte alloantibodies of CKD patients who received PRC transfusions in Sanglah Hospital.

Methods: This study was a cross sectional descriptive study in adult CKD patients with history of PRC transfusion more than twice.

Results: A total of 50 patients with Chronic Kidney Disease consisting of 31 men and 19 women, mostly 46-65 years old (60%) and the most blood group were blood group O (44%). There were 3 patients with positive antibody screening and identification results, 2 male patients (66.67%) and 1 female (33.33%). Two patients 46-65 years (66.67%) while 1 person 18-45 years (33.33%), with 2 person with blood group A (66.67%) and one person with blood group O (33.37%). These three patients presented multiple alloantibodies in the form of anti-K, anti-Kp^a, anti-Lu^a

Conclusion: From the CKD patients who received PRC transfusions in Sanglah Hospital, ±6% formed alloantibodies. All of the alloantibodies formed were multiple alloantibodies, in the form of anti-K, anti-Kp^a and Lu^a.

Keywords: Chronic kidney disease, erythrocyte alloantibodies, packed red cell, transfusion

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INTRODUCTION

In modern health services, blood transfusion is one of the important things in saving patients' lives and improving their health status. Blood transfusion is merely done on the basis of indications and emergencies, if done inappropriately and irrationally it can cause various fatal consequences.[1] Anemia as a severe complication of Chronic kidney disease (CKD) generally occurs in more than 80% of patients with impaired renal function.[2,3] The main cause of anemia in CKD is inadequate erythropoietin production due to the damaged kidney. Erythropoietin is a glycoprotein secreted by renal interstitial fibroblasts and is very important for the growth and differentiation of red blood cells in the bone marrow. In patients with chronic kidney disease, tubular atrophy causes tubule-interstitial fibrosis resulting in decreased ability of erythropoietin synthesis and causing anemia.[2-5]

Alloimunization of red blood cells is a common complication among CKD patients who need regular blood transfusions.[6] Immune response due to genetic differences between donor blood and recipient induces alloantibodies. Other factors influencing the formation of alloantibodies are the recipient's immune status and the large number of transfusions, as well as the immunogenicity of the antigen.[1,6] Several studies have shown the incidence of alloimmunization among patients with chronic kidney disease. A study conducted by Mervat et al, reported 9.5% alloimmunization rates in recurrent transfusion patients.[7] Shukla et al, found 9.8% erythrocyte alloimmunization rates in patients with chronic kidney disease.[8] In accordance, Domen and Ramirez have reported a low level of 6.1% antibody formation in the same group of patients.[7] In a study conducted by Hytum et al in Port Sudan blood banks, the incidence of alloantibodies among CKD patients was 13.1% and most alloantibodies were Anti-c (27.3%), anti-C (18.2%), and anti-K (18.2%).[6]

The emergence of alloantibodies in CKD patients who routinely require PRC transfusion in Bali has never been evaluated. The aim of the study was to determine the descriptive aspects of erythrocyte alloantibodies in CKD patients who receive PRC transfusion at Sanglah Hospital. Further, the data can be used as a basis for making an investigation system and blood service flow that prioritizes patient safety.

MATERIAL AND METHODS

This study was a cross-sectional descriptive study conducted from January to April 2018, in patients with adult chronic kidney disease with a history

of PRC transfusion more than twice. In this study, the research materials was venous blood samples in EDTA anticoagulants for antibody screening and identification examination.

Patients with chronic kidney disease at Sanglah General Hospital who submitted a request for PRC at the Sanglah Hospital Blood Bank received pre-transfusion examination prior to transfusion. Pre-transfusion tests were the examination of ABO and rhesus blood groups and cross-match (major and minor) as well as antibody screening tests. Where the result was positive, antibody screening will be followed by an antibody identification check. Samples of hemolysis were excluded from the study sample. A total of 50 samples of CKD patients were classified according to age, sex and blood type. Antibody screening tests used the gel agglutination technique with 2 cell screening panels, while the antibody identification examination was carried out using the gel agglutination technique using 11 panel cells. The reagents used were cell panels from Bio-rad®.

RESULTS

In this study, from 50 samples of chronic kidney disease patients, there were 31 men (62%) and 19 women (38%). Based on age groups, age 18-45 years was 28%, age 46-65 years was 60% and above 65 years was 12%. The most blood group was blood type O (44%), while blood type A was 22%, blood group B was 30% and blood group AB was 4% (Table 1). Moreover, most of the chronic kidney disease patients were in blood type O, aged 46-65 years and male dominant (Table 2).

Based on the results of antibody screening and identification, from 50 samples of chronic kidney disease patients, we found 3 positive samples (6%) formed alloantibodies. Of the three samples, 2 of them were male (66.67%) and one female (33.3%). Two people were aged 46-65 years (66.67%) and one person aged 18-45 years (33.33%). One patient was blood type O (33.33%) and 2 patients were blood type A (66.67%) (Table 3). These three patients who tested positive and identified antibodies had shown multiple alloantibody in the form of anti-K, anti-Kpa and anti Lua (Figure 1).

Table 1 Characteristics of patients with chronic kidney disease

Characteristics	Number (%)
Ages (years)	
18-45	14 (28%)
46-65	30 (60%)
>65	6 (12%)
Sex	
Male	31(62%)
Famale	19(38%)
Blood types	
A	11(22%)
B	15(30%)
O	22(44%)
AB	2 (4%)

DISCUSSION

Alloimunization of red blood cells is a common complication among CKD patients who need regular blood transfusions. Immune response due to genetic differences between donor blood and recipient induces alloantibodies. The recipient's immune status, antigen immunogenicity and antigen dosage are several factors that play important roles in alloantibody formation. The presence of erythrocyte alloantibodies will disrupt transfusion therapy, hence, suitable antigens with the appropriate blood are needed for safer transfusion.[1,6,7]

Alloantibodies in patients with chronic kidney disease occur after patients are exposed to repeated PRC transfusions. Unlike thalassemia patients, data on the incidence of alloantibodies in patients with chronic kidney disease in Indonesia is still very limited.[6,7] In this study, the prevalence of 6% alloantibodies was detected in 3 samples from 50 samples studied. This is far lower than the frequency of previous research conducted by Hythum et al (2014) in Sudan which was reported to be 13.1%.[7] In the other hand, similar result were shown by the studies conducted by Doman and Ramire (2008) who had an alloantibody incidence of 6.1%,[8] whereas 9.9% reported by Shukla (2009) in CKD patients undergoing dialysis.[9]

In the results of alloantibody screening and identification of this study, it was found that all three patients had shown multiple alloantibodies in the form of anti-K, anti-Kp^a and anti Lu^a. Most alloantibodies were found in blood group A (66.67%). This is different from the study of Amran (2017) in Jaipur, who found the prevalence of alloantibodies in 18% CKD patients, specifically with single alloantibody 85% and 15% multiple alloantibodies. In this study, it was also found that the most formed alloantibodies in blood group B (71%),[10] whereas Hynthum (2014) found that the most common alloantibodies among CKD patients were Anti-c (27.3%), anti-C (18.2%) and anti-K (18.2%). The difference in the level of alloantibodies formed is influenced by the heterogenity of the

Table 2 Characteristics of blood group, gender and age of patients with chronic kidney disease

Blood types		Ages (years) 18-45	46-65	>65	Total Sample (%)
A	Male	0	5 (10%)	2 (4%)	7 (14%)
	Female	1 (2%)	3 (6%)	0	4 (8%)
B	Male	1 (2%)	6 (12%)	1 (2%)	8 (16%)
	Female	2 (4%)	4 (8%)	1 (2%)	7 (14%)
AB	Male	1 (2%)	1 (2%)	0	2 (4%)
	Female	0	0	0	0
O	Male	5 (10%)	8 (16%)	1 (2%)	14 (28%)
	Female	4 (8%)	3 (6%)	1 (2%)	8 (16%)

Table 3 Characteristics of the results of alloantibody screening

Characteristics	Alloantibody Positive (%)	Negative (%)
Ages (Years)		
18-45	1 (33.33%)	13 (26%)
46-65	2 (66.67%)	28 (56%)
>65	0	6 (12%)
Sex		
Male	2 (66.67%)	29 (58%)
Female	1 (33.33%)	18 (36%)
Blood Types		
A	2 (66.67%)	9 (18%)
B	0	15 (30%)
O	1 (33.33%)	21 (42%)
AB	0	2 (4%)

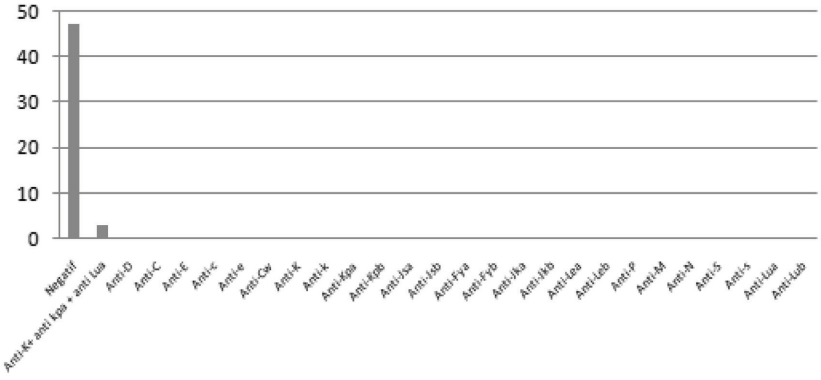

Figure 1 Frequency of erythrocyte alloantibody in patients with chronic kidney disease

population, pre-transfusion blood tests in which only use ABO and rhesus blood type tests as well cross-match, the number of the study population sample and the different sensitivity of the test method used.[7]

Based on the age characteristics of the study, more alloantibodies were found at the age of 46-65 years (66.67%) than those aged 18-45 years (33.33%). It was in accordance with the study by Amran (2017) who found alloantibodies in patients over 35 years of age (57%) more than patients aged less than 35 years (43%).[10] In this study, more alloantibodies were found in men (66.67%) than in women (33.3%). Al-Joudi (2011) stated that the incidence of alloantibodies in women is higher (26.9%) than men (6.9%) because they have a history of pregnancy.[11] Further research is needed to elucidate the relationship between pregnancy and the presence of alloantibiodies.

CONCLUSION

In this study, 3 patients (6%) were found with the results of positive antibody screening and identification from 50 research subjects. These patients presented with multiple alloantibodies in the form of anti-K, anti-Kp^a and anti Lu^a. The necessity to add secondary data in term of history of pregnancy and the number of transfusions from patients with chronic kidney disease will help in order to elaborate the effect of these factors on the formation of alloantibodies in patients with chronic kidney disease who routinely need transfusions.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICAL CONSIDERATION

This article was approved by Udayana University Ethics Committee.

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