

Packed Red Cell Transfusion in Elderly Patients at Dr. Sardjito Hospital: A Retrospective Study in Yogyakarta Indonesia

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Abstract

Objective: Yogyakarta has the highest elderly population in Indonesia. Anemia in the elderly is an important problem because it can reduce the quality of life. One of the therapies for anemia in the elderly is Packed Red Cell (PRC) transfusion. PRC transfusion in the elderly is a challenge because it must consider various factors such as hemoglobin level, clinical conditions, risks and benefits of transfusion, as well as complications that often occur. Dr Sardjito Hospital is a tertiary referral hospital located in Yogyakarta, Indonesia. This study aimed to analyze the pattern of PRC transfusion in elderly patients at Dr Sardjito Hospital, Yogyakarta.

Materials and Methods: This was a descriptive observational study. Elderly patient data in August 2020 were taken retrospectively from the hospital information system and laboratory information system Dr. Sardjito Hospital Yogyakarta. Data was presented in the form of number (percentage), mean (standard deviation) or median (min-max) according to the distribution of the data.

Results: A total 192 elderly patients were recorded during period of study. The PRC transfusions in elderly patients were 21.82%, dominated by patients with diagnosis of malignancy (63.02%). The most common malignancy diagnosis was non-haematological malignancy (46.87%). The median of PRC units requested was 3 (1-17) units and the median of units transfused was 2 (1-14) units. The highest proportion of pretransfusion hemoglobin level was 7-8.9 g/dL (35.88%). The post transfusion hemoglobin increment was 0.55 – 1.1 g/dL per PRC unit.

Conclusion: PRC transfusions rate in elderly patients at Dr Sardjito Hospital Yogyakarta were dominated by malignant patients. Guidelines on the number of PRC units required by patients and pretransfusion hemoglobin levels in elderly patients are needed to establish a rational blood transfusion practices.

Keywords: Elderly, Transfusion, PRC, Anemia, Hemoglobin.

1. Introduction

Anemia is a major health problem worldwide that can cause chronic disability that affects health, economic conditions and social welfare [1]. In Indonesia, anemia has a prevalence of 21.70% [2]. Anemia can also occur at all ages, even the elderly. It is one of the most common diseases suffered by the elderly [3]. The elderly population in Indonesia continues to increase. In almost five decades, the percentage of the elderly in Indonesia has increased by about 2 times (1971-2019) to 9.6% [4]. The Special Region of Yogyakarta is the province with the largest elderly population in Indonesia, reaching 14.71% [5].

Anemia in the elderly population is important because it can increase the risk of decreasing physical and muscle strength, increase the risk of falling, create cognitive impairment, and increase hospitalization frequency and mortality [6]. One of the therapies for elderly anemia patients is blood transfusion. Blood transfusion in the elderly often causes complications, such as immediate and delayed complications due to vulnerabilities and the risk of repeated transfusions [7]. Furthermore, transfusions in the elderly are delivered not only based on hemoglobin, but also the need to consider risks or benefits of giving transfusions related to the patient's comorbidities [8]. Another study stated that elderly suffering from cardiovascular diseases has slightly higher pretransfusion hemoglobin (Hb) level than adult patients in general [9].

On the other hand, the side effects of transfusion, especially those related to Packed Red Cell (PRC), are more common in elderly patients. The most frequent complications are TACO (Transfusion Associated Cardiac Overload), then TRALI (Transfusion Related Acute Lung Injury), TRIM (Transfusion-related Immunomodulation), ABO incompatibility, and even delirium [9]. Given the importance of blood transfusion in elderly patients, this study aimed to analyze the pattern of blood transfusion practices, especially PRC transfusion in the elderly patient at Dr Sardjito Hospital, Yogyakarta.

2. Materials and Methods

This is a descriptive observational study and data were taken retrospectively. The subjects were patients aged over 60 years old who were treated at Dr. Sardjito Hospital Yogyakarta and received a PRC transfusion in August 2020.

Demographic data such as age, sex, blood groups, type and number of blood units transfused, division of clinicians who requested the blood, and patient diagnosis were obtained from the hospital information system of Dr. Sardjito Hospital Yogyakarta. Laboratory data in the form of pre-transfusion and post-transfusion hemoglobin levels were obtained from the Laboratory Information System of Central Laboratory Dr Sardjito Hospital Yogyakarta.

Hemoglobin examination were performed using a hematology analyzer Sysmex XN series (Kobe, Japan) and Abbott CELL-DYN Ruby (Illinois, USA). The number of PRC units transfused is revealed as mean and standard deviation if it has a normal distribution, or as median if it has an abnormal distribution. Data distribution was assessed using the Kolmogorov Smirnov or Shapiro Wilk tests through SPSS software. This study has been approved by the Ethics Committee of the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta (KE/FK/1228/EC/2020).

3. Results

In August 2020, the number of patients who received blood transfusions were 880 patients, which consisted more female than male. The blood components that were transfused to patients were dominated by PRC (2,133 units). A total of 215 (24.43%) elderly patients received blood transfusion in this period. Their clinical characteristics can be seen in Table 1.

Based on Table 1, elderly patients who received blood transfusion were dominated by 60-64 years (46.98%) with female dominance (53.96%). PRCs were the most common transfused in elderly patients. There were 192 elderly patients who received PRC transfusions (21.82%). Clinical characteristics of elderly patients with PRC transfusion at Dr. Sardjito Hospital shown in Table 2.

Table 1. Clinical Characteristics of elderly patients who received blood transfusion at Dr. Sardjito Hospital in August 2020

Clinical Characteristics	n (%)
Age (years)	
60-64	101 (46.98)
65-69	43 (20.00)
70-74	32 (14.88)
Over 74	39 (18.14)
Sex	
Male	99 (46.04)
Female	116 (53.96)
Units transfused	
PRC	460 (86.14)
Fresh Frozen Plasma	115 (2.81)
Thrombocyte concentrate	59 (11.05)
Blood groups	
A	54 (25.12)
B	71 (33.02)
AB	14 (6.51)
O	76 (35.35)

Table 2. Clinical characteristics of elderly patient who received PRC transfusion at Dr. Sardjito Hospital in August 2020

Clinical characteristics	n (%)
Age (year)	
60-64	89 (46.35)
65-69	44 (22.92)
70-74	24 (12.5)
Over 74	35 (18.23)
Sex	
Man	87 (45.31)
Woman	105 (54.69)

Diagnosis	
Malignancy-related diseases	121 (63.02)
Non-hematological malignancies, with top diagnosis:	90 (46.87)
a. Breast cancer	15 (16.67)
b. Colorectal cancer	8 (8.89)
c. Cervical cancer	7 (7.78)
Hematological malignancies, with top 3 diagnosis:	31 (16.14)
a. Non-Hodgkin Lymphoma	6 (19.35)
b. <i>Myelodysplasia Syndrome</i>	5 (16.13)
c. Multiple Myeloma	5 (16.13)
Non malignancy diseases:	71 (36.98)
1. Melena	6 (8.45)
2. Covid-19	4 (5.63)
3. Chronic renal failure	4 (5.63)

In addition, clinical division that most requested PRC was Internal Medicine (49.47%), followed by Surgery and Non-Surgical departments (Cardiology, Anesthesiology, Radiology oncology, Obstetrics gynecology, Neurology, and ENT) as much as 34.37% and 16.14%, respectively.

Incompatibilities during the pretransfusion testing were found in 67 patients, with 64 patients (33.33%) experiencing minor incompatibility and 3 patients (1.56%) experiencing major incompatibility. The number of requests for PRC units and the number of units delivered are shown in Table 3.

Tabel 3. Number of PRC units requested and transfused according to clinician division

Clinical division	Number of PRC units requested	Number of PRC unit transfused
	Median (min – max)	Median (min – max)
Internal medicine (hematology oncology)	4 (1-17)	2 (1-14)
Digestive surgery	3 (3-8)	2 (1-5)
Urology	5 (2-5)	2.5 (1-4)
Internal medicine (Non-hematology)	3.50 (1-11)	2 (1-6)
Oncology surgery	2 (1-6)	1 (1-3)
Cardiology	4 (1,5)*	1 (1-6)
Plastic surgery	7 (6-8)	2.5 (2-3)
Anesthesiology	5.37 (2.92)*	2 (1-9)
Orthopaedic	6 (2.2)*	3.12(1.55)*

Obstetric gynecology	2 (1-5)	2 (1-4)
Thorax surgery	3.5 (3-10)	2.17(1.17)*
Neurology	5.2 (2.58)*	2.6 (1.51)*
Total	3 (1 -17)	2 (1 – 14)

In this study, an analysis of the pre-transfusion hemoglobin level of the PRC transfusion was also carried out. Data on pre-transfusion hemoglobin level in 22 patients were not available, this could be because the patient did a hematological examination outside the Dr. Sardjito Hospital. Distribution of pretransfusion hemoglobin levels can be seen in Table 4.

Tabel 4. Pre-transfusion hemoglobin level in PRC transfusion

Pre-transfusion hemoglobin level	n (%)
< 7 g/dL	42 (24.70)
7 – 8.9 g/dL	61 (35.88)
9 – 10.9 g/dL	53 (31.17)
11 – 12.9 g/dL	14 (8.23)
≥ 13 g/dL	0 (0)

Post-transfusion hemoglobin increment which was also analyzed in this study, defined as the difference between post-transfusion and pre-transfusion hemoglobin level in patients who received PRC transfusion. Pre-transfusion and post-transfusion hemoglobin data were not available in 65 patients. These patients were excluded from the post-transfusion PRC hemoglobin delta count. The patient's delta hemoglobin was classified based on the number of PRC units transfused and can be seen in Table 5. There were 2 patients who received 11 units and 14 units PRC, respectively.

Tabel 5. Post-transfusion delta hemoglobin

Number of PRC units transfused	Post-transfusion hemoglobin increment	Average increase in Hb level per unit transfused (g/dL)
	Median (min – max)	
1 unit	1 (-2.20 – 3.10)	1
2 units	2.2 (-2.00 – 4.90)	1.1
3 units	2.55 (0.80 – 7.08)	0.85
4 units	2.21(2.48)*	0.55
5 units	3.60 (-2.60 – 5.70)	0.72
6 units	3.89 (3.18 – 4.60)	0.64
7 units	5.39 (3.30 – 7.49)	0.77

4. Discussion

Anemia in the elderly can be divided into 3 groups based on the etiology: anemia related to nutritional deficiency, anemia of chronic disease, and unexplained anemia. Nutritional deficiency anemia is caused by a deficiency of iron, B12, or folic acid. Anemia of chronic disease occurs when there is low serum iron without evidence of iron deficiency, e.g anemia in chronic kidney disease, while unexplained anemia is a diagnosis of exclusion when there is no evidence of nutritional deficiency or chronic disease. Thalassemia or hematologic malignancies can be categorized as unexplained anemia. These three types of anemia have the same proportion of one third of anemia in the elderly [10,11].

The prevalence of elderly who received blood transfusion in this study were 24.43% while the proportion of elderly who needed PRC transfusion were 21.82%. This reveals that the proportion of the elderly who need blood transfusions, especially PRC is quite a lot. In this study, it was found that the dominant diagnosis of elderly patients who received PRC transfusions were diseases related to malignancy which reached 63.02%, of which 25.62% were hematological malignancies. This was higher than previous studies which showed that haematological malignancies accounted for 4.1% as an etiology of anemia in the elderly [10]. The high rate of anemia caused by malignancies, both hematological and non-hematological malignancies, is also due to the fact that the hospital where this study was conducted is a one of the highest hospital referral in Indonesia that has Integrated Cancer Center Services.

Major incompatibility was found in 3 elderly patients while minor incompatibility was found in 64 patients (33.33%). These patients with minor incompatibility are mostly accompanied by positive autocontrol, which likely affect the results of the minor crossmatch test. On the other hand, the number of PRC units requested by clinicians in this study was still higher than the number of units who were finally transfused. This inappropriate blood request may occur due to several factors, including the physician's clinical judgment (diagnosis, pallor level, initial hemoglobin level, sex, age, and heart rate), need for surgery (preoperative), and ward asking for blood [12].

Packed Red Cell administration to the elderly does not only consider pre-transfusion hemoglobin levels, but also has to evaluate the risks and benefits of the diseases suffered [9,13]. Study conducted by Bouraue(2019), reported that the elderly with hemoglobin levels <7 g/dL should receive a PRC transfusion even if asymptomatic. If cardiovascular disease is present, a hemoglobin level < 8 g/dL is indicated for PRC transfusion, and even if the elderly clinically unfavorable, PRC transfusion below 10 g/dL is acceptable [9]. Pre-transfusion hemoglobin levels in this study were at levels 7-8.9 g/dL (35.88%) then followed by level of 9-10.9 g/dL (31.17%) and below 7 g/dL (24.70%). This suggests that clinicians requested a PRC at higher hemoglobin threshold than the recommended level which is below 7 g/dL. Giving PRC transfusion to the elderly requires a comprehensive understanding of the aging process, in addition to clinical diagnosis of the patient. Administration of PRC could utilize the protocol in general adult patients, but it should be adjusted according to the physiology of the elderly patients [14].

The restrictive strategy of blood transfusion is believed to reduce the number of transfusions given to the elderly by 43% and does not increase 30-day mortality [15]. This strategy is also able to reduce the risks of transfusion in the elderly including transmission of hepatitis B and C

viruses, cardiac overload, TRALI, and TRIM [13]. In this study, it was reported that the administration of PRC with a liberal strategy (pre-transfusion hemoglobin level above 7 g/dL) was high enough, so that appropriate guidelines is needed for arranging PRC transfusion in the elderly.

In addition, the post-transfusion hemoglobin increment in the elderly patients in this study increased with the number of PRC units administered. The higher number of units given, the higher increase in the patient's hemoglobin, except for transfusions of 4 units. There was a decrease in the post-transfusion hemoglobin in patients with hematological malignancy on active bleeding. In this study, there were 2 patients who received more than 10 PRC, i.e, 11 and 14 units. The patient with the administration of 14 PRC units was diagnosed as bradycardia with permanent pacemaker. This patient showed major incompatibility in crossmatch test. Patient with the administration of 11 PRC units was an accelerated phase CML (Chronic Myelogenous Leukemia) patient who experienced minor incompatibility and has a positive Direct Coombs Test.

The average increment of hemoglobin per PRC unit showed a range of 0.55 – 1.1 g/dL, in accordance with previous studies which mentioned that the increase in post-transfusion hemoglobin of 1 PRC unit was about 1 g/dL [16]. There are some factors that influence the post transfusion hemoglobin increment, including the quality of blood products provided (influenced by donor collection methods, product manufacturing methods, the use of additives, and product storage) and recipient characteristics [17].

5. Conclusions

PRC transfusion rate in elderly patients at Dr Sardjito Hospital was 21.82% and were dominated by patients with diagnosis of malignancy (63.02%). The highest (35.88%) pre-transfusion hemoglobin level was in the range of 7-8.9 g/dL. Guidelines of PRC transfusion in elderly patients are needed to establish a rational blood transfusion practices.

Ethics

Ethic committee approval: this study was approved by the ethics committee of the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Ypgyakarta, Indonesia (KE/FK/1228/EC/2020).

Informed Consent

Informed consent is not applicable to this study.

Conflict of Interest

The authors declare no conflict of interest.

Author Contribution

Analysis or interpretation: U.S, T.T, R.A; Literature search: U.S, T.T, R.A; Writing: U.S, T.T, R.A.

Financial Disclosure

The authors declare that this study received no financial support

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