

## Original Research Article

**BLOOD TRANSFUSION PRACTICES AT THE INTENSIVE OBSERVATION UNIT (RUANG OBSERVASI INTENSIF/ROI) OF DR. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA**Almira Saskia Sabila<sup>1</sup> , Maulydia<sup>2a</sup> , Betty Agustina Tambunan<sup>3</sup> , Edward Kusuma<sup>2</sup> <sup>1</sup> Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia<sup>2</sup> Department of Anesthesiology and Reanimation, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia<sup>3</sup> Department of Clinical Pathology, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia<sup>a</sup> Corresponding author: [maulydia@fk.unair.ac.id](mailto:maulydia@fk.unair.ac.id)**ABSTRACT**

**Introduction:** Blood transfusion is the process of transferring blood or its components, such as red blood cells, plasma, and platelets, from donor to recipient. The major reason for blood transfusion is anemia and bleeding, frequently seen in critically ill trauma patients in Intensive Observation Unit (*Ruang Observasi Intensif/ROI*). One of the most prevalent causes of potentially preventable death in trauma patients is uncontrolled bleeding. In addition to controlling the bleeding by surgical or interventional procedures, blood transfusion is carried out to maintain oxygenation to tissue, preventing organ dysfunction due to hypoxia. **Objective:** This study aimed to determine the profile of blood transfusion carried out on the patients in the *ROI* of Dr. Soetomo General Academic Hospital. **Methods:** This retrospective descriptive study was conducted using medical records involving 258 patients who met the inclusion criteria. **Results:** The result showed that the majority of patients were female, aged 26–35 years, had blood type O, and Rhesus (Rh)-positive, accounting for 55.04%, 26.36%, 39.53%, and 100%, respectively. The most common indication for transfusion was anemia, with a percentage of 69.10%, particularly severe anemia, accounting for 48.45%. Furthermore, 57.36% of patients were from the surgery department, and 36.05% stayed in *ROI* for 2–3 days. The most common blood component and unit transfused was packed red blood cells (PRC), with a percentage of 57.50% and 439 units at 47.82%. Most of the transfusions, with a percentage of 37.80%, were carried out within 3–4 hours. Some patients were experiencing pruritus, febrile, urticaria, and chills, accounting for 0.39%, 0.39%, 0.39%, and 0.39%, respectively. **Conclusion:** Understanding transfusion practices, including blood type distribution, can prevent blood shortage, estimate the need for blood among *ROI* patients in Dr. Soetomo General Academic Hospital, and further ensure that all transfusions are ABO and Rh compatible.

**Keywords:** ABO Blood Type; Profile; Preventable Death; Rhesus; *Ruang Observasi Intensif (ROI)*; Transfusion**ABSTRAK**

**Pendahuluan:** Transfusi darah adalah suatu proses memberikan darah atau komponen darah seperti *red blood cells*, plasma, dan platelet dari donor ke resipien. Indikasi transfusi darah yang paling sering adalah anemia dan pendarahan. Pendarahan seringkali terjadi pada pasien trauma di Ruang Observasi Intensif (ROI). Pendarahan yang tidak terkontrol adalah salah satu penyebab paling umum dari kematian yang berpotensi dapat dicegah pada pasien trauma. Selain mengontrol pendarahan dengan pembedahan atau prosedur intervensi lainnya, transfusi darah dilakukan untuk mempertahankan oksigenasi ke jaringan sehingga mencegah disfungsi organ akibat hipoksia. **Tujuan:** Penelitian ini bertujuan untuk mengetahui profil transfusi darah pada pasien di ROI RSUD Dr. Soetomo. **Metode:** Penelitian ini merupakan penelitian deskriptif retrospektif yang menggunakan rekam medis. Didapatkan 258 pasien yang memenuhi kriteria inklusi. **Hasil:** Penelitian ini menunjukkan bahwa sebagian besar pasien adalah perempuan (55.04%), berumur 26–35 tahun (26.36%), golongan darah O (39.53%) dan rhesus positif (100%). Indikasi transfusi darah paling sering adalah anemia (69.10%) dengan derajat berat (48.45%). Sebagian besar pasien berasal dari departemen bedah (57.36%) dan tinggal di ROI selama 2–3 hari (36.05%). Komponen darah yang paling sering diberikan adalah *packed red blood cells* (PRC) (57.50%) sebanyak 439 kantong (47.82%). Sebagian besar transfusi diberikan dalam waktu 3–4 jam (37.80%). Beberapa resipien mengalami pruritus (0.39%), demam (0.39%), urticaria (0.39%), dan menggigil (0.39%). **Kesimpulan:** Pemahaman mengenai profil transfusi darah seperti distribusi golongan darah dapat mencegah kekurangan darah dan memperkirakan kebutuhan darah pada pasien ROI RSUD Dr. Soetomo, dan memastikan semua transfusi darah yang dilakukan kompatibel terhadap ABO dan rhesus pasien.

**Kata kunci:** Golongan Darah ABO; Profil; Kematian Yang Dapat Dicegah; Rhesus; Ruang Observasi Intensif (ROI); Transfusi

**Article info:** Received: September, 14<sup>th</sup> 2022; Revised: September, 21<sup>st</sup> 2022; Accepted: December, 19<sup>th</sup> 2022; Published: January, 20<sup>th</sup> 2023

## INTRODUCTION

Blood transfusion is the process of transferring blood or its components, such as plasma, red blood cells, or platelets, from the donor to the recipient (1). It is a potentially life-saving procedure by replacing blood loss due to surgery, injury, and certain medical conditions (2). The need for blood transfusion in this world is increasing, and it is required by approximately 1 out of 7 patients who are admitted to the hospital (3). The transfusion of red blood cells or other products is a common intervention in intensive care unit (ICU) patients. Furthermore, about 40%-50% of critically ill patients in the ICU received a blood transfusion during their period of hospitalization (4). It has also been estimated that 1 out of 4 critically ill patients in ICU receives red blood cell transfusion (5).

These practices include planning as well as providing and distributing blood, which is facilitated by the transfusion unit. It also includes giving blood to the patients, which is facilitated by the hospital blood bank. The transfusion unit will provide the blood or its component to the hospital blood bank according to the requests. Furthermore, the blood and its component screened in advance for ABO and Rhesus (Rh) group, as well as transfusion-transmitted diseases. The blood units will only be delivered to the hospital when the screening for transfusion-transmitted disease is non-reactive. Meanwhile, pre-transfusion testing is carried out to confirm the presence of antibodies in the recipient that will react to the donor's red cells when transfused (6).

This study focuses on assessing blood transfusion practices in Intensive Observation

Unit (*Ruang Observasi Intensif/ROI*) as it is a common intervention in treating patients, specifically with trauma. Patients in severe condition or with life-threatening organ insufficiency are treated and monitored in the Emergency Care Unit (Instalasi Rawat Darurat/IRD) of Dr. Soetomo General Academic Hospital. The critically ill patients in *ROI*, which are in the postoperative period, frequently need a blood transfusion, a common intervention for most experiencing anemia and bleeding.

Uncontrolled bleeding in trauma patients is the most prevalent cause of potentially preventable death (7). It is treated by first identifying the potential source of bleeding and controlling it through surgical or interventional procedures (8). One of the steps includes hemostatic resuscitation to maintain oxygenation to tissue and prevent death caused by bleeding (9). The management may include fluid replacement using crystalloids and transfusion of RBC, which is a blood product. RBC transfusion generally aims to correct hemoglobin (Hb) levels. Inadequate correction of low Hb levels will result in organ failure due to low oxygenation to tissue and hypoxia, hence, blood transfusion is required to prevent dysfunction (10). Previous studies showed that early resuscitation and transfusion of blood products are likely to reduce mortality rates in trauma patients (9).

This study aims to assess the clinical profile of blood transfusion practices in *ROI*, including the pre-transfusion procedure. It will help identify the reasons and triggers for blood transfusion in hospitals and reduce unnecessary and unsafe practices to prevent reactions in the future. It also evaluates the profile of the

transfusion recipients, such as age, gender, ABO, and Rh blood types.

## METHODS

This descriptive retrospective study was conducted using secondary data based on the medical records of patients who experienced blood transfusion in *ROI* from January 1 to December 31, 2020. The total sampling technique was adopted where the inclusion criteria were adult patients (>17 years old) who experienced blood transfusion in *ROI* Dr. Soetomo General Academic Hospital Surabaya from January to December 2020. Meanwhile, patients with incomplete medical records were excluded from this study.

The data consisted of the clinical profile, including age, gender, blood type, laboratory examination, length of stay, department, indication, blood or its components, units transfused, duration, reaction, and pre-transfusion testing, such as ABO and Rh blood types. It was then processed using Microsoft Excel and presented as distribution frequency tables. This research was approved by the Ethical Committee (No. 0594/LOE/301.4.2/IX/2021) of Dr. Soetomo General Academic Hospital.

## RESULTS AND DISCUSSION

A total of 1046 patients were admitted to *ROI* during the study period, and 300 received a blood transfusion. However, only 258 samples were included because the remaining 42 were less than 17 years old.

Most blood transfusion encounters occurred in the 26-35 age group, followed by the 36-45, accounting for 26.36% and 22.87%, respectively. Approximately 6.20% of the transfusion recipients were at least 65 years old while those aged 26-35 years mainly received transfusions for pregnancy and childbirth-related conditions. This result was consistent

with the previous study by Okoroiwu and Okafor (2018), where the majority of the transfusion recipients are in the reproductive age group, which is 15-49 years (11). In contrast, other studies showed that the elderly received more transfusions due to the presence of co-morbidities and low cardiac reserve (12).

**Table 1.** Distribution of Patients' Clinical Profiles

Clinical Profiles	N (%)
Age (Years)	
17-25	54 (20.93)
26-35	68 (26.36)
36-45	59 (22.87)
46-55	32 (12.40)
56-65	29 (11.24)
>65	16 (6.20)
Gender	
Male	116 (44.96)
Female	142 (55.04)
ABO Blood Type	
A	58 (22.48)
B	78 (30.23)
AB	20 (7.75)
O	102 (39.53)
Length of Stay (days)	
1	37 (14.34)
2-3	93 (36.05)
4-7	86 (33.33)
>7	42 (16.28)

A total of 142 recipients were female, while the rest were male, with percentages of 55.04% and 44.96%, respectively. The considerable number of females indicated the prevalence of pregnancy and birth-related cases. Based on previous studies, the majority of blood transfusions in females were associated with complications related to pregnancy, such as intrapartum and postpartum haemorrhage (13). Understanding the management and complications of pregnancy in pregnancy might be useful in reducing the risks and the need for blood transfusion.

The distribution of ABO blood type among the samples was also assessed since it plays an important role in blood transfusion practices. Understanding the distribution is important to prevent a shortage of blood and estimate the need among *ROI* patients in the future. This

helps to ensure that the patients receive blood compatible with their ABO blood type. Furthermore, the most common and the least blood types observed in this study were O and AB, accounting for 39.53% and 7.75%, respectively. Blood type B was more frequent than A among the transfusion recipients. Within the study population, the frequency of blood type O is more prevalent in both genders. The distribution of ABO among the transfusion recipients is also consistent with the reported donor population in which the proportion of blood type O was the largest (14). This result was consistent with the report of a previous study that the most common blood type in Indonesia was O (15).

This study observed that the incidence of blood transfusion was more common in patients with a length of stay of 2-3 days, accounting for 36.05%. A total of 42 patients who received a blood transfusion stayed in *ROI* for at least 8 days. In addition, those who stayed more than 7 days experienced major surgery or had complications such as excessive bleeding. Approximately 14.34% of patients in this study stayed in *ROI* for 1 day in preparation for elective surgery. A similar result was previously reported where more than half of patients admitted to the hospital received a transfusion within the first 2 days (16). However, another study showed that the incidence of blood transfusion was more common in patients with ICU length of stay of  $\geq 7$  to  $\geq 15$  days. This is due to the longer exposure to the risk of transfusion, such as blood loss from gastrointestinal bleeding, decreased erythrocyte life span caused by hemolysis and DIC, decreased erythrocyte production, or ineffective erythropoiesis secondary to an increased inflammatory state. Consequently, the incidence of anemia experiences a rapid increase (17).

**Table 2.** Distribution of ABO Blood Type According to Gender

Blood Type	Recipients N (%)	Male N (%)	Female N (%)
A	58 (22.48)	20 (17.24)	38 (26.76)
B	78 (30.23)	34 (29.31)	44 (30.99)
AB	20 (7.75)	11 (9.48)	9 (6.34)
O	102 (39.53)	51 (43.97)	51 (35.92)

The majority of blood group among the transfused patients was type O, accounting for 39.53%, with the same amount in both males and females, which is 51 each. Meanwhile, the least blood type in both genders was AB at 7.75%. AB was more frequent in males than females, with percentages of 9.48% and 6.34%, respectively. In this study, blood types A and B were more frequent in females than males. This is due to the higher number of female transfusion recipients during this study.

**Table 3.** Distribution of Laboratory Examination According to The Severity of Anemia

Severity	N (%)
Mild anemia	9 (3.49)
Moderate anemia	119 (46.12)
Severe anemia	125 (48.45)
Non-anemia	4 (1.94)

The laboratory examination of patients is classified according to the severity of anemia using the criteria set by the World Health Organization (WHO). According to WHO, anemia can be classified into mild (Hb 11-12.9 g/dl in males and Hb 11-11.9 g/dl in females), moderate (Hb 8-10.9 g/dl), severe (Hb <8 g/dl), and non-anemia (Hb  $\geq 13$  g/dl in males and Hb  $\geq 12$  g/dl in females). The majority of transfused patients in this study were experiencing severe anemia with a Hb level below 8 g/dl before the transfusion. However, 5 non-anemia patients (1.94%) were indicated for blood component transfusions, such as platelet concentrate and fresh frozen plasma. The data on the Hb levels

of the patient were taken prior to the transfusion. This result was consistent with a European observational study where one-third of critically ill patients were experiencing anemia with Hb concentrations of <10 g/dl (12). However, several non-anemia patients with a Hb concentration of at least 13 g/dl had other indications for transfusion, such as thrombocytopenia and coagulation defect. Thrombocytopenia patients were given platelet concentrate transfusion, and those with coagulation defects were indicated for fresh frozen plasma transfusion.

**Table 4.** Distribution of Clinical Department

Department	N (%)
Surgery	148 (57.36)
Obstetrics and Gynecology	85 (32.95)
Internal Medicine	12 (4.65)
Others	13 (5.04)

Distribution of blood transfusion recipients based on the three broad categories of the department showed that most patients, at 57.36%, were from the surgery department. The other patients were from obstetrics and gynecology, accounting for 32.95%, and internal medicine at 4.65%. Approximately 5.04% of the rest were from the neurology, urology, ENT, and pulmonology department.

This study showed that the surgery department had the most patients receiving blood transfusions. Patients needing surgical intervention were frequently given transfusions due to blood loss during surgery. Following the surgery department, obstetrics and gynecology departments also constituted a large number of *ROI* patients who received blood transfusions. This is due to the high prevalence of transfusion in females with pregnancy and childbirth-related complications. A previous study also reported that more blood requests were made in the surgery department (13). However, another study reported that most recipients were

obstetrics and traumatic brain injured patients in their third and fourth decade of life (18). In this study, traumatic brain-injured patients were not specified and were included in the surgery department.

**Table 5.** Distribution of ABO and Rh Blood Group

Blood Group	Recipients N (%)	Male N (%)	Female N (%)
A <sup>+</sup>	58 (22.48)	20 (17.24)	38 (26.76)
A <sup>-</sup>	0 (0)	0 (0)	0 (0)
B <sup>+</sup>	78 (30.23)	34 (29.31)	44 (30.99)
B <sup>-</sup>	0 (0)	0 (0)	0 (0)
AB <sup>+</sup>	20 (7.75)	11 (9.48)	9 (6.34)
AB <sup>-</sup>	0 (0)	0 (0)	0 (0)
O <sup>+</sup>	102 (39.53)	51 (43.97)	51 (35.92)
O <sup>-</sup>	0 (0)	0 (0)	0 (0)

This study also evaluated the technique for transfusion, including pre-transfusion tests such as ABO and Rh grouping, in addition to the recipients' demographics. The majority of blood groups were O Rh-positive in both males and females, accounting for 43.97% and 35.92%, respectively. The result indicated that all transfusion recipients were Rh-positive. This was consistent with a previous study that approximately 85% of the population is Rh-positive, and the rest is negative. The importance of knowing the distribution of the Rh blood group among the population is to prevent hemolysis since most Rh-negative recipients produce anti-D when they receive Rh-positive (19).

The most common blood group type observed in the blood transfusion recipients in both genders was O Rh-positive, accounting for 33.72%. This result is consistent with a previous study that the frequency of blood group O Rh-positive was the highest (20). Furthermore, the knowledge of the prevalence and distribution of ABO and Rh blood groups plays an important role in blood transfusion

practices. ABO and Rh incompatible transfusion can be potentially fatal to health.

**Table 6.** Distribution of Indication

Indication	N (%)
Anemia	237 (69.10)
Hemorrhage	46 (13.41)
Thrombocytopenia	31 (9.04)
Coagulation defect	8 (2.33)
Therapy	8 (2.33)
Major burn	7 (2.04)
Surgery preparation	6 (1.75)

There are several reasons for blood transfusion, and the majority in this study was anemia, accounting for 69.10%. This result was similar to a previous study where anemia was the most common reason for blood transfusion (21). The high incidence of anemia is due to the excessive use of packed red blood cells (PRC) to correct anemia among ROI patients, as shown in Table 7. Meanwhile, some of the transfusion recipients had more than one reason for blood transfusion. Anemia often coexists in the same patients with primary blood losses, including hemorrhage, and loss due to surgery and trauma.

Other causes recorded in this study are thrombocytopenia and coagulation effect, accounting for 9.04% and 2.33%, respectively. Patients with thrombocytopenia are indicated for platelet concentrate transfusion (22). Another blood component transfusion was in patients with coagulation defects in which the prothrombin time (PT) or activated partial thromboplastin time (aPTT) was prolonged. In general, patients with abnormal clotting factors should be transfused with fresh frozen plasma (FFP) (23). Approximately 1.75% of patients admitted to ROI for surgery preparation was also indicated for blood transfusion. A study assessing blood transfusion in patients with major elective surgery showed that 25.8% received at least 1 unit of a blood component

transfusion. The most common reason for transfusion among these patients is Hb triggers (24). Furthermore, plasma transfusion is recommended in several conditions, including active bleeding with multiple coagulation factors deficiencies, which is commonly seen in burn patients. In this study, some patients had major burn injuries and were given fresh frozen plasma transfusion for resuscitation.

**Table 7.** Distribution of Blood Component

Blood Component	Amount	Unit
	N (%)	N (%)
PRC	207 (57.50)	439 (47.82)
Whole Blood (WB)	115 (31.94)	182 (19.83)
PC	19 (5.28)	208 (22.66)
FFP	19 (5.28)	89 (9.69)

The majority of blood components transfused to ROI patients were PRC, accounting for 57.50%. This result was attributable to the observation of indications among ROI patients, in which the majority exhibited anemia and active bleeding. A previous study in a blood transfusion service unit in Cipto Mangunkusumo Hospital, Jakarta, also reported that PRC was the predominant blood product transfused to the subjects (25).

From a total of 918 units of blood component transfused during the study, PRC had the largest number of units, accounting for 47.82%. This result is consistent with the previous report that most transfused units were red blood cells (26). However, a study regarding the demographics of blood and its component found that the majority of units issued was whole blood. This was attributed to the lack of facility for blood component separation, thereby making it harder to get red cell and platelet concentrates, as well as fresh frozen plasma (11).

**Table 8.** Distribution of Transfusion Duration

Blood Component	Unit N (%)	<0.5 hours N (%)	0.5-2 hours N (%)	3-4 hours N (%)	Not Available N (%)
PRC	439 (47.82)	0 (0)	84 (42.86)	236 (68.01)	119 (34.00)
WB	182 (19.83)	0 (0)	14 (7.14)	111 (31.99)	57 (16.29)
PC	208 (22.66)	25 (100)	59 (30.10)	0 (0)	124 (35.43)
FFP	89 (9.69)	0 (0)	39 (19.90)	0 (0)	50 (14.29)

Each duration in the blood transfusion practices was also evaluated. The result showed that the majority of blood transfusions were within 3-4 hours, accounting for 37.80%. PRC and whole blood transfusion should be administered within 3-4 hours. However, several units of PRC were given within 0.5-2 hours due to the small volume in one unit. Platelet concentrate and fresh frozen plasma transfusion in this study were mostly administered within 0.5-2 hours. The duration of the remaining transfused units was not available in the medical record.

The duration of each transfusion varies depending on the blood products being used. Products, such as whole and PRC, should be completed in less than 4 hours (27). The transfusion of the majority of blood and its component was carried out within 3-4 hours. The most common blood component transfused in 3-4 hours was PRC (68.01%). However, a study at London Thalassemia Center implied that transfusions can be administered at one unit per hour in selected patients without cardiac disease and not receiving large volumes (28). The duration of about 38.13% of the total units transfused was not recorded. It may be necessary to enhance blood transfusion monitoring to minimize responses, lowering related morbidity and mortality.

**Table 9.** Distribution of Transfusion Reaction

Transfusion Reaction	N (%)
Acute reaction	
Pruritus	1 (0.39)
Febrile	1 (0.39)
Urticaria	1 (0.39)
Chills	1 (0.39)
Delayed reaction	0 (0)
No reaction	254 (98.45)

The majority of the transfused *ROI* patients in this study were not experiencing any reactions, accounting for 98.45%. However, some were experiencing acute reactions, such as pruritus, febrile, urticaria, and chills, with a percentage of 0.39% each, but they are no delayed reactions among the transfusion recipients.

It is also necessary to monitor patients for each unit of blood transfused in order to anticipate any reaction as soon as possible. In this study, 4 *ROI* patients experienced acute transfusion reactions. In the case of a transfusion reaction, the process should be stopped immediately. Transfusion-related acute lung injury (TRALI), a serious consequence of blood transfusion, was reported in a patient after a PRBC at Dr. Soetomo General Academic Hospital (29). Another study in Jakarta reported acute transfusion reactions in 288 subjects (0.5%), out of which 57.227 received a blood transfusion. In this study, the most common acute transfusion reaction was pruritus/itch. In a previous study, delayed transfusion reaction was not included (25).

## CONCLUSION

This study showed that the most common blood type found was O Rh-positive in both genders. Furthermore, the knowledge of the prevalence and distribution of ABO and Rh blood groups plays an important role in blood transfusion practices. It can prevent a shortage of blood, estimate the need among *ROI* patients

in Dr. Soetomo General Academic Hospital, and further ensure that ABO and Rh incompatible transfusions will not occur in the future. In addition, understanding the practices will help identify the indications and triggers in hospitals and reduce unnecessary and unsafe transfusions to prevent reactions. In this study, the majority of the reason for transfusion was anemia, which is due to the high usage of PRC among *ROI* patients.

### Acknowledgment

The authors are grateful Dr. Soetomo General Academic Hospital and the Faculty of Medicine, Universitas Airlangga, for supporting this study.

### Conflict of Interest

The authors declared that there is no conflict of interest in this study.

### Funding

Nil.

### Authors' Contributions

ASS, M, BAT & EK made substantial contributions to the conception, design of the study, the acquisition, analysis, and interpretation of data, as well as the creation of new software used. All authors have drafted the work or substantively revised it.

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