JK JURNAL KESEHATAN

Description of Fulfillment of Demand for Blood Products at the PMI Yogyakarta City Blood Donor Unit in 2022

Arliana Azizah[1], Nur'Aini Purnamaningsih[2*], Dwi Eni Danarsih[3]

[1,2,3]Prodi Teknologi Bank Darah, Fakultas Kesehatan, Universitas Jenderal Achmad Yani Yogyakarta

Article Information	ABSTRACT
	Introduction: The fulfillment of blood demand is very important in improving the quality of health services because it is related to the safety of other people's lives and the need for blood continues to increase every year as the population increases. **Methods:** This study was a quantitative descriptive study with a retrospective approach. The population and sample in this study were all blood requests totaling 44,232 at Blood Donation Unit PMI Yogyakarta City in 2022. Sampling techniques used total sampling. Data analysis was descriptive. **Results:** The number of requests for blood from blood donation unit PMI Yogyakarta City in 2022 was 44,232, most of which were for blood type O as many as 17,048 (38.54%), positive rhesus blood type as many as 44,186 (99.89%), and Packed Red Cell blood components as many as 34,697 (78.44%). The number of blood requests that can be fulfilled the most is blood type O as much as 16,498 (96.77%), positive rhesus blood type as much as 41,823 (94.65%), and Packed Red Cell blood components as much as 33,295 (95.96%). The most unfulfilled blood requests are blood type B as much as 922 (6.99%), negative rhesus blood type as much as 3 (6.52%), type of Washed Erytrocyte blood component as much as 2 (22.22%). **Conclusion:** The fulfillment of blood requests at UDD PMI Yogyakarta City that can be fulfilled is 42,268 (95.56%) of the total number of requests of 44,232 blood requests.

Corresponding Authors: (*)
Prodi Teknologi Bank Darah, Fakultas Kesehatan, Universitas Jenderal Achmad Yani Yogyakarta, Jl. Brawijaya, Ringroad Barat, Sleman, Yogyakarta 55294, Indonesia
Email: nurainipurnamaningsih21@gmail.com

INTRODUCTION

One health service that is very important to pay attention to is blood services. Blood services provide human blood for humanity, so there is no aim to commercialize it. The government needs to be responsible for administering blood services. This support is a significant health effort for patients to supply blood or blood products that are complete, safe, useful, easily accessible, and affordable to the public so that they can support the process of healing patient illnesses (PP RI No 7 tentang Pelayanan Darah, 2011).

Blood supply services in Indonesia are carried out by the Blood Transfusion Unit (UTD) or Blood Donation Unit (UDD). As a blood provider, UTD or UDD is required to

meet the demand for blood in their respective work areas. Based on data from the National PMI Blood Transfusion Unit in 2016, the total production of blood and blood components in Indonesia reached 4,201,578 blood bags. Component production is divided into two: Whole Blood (WB) blood components, which reach 27.3% of total blood production, and other components, which reach 72.7%. Blood products consist of Packed Red Cell (PRC) as much as 68.50%, Thrombocyte Concentrate (TC) 20.40%, Fresh Frozen Plasma (FFP) 6.30%, Plasma 3.20%, Cryoprecipitate 0.80%, and Wash Erythrocyte (WE) 0.90% (Kementerian Kesehatan RI, 2018).

Blood donation is a voluntary activity aimed at providing treatment to needy patients. One in four people worldwide will probably need treatment through a blood transfusion, but 37% of the population can qualify for blood donation, and under 10% are willing to donate blood regularly. Blood donation has many essential benefits but needs to be remembered. Blood donation helps provide quality of life to patients by relieving symptoms that can be disturbing and centered on at-risk patients because it can be a risk to someone's life (Kuncoro, 2015). Based on World Health Organization (WHO) standards, the annual blood supply requirement in an area is 2% of the population, and the total blood in Indonesia per year is at least 5.1 million out of 3.4 million whole blood bags.

As the population continues to increase every year and the development of medical science is increasingly rapid, it is estimated that the demand for blood will increase. With the increasing demand for blood if not followed by an increase in the number of donors, the PMI Blood Donor Unit may experience a shortage of blood supply which can lead to unfulfilled blood demand and currently the supply and demand of blood in any country is a major problem that needs to be addressed. The growth rate of supply is significantly less than the increase in demand. The complexity of the blood problem starts from its perishable nature due to the different expiry dates of each blood product and the mismatch between blood supply and demand. Some actions that require treatment through blood transfusion include surgery, transplantation, cancer treatment, dialysis, disaster victims and other actions (Rusman, 2014). Based on the Yogyakarta Provincial Statistics Center, the total population in 2021 was 3,970,220 and there was an increase in 2022 by 51,596 so that the total population in 2022 was 4,021,816 residents.

Based on the research results of Astuti et al. (2021), the amount of blood supply and demand at UDD PMI Sleman Regency in 2019 was able to be met because the amount of blood supply was more significant than demand. However, in 2020, there was an increase in the number of requests and a decrease in the amount of blood supply, so the incoming demand for blood could not be met due to non-existent blood supplies. Based on a preliminary study conducted at UDD PMI Yogyakarta City, the number of donors in 2021 was 41,236, and in 2022 it was 6,603. Meanwhile, the number of blood requests in 2021 was 39,810 blood bags, and in 2022, there was an increase in the number of blood requests to 44,232 blood bags. Therefore, this research aims to provide an overview of fulfilling the demand for blood products in UDD PMI Yogyakarta City in 2022.

LITERATUR REVIEW

The blood supply chain is a complex system involving different parameters interconnected with interested managers such as hospitals, blood banks, and donors. This supply chain has another sensitive aspect, namely a high level of fulfillment of needs (high order fulfillment), which is a matter of life and death for patients (Katsaliaki et al., 2014).

Blood donation services are one form of blood service carried out by the PMI Blood Donor Unit. The PMI Blood Donation Unit serves people who want to donate blood. People who donate blood are called donors, and this activity is called a blood donation service.

The blood donation service aims to maintain the PMI Blood Donor Unit's blood supply so that bloodstock will always be available and ready for those who need blood (Gustaman, 2013).

The Indonesian Red Cross is a humanitarian organization in health, disaster response, and community services. The most important task that must be done is to take care of the blood supply, but the problem is that the number of patients who need blood is vast. This condition must be followed by awareness among people who voluntarily donate blood. The demand for blood continues to increase yearly; people who need blood do so because of an urgent need and concerns about someone's life or death (Wijanarko, 2013).

The demand for blood in Indonesia has continued to increase in recent years for operations in accidents and planned operations. As one of the blood providers, the Indonesian Red Cross (PMI) is currently having problems due to insufficient blood availability for patients. According to the World Health Organization (WHO), ideal blood availability is 2% of the population, which means that Indonesia currently needs 4.6 million bags of blood. However, PMI only got less than 0.5% of the need in 2005 (Marceline et al., 2017).

Each Blood Donation Unit (UDD) is responsible for fulfilling the availability of blood in its work area or network. The availability of blood depends on people's willingness and awareness to donate blood voluntarily and regularly. To achieve this, UDD needs to carry out donor recruitment activities, which include outreach efforts and voluntary blood donation campaigns, mobilization of donors, and preservation of donors (Astuti et al., 2021).

METHOD

This research is a quantitative descriptive study with a retrospective approach. This study used secondary data from the PMI Yogyakarta City Blood Donation Unit in 2022. The population used in this research was all blood request data at the Yogyakarta City PMI UDD in 2022, namely 44,232 blood requests. The sample used in this study was all blood request data at UDD PMI Yogyakarta City in 2022, namely 44,232 blood requests, and in this research, the sampling technique used total sampling.

The data collection tool is a checklist for recording results based on secondary data obtained and interviews with blood distribution officers following interview guidelines. The data collection method is observing secondary data in the form of requests and blood fulfillment at the PMI Yogyakarta City Blood Donation Unit in 2022. The data analysis technique uses descriptive analysis and is presented in tabular form. This research has been approved and declared ethically appropriate by the Research Ethics Commission of Jenderal Achmad Yani University Yogyakarta with Number SKep/86/KEPK/IV/2023.

RESULT AND DISCUSSION

This research focused on the number of 44,232 blood requests received at UDD PMI Yogyakarta city in 2022, and the data was grouped based on ABO system blood group, Rhesus system blood group, and blood component types. Of the 44,232 blood requests, 42,268 (95.56%) of the total number of requests could be fulfilled. The number of blood requests received at UDD PMI Yogyakarta City in 2022 based on ABO system blood groups is shown in Table 1.

Table 1 shows that the number of requests for blood coming into UDD PMI Yogyakarta City based on ABO system blood groups in 2022 shows that the highest number of blood requests is for blood type O, amounting to 17,048 bags with a percentage of 38.54%, while the lowest demand is for blood type AB. a total of 3,374 bags with a percentage of

7.62%. Andriyani et al. (2015) Blood type is a unique characteristic of an individual's blood because of the different types of carbohydrates and proteins on the surface of the red blood cell membrane, and it is known that there are around 46 types of antigens in the world apart from ABO and Rh antigens.

Table 1. Number of Blood Requests Entering UDD PMI Yogyakarta City in 2022 Based on ABO System Blood Groups

ABO System Blood Types	Total Request (F)	Percentage (%)
A	10,622	24.02%
B	13,188	29.82%
O	17,048	38.54%
AB	3,374	7.62%
Total	**44,232**	**100%**

The ABO system discovered by Karl Landsteiner is the most critical in blood banking and transfusion medicine; the main antigens are A and B, and the primary antibodies are anti-A and anti-B. DukCapil D.I. Yogyakarta Data, 2020 supports this research. The blood group that dominates in the Special Region of Yogyakarta is blood type O, with 120,623 people, more than any other blood group, and the most minor blood type is blood group AB, with 22,487 people. This condition follows research by Amroni (2016), which states that blood type O is the most common population in the world, whereas in specific areas such as Sweden and Norway, blood type A is common. In some areas, 80% of the population has blood type B, while blood type AB is the least common in the world because blood type AB requires the presence of two antigens, namely A and B. This research also follows research by Khotimah and Budiharjo (2022) that the highest percentage of incoming blood requests is for blood type O (+) at 39.67%, and the lowest percentage of incoming blood requests was for blood type AB (+) at 7.14%.

Table 2. Number of Blood Requests Entering UDD PMI Yogyakarta City 2022 Based on Rhesus System Blood Type

Blood Type Rhesus System	Total Request (F)	Percentage (%)
Positive	44,186	99.89%
Negative	46	0.11%
Total	**44,232**	**100%**

Table 2 shows the number of requests for blood coming to the UDD PMI Yogyakarta City based on the rhesus system blood group in 2022. It is known that the most significant number of requests for rhesus-positive blood is 41,186 bags, with a percentage of 99.89%, while the number of requests for the negative rhesus blood group is at least 46 bags, with a percentage of 0.11%. Maharani and Noviar (2018) Rhesus is a factor found in red blood cells, which was first discovered by Landsteiner and Liner in 1940 by injecting the red blood of Rhesus monkeys into the bodies of rabbits. The anti-substance found in the rabbit's body was later called anti-Rhesus, and it turns out that it can also agglutinate most humans' red blood cells. A person whose blood agglutinates when reacted with anti-Rhesus is said to have Rhesus antigen. The results of this study follow research by Raihanun et al. (2019), which states that in Indonesia, the most common rhesus blood type is Rhesus positive, less than 1% or 2% of the total Indonesian population has Rhesus negative blood type. This

result differs from European, American, and Australian residents with more Rhesus harmful blood types, namely around 15% - 18%. Based on data (Kementrian Kesehatan RI, 2018), data on the distribution of blood donations according to Rhesus blood group in 2016 states that Rhesus negative blood type was only 0.1% of total donations.

Table 3. Number of Blood Requests Entering UDD PMI Yogyakarta City
2022 Based on Blood Component Type

Type of Blood Component	Total Request (F)	Percentage (%)
Whole Blood	574	1.31%
Packed Red Cell	34,697	78.44%
Packed Red Cell Leucodepleted	139	0.31%
Liquid Plasma	5	0.01%
Fresh Frozen Plasma	2,147	4.85%
Trombocyte Concentrate	6,661	15.06%
Washed Erytrocyte	9	0.02%
Total	**44,232**	**100%**

Table 3 shows that the number of requests for blood entering UDD PMI Yogyakarta City based on the type of blood component is known to be the highest for Packed Red Cell (PRC) blood component types amounting to 34,697 bags with a percentage of 78.44% while the number of requests for blood component types is the least for Liquid Plasma (LP) in the amount of 5 bags with a percentage of 0.01%. This research was conducted by Eka and Dwiatmono, (2021), who stated that the Packed Red Cell (PRC) blood type was the most requested in UDD PMI Surabaya City within five years. The number of requests reached 347,872 bags. The average demand for PRC one month during that period was 5,798 bags. This research follows research by Fauzi and Bahagia (2019), which showed that the highest demand for blood components for transfusion purposes is Packed Red Cells (PRC), with an average annual demand of 105,878 blood bags. The primary function of the Packed Red Cell (PRC) blood component is to increase the number of red blood cells in the body. The main component of Packed Red Cells (PRC) is erythrocytes obtained from whole blood processing, which removes most of the plasma.

Table 4. Number of Fulfilled and Unfulfilled Blood Requests UDD PMI Yogyakarta City
in 2022 Based on ABO System Blood Type

ABO System Blood Type	Completed	Not Completed	Total
A	10,250 (96.50%)	372 (3.50%)	10,622 (100%)
B	12,266 (93.01%)	922 (6.99%)	13,188 (100%)
O	16,498 (96.77%)	550 (3.23%)	17,048 (100%)
AB	3,224 (95.55%)	150 (4.45%)	3,374 (100%)
Total	**42,238 (95.49%)**	**1,994 (4.51%)**	**44,232 (100%)**

Table 4 shows that the number of fulfilled and unfulfilled blood requests by UDD PMI Yogyakarta City based on the blood group of the ABO system in 2022 shows that the highest number of fulfilled blood requests for blood group O is 16,498 bags with a percentage of 96.77% while the highest 922 blood groups did not meet blood group B with a percentage of 6.99%. Haqq et al. (2018) stated that people with blood type O in their blood have blood cells without antigens but produce antibodies against antigens A and B in their blood

serum. So, people with blood type O do not have antigens but agglutinins (antibodies to antigens) A and B. This study's results do not follow research by Khotimah and Budihardjo (2022), which states that the highest percentage of blood content is blood group B (+). 97.59%, and the lowest percentage of blood fulfillment was blood type O (+) at 87.15%. Based on the results of interviews conducted with blood distribution officers, the cause of blood requests not being fulfilled was that the requested blood components were not available at the PMI Yogyakarta City UDD because there were no mobile unit activities during Ramadan and year-end holidays, most of the donors who usually donate blood go home—and leaving the city so that the incoming blood supply continues to decrease, which causes the demand for blood not to be fulfilled. PMI Yogyakarta City is trying to find family donors or replacements.

Table 5. Number of Fulfilled and Unfulfilled Blood Requests by UDD PMI Yogyakarta City in 2022 Based on Rhesus System Blood Type

Rhesus System Blood Type	Completed	Not Completed	Total
Positive	41,823 (94.65%)	2,363 (5.34%)	44,186 (100%)
Negative	43 (93.48%)	3 (6.52%)	46 (100%)
Total	**41,866 (94.65%)**	**2,366 (5.35%)**	**44,232 (100%)**

Table 5 shows that the number of fulfilled and unfulfilled blood requests by UDD PMI Yogyakarta City based on the blood group of the Rhesus system in 2022 shows that the highest number of blood requests fulfilled by the Rhesus positive blood group is 41,823 bags, with a percentage of 94.65% while the most the number of rhesus harmful blood types is three bags with a percentage of 6.52%. Oktari and Silvia (2016) Blood has four groups: blood group A has A and Anti-B antigens; blood group B has B antigens and anti-A; blood group O has antibodies but does not have antigens and blood group AB has antigens but does not have antibodies. ABO blood group examination is carried out to determine the blood type in humans. There are two types of Rhesus, namely positive Rhesus and negative Rhesus; almost the entire Indonesian population has positive Rhesus (+). The results of this study are in line with research by Jahanpour (2017) entitled ABO and Rhesus blood group distribution and frequency among blood donors at Kilimanjaro Christian Medical Center, Moshi, Tanzania, which stated that the distribution of Rhesus positive was at most 1,815 donors with Rhesus positive 1,773 (98%) while the most negligible Rhesus negative was 42 (2%). Based on the results of interviews conducted with blood distribution officers, the cause of blood requests not being met was that the requested blood components were not available at the PMI Yogyakarta City UDD because there were no mobile unit activities during Ramadan and year-end holidays, most of the donors who usually donate blood go home—moreover, leaving the city so that the incoming blood supply continues to decrease, which causes the demand for blood not to be fulfilled. PMI Yogyakarta City is trying to find family donors or replacements.

Table 6 shows the number of fulfilled and unfulfilled blood requests by UDD PMI Yogyakarta City based on the blood component type in 2022. It shows that the Packed Red Cell (PRC) blood component type has the highest number of blood requests fulfilled, amounting to 33,295 bags with a percentage of 95. 96%, while the most frequently not met was the Washed Erythrocyte (WE) blood component type in the amount of 2 bags with a percentage of 22.22%. Packed Red Cell (PRC) is a blood component obtained after most of the plasma is separated from whole blood. One unit of PRC derived from 450 ml of whole blood can produce 200-250 ml of PRC. Red blood cells in whole blood can be separated

from other parts of the blood through a centrifugation process. Packed Red Cells can increase the number of red blood cells. The red blood cells formed still have all the capacity to carry oxygen. Erythrocyte concentrate can be used as a therapy for people who experience a symptomatic decrease in oxygen-carrying capacity due to acute or chronic anemia. This condition is essential for patients with chronic anemia, congestive heart failure, or difficulty regulating their blood volume. Packed Red Cells are more effective than whole red blood cells in providing oxygen transport capacity and increasing the patient's hematocrit (Maharani & Noviar, 2018).

Table 6. Number of Fulfilled and Unfulfilled Blood Requests UDD PMI Yogyakarta City in 2022 Based on Blood Component Type

Types of Blood Components	Completed	Not Completed	Total
Whole Blood	546 (95.12%)	28 (4.88%)	574 (100%)
Packed Red Cell	33,295 (95.96%)	1,402 (4.04%)	34,697 (100%)
Packed Red Cell Leucodepleted	117 (84.17%)	22 (15.83%)	139 (100%)
Liquid Plasma	4 (80.00%)	1 (20.00%)	5 (100%)
Fresh Frozen Plasma	1,706 (79.46%)	441 (20.54%)	2,147 (100%)
Trombocyte Concentrate	6,157 (92.43%)	504 (7.57%)	6,661 (100%)
Washed Erytrocyte	7 (77.78%)	2 (22.22%)	9 (100%)
Total	**41,833 (94.58%)**	**2,399 (5.42%)**	**44,232 (100%)**

These results also follow Putri's research (2021), which states that the most common use of Packed Red Cell (PRC) blood components is because obstetric patients have the potential to require blood transfusions with Packed Red Cell (PRC) blood components. Based on the results of interviews conducted with blood distribution officers, the cause of blood requests not being met was that the requested blood components were not available at the PMI Yogyakarta City UDD because there were no mobile unit activities during Ramadan and year-end holidays, most of the donors who usually donate blood go home — moreover, leaving the city so that the incoming blood supply continues to decrease, which causes the demand for blood not to be fulfilled. PMI Yogyakarta City is trying to find family donors or replacements.

CONCLUSION

Fulfillment of blood requests at UDD PMI Yogyakarta City was 42,268 (95.56%) of the total number of requests of 44,232 blood requests. The highest blood requests are for type O, rhesus-positive blood group, and Packed Red Cell blood components. The highest blood requests can be fulfilled are blood type O, rhesus-positive blood type, and Packed Red Cell blood components. The most unmet demand for blood is blood type B, rhesus negative blood type, and the Washed Erythrocyte blood component type.

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