Jurnal Kesehatan
" Jurnal Ilmu Kesehatan dan teknologi Kesehatan "
E-ISSN : 2987 -9221
VOL. 04 No.01 Tahun 2026 . Edisi Januari - Juni 2026

Improving Public Knowledge of Safe Blood Donation and the Importance of Blood Grouping and Pre-Transfusion Compatibility Testing

Citra Yolanda Sari[1]*, Rina SE Sitindaon[2], Fika Minata Wathan[3], Monalisa Puspitasari[4], Shelvy Andela[5]
Universitas Kader Bangsa[1-5]

citraahmad.28@gmail.com

Abstract

Safe blood transfusion requires healthy donors and complete pre-transfusion testing, namely ABO and Rhesus blood grouping and crossmatching. However, public knowledge of blood donation requirements and the reasons for pre-transfusion testing remains limited, and various myths hinder willingness to donate. This community service activity aimed to improve public knowledge of safe blood donation and the importance of blood grouping and pre-transfusion compatibility testing. The activity was held on 25 November 2025 at Universitas Kader Bangsa Palembang and involved 50 residents and students. It included interactive counseling, video, a demonstration of blood grouping and a crossmatch simulation, and donor eligibility screening through hemoglobin and blood pressure measurement. Knowledge was measured with a 15-item questionnaire before and after education. The mean knowledge score increased from 45.2 ± 19.8 to 79.6 ± 13.4 ($p < 0.001$), with a mean N-gain of 0.64 (moderate). The proportion of participants with good knowledge rose from 6.0% to 64.0%. Willingness to donate blood increased from 44.0% to 78.0% (McNemar $p < 0.001$). In the screening, 74.0% of participants met the hemoglobin and blood pressure requirements for donation. Education combined with demonstration effectively improves public knowledge and willingness to become voluntary blood donors.
Keywords: *blood donation; blood group; blood transfusion; crossmatch; health education*

INTRODUCTION

Blood transfusion is a life-saving procedure for patients suffering from hemorrhage, severe anemia, or blood disorders, as well as for those undergoing surgery. The availability of safe blood depends on two factors: healthy, voluntary donors and a rigorous, properly executed series of pre-transfusion tests. Donated blood must pass screening for transfusion-transmissible infections (TTIs)—such as HIV, hepatitis B, hepatitis C, and syphilis. Furthermore, before being administered

to a patient, the blood must undergo ABO and Rhesus blood-group typing, as well as crossmatching, to ensure compatibility between the donor's blood and the patient.

Crossmatching involves testing the donor's red blood cells against the patient's serum (major crossmatch) and the donor's serum against the patient's red blood cells (minor crossmatch) to prevent hemolytic transfusion reactions. Incompatible results are still frequently encountered in clinical practice. At the Blood Transfusion Unit (BTU) of RSUP Dr. M. Djamil Padang, most patients with incompatible crossmatch results exhibited minor incompatibility and had a history of prior transfusions (Purwati & Rofinda, 2020); similar patient characteristics have also been reported at the Indonesian Red Cross (PMI) BTU in Bekasi Regency (Srihartaty & Uswiyanti, 2022). At the PMI BTU in Metro City, 439 patients were found to have incompatible crossmatch results over a three-month period—predominantly minor incompatibilities accompanied by a positive autocontrol (Dea, 2025). Comparable findings have also been documented at the Blood Transfusion Unit of North Luwu Regency (Yunus et al., 2025). These findings demonstrate that blood of the same ABO/Rhesus group is not necessarily compatible, underscoring why pre-transfusion testing must never be omitted.

Within the general public, many individuals are unaware of their own blood type, do not understand the requirements for becoming a donor, and continue to believe in myths—such as the ideas that donating blood weakens the body or creates a dependency, or that type O blood can always be given to anyone. In Indonesia, blood types O and B are the most prevalent, while the Rhesus-negative factor is extremely rare (Bidayah, 2025); consequently, the demand for specific blood types can only be met if a large number of people are willing to become regular donors. Educating the public on the benefits of blood typing has been shown to foster awareness and support the availability of blood supplies (Ammariah et al., 2022).

In light of this, a team from the Bachelor of Applied Science (D4) program in Medical Laboratory Technology and the Master's program in Public Health at Universitas Kader Bangsa (UKB) conducted an educational initiative regarding safe blood donation, the importance of blood typing, and pre-transfusion compatibility testing for members of the UKB community, including students and local residents. The objectives of this activity were to: (1) enhance participants' knowledge regarding blood donation requirements, donor blood screening, blood typing, and

cross-matching; (2) increase the willingness of participants to become voluntary blood donors; and (3) assess donor eligibility through hemoglobin and blood pressure screening.

METHOD

Time, location, and target participants. The activity was held on Tuesday, November 25, 2025, at Universitas Kader Bangsa (UKB) Palembang. The target participants included individuals living near the campus and students aged 18–60 who were willing to participate in the entire program. A total of 50 participants completed the full activity.

Implementation team and partners. The activity was conducted by faculty members from the Bachelor of Applied Science (D4) program in Medical Laboratory Technology and the Master's program in Public Health at UKB, with assistance from students.

Activity stages.

1. Preparation. The team developed educational materials, including videos, leaflets titled "Safe Blood Donation, Proper Transfusion," and questionnaires. They also prepared blood-typing reagents, materials for cross-matching simulations, a hemoglobinometer, and a digital blood pressure monitor.
2. Pre-test. Participants provided information regarding their personal characteristics, donation history, and willingness to become blood donors, and completed a 15-item knowledge questionnaire.
3. Education. An interactive 60-minute session covered the requirements for blood donation, pre-donation preparation and post-donation care, screening for transfusion-transmitted infections (TTI), ABO and Rhesus blood typing, major and minor cross-matching, transfusion reactions, and common myths and facts about blood donation.
4. Demonstration. The team demonstrated blood typing using the slide method and simulated cross-matching using the tube method, illustrating both compatible results (no agglutination) and incompatible results (agglutination present).
5. Donor eligibility screening. Hemoglobin levels were measured using a digital hemoglobinometer (specify device brand) via capillary blood, and blood pressure was assessed using a digital blood pressure monitor. Eligibility criteria included a hemoglobin level of 12.5–17.0 g/dL, a systolic blood pressure of 100–170 mmHg, and a diastolic blood pressure of 70–100 mmHg (refer to the applicable donor selection guidelines).

6. Evaluation. Participants completed a post-test and reaffirmed their willingness to become blood donors.

Instruments and data analysis. The questionnaire consisted of 15 true–false items, with scores ranging from 0–100, categorized as good (≥76), fair (56–75), and poor (<56). The score differences followed a normal distribution (Shapiro–Wilk p = 0.056); therefore, they were analyzed using a paired t-test. The effectiveness of the education was assessed using the N-gain. Changes in willingness to become a donor were analyzed using the exact McNemar test. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Implementation of activities

The activity lasted for approximately 3 hours and involved 50 participants. The most frequently asked questions concerned whether donating blood could transmit diseases to the donor, why blood of the same type still requires compatibility testing, and how long it takes for the body to replenish the donated blood. A cross-matching simulation helped participants observe firsthand the differences between compatible and incompatible results.



Figure 1. Documentation of the Blood Type Testing Activity

Participant characteristics

Table 1. Participant characteristics (n = 50)

Characteristics	Category	n	%
Gender	Male	22	44,0
	Female	28	56,0
Age	18–25 years	21	42,0
	26–40 years	17	34,0
	41–60 years	12	24,0
Education	Elementary/Junior High School	5	10,0
	High school/Equivalent	27	54,0
	College	18	36,0
Have donated blood	Yes	9	18,0
	No	41	82,0
Know your own blood type	Yes	24	48,0
	No	26	52,0

Only 18.0% of participants have ever donated blood, and more than half do not yet know their own blood type. This situation indicates that there is still significant potential for new donors within the campus community and its surrounding areas.

Changes in participants' knowledge

Table 2. Knowledge scores and categories before and after education (n = 50)

Parameter	*Pre-test*	*Post-test*
Mean ± SD	45,2 ± 19,8	79,6 ± 13,4
Median (min–maks)	40,0 (13,3–80,0)	80,0 (46,7–100)
Good, n (%)	3 (6,0)	32 (64,0)
Sufficient, n (%)	12 (24,0)	14 (28,0)
Insufficient, n (%)	35 (70,0)	4 (8,0)
Mean difference (95% CI)	34,4 (30,5–38,3)	
Paired t test	t = 17,59; p < 0,001	
Average N-gain	0,64 (moderate)	
Score increased/remained the same/decreased	49/1/0	

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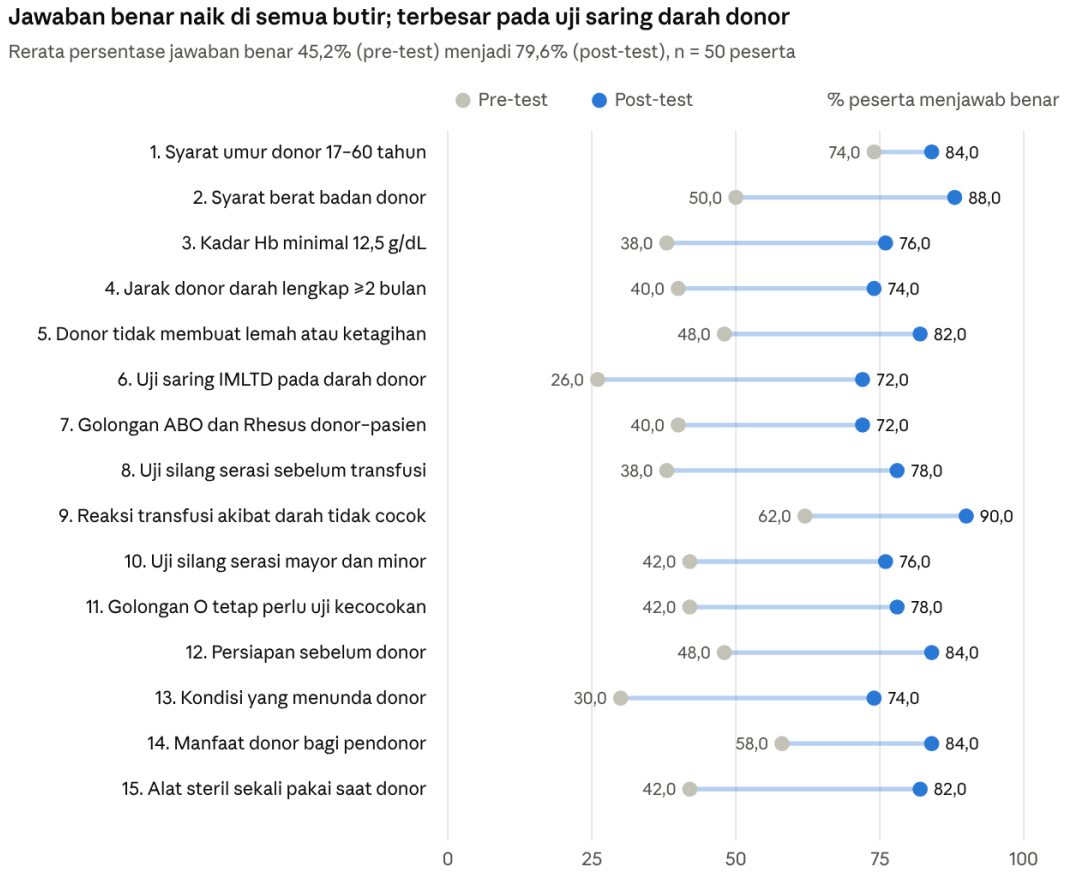


Figure 2. Percentage of participants who answered each item correctly before and after education

The mean knowledge score increased by 34.4 points following the educational intervention ($p < 0.001$), and the proportion of participants with a good level of knowledge rose from 6.0% to 64.0%. Figure 2 illustrates that, prior to the education, the items with the lowest correct response rates concerned IMLTD (Infection Markers Transfusion-Transmitted Diseases) screening for donor blood and the conditions that necessitate a deferral of blood donation. These two areas also showed the most significant improvement following the educational intervention. Knowledge regarding screening tests is crucial, as it fosters confidence that transfused blood has been verified for safety. Understanding of crossmatching procedures also improved, increasing from 38.0% to 78.0%. These findings are significant, as data from various blood transfusion units indicate that incompatible crossmatch results are still frequently encountered, even among patients with the same blood type (Purwati & Rofinda, 2020; Dea, 2025; Yunus et al., 2025).

Willingness to become a donor and eligibility screening

Table 3. Willingness to become a blood donor before and after education (n = 50)

Prior consent	Willing to do so afterwards	Not willing afterwards	Total
Willing	20	2	22 (44,0%)
Not willing	19	9	28 (56,0%)
Total	**39 (78,0%)**	**11 (22,0%)**	**50**

Uji McNemar eksak: p < 0,001.

Table 4. Results of donor eligibility screening (n = 50)

Parameter	Meets criteria, n (%)	Does not meet criteria, n (%)
Hemoglobin 12,5–17,0 g/dL	41 (82,0)	9 (18,0)
Blood pressure within limits	44 (88,0)	6 (12,0)
Both meet the requirements	37 (74,0)	13 (26,0)

Willingness to become a donor increased from 44.0% to 78.0% (p < 0.001). Nineteen participants who were initially unwilling became willing, while only 2 participants shifted in the opposite direction. The most common reasons cited prior to the educational session included a fear of needles, fear of physical weakness, and concerns about contracting diseases. These concerns diminished once participants understood that the equipment used is sterile and single-use, and that the body naturally replenishes the donated blood. Screening results indicated that 74.0% of participants met the requirements for hemoglobin levels and blood pressure. Most of those who did not meet the hemoglobin criteria were women; consequently, these individuals received education on anemia prevention before registering as donors. This increase in knowledge regarding blood types and blood donation aligns with the educational activities on blood type testing reported by Ammariah et al. (2022).

Limitations

Willingness to become a donor is assessed through a statement, which does not necessarily translate into the actual act of donating. Eligibility screening is limited to hemoglobin levels and blood pressure, whereas the formal donor selection process also includes a health history interview and a medical examination by a physician. The cross-matching simulation serves as a demonstration and, therefore, does not represent an actual patient case.

CONCLUSIONS AND SUGGESTIONS

Conclusion. Education regarding safe blood donation, blood typing, and pre-transfusion compatibility testing significantly improved participants' knowledge (increasing from 45.2 to 79.6; p < 0.001; N-gain 0.64). The willingness to become a voluntary blood donor rose from 44.0% to

78.0%, and 74.0% of participants met the hemoglobin and blood pressure requirements for donation.

Recommendations.

1. For Universitas Kader Bangsa: Organize regular blood donation events in collaboration with the Indonesian Red Cross (PMI) Blood Transfusion Unit (UTD), and engage those who expressed willingness to donate as potential regular donors.
2. For the general public: Know your own blood type, maintain your health to meet donor eligibility criteria, and become a regular voluntary blood donor.
3. For future initiatives: Assess the actual rate of blood donation following the educational sessions, and involve UTD personnel to provide direct explanations regarding the processes for donor blood screening and pre-transfusion testing.

Acknowledgments

The community service team expresses its gratitude to Universitas Kader Bangsa Palembang—through its Institute for Research and Community Service (LPPM UKB)—for its support, as well as to the participating students and all attendees.

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