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IMPROVING ADOLESCENTS' KNOWLEDGE OF THE IMPORTANCE OF ABO AND RHESUS BLOOD GROUP TESTING THROUGH HEALTH EDUCATION

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Abstract

Knowledge of ABO and Rhesus blood groups is important for transfusion safety, readiness to donate blood, and prevention of Rhesus incompatibility in pregnancy. However, many adolescents do not know their own blood group or understand the benefits of testing. This community service activity aimed to improve adolescents' knowledge of the importance of ABO and Rhesus blood group testing through health education combined with blood group testing. The activity was held on 12 December 2024 at Universitas Kader Bangsa Palembang and involved 50 adolescents aged 17–21 years. Education was delivered through interactive lectures, video, a demonstration of the slide blood grouping method, and leaflets. Knowledge was measured with a 15-item questionnaire before and after education and analyzed using the paired t-test and N-gain. Before the activity, only 23 participants (46.0%) knew their blood group, and 3 of them (13.0%) were incorrect. Testing showed blood group O in 38.0%, B in 30.0%, A in 24.0%, and AB in 8.0% of participants, and all participants were Rhesus positive. The mean knowledge score increased from 46.3 ± 18.1 to 82.3 ± 11.3 ($p < 0.001$), with a mean N-gain of 0.66 (moderate). The proportion of participants with good knowledge rose from 4.0% to 70.0%. Health education combined with hands-on testing effectively improves adolescents' knowledge of ABO and Rhesus blood groups and should be conducted regularly.
Keywords: *ABO blood group; adolescents; health education; knowledge; rhesus*

INTRODUCTION

Blood types are determined by the presence or absence of specific antigens on the surface of red blood cells. The ABO and Rhesus systems are the two most clinically significant blood group systems. Compatibility between the donor's and recipient's ABO and Rhesus blood types is a fundamental requirement for safe blood transfusion, as incompatibility can trigger dangerous hemolytic transfusion reactions. During pregnancy, a Rhesus-negative mother carrying a Rhesus-positive fetus is at risk of developing antibodies that could lead to hemolytic disease in the fetus or newborn.

The distribution of ABO blood types in Indonesia differs from global patterns. Serological analysis of over 1.6 million blood samples from five Indonesian cities reveals the following distribution: O (39.42%), B (29.96%), A (23.53%), and AB (7.09%) (Bidayah, 2025). The Rhesus-negative phenotype is extremely rare, estimated to be present in less than 1% of the Indonesian population. Given its rarity, individuals with a Rhesus-negative blood type should be aware of their status early on to avoid complications should they ever require a transfusion.

Despite its importance, many adolescents have never had their blood type tested. Various community outreach initiatives conducted in schools and universities have reported that most participants were unaware of their blood type prior to testing; furthermore, educational sessions combined with on-site testing have been shown to improve participants' understanding of the benefits of blood typing (Dahniar et al., 2023; Hasrianti et al., 2023; Nuraini et al., 2022). Educational interventions using simple materials, such as booklets, have also proven effective in helping participants grasp the importance of blood type testing (Natsir, 2022). Moreover, knowledge of one's blood type serves as a foundation for fostering a willingness to become a voluntary blood donor (Ammariah et al., 2022).

Universitas Kader Bangsa (UKB) Palembang has a large number of incoming students who are still in their adolescence. The team's preliminary survey indicated that some students were unaware of their own blood type and Rhesus (Rh) status, while others only knew this information based on what their parents had told them, without ever having undergone formal testing. Consequently, the team from the Bachelor of Applied Science (D4) program in Medical Laboratory Technology and the Master's program in Public Health at UKB conducted a health education session, which included ABO and Rhesus blood type testing. This initiative aimed to (1) enhance the students' knowledge regarding ABO and Rhesus blood types and the benefits of being tested, and (2) provide each participant with accurate information about their blood type.

METHOD

Time, location, and target audience. The activity was held on Thursday, December 12, 2024, at Universitas Kader Bangsa (UKB) Palembang. The target audience consisted of young adults aged 17–21—specifically, first-year students at UKB. Participants were recruited through announcements within their study programs and agreed to take part in the entire series of activities after signing a consent form. A total of 50 young adults participated in the full program.

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

Stages of the activity.

1. Preparation. The team developed educational materials, videos, a leaflet titled "Know Your Blood Type," and a questionnaire. They also prepared the necessary equipment and supplies for blood typing (anti-A, anti-B, and anti-D reagents; glass slides/blood-typing cards; sterile lancets; 70% alcohol swabs; and stirring sticks).
2. Pre-test and initial survey. Participants provided demographic information, indicated whether they already knew their blood type, and completed a 15-item knowledge questionnaire.
3. Education. An interactive session lasting approximately 60 minutes covered the ABO and Rhesus blood group systems, the inheritance of blood types, the principle of agglutination, the importance of blood types in transfusions and blood donation, Rhesus incompatibility during pregnancy, and the scarcity of Rhesus-negative blood types in Indonesia. The session included video presentations and a Q&A segment.
4. Demonstration and blood typing. The team demonstrated the slide method for blood typing and then tested the capillary blood of each participant. One drop each of anti-A, anti-B, and anti-D reagents was mixed with a drop of the participant's blood, stirred, and gently rocked for about two minutes. The presence of agglutination indicated a positive reaction. Each participant observed their own results firsthand and received a blood-type card.
5. Evaluation. Participants completed a post-test containing the same questions, along with a statement regarding their follow-up action plan.

Instruments and data analysis: The questionnaire consisted of 15 true-false items. Scores were calculated as the percentage of correct answers (0–100) and categorized as good (≥76), fair (56–75), or poor (<56). Data are presented as frequencies, percentages, and means ± standard deviation (SD). The difference between pre-test and post-test scores followed a normal distribution (Shapiro–Wilk $p = 0.184$); therefore, a paired t-test was used for analysis. The

effectiveness of the education was assessed using the N-gain, categorized as high (≥0.7), moderate (0.3–0.69), or low (<0.3). Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Implementation of activities

The activity lasted for approximately 3 hours and involved 50 teenagers. The participants were highly enthusiastic during the blood type testing, especially when they observed the actual occurrence of agglutination on the glass slides. The most frequently asked questions concerned whether one's blood type could change, whether individuals with type O blood could truly donate to all other blood types, and what the implications are if a husband and wife have different Rhesus factors.



Figure 1. Documentation of Health Education

Participant characteristics and blood type test results

Table 1. Participant characteristics and blood type test results (n = 50)

Variable	Category	n	%
Gender	Male	14	28,0
	Female	36	72,0
Age	17–18 years	21	42,0
	19–21 years	29	58,0
Know your blood type before the activity	Yes	23	46,0
	No	27	54,0
Consistency with examination results (n = 23)	In accordance	20	87,0
	It is not in accordance with	3	13,0
ABO blood group	O	19	38,0
	B	15	30,0
	A	12	24,0

Variable	Category	n	%
	AB	4	8,0
Rhesus	Positive	50	100,0
	Negative	0	0,0

More than half of the participants (54.0%) did not know their blood type. Among the 23 participants who claimed to know theirs, three (13.0%) were actually mistaken—for instance, believing they had type O blood when the test results indicated type B. These findings suggest that blood type information based solely on personal recollection or family accounts is not always accurate; such errors can be dangerous in emergency situations. The distribution of blood types among the participants (O > B > A > AB) aligns with the national pattern reported by Bidayah (2025) and is consistent with findings from a study of students at SMA Negeri 9 Gowa, where type O was also the most prevalent (Dahniar et al., 2023). Blood type testing among high school students during the EXPO 2024 event further underscores the importance of mapping blood types as early as the school-age years (Nur et al., 2025). All participants were Rhesus-positive, which is consistent with the low proportion of Rhesus-negative individuals in Indonesia and mirrors findings from a study of high school students in Bangkalan, all of whom were also Rhesus-positive (Fahmi et al., 2025).

Changes in participants' knowledge

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

Parameter	*Pre-test*	*Post-test*
Mean ± SD	46,3 ± 18,1	82,3 ± 11,3
Median (min–maks)	40,0 (13,3–93,3)	80,0 (53,3–100)
Good, n (%)	2 (4,0)	35 (70,0)
Enough, n (%)	11 (22,0)	13 (26,0)
Not Enough, n (%)	37 (74,0)	2 (4,0)
Mean difference (95% CI)	36,0 (32,1–39,9)	
Paired t test	t = 18,44; p < 0,001	
Average N-gain	0,66 (moderate)	
Score increased/remained the same/decreased	49/1/0	

The mean knowledge score increased by 36.0 points following the educational intervention ($p < 0,001$), with 49 out of 50 participants showing an improvement in their scores. The proportion of participants with a good level of knowledge rose from 4.0% to 70.0%, while the proportion with a poor level of knowledge fell from 74.0% to 4.0%. The mean N-gain was 0.66, which falls into the moderate category and approaches the threshold for the high category.

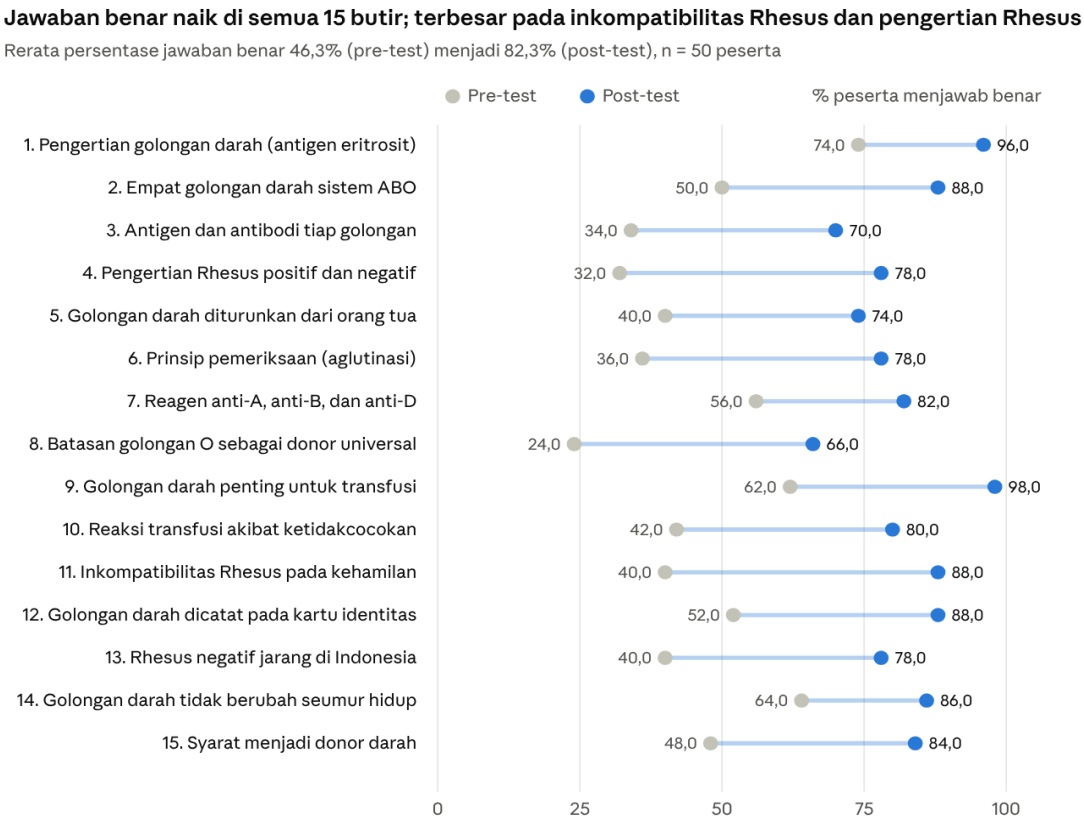


Figure 2. Percentage of participants who answered each item correctly before and after education

Figure 2 shows that the percentage of correct answers increased across all items. The most significant improvement occurred for the items concerning Rhesus incompatibility during pregnancy and the definition of the Rhesus factor—concepts that were the least understood prior to the educational session. Conversely, the item regarding the limitations of blood type O as a "universal donor" remained the one with the lowest percentage of correct answers even after the session, as the long-held belief that type O blood can be given to anyone persists. In reality, transfusion practice dictates that, whenever possible, the donor blood should match the

recipient's ABO and Rhesus blood types, and a cross-match test must always be performed beforehand. This point requires further emphasis in future activities.

The improvement in knowledge observed here is consistent with findings from an educational initiative on the importance of blood typing for students at SMA Negeri 9 Gowa (Hasrianti et al., 2023) and an educational program using booklets for elementary school students (Natsir, 2022). This activity combined formal education with hands-on testing, allowing participants not only to grasp the theory but also to personally observe the agglutination reactions that determine blood type. Such direct experience makes the material easier to recall. Furthermore, blood typing among university students serves as valuable baseline data to support campus-based blood donation initiatives (Nuraini et al., 2022; Ammariah et al., 2022).

Participant follow-up plans

Following the activity, 47 participants (94.0%) stated that they would record their blood type and Rhesus status on their identification cards or personal documents, and 38 participants (76.0%) expressed a willingness to become voluntary blood donors, provided they meet the necessary criteria. The blood type card provided to participants can serve as an initial record, although re-testing remains mandatory prior to any transfusion.

Limitations

The evaluation employed a single-group design without a control group, and the post-test was administered immediately following the educational session; therefore, long-term knowledge retention remains unknown. Blood typing was performed using the slide method, which serves as a screening test. This method does not include reverse grouping or the detection of weak D variants. Re-testing in a laboratory or blood transfusion unit is still required for clinical purposes.

CONCLUSIONS AND SUGGESTIONS

Conclusion. Health education combined with blood type testing significantly improves adolescents' knowledge regarding ABO and Rhesus blood groups. The mean knowledge score increased from 46.3 to 82.3 ($p < 0.001$; N-gain 0.66), and the proportion of participants with a good level of knowledge rose from 4.0% to 70.0%. The activity also revealed that more than half of the participants did not know their own blood type, while 13.0% of those who believed they knew it were, in fact, mistaken.

Recommendations.

1. For Universitas Kader Bangsa: Incorporate blood type testing and brief health education into the medical screening process for new students, and establish a database of student blood types to support blood donation initiatives.
2. For participants: Keep your blood type card, record your blood type in your personal documents, and consider becoming a voluntary blood donor once you meet the eligibility requirements.
3. For future activities: Emphasize that blood transfusions must utilize compatible blood and be preceded by cross-matching; include reverse blood grouping (confirmatory testing); and evaluate knowledge retention several months after the activity.

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