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Improving Public Health Literacy Regarding the Importance of Hemoglobin, Leukocyte, and Platelet Testing through Education on Routine Blood Examinations

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Abstract

Routine blood examination, particularly of hemoglobin, leukocytes, and platelets, is a basic laboratory test for detecting anemia, infection, and bleeding disorders. However, many people do not understand these parameters and rarely have their blood tested before they feel ill. This community service activity aimed to improve public health literacy on the importance of hemoglobin, leukocyte, and platelet testing. The activity was held on 14 January 2026 at Universitas Kader Bangsa Palembang and involved 50 residents. It included interactive counseling, a demonstration of the routine blood testing workflow with a hematology analyzer, complete blood count testing of participants, and individual explanation of results. Knowledge was measured with a 15-item questionnaire before and after education. Overall, 62.0% of participants had never had a complete blood count. Testing showed anemia in 11 participants (22.0%), more often in women (29.0%) than in men (10.5%), leukocytosis in 8.0%, leukopenia in 4.0%, thrombocytosis in 4.0%, and thrombocytopenia in 2.0%. The mean knowledge score increased from 42.1 ± 17.2 to 76.9 ± 13.5 ($p < 0.001$), with a mean N-gain of 0.61 (moderate). The proportion of participants with good knowledge rose from 0% to 56.0%. Education combined with routine blood testing and explanation of results effectively improves public health literacy and identifies hematological abnormalities requiring follow-up.

Keywords: *health literacy; hemoglobin; leukocytes; platelets; routine blood examination*

INTRODUCTION

A routine blood test, or complete blood count (CBC), is the most frequently requested laboratory examination in healthcare. Its three primary parameters hold significant clinical

importance. Hemoglobin (Hb) indicates the blood's capacity to transport oxygen and serves as the basis for diagnosing anemia. Leukocytes (white blood cells) reflect the body's response to infection and inflammation. Platelets play a role in blood clotting, and their levels decrease in various conditions, such as dengue hemorrhagic fever. Abnormalities in these three parameters often do not present with clear symptoms in the early stages, meaning they are typically only discovered once a test is performed.

Anemia remains a public health issue in Indonesia. The 2023 Indonesian Health Survey (SKI) reported an anemia prevalence of 15.5% among the 15–24 age group, with higher rates observed in females (Health Development Policy Agency, 2023). Low health literacy leads many individuals to rarely undergo routine blood testing; furthermore, they often fail to understand the meaning of their test results, sometimes interpreting them on their own without consulting healthcare professionals.

Various community outreach initiatives demonstrate that education regarding blood testing can enhance public knowledge. Providing education on routine hematological examinations to students at SMP N 29 Semarang increased their average score from 52.9 to 95.5 (Saptaningtyas et al., 2025). Similarly, education combined with hemoglobin testing for adolescent girls increased the proportion of participants with a good level of knowledge from 8% to 68% (Karyawati et al., 2024), while education paired with anemia screening also improved the knowledge of high school students (Maharani et al., 2024). Educational efforts are more meaningful when participants are able to see their own blood test results firsthand and receive an explanation of what those results signify.

Therefore, the 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 on routine blood testing for the community within the UKB environment. This activity aimed to (1) improve public literacy regarding the functions and normal reference ranges for hemoglobin, leukocytes, and platelets, as well as the importance of periodic testing, and (2) perform routine blood tests on participants for the early detection of hematological abnormalities.

EXECUTION METHOD

Time, location, and target participants. The activity took place on Wednesday, January 14, 2026, at Universitas Kader Bangsa (UKB) Palembang. The target participants were individuals aged 18–60 living in the vicinity of UKB who were willing to take part in the entire program and sign a consent form for blood collection. A total of 50 residents participated in the activity through to its completion.

Implementation team. The activities are carried out by lecturers from the Bachelor of Applied Science (D4) Medical Laboratory Technology study program and the Master of Public Health program at UKB, with the assistance of students from the Bachelor of Applied Science (D4) Medical Laboratory Technology program.

Stages of the activity.

1. Preparation. The team prepares educational materials, a leaflet titled "Understanding Your Routine Blood Test Results," and a questionnaire. Additionally, quality control for the hematology analyzer (specify the brand and model of the device) is performed using control materials prior to the testing process.
2. Pre-test. Participants provide their demographic information, history of blood testing, and complete a 15-item knowledge questionnaire.
3. Education. An interactive session lasting approximately 60 minutes covers the functions and reference ranges for hemoglobin, leukocytes, and platelets; conditions that may cause these levels to rise or fall—such as anemia, infections, or dengue fever; preparation required before testing; the importance of regular check-ups; and the necessity of interpreting results in consultation with a healthcare professional.
4. Demonstration and Testing. The team demonstrates the testing procedure, covering venous blood collection into K3EDTA tubes, analysis using the hematology analyzer, and how to interpret the results report. Subsequently, blood samples are collected from each participant by trained personnel and analyzed.
5. Explanation of Results and Evaluation. Each participant receives their results report along with a brief explanation from the team. Participants whose results fall outside the

reference ranges are advised to seek further consultation at a healthcare facility. Finally, participants complete a post-test.

Reference values. Anemia is defined as Hb <13 g/dL in men or <12 g/dL in women. Leukopenia is defined as a leukocyte count <4,000/µL, and leukocytosis as >10,000/µL. Thrombocytopenia is defined as a platelet count <150,000/µL, and thrombocytosis as >450,000/µL (note: adjust according to the reference values of the laboratory being used).

Data analysis. Data are presented as frequencies, percentages, and means ± SD. Knowledge scores (0–100) are categorized as good (≥76), fair (56–75), and poor (<56). A normality test on the score differences yielded a Shapiro–Wilk p-value of 0.050—exactly at the threshold of significance—therefore, the differences in scores were analyzed using the Wilcoxon test. The effectiveness of the education was assessed using the N-gain. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Implementation of activities

The activity lasted for approximately 4 hours and involved 50 participants. The participants were enthusiastic about observing the testing process using a hematology analyzer and receiving their own individual test result sheets. The most frequently asked questions were whether low hemoglobin (Hb) levels always indicate anemia caused by inadequate food intake, why leukocyte counts can rise even in the absence of a fever, and what platelet count level is considered dangerous in cases of dengue fever.



Figure 1. Documentation of Activities

Participant characteristics

Table 1. Characteristics of participants (n = 50)

Karakteristik	Kategori	n	%
Jenis kelamin	Laki-laki	19	38,0
	Perempuan	31	62,0
Umur	18–30 tahun	22	44,0
	31–45 tahun	16	32,0
	46–60 tahun	12	24,0
Pendidikan	SD/SMP	7	14,0
	SMA/sederajat	26	52,0
	Perguruan tinggi	17	34,0
Pernah menjalani pemeriksaan darah rutin	Ya	19	38,0
	Tidak	31	62,0

The majority of participants (62.0%) had never undergone a routine blood test. Those who had been tested generally did so while hospitalized or ill, rather than as a periodic check-up.

Routine blood test results

Table 2. Results of hemoglobin, leukocyte, and platelet examinations (n = 50)

Parameter	Rerata ± SD	Kategori	n (%)
Hb laki-laki (g/dL), n = 19	14,6 ± 1,2	Anemia (<13)	2 (10,5)
Hb perempuan (g/dL), n = 31	12,6 ± 1,3	Anemia (<12)	9 (29,0)
Anemia seluruh peserta			11 (22,0)
Leukosit ($\times 10^3/\mu L$)	7,4 ± 1,9	Leukopenia	2 (4,0)
		Leukositosis	4 (8,0)
Trombosit ($\times 10^3/\mu L$)	286 ± 68	Trombositopenia	1 (2,0)
		Trombositosis	2 (4,0)
Sedikitnya satu hasil di luar nilai rujukan			17 (34,0)

Kelainan yang paling sering ditemukan adalah anemia (22,0%), terutama pada perempuan (29,0%). Temuan ini sejalan dengan data SKI 2023 yang menunjukkan bahwa anemia lebih banyak dialami perempuan (Badan Kebijakan Pembangunan Kesehatan, 2023). Kehilangan darah saat menstruasi dan asupan zat besi yang kurang merupakan penyebab yang sering ditemukan pada perempuan usia subur. Sebanyak 34,0% peserta memiliki sedikitnya satu hasil di luar nilai rujukan, padahal sebagian besar merasa sehat. Hal ini menunjukkan manfaat pemeriksaan darah rutin sebagai deteksi dini. Peserta dengan hasil di luar nilai rujukan disarankan menjalani pemeriksaan lanjutan, seperti indeks eritrosit dan status besi untuk anemia, serta pemeriksaan ulang untuk kelainan leukosit dan trombosit.

Changes in participants' knowledge

Table 3. Knowledge scores and categories before and after education (n = 50)

Parameter	*Pre-test*	*Post-test*
Rerata ± SD	42,1 ± 17,2	76,9 ± 13,5
Median (min–maks)	43,3 (13,3–73,3)	80,0 (40,0–100)
Baik, n (%)	0 (0,0)	28 (56,0)
Cukup, n (%)	10 (20,0)	18 (36,0)
Kurang, n (%)	40 (80,0)	4 (8,0)
Selisih rerata (IK 95%)	34,8 (31,1–38,5)	
Uji Wilcoxon	p < 0,001	
Rerata N-gain	0,61 (sedang)	
Skor meningkat/tetap/menurun	50/0/0	

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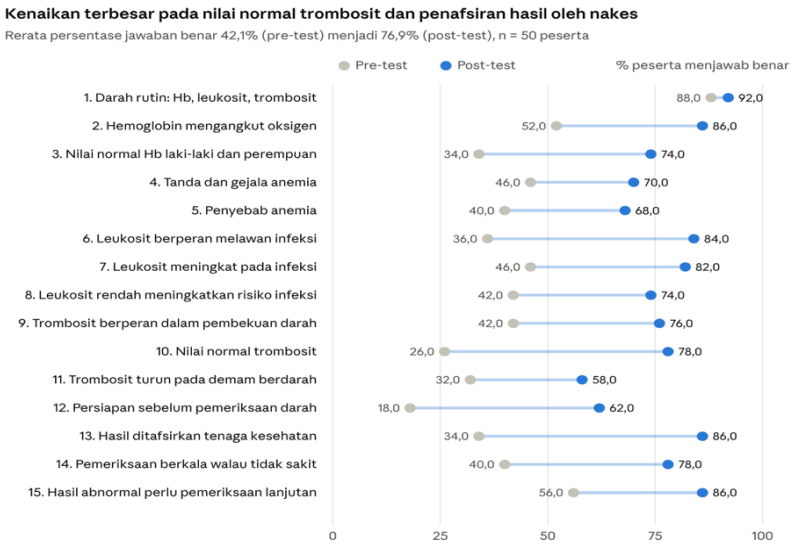


Figure 2. Percentage of participants who answered each item correctly before and after education

The mean knowledge score increased by 34.8 points following the educational intervention ($p < 0.001$), with scores improving for all participants. Prior to the intervention, no participants demonstrated a "good" level of knowledge; afterward, this proportion reached 56.0%. Figure 2 illustrates that while nearly all participants were aware that a routine blood test assesses hemoglobin (Hb), leukocytes, and platelets, very few were familiar with normal platelet ranges, pre-test preparation, or the importance of interpreting results in consultation with a healthcare professional. The most significant gains were observed in knowledge regarding normal platelet ranges and the interpretation of results by healthcare professionals, followed by the function of leukocytes and pre-test preparation. The item concerning the decrease in platelet counts during dengue fever remained the least correctly answered, even after the intervention; this topic warrants further emphasis, particularly given the frequent occurrence of dengue fever in Palembang. These findings are consistent with other educational initiatives, such as those focused on routine hematological testing for junior high school students (Saptaningtyas et al., 2025) and programs for adolescent girls that combined education with hemoglobin screening (Karyawati et al., 2024; Maharani et al., 2024). Explaining the participants' own test results made the educational content more meaningful, thereby enhancing their understanding of the importance of periodic blood testing.

Limitations

The evaluation was conducted immediately following the education session using a single-group design without a comparison group; therefore, long-term knowledge retention remains unknown. Blood testing was performed only once, with no follow-up assessments; consequently, the specific type of anemia and the underlying causes of any leukocyte or platelet abnormalities could not be determined.

Conclusions and Suggestions

Conclusions

Education regarding routine blood tests, accompanied by the tests themselves and an explanation of the results, significantly improved participants' health literacy (from 42.1 to 76.9; $p < 0.001$; N-gain 0.61). Routine blood testing revealed anemia in 22.0% of participants—predominantly women—while 34.0% of participants had at least one result outside the reference range, despite feeling healthy.

Suggestions

1. For Posbindu Sayang Ibu: implement the use of digital forms for all Posbindu activities, appoint a coordinator among the volunteers (kaders) to oversee data quality, and maintain a supply of backup (paper) forms in case of internet connectivity issues.
2. For Puskesmas Nagaswidak: utilize digital summaries to monitor non-communicable diseases (NCDs) and expand this practice to other Posbindu units within its service area, while ensuring the security and confidentiality of residents' data.
3. For future initiatives: evaluate the sustainability of the system over the next 3–6 months, incorporate blood pressure recording and other NCD-related indicators, and provide training for volunteers (kaders) on how to interpret trends in residents' health results.

Thank-you note

The community service team expresses its gratitude to Universitas Kader Bangsa Palembang—through its Institute for Research and Community Service (LPPM UKB)—for its

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