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Measuring the impact of blood donation: differences in hemoglobin (Hb) levels before (Pre) and after (Post) donation at Blood Donation Unit (BDU) Indonesian Red Cross (IRC) North Aceh



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ABSTRACT

Background: Concerns over the side effects of blood donation contribute to a decline in donor visits. Indonesia has yet to reach the WHO's minimal demand of 5.1 million blood bags annually for blood supply. The purpose of this study is to determine the variations in haemoglobin levels before and after blood donation among donors at the Blood Donation Unit (BDU) of the Indonesian Red Cross (IRC) North Aceh, as well as analyse the effects of blood donation by comparing the haemoglobin levels of blood donors before and after the donation.

Methods: This is a non-experimental observational study using the Wilcoxon test on 97 donors. Hemoglobin levels were measured using an Hb meter. Data were analyzed using *Statistical Product Service Solution for Windows* (SPSS) version 25.0 for Windows.

Results: The study showed that the highest hemoglobin level among donors before blood donation was 17 g/dL, and after donation, it was 16.4 g/dL. The lowest hemoglobin level before donation was 12.5 g/dL, and after donation, it dropped to 9.1 g/dL ($p=0.000$). The mean hemoglobin level before donation was 14.67 g/dL, while after donation, it was 13.42 g/dL. This indicates an 8.5% decrease in hemoglobin levels post-donation.

Conclusion: There is a significant difference in hemoglobin levels before and after blood donation. The observed differences and the percentage decrease in hemoglobin levels pre- and post-donation were statistically significant, this demonstrates a notable impact of blood donation on hemoglobin levels.

Keywords: Blood Donation, Hemoglobin Levels, Blood Donation Unit

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INTRODUCTION

Blood is one of the most important components in the human body. It functions to circulate substances that enter the body or are produced by the body, defend against antigens, and regulate body temperature stability. The lack of a safe blood supply for transfusions is one of the major issues faced by healthcare systems in developing countries. The global demand for blood continues to rise, with 1 in 7 patients admitted to hospitals requiring a blood transfusion. The need for blood also increases in line with the growing number of patients with blood disorders such as thalassemia, hemophilia, and others.¹⁻⁵

The WHO estimates that Indonesia's minimum blood demand in 2020 was

2% of the country's total population, or about 5.1 million blood bags annually. In the meantime, 4.1 million bags were made from 3.4 million donations of blood and its components. The Aceh Province, in 2020, had a population of 5,274,871. According to data from the Indonesian Red Cross (IRC) Aceh Province, cumulatively, the blood demand for Aceh Province across four PMI units reached 150,000 bags per year. About 11% of Aceh Province's population lives in North Aceh Regency. Blood donation numbers from the Indonesian Red Cross (IRC) Blood Donation Unit (BDU) in North Aceh Regency show a decrease in blood donors between 2017 and 2019. In 2017, there were 12,519 blood donors. This number

continued to decrease, dropping to 11,273 donors in 2018 and 10,911 donors in 2019. In 2020, the number of donors slightly increased to 10,931, but this figure was still below 2% of the population.^{1,5-9}

The process of collecting a part of a person's blood and donating it, then storing it in a blood bank so that it can be used for transfusions by others in need, is known as blood donation. The Indonesian Ministry of Health Regulation states that certain conditions must be fulfilled in order to guarantee the safety of blood donors and recipients. For both men and women, these prerequisites include being at least 17 years old, weighing at least 45 kg, and having a haemoglobin level of at least 12.5 g/dL.¹⁰ Red blood cells contain the protein

haemoglobin (Hb), which is responsible for carrying oxygen throughout the body. This protein may rise or fall. Symptoms of low haemoglobin levels include weakness, exhaustion, lethargy, a fast heartbeat, an irregular heartbeat, ringing in the ears, and lightheadedness.^{11,12}

One of the major issues facing the world today is the scarcity of available blood. The adverse consequences of blood donation are one of the reasons behind this problem. Newman (2014) cites a prior study by Elder (2008) that found that post-donation side effects lead to a drop in donor visits, which in turn reduces the amount of blood available. Mild to severe adverse effects are possible for donors. Sweating, paleness, lightheadedness, nausea, and fainting are examples of mild side effects. Loss of consciousness, vomiting, and hyperventilation are examples of moderate adverse effects. Seizures and extreme hyperventilation are examples of severe adverse effects.¹³

According to a study conducted by Van Dounge (2014), side effects can be caused by anxiety experienced by blood donors, which may stem from various reasons such as fear of needles, fear of fainting, or fear of medical environments. Another study in India found that blood donors feared feeling weak after donating blood and experiencing side effects post-donation.¹³

Public awareness of blood donation is crucial in addressing this problem. Thus, the researcher would like to investigate the differences in haemoglobin levels amongst donors at the Indonesian Red Cross (IRC) Blood Donation Unit (BDU) in North Aceh before and after donating blood. The purpose of this study is to ascertain how donors' haemoglobin levels at the IRC North Aceh Blood Donation Unit differ before and after giving blood.

METHODS

Study Design

This non-experimental study uses an observational methodology to compare the haemoglobin levels of blood donors at the Indonesian Red Cross (IRC) Blood Donation Unit (BDU) in North Aceh before and after giving blood. In March of 2023, the study was carried out.

Population and Sample

The population of this study comprised all donors at UDD PMI North Aceh, with an average of 1,044 donors per month. The sampling technique used was purposive sampling. Sample selection was based on inclusion and exclusion criteria. The sample size was calculated using the Lemeshow formula, resulting in 97 samples.

Data Collection

The research instruments used in this study included informed consent forms, research questionnaires, a hemoglobin meter, hemoglobin test strips, sterile cotton, 70% alcohol, lancet needles, and a lancet pen.

Data Analysis

Univariate and bivariate analyses were the data analysis techniques employed. The statistical product and service solutions for Windows (SPSS) software was used to analyze the data that was gathered. The

Shapiro-Wilk test was used to determine whether the data were normal. To find out if blood donation had an impact on haemoglobin levels, data that were not normally distributed were further examined using the Wilcoxon test.

RESULTS

Both univariate and bivariate analyses are used to present the study's findings. The frequency distribution of variables for each attribute, such as the donors' gender, age, frequency of donations, and educational attainment, was ascertained at BDU IRC North Aceh using univariate analysis. The bivariate study evaluated the variations in haemoglobin levels among BDU IRC Aceh donors prior to and following blood donation.

Table 1 shows that the majority of donors at BDU IRC North Aceh are male, totaling 65 individuals (67%). Most donors are late adolescents, amounting to 53 individuals (54.6%). The majority of donors have a secondary education

Table 1. Frequency Distribution of Donor Characteristics at the Blood Donation Unit (BDU) IRC North Aceh

Category	Frequency (n=97)	Percentages (%)
Gender		
Male	65	67.0
Female	32	33.0
Age		
Late adolescents	53	54.6
Early adults	24	24.7
Late adults	14	14.4
Early elderly	5	5.2
Late elderly	1	1.0
Elderly	0	0.0
Education level		
Basic education	1	1.0
Secondary education	49	50.5
High education	47	48.5
Donor Frequency		
First-time	26	26.8
Repeat	71	73.2

Table 2. Overview of Hemoglobin Levels Before (Pre) Blood Donation Among Donors at the Blood Donation Unit (BDU) IRC North Aceh

Hb Levels Before (Pre) Blood Donation	Frequency (n=97)	Percentages (%)
Low	0	0.0
Normal	97	100.0
High	0	0.0

level, with 49 individuals (50.5%). Repeat donors are the majority, totaling 71 individuals (73.2%).

Table 2 presents the hemoglobin levels before blood donation. Based on the research results, all donors, totaling 97 individuals (100%), had normal hemoglobin levels prior to donating blood.

Table 3 depicts the hemoglobin levels after blood donation. Based on the research results, the majority of donors, totaling 68 individuals (70.1%), had normal hemoglobin levels, 29 individuals (29.9%) had low hemoglobin levels, and no respondents (0%) had elevated hemoglobin levels after donating blood.

Based on **Table 4**, which illustrates hemoglobin levels before and after blood donation, the research results show that the majority of donors, 97 individuals (100%), had normal hemoglobin levels before donating blood, and the majority of respondents, totaling 68 individuals (70.1%), also had normal hemoglobin levels after donating blood.

Table 5 shows the relationship between blood donation and hemoglobin levels among donors at BDU IRC North Aceh. Based on the Wilcoxon test, a p-value of 0.000 (< 0.05) was obtained, indicating a significant correlation between blood donation and hemoglobin levels among donors at BDU IRC North Aceh. The highest hemoglobin level among donors before donation was 17 g/dL, and after donation, it was 16.4 g/dL. The lowest hemoglobin level among donors before donation was 12.5 g/dL, and after donation, it was 9.1 g/dL. The mean hemoglobin level among donors before donation was 14.67 g/dL, whereas after donation, it was 13.42 g/dL. The percentage decrease in hemoglobin levels among donors before and after donation was 8.5%.

DISCUSSION

The results presented in **Table 1** indicate that the majority of donors are male, totaling 65 individuals (67%). This aligns with the study by Septiana et al., which states that most donors are male. This is due to the higher failure rate among female donors, as women face more stringent requirements for donating blood compared to men. Additionally, women tend to have lower hemoglobin levels

Table 3. Overview of Hemoglobin Levels After (Post) Blood Donation Among Donors at the Blood Donation Unit (BDU) IRC North Aceh

Hb Levels After (Post) Blood Donation	Frequency (n=97)	Percentages (%)
Low	29	29.9
Normal	68	70.1
High	0	0.0

Table 4. Overview of Hemoglobin Levels Before (Pre) and After (Post) Blood Donation

Hemoglobin (Hb) levels	Blood Donor		Percentages (%)
	Before (Pre)	After (Post)	
Low	0	29	29.9
Normal	97	68	70.1
High	0	0	0.0

Table 5. Differences and Percentage Decrease in Hemoglobin Levels Before and After Blood Donation Among Donors at the Blood Donation Unit (BDU) IRC North Aceh

Variables	Mean	P-Value	Percentage Decrease (%)
Hb Levels			
Before Blood Donation	14.67	0.000*	8.5
After Blood Donation	13.42		

*Statistically significant if p-value less than 0.05

due to monthly menstruation, as well as pregnancy and childbirth.

Research conducted by Irawan et al. states that the interest in blood donation among women is lower due to the higher incidence of anemia and vasovagal reactions in females. Furthermore, female donors are more likely to be rejected due to higher levels of anxiety among prospective female blood donors, which affects their blood pressure. The average body mass index (BMI) of male donors also tends to meet the eligibility criteria for blood donation more frequently compared to female donors.¹⁴⁻¹⁷

The majority of donors are late adolescents, totaling 53 individuals (54.6%). This aligns with the Indonesian Ministry of Health's 2017 report, which states that, based on age groups in Indonesia, the largest number of blood donors are aged 18–24 years, comprising 39%. The findings of Nurlita et al., who found that teenagers and young adults have a low rejection rate for blood donations since they are likely to be in generally good health and rarely have a history of illness, are in line with this. According to study by

Afrianti et al., older people are more likely to be rejected for a variety of health-related reasons. These findings are also consistent with that research. This is also in line with a study by Akbar et al. that indicated the majority of blood donors are between the ages of 25 and 44. This is because people in this age bracket are more conscious, concerned, and knowledgeable about blood donation.^{14,16-19}

The majority of donors, 49 people in all (50.5%), had only completed secondary school. Afrianti et al's study, which found that most donors have only completed high school, supports this.¹⁹ The vast majority of donors, 71 people or 73.2%, are repeat contributors. This supports the conclusion drawn by Akbar et al. that the majority of donors are repeat contributors. This is because recurring donors are increasingly accustomed to the data that blood services supply.^{15,17,19}

The results in **Tables 2, 3, and 4** demonstrate that all 97 samples had normal haemoglobin levels prior to blood donation. This is because blood donation requires a certain amount of haemoglobin. The Indonesian Ministry

of Health Regulation No. 91 of 2015 states that donors must have a haemoglobin level between 12.5 and 17 g/dL. This result is in line with research by Zainuddin et al. that found no donors had haemoglobin levels below the recommended.^{20,21}

Every one of the 97 donors (100%) had a drop in haemoglobin levels. Following their blood donation, the majority of donors, 68 people or 70.1%, still maintained normal haemoglobin levels. Zainuddin et al.'s study, which found that haemoglobin levels before and after blood donation differed significantly but stayed within the normal range, is in line with this finding. Unlike apheresis blood donation, whole blood donation does not concentrate on a specific blood component. Additionally, dietary practices affect the variation in haemoglobin levels following donation. The haemoglobin levels of people who eat a healthy and nourishing diet, especially by eating foods high in folic acid, iron, vitamin B12, soy-based products, and fruits high in vitamin C, tend to vary less.^{20,22}

According to the Wilcoxon test analysis in **Table 5**, there was a significant difference in haemoglobin levels between donors at the Blood Donation Unit (BDU) IRC North Aceh before and after blood donation, with a p-value of 0.00 ($p < 0.05$). This result is consistent with the earlier study that found haemoglobin levels decreased after blood donation. This decline is explained by the fact that blood and its constituents are removed throughout the donation process, which lowers haemoglobin levels and blood volume.²⁰

According to this study, the hemoglobin levels of all donors decreased after donating blood. The average hemoglobin level showed a reduction, with a pre-donation average of 14.67 g/dL dropping to 13.42 g/dL post-donation, representing an 8.5% decrease. These findings are consistent with studies by Saputro et al and Zainuddin et al., which reported a significant decrease in hemoglobin levels among donors.^{21,24} However, this reduction was still within the normal range of hemoglobin levels. Hemoglobin levels can be influenced by various factors, including physical activity, nutrition, geography, age, gender, and blood donation. Intense

physical activity can trigger oxidative stress, leading to lipid peroxidation of cell membranes and disrupting membrane organization. This process facilitates hemolysis in erythrocytes, releasing hemoglobin and ultimately causing a decrease in hemoglobin levels.^{20,22,23}

In terms of nutrition, vitamin C can enhance iron absorption, which is essential for the production of red blood cells and hemoglobin, by up to four times. Geographically, red blood cell production tends to be more active in individuals living in high-altitude areas compared to those in low-altitude regions. According to previous studies, hemoglobin levels tend to decrease with age. This decline is attributed to the higher prevalence of anemia in older age groups, often caused by deficiencies in iron, folate, and vitamin B12. Anemia in the elderly is also linked to age-related diseases and impaired kidney excretory function.^{24,25}

Regarding gender, women tend to have lower hemoglobin and hematocrit levels, and a decrease in hemoglobin is more likely to occur in women than in men, particularly during menstruation. According to the Australian Red Cross, hemoglobin levels can also be influenced by blood donation. Since donating blood involves the removal of red blood cells, it temporarily reduces hemoglobin levels after the donation.²²⁻²⁶

CONCLUSION

The study found that the majority of donors at BDU IRC North Aceh were male, in the late adolescent age group, first-time donors, and had a secondary education level. The average hemoglobin levels of donors before and after blood donation were 14.67 g/dL and 13.42 g/dL, respectively. According to the study, there was a significant difference in hemoglobin levels before and after blood donation, with a percentage decrease of 8.5%. Further research is needed with different study designs and larger samples for future development of this topic.

DISCLOSURES

Ethical Considerations

According to the Declaration of Helsinki's ethical guidelines, this study was carried

out. The Ethics Committee of the Faculty of Medicine of Universitas Malikussaleh provided ethical permission. Before the study started, informed consent was acquired from each participant, guaranteeing that they were aware of the goals and methods.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

H.A.F.S. conceptualized the study, collected the data, and contributed to the initial draft of the manuscript. T.I.S.A. supervised the research, provided critical analysis, and guided the preparation of the final manuscript. K.Z. conducted data analysis, prepared the results, and assisted with the writing and editing of the manuscript. All authors collaborated in interpreting the findings, reviewed the manuscript, and approved the final version for publication.

REFERENCES

1. Puspita R. Paparan Konseling Terhadap Pengetahuan Donor Darah pada Siswa Kelas XI SMK Negeri 1 Jepara. *J Ilm EDUNOMIKA*. 2021;6(1):77. Available from: <http://dx.doi.org/10.29040/jie.v6i1.3889>
2. Lestari L, Tanjung R, Ladon KT, Elfina R. Pengabdian Donor Darah pada Masyarakat "Setetes Darah untuk kemanusiaan di tengah Pandemi COVID-19. *MINDA BAHARU*. 2020;4(2):62. Available from: <http://dx.doi.org/10.33373/jmb.v4i2.2697>
3. Sonita A, Kundari R. Aplikasi Seleksi Calon Pendoron Darah Menggunakan Algoritme C4.5. *Pseudocode*. 2019;6(2):96–103. Available from: <http://dx.doi.org/10.33369/pseudocode.6.2.96-103>
4. Fitria L. Profil Hematologi Tikus (*Rattus norvegicus* Berkenhout, 1769) Galur Wistar Jantan dan Betina Umur 4, 6, dan 8 Minggu. *Biog J Ilm Biol*. 2014;2(2):94–100. Available from: <http://dx.doi.org/10.24252/bio.v2i2.473>
5. Pakirisamy H. Hubungan Tingkat Pengetahuan dan Sikap dengan Tindakan Donor Darah pada Mahasiswa Angkatan 2013 Fakultas Kedokteran Universitas Andalas [Internet]. Universitas Andalas. Universitas Andalas; 2016. Available from: <http://dx.doi.org/10.25077/jka.v7.i1.p108-111.2018>
6. WHO. Blood safety and availability. [Internet]. WHO. 2022. Available from: <https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability>

7. Aceh BPSP. Jumlah Penduduk (Jiwa) 2018-2020 [Internet]. Badan Pusat Statistik Provinsi Aceh. 2021. Available from: <https://aceh.bps.go.id/indicator/12/55/1/jumlah-penduduk.html>.
8. Unit Donor Darah PMI kabupaten Aceh Utara. Grafik Penyumbangan Darah Berdasarkan Jenis Donor [Internet]. Unit Donor Darah PMI Kab. Aceh Utara. 2020. Available from: <https://utd-pmiacehutara.id/statistik>
9. Wardati W, Nur'aini N, J. Hadi A. Faktor Yang Memengaruhi Perilaku Donor Darah di Unit Transfusi Darah Rs Dr. Fauziah Bireuen. Media Publ Promosi Kesehat Indones. 2019;2(3):181–5. Available from: <http://dx.doi.org/10.56338/mppki.v2i3.804>
10. Indarwati I, Putri CA, Arini LDD. Efisiensi Penggunaan Tempat Tidur di Rumah Sakit Wilayah Surakarta pada Tahun 2023. Infokes J Ilm Rekam Medis dan Inform Kesehat. 2024;14(2):117–25. Available from: <http://dx.doi.org/10.47701/infokes.v14i2.3890>
11. Tutik NS. Pemeriksaan Kesehatan Hemoglobin di Posyandu Lanjut Usia (Lansia) Pekon Tulung Agung Puskesmas Gadingrejo Pringsewu. J Pengabd Farm Malahayati. 2019;1(1):16–9. Available from: <http://dx.doi.org/10.52841/jpmk.v1i1.64>
12. Saraswati P. Hubungan Kadar Hemoglobin (Hb) dengan Prestasi pada Siswa Menengah Atas (SMA) atau Sederajat. J Med Hutama. 2014;32(2). Available from: <http://dx.doi.org/10.36457/gizindo.v32i2.74>
13. Fernandes I, Sriati A, Sutini T. Tingkat Kecemasan State dan Trait Pendoron Darah di Mobil Unit Donor Darah yang Diselenggarakan di Universitas Padjadjaran. J-Dinamika J Pengabd Masy. 2022;7(1):89–92. Available from: <http://dx.doi.org/10.25047/j-dinamika.v7i1.3062>
14. Septiana D, Astuti Y, Baroka L. Gambaran Karakteristik Pendoron Darah yang Lolos Seleksi Donor di Unit Transfusi Darah Palang Merah Indonesia Kabupaten Gunungkidul. J Penelit dan Pengemb Pelayanan Kesehat. 2020;160–7. Available from: <http://dx.doi.org/10.22435/jpppk.v3i3.2737>
15. Irawan SAR, Indriani V, Faniyah F. Karakteristik Donor di RSUD Prof. Dr. Margono Soekarno Tahun 2016 – 2020. Sriwij J Med. 2021;4(3):186–93. Available from: <http://dx.doi.org/10.32539/sjm.v4i3.137>
16. Rosyidah R azimata. Gambaran Kepuasan Pendoron Darah terhadap Pelayanan Petugas Seleksi Donor Darah di UDD PMI Kota Yogyakarta Tahun 2022. J ILMU Kesehat BHAKTI SETYA Med. 2022;7(2):54–63. Available from: <http://dx.doi.org/10.56727/bsm.v7i2.108>
17. Surya Akbar TI, Ikhsa M, Dewi RS. Implementation of the blood donation preservation strategy at Indonesian red cross (IRC) blood donor unit (BDU) Banda Aceh during the COVID-19 pandemic. Bali Med J. 2022;11(3):1751–4. Available from: <http://dx.doi.org/10.15562/bmj.v11i3.3622>
18. Nurulita, Purnamaningsih N, Hardjo K. Gambaran Hasil Seleksi Pendoron Darah Sukarela di UDD PMI Kota Pangkalpinang Tahun 2020. J Kesehat. 2022;15(1):23–9. Available from: <http://dx.doi.org/10.23917/jk.v15i1.16039>
19. Afrianti D, Susilawati E, Sofyanita EN. Tingkat Pengetahuan terhadap Donor Darah pada Masyarakat Pendoron. Jar Lab Medis. 2022;4(1). Available from: <http://dx.doi.org/10.31983/jlm.v4i1.8445>
20. Zainuddin A, Fahmy S, Sudiastuti. Kadar Nilai Hb (Haemoglobin) Pendoron Sebelum dan Sesudah Donor Darah di Unit Donor Darah Palang Merah Indonesia. Pros Semin Sains dan Teknol FMIPA Unmul. 2015;(September):35–44.
21. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 91 Tahun 2015 tentang Standar Pelayanan Transfusi Darah. 2015.
22. Twistiandayani R, Vauzyana I, Yazid EA. Perbedaan Kadar Hemoglobin Sebelum dan Sesudah Donor Darah dengan Pemeriksaan Metode POCT (Point of Care Testing). JournalPbnsurabayaCoId. 2022;1(1):56–60. Available from: <https://journal.pbnsurabaya.co.id/index.php/jupm/article/view/12>
23. Australian Red Cross Lifeblood. Iron health and blood donation [Internet]. Australian Red Cross Lifeblood. 2022. Available from: <https://www.lifeblood.com.au/blood/learn-about-blood/iron-health>
24. Saputro. Pemberian Vitamin C Pada Latihan Fisik Maksimal dan Perubahan Kadar Hemoglobin dan Jumlah Eritrosit. J Sport Sci Fit. 2015;4(3):32–40.
25. Nidianti E, Nugraha G, Aulia IAN, Syadzila SK, Suciati SS, Utami ND. Pemeriksaan Kadar Hemoglobin dengan Metode POCT (Point of Care Testing) sebagai Deteksi Dini Penyakit Anemia Bagi Masyarakat Desa Sumbersono, Mojokerto. J Surya Masy. 2019;2(1):29.
26. Saputro AA, Mawati A. Perbedaan Kadar Hemoglobin Sebelum Dan Sesudah Donor Darah Pada Wanita Pekerja Pabrik Rokok Djarum Di Kudus. J Med Indones. 2020;10(2):231–40.



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