SCI-CONF.COM.UA

SCIENTIFIC ACHIEVEMENTS OF CONTEMPORARY SOCIETY

PROCEEDINGS OF XIII INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE JULY 24-26, 2025

LONDON
2025

SCIENTIFIC ACHIEVEMENTS OF CONTEMPORARY SOCIETY

Proceedings of XIII International Scientific and Practical Conference

London, United Kingdom

24-26 July 2025

London, United Kingdom

2025

UDC 001.1

The 13th International scientific and practical conference "Scientific achievements of contemporary society" (July 24-26, 2025) Cognum Publishing House, London, United Kingdom. 2025. 264 p.

ISBN 978-92-9472-192-1

The recommended citation for this publication is:
Ivanov I. Analysis of the phaunistic composition of Ukraine // Scientific achievements of contemporary society. Proceedings of the 13th International scientific and practical conference. Cognum Publishing House. London, United Kingdom. 2025. Pp. 21-27. URL: https://sci-conf.com.ua/xiii-mizhnarodna-naukovo-praktichna-konferentsiya-scientific-achievements-of-contemporary-society-24-26-07-2025-london-velikobritaniya-arhiv/.

Editor
Komarytskyy M.L.
Ph.D. in Economics, Associate Professor

Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine and from neighbouring countries and beyond. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

e-mail: london@sci-conf.com.ua

homepage: *https://sci-conf.com.ua*

TABLE OF CONTENTS

MEDICAL SCIENCES

CHEMICAL SCIENCES

TECHNICAL SCIENCES

PHYSICAL AND MATHEMATICAL SCIENCES

MEDICAL SCIENCES

UDC 615.387:611-018.51+611-018.53

IRON METABOLISM INDICATORS IN BLOOD DONORS

Kalynychenko Tetiana
Doctor of Medical Sciences, Senior Research Fellow, Head of the Laboratory,
Malygon Olena
PhD in the Medical Sciences, Assistant Professor of the Department,
Kharkiv National Medical University,
Belousov Andrey
Doctor of Medical Sciences, Professor of the Department,
Kharkiv National Medical University,
Yahovdik Maryna
PhD in Biological Sciences, Senior Research Fellow,
Parubets Lidiia
Researcher,
State Institution "National Research Center for Radiation Medicine,
Hematology and Oncology of National Academy
of Medical Sciences of Ukraine", Kyiv, Ukraine;
Kharkiv National Medical University, Kharkiv, Ukraine

Abstract. The quality, safety, and proper use of donor blood resources are the most important aspects of transfusion medicine. One significant issue is the risk of developing iron deficiency in whole blood donors. This study examined iron metabolism and blood hemoglobin levels in a group of regular whole blood donors. It has been shown that some donors, after multiple blood donations, have serum ferritin levels as low as 15 μg/l, which is below the threshold value (criterion) for blood donation eligibility. The results are important for considering the timing of medical examinations for regular donors, especially regarding the need for timely restoration of iron reserves.

Key words: whole blood donors, iron metabolism, donor examination, ferritin, iron deficiency.

Introduction. To prevent iron deficiency anemia and promote health among regular blood or red blood cell donors (apheresis), the ferritin level in serum or blood plasma is checked after every fourth consecutive donation [1]. In the presence of iron deficiency, the medical professional (transfusionist and general practitioner) of the blood system subject temporarily suspends the donor from donation and, if necessary, refers him for additional tests and consultations at healthcare facilities. At the same time, the hemoglobin level of donors is measured before each blood donation. According to the order of the Ministry of Health, donors are eligible to donate if their hemoglobin level meets the following criteria: ≥ 125 g/l for women or ≥ 135 g/l for men. It should be noted that donors with normal hemoglobin levels may already be iron deficient without overt anemia [2]. The choice of measuring ferritin after every fourth donation rather than at other intervals is arbitrary and not based on extensive research [3]. A regular donor who has been suspended due to the development of iron deficiency anemia is reinstated in donation based on the results of determining the hemoglobin concentration, as well as the ferritin content in blood serum (or plasma), following the above criteria.

Aim. To investigate iron metabolism indicators and hemoglobin concentration in regular donors, following the criteria for admission to whole blood donation, and from the point of view of the risk of developing iron deficiency.

Materials and methods. The study group consisted of regular whole blood donors (n = 24), of whom 62.5% were women. One-third of these women were postmenopausal. The donors' blood was analyzed for iron metabolism and hemoglobin. Biochemical studies were carried out on serum from a vacuum tube without a filler. We utilized several photometric methods, specifically the determination of serum iron concentration and total iron-binding capacity (TIBC) measured in μmol/L [4], along with the cyanide method for measuring hemoglobin concentration in g/L [5]. Ferritin content was determined by enzyme-linked

immunosorbent assay (μg/l) [6].

Statistical processing and data analysis were performed using STATISTICA 10 (StatSoft, USA).

Results. Iron metabolism indicators in the donor group were: ferritin - 47.65±34.34 μg/l (Min – 4.28 μg/l; Max – 128.35 μg/l; normal value (NV) for women: pre-menopausal – 8.4-156.9 μg/l; post-menopausal – 16.8-180.8 μg/l; NV for men – 21.7-276.4 μg/l); serum iron – 17.69±3.84 μmol/l (Min – 11.3 μmol/l; Max – 27.0 μmol/l; NV – 9-29 μmol/l); TIBC - 69.14±3.63 μmol/L (Min – 11.3 μmol/l; Max – 27.0 μmol/l; NV – 60.8-74.3 μmol/l; NV for women – 40-60 μmol/l; NV for men – 45-70 μmol/l); transferrin – 2.66±0.14 g/L (Min – 2.34 g/L; Max – 2.86 g/L; NV – 2-4 g/L); transferrin saturation – 25.7±5.2% (Min – 16.7%; Max – 36.3%; NV – average 25%). Hemoglobin content was 137.46±11.89 g/L (Min – 115 g/L; Max – 160 g/L). 17% of donors had ferritin levels below the normal reference values; all of them were men. 25% of donors from the study group had ferritin levels below the threshold criterion of 15 μg/L. All of these donors had low hemoglobin. In gender, they were women in the pre-menopause phase and men. 12 % of individuals had moderately low ferritin values for the whole blood donor category, namely between 15 μg/l and 30 μg/l. At such ferritin levels, hemoglobin content usually exceeds the threshold. This was confirmed in our study, where 100% of cases exceeded the threshold hemoglobin criteria for admission to blood donation. And this applied to both women and men. Unfortunately, according to scientific data, such regular donors who donate blood every few months have a high risk of developing iron deficiency with a fall ferritin level below 15 ng/ml [3]. Increasing the intervals between donations under ferritin control significantly improves hemoglobin and ferritin levels, which is ultimately a way to prevent iron deficiency [7].

Thus, iron deficiency without obvious anemia manifestations can develop in regular donors in conditions of individual lack of time to replenish these reserves. When maintaining only generally established norms of intervals between donations with measurement of only hemoglobin concentration as a marker of iron when admitted to blood donation, there is a significant risk of developing iron deficiency in

regular whole blood donors.

Conclusions. For preventing the development of significant iron deficiency in donors with previously detected moderately low iron levels (under ferritin levels not exceeding 30 μg/l), regular ferritin content testing of such individuals before each subsequent donation is fully necessary. This is one of the promising ways to solve this problem.

REFERENCES

1. "Procedure for medical examination of a donor", approved by Order of the Ministry of Health of Ukraine dated August 1, 2005, No. 385 (as amended by Order of the Ministry of Health of Ukraine dated February 8, 2021 No. 207). [Internet]. [cited 2025 Jul 5]. (in Ukrainian) Available from: https://zakon.rada.gov.ua/laws/show/z0896-05#Text

2. Soppi ET. Iron deficiency without anemia - a clinical challenge. Clin Case Rep. 2018 Apr 17;6(6):1082-1086. doi: 10.1002/ccr3.1529. PMID: 29881569; PMCID: PMC5986027.

3. Vinkenoog M, van den Hurk K, van Kraaij M, van Leeuwen M, Janssen MP. First results of a ferritin-based blood donor deferral policy in the Netherlands. Transfusion. 2020 Aug;60(8):1785-1792. doi: 10.1111/trf.15906. Epub 2020 Jun 13. PMID: 32533600; PMCID: PMC7496980.

4. [Instructions for reagents set for the determination of iron and total iron-binding capacity of blood serum (TIBS) of the RPI Company "Filicit-Diagnostics"] [Internet]. TC Ukr 24.4-24607793-019-2003. REF No. HP012.01. Approved on Oct 30, 2012. Agreed by the First Deputy Head of the State Service of Ukraine on Medicines and Drugs Control on Nov 9, 2012 [updated 2012 Nov 9; cited 2023 Nov 5]. (in Ukrainian) Available from: http://felicit.com.ua/wp-content/uploads/2020/09

5. [Instructions for reagents set for the determination of hemoglobin concentration by the hemoglobin cyanide method of the “Genesis” LLC, Ukraine] [Internet]. [cited 2025 Jul 5]. (in Ukrainian) Available from: https://www.genesislab.com.ua/data/files/1508833553-instrukciya-gemoglobin-400.pdf

6. Instructions for reagents set for the direct immunoenzymatic

determination of ferritin in human serum or plasma (DiaMetra, Italy); DCM039-12 Ed. 01/2024 [Internet] Available from: https://diametra.com/product/ferritin/

7. Meulenbeld A, Ramondt S, Sweegers MG, Quee FA, Prinsze FJ, Hoogendijk EO, Swinkels DW, van den Hurk K. Effectiveness of ferritin-guided donation intervals in whole-blood donors in the Netherlands (FIND'EM): a stepped-wedge cluster-randomised trial. Lancet. 2024 Jul 6;404(10447):31-43. doi: 10.1016/S0140-6736(24)01085-7. Epub 2024 Jun 13. PMID: 38880108.