

THE IMPACT OF INFLUENZA A ON BLOOD DONATION

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Abstract

Numerous elements affect the body's and the provided components' safety. The primary factor that guarantees safe transfusion is the management of a steady stream of voluntary, frequent, unpaid, and willing contributions. Through quantitative analysis of the total number of blood donors, voluntary blood donors, multiple blood donors, age structure, social structure, and unresolved blood donors, this paper aims to present the impact of influenza A on blood donation and the issuance of units in clinical service during the period from 2024 to 2025. By enabling the safe and efficient conveyance of the necessary components, transport medicine plays a crucial role in contemporary healthcare.

Healthcare workers can use blood transfusions to save lives, restore life-support capacity, and assist the life support system. Blood transfusions are a medical procedure that can save lives. Optimal transfusion therapy necessitates knowledge of components and natural cross-matching, blood sources and donor selection, blood collection and delivery techniques, component therapy, transfusion responses, and red cell replacements.

Keywords: blood, components, transfusion, drugs, donors

Introduction

Due to an aging population, the supply of blood, a valuable resource, is always growing. The appropriate use of blood or blood products for the treatment or prevention of disease is the focus of the multidisciplinary field of transfusion medicine. When the human body is unable to generate or replace the components that make up blood itself, blood is an essential medication for a variety of ailments and disorders.

Blood transfusions or blood components must be ordered and provided in a safe and suitable manner. Transfusion is a continuous process rather than a single occurrence. The transfusion process begins with donor selection. Once the blood is obtained, the safety of the blood product is prioritized (infectious disease testing and compatibility testing). The transfusion procedure concludes with the following steps: proper identification of the unit and the patient, suitability of the blood as the best treatment, administration of the unit, and evaluation of the recipient.

People have blood transfusions for a variety of reasons, including surgery, injury, disease, and bleeding problems. Blood has various components, including:

- Red cells transport oxygen and remove waste,
- White cells combat pathogens
- Plasma is the liquid component of blood
- Platelets aid in effective blood clotting.

Red blood cells are the most often transfused blood type. A transfusion supplies the portion or portions of blood that are required. It is also possible to get whole blood, which is made up of all the components, however whole blood transfusions are uncommon.

The foundation for guaranteeing adequate amounts of safe blood on the one hand, and the intensity of transfusion therapy as a crucial component of the strategy for safe blood on the other, is made up of voluntary blood donors who are carefully chosen, regularly donate blood, and are appropriately monitored in accordance with national requirements. To reduce these hazards and guarantee patient safety, transfusion medicine adheres to stringent quality control and safety procedures.

Possible risks:

Blood transfusions are generally regarded safe, however there is some chance of consequences. Mild, but rarely serious, problems can arise during the transfusion or for several days or more following.

The most common mild responses are itching and fever.

While less common and more intricate reactions that may occur include:

- Acute immune hemolytic reaction. The immune system attacks the transfused red blood cells because the donor's blood type is not compatible. The attacked cells release a substance into the blood that damages the kidneys.
- Delayed hemolytic reaction. Similar to acute immune hemolytic reaction, this reaction occurs more slowly. It may take one to four weeks for a decrease in red blood cell counts to be noticed.
- Transfused white blood cells attack the bone marrow. Usually fatal, it is more likely to affect people with severely weakened immune systems, such as those being treated for leukemia or lymphoma.

Doctors supervising transfusion therapy must understand the effective and sensible clinical use of blood, which can only be accomplished through communication and collaboration between transfusion services/transfusiologists and clinical physicians. Continuous training for all professionals will help to reduce needless transfusions and improve the efficiency of transfusion therapy.

A few years ago, the world faced the Covid 19 (COVID-19) pandemic, which posed a major challenge and significantly impacted transfusion medicine both globally and locally. A shortage of blood products emerged along with concerns about the safety of blood products. Measures were implemented to overcome these challenges in order to reduce the demand for blood products and encourage blood donation, while taking full precautions to minimize the risk of COVID-19 transmission mainly in medical/transfusion centers. In addition, plasma therapy was proposed in the treatment of COVID-19 patients, especially in severe cases, and ongoing studies were conducted to determine its efficacy.

COVID-19 has presented a new challenge for the transfusion sector with preliminary data suggesting the presence of viremia in 15% of COVID-19 patients, meaning that the risk of transmission of the virus through transfusion cannot be excluded despite the fact that detectable viral RNA concentrations in blood are low. It takes at least 2 to 3 days for viral RNA to be detectable in plasma or serum after the onset of symptoms. In addition, most patients, especially younger adults who can donate blood, are either asymptomatic or have mild symptoms, increasing the possibility that patients who are carriers of the virus may donate blood.

The COVID-19 pandemic has impacted the transfusion field in many ways, threatening its efficiency and safety through potential shortcomings, including blood shortages due to reduced donations, increased demand in intensive care units, and the risk of virus transmission.

This paper covers the period from 2024 to 2025, characterized by the dominance of influenza A, and analyzes the situation with blood donation at the Transfusion Medicine Service in Veles.

The Transfusion Medicine Service in Veles has been continuously exceeding the annual projected quotas for blood units for the last decade. Based on this, the aim of our study is to show the number of blood donors in the period 2024–2025 in the Municipality of Veles during the influenza A season which runs from October to March, while the months from April to September are off-season.

Material and method

The quantitative research method was mostly applied to the preparation of this topic, which as a method for collecting data used the database of the STM-Veles Registers as well as the database of the Veles Municipal Organization of the Red Cross.

The total number of analyzed respondents is 4684 who are divided according to quality indicators in the blood donor recruitment process:

- Total number of realized blood donations (ethnic and gender structure),
- Type (voluntary, family) and number (first-time, multiple) of blood donations,
- Age and social structure of blood donors,
- Number of rejected donors and unsuccessful punctures,
- Planned, realized blood donations at the level of the Municipality of Veles and used units in

the PHI General Hospital Veles

The results obtained are presented in tabular and graphical form. The statistical mass in the first part of the study consists of all persons who donated blood in the period from 2024-2025.

The analysis of the structure of the statistical masses was made according to the value of their numerical characteristics during a certain period of time (2024-2025) in order to determine the dynamics of a given phenomenon, i.e. during influenza A. An average, i.e. arithmetic value, was used, which gives the basic characteristics of the analyzed phenomenon in the given statistical mass. Changes in the phenomena during the analyzed period were monitored through basic indices, i.e. indices of dynamics with a constant base, against which the remaining values of the time series are compared.

Results and Discussion

A review of the development of blood donation in the Transfusion Medicine Service – Veles in the period 2024 – 2025 through an analysis of quality indicators in the blood donor selection process and the impact of influenza A on blood donation.

Table 1. Overview of the total number of blood donations, ethnic and gender structure of blood donors in the Veles Transfusion Medicine Service during the influenza A season which runs from October to March, while the months from April to September are off-season

year	Total blood donations	October–March (season)	April–September (off-season)	Macedonians	Other nationalities	Albanians	Men	Women
2024	2398	950	1448	2209	109	79	2013	385
2025	2286	900	1386	2120	86	85	1933	346
total	4684	1850	2834	4329	195	164	3946	731

Chart 1. Overview of blood donations carried out by influenza A season

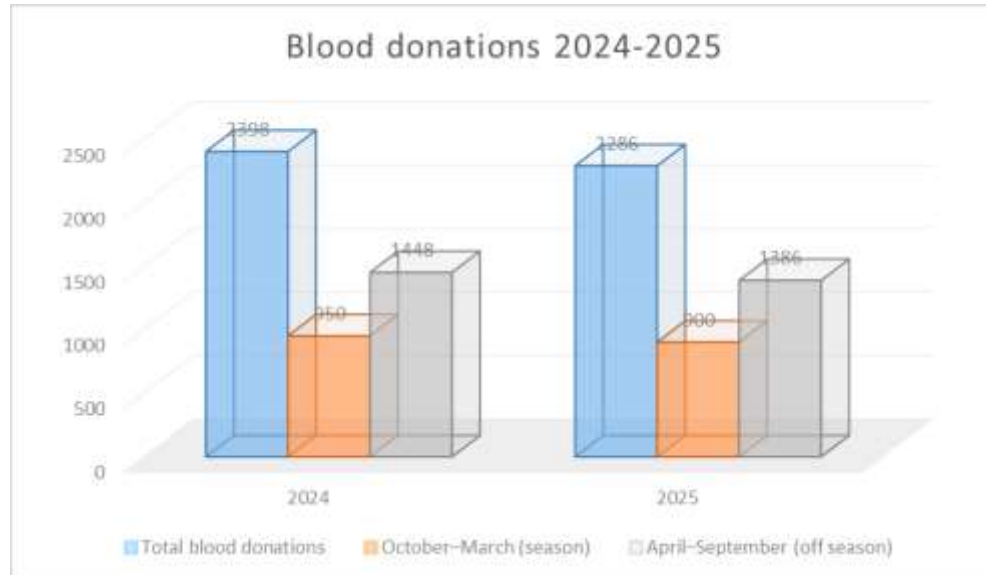


Chart 1 shows the total number of blood donations by influenza A season for the period 2024–2025. It is clearly seen that the number of blood donations decreased in the period October–March (influenza season), while in the period April–September (out of season) an increased number of donations was recorded. This trend indicates the impact of seasonal influenza on blood donors, who

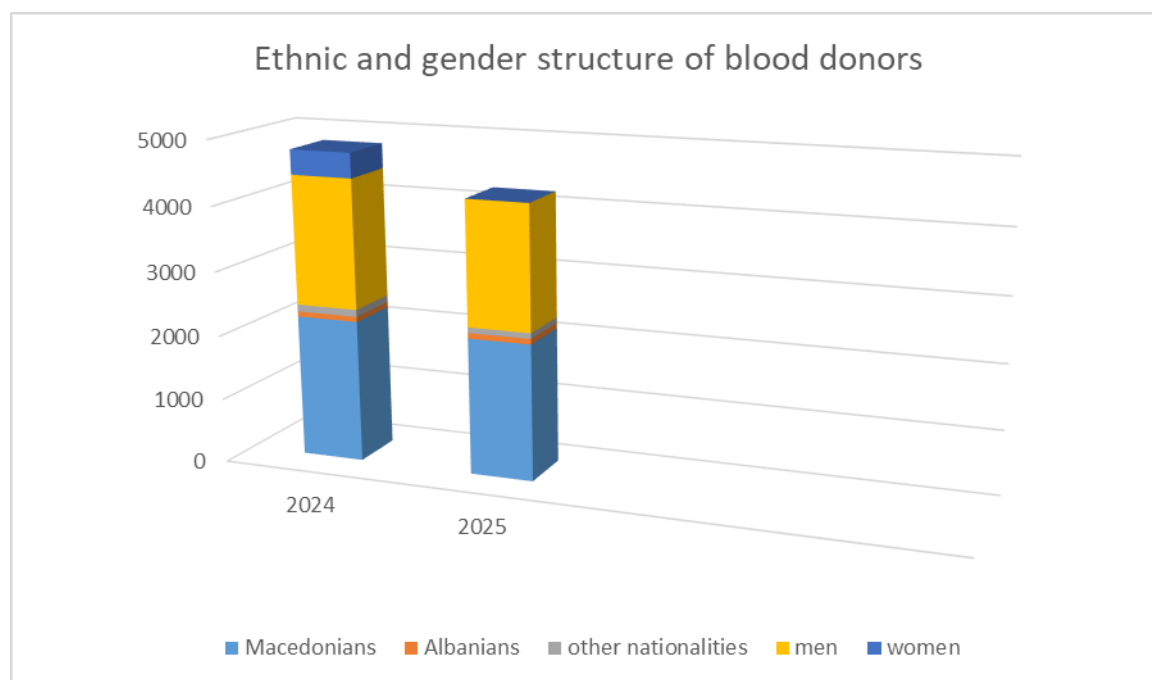
refrain from donating during times of illness or increased risk of infection, which is in accordance with the recommendations of transfusion medicine for the protection of blood donors and recipients.

In 2024, out of a total of 2398 blood donations, 950 (39.6%) were realized in the period October–March, while 1448 (60.4%) were realized out of season.

In 2025, out of a total of 2286 blood donations, 900 (39.4%) are in season, and 1386 (60.6%) are out of season.

These data clearly show that approximately 60% of blood donations are realized outside the influenza season, while about 40% occur during the season, which further confirms the seasonal variation. This graph emphasizes the need for better planning of blood donation actions, especially in the seasonal months, as well as for enhanced communication and information to donors about the importance of continuous blood donation.

Chart 2. Ethnic and gender structure of blood donors



The graph shows the structure of blood donors by nationality and gender for the period 2024–2025. Out of a total of 4684 blood donations, the majority are of Macedonian nationality – 4329 donations, which represents 92.4% of the total number. Albanian nationality is represented by 164 donations (3.5%), while other nationalities participate with 195 donations (4.2%). These data indicate a dominant participation of the Macedonian population in blood donation activities, with a relatively smaller, but significant involvement of other ethnic communities.

In terms of gender, the graph shows a significant difference between male and female blood donors. Of the total number, 3946 donations were made by men (84.3%), while 731 donations were made by women (15.7%). This imbalance indicates that men are significantly more active as blood donors compared to women, which can be associated with health, physiological or social factors.

Analyzed by year, in 2024, out of a total of 2398 blood donations, 2209 (92.1%) were from Macedonians, 109 (4.5%) from other nationalities and 79 (3.3%) from Albanians. In 2025, out of 2286 blood donations, 2120 (92.8%) were from Macedonians, 86 (3.8%) from other nationalities and 85 (3.7%) from Albanians, which shows a relatively stable ethnic structure over the two years. In terms of gender, in 2024, men participated with 2133 donations (83.9%), and women with 385 (16.1%). In 2025, 1933 donations (84.6%) were from men, while 346 (15.4%) were from women. These data confirm a consistent trend of dominance of male blood donors over the two-year period.

The graph clearly highlights the need for additional activities to increase the participation of women and underrepresented ethnic communities in blood donation campaigns, in order to ensure a more inclusive and balanced approach to the voluntary blood donation system.

Table 2. Overview of voluntary, family, first-time and repeat donors

year	Voluntary	Family	First-time donors	Repeat donors
2024	2362	36	203	2195
2025	2269	17	172	2114

Chart 3. Types of blood donations

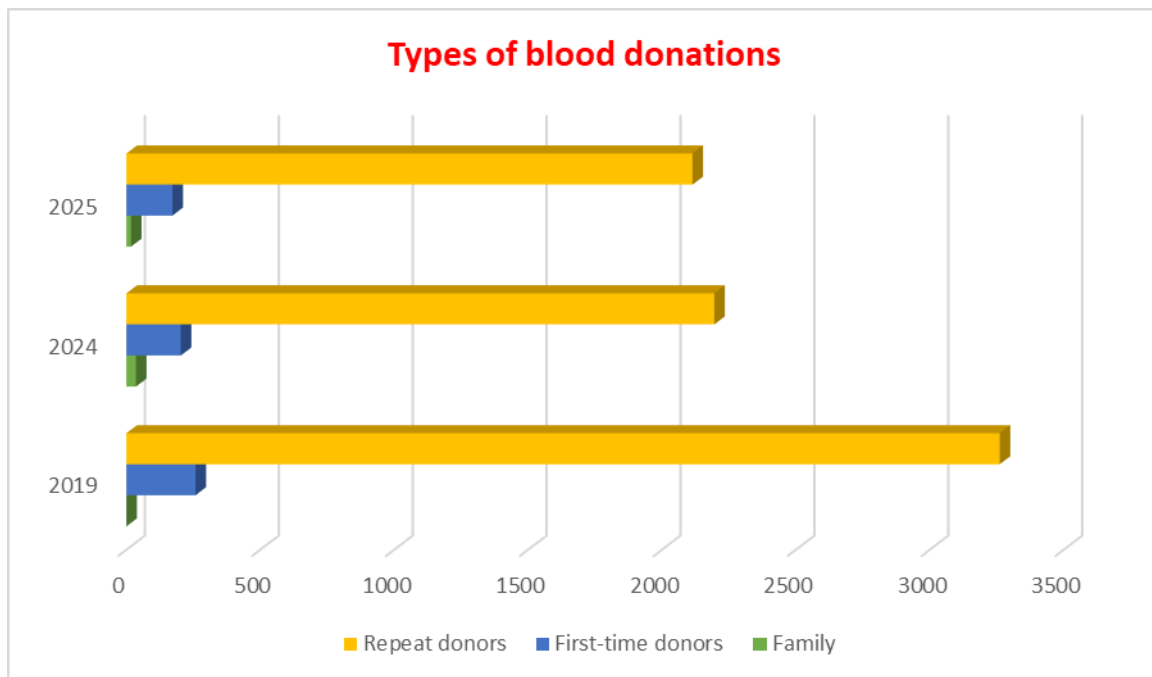


Table 2 and chart3 show the relationship between voluntary and family donations, as well as the relationship between first-time and repeat donors. The analysis shows that the blood donation system relies heavily on voluntary donation and a loyal base of repeat donors.

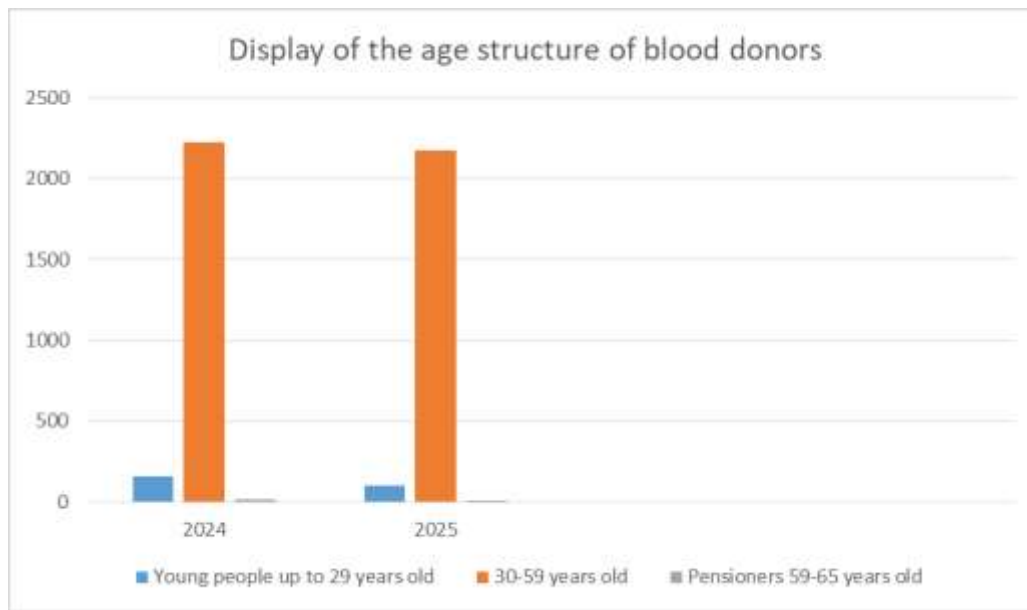
In 2024, out of a total of 2398 blood donations, 2362 (98.5%) were voluntary, while only 36 (1.5%) were family donations. In 2025, out of 2286 donations, 2269 (99.3%) were voluntary, and 17 (0.7%) were family donations. These data indicate an exceptionally high level of developed awareness and culture of voluntary blood donation, with minimal participation of family (designated) donations.

In terms of the structure by experience, in 2024, 203 donations (8.5%) were from first-time donors, while 2195 (91.5%) were from repeat donors. In 2025, 172 donations (7.5%) were from first-time donors, and 2114 (92.5%) were from repeat donors. This ratio shows a stable and strong base of regular donors who continuously participate in blood donation campaigns. Overall, in the two-year period, more than 98% of donations were voluntary, while over 90% were realized by repeat donors. This trend is a positive indicator of the sustainability of the system, but at the same time it also indicates the need to increase the number of first-time donors, with the aim of long-term renewal and expansion of the blood donor base.

Table 3. Presentation of the age structure of blood donors

year	Young people up to 29 years old	30-59 years old	Pensioners 59-65 years old
2024	160	2223	15
2025	101	2178	7

Chart 4. Display of the age structure of blood donors



The chart shows the distribution of blood donors by age group for the period 2024–2025. The analysis shows that the majority of blood donations are made by the population aged 30 to 59, while the participation of young and older donors is significantly lower.

In 2024, out of a total of 2398 blood donations, 160 (6.7%) are from young people up to 29 years old, 2223 (92.7%) from people aged 30–59, while only 15 (0.6%) are from the 59–65 age group.

In 2025, out of a total of 2286 donations, 101 (4.4%) are from young people, 2178 (95.3%) from the 30–59 age group, and 7 (0.3%) from older donors.

These data indicate a pronounced dominance of the middle-aged group, which participates with over 90% of the total blood donations in both years. At the same time, a reduced participation of young donors is observed in 2025 compared to 2024, which may represent a potential challenge for the future sustainability of the blood donor base. The graph highlights the need for targeted activities and campaigns to motivate the young population to engage in blood donation, in order to create new regular donors and ensure continuity in the system.

Conclusion

The results of this quantitative analysis indicate that blood donation in the Transfusion Medicine Service – Veles in the period 2024–2025 is characterized by a high degree of stability, dominance of voluntary donation and a strong presence of multiple donors. Voluntary blood donations participate with over 98%, while multiple donors with over 90%, which is a key indicator of the quality and safety of the blood system.

The seasonal analysis confirms a statistically consistent trend of reduced activity during the influenza A period (October–March), when about 40% of blood donations are realized, compared to the off-season period (about 60%). This indicates a significant impact of seasonal infectious diseases on the availability of blood units and emphasizes the need for adaptive planning of blood donation activities.

The demographic analysis shows a pronounced imbalance in the gender structure, with a dominance of male donors (over 84%), as well as ethnic homogeneity with a dominant participation of the Macedonian population (over 92%). The age structure is concentrated in the 30–59 age group (over 90%), while the participation of the young population is low and shows a decreasing trend, which represents a potential risk for the future sustainability of the blood donor base.

Despite the high level of functionality of the system, structural limitations have been identified, especially in relation to the low participation of first-time donors (under 10%), the young population and women. These findings indicate the need for targeted interventions aimed at diversifying and renewing the blood donor population.

In this regard, the implementation of strategic, continuous and seasonally adjusted donor recruitment and retention programs is recommended, with a focus on education, promotion and increasing public awareness. Additionally, promoting inter-institutional collaboration and implementing evidence-based policies are key to ensuring the long-term sustainability, safety, and efficacy of transfusion therapy.

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