BEYOND RECRUITMENT – A DEFERRAL ANALYSIS REVEALS THE KEY TO A SUSTAINABLE BLOOD SUPPLY

ANALIZA ODBIJANJA DAVALACA KRVI – KLJUČ ZA DUGOROČNO STABILNO SNABDEVANJE KRVLJU

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Original study
Originalni naučni rad
UDK 615.38-052
https://doi.org/10.2298/MPNS2508148S

Abstract

Introduction. Blood donor deferral, although essential for ensuring transfusion safety, represents a significant challenge to donor retention and overall blood supply. Understanding its causes and demographic patterns is crucial for developing effective interventions. **Material and Methods.** A retrospective cross-sectional study was conducted at the Blood Transfusion Institute of Vojvodina, including all voluntary blood donors from January to December 2024. Collected data encompassed demographic characteristics, donor status, and reasons for temporary or permanent deferral. Descriptive statistical methods were applied. **Results.** Among 15,791 donor candidates, 1,957 (12.39%) were deferred. Most deferrals were temporary. Low hemoglobin was the leading cause, predominantly affecting women and younger donors. Notably, the majority of deferred individuals were repeat donors. Other common reasons included medication use and acute infections. Over 90% of all deferrals were due to temporary conditions, indicating substantial potential for donor return with appropriate follow-up and management. **Conclusion.** Donor deferral is primarily driven by reversible health factors. Targeted improvements in pre-donation screening, donor education, and iron deficiency prevention could reduce avoidable deferrals. Importantly, the manner in which deferred donors are approached significantly influences their likelihood of returning. Ensuring empathetic communication and clear guidance is essential for maintaining a stable and sustainable blood supply.
Key words: Blood Donors; Blood Safety; Donor Selection; Eligibility Determination; Risk Factors

Sažetak

Uvod. Odbijanje davalaca krvi, iako neophodno radi sigurnosti transfuzije, predstavlja izazov za očuvanje baze davalaca i stabilnost zaliha krvi. Razumevanje uzroka i demografskih obrazaca može doprineti efikasnijem planiranju i sprovođenju mera za unapređenje davalaštva. **Materijal i metode.** Retrospektivna studija preseka sprovedena je u Zavodu za transfuziju krvi Vojvodine tokom 2024. godine. Analizirani su podaci svih dobrovoljnih davalaca krvi, uključujući demografske karakteristike, status davaoca i razloge za privremeno ili trajno odbijanje. **Rezultati.** Od ukupno 15.791 prijavljenih, 1.957 je bilo odbijeno. Većina odbijanja bila je privremena. Najčešći uzrok bila je niska koncentracija hemoglobina, posebno kod žena i mlađih davalaca. Zanimljivo je da su većinu odbijenih činili redovni davaoci. Ostali uzroci uključivali su upotrebu lekova i akutne infekcije. Više od 90% odbijanja odnosi se na privremene faktore, što ukazuje na mogućnost ponovnog angažovanja tih davalaca. **Zaključak.** Većina uzroka odbijanja davalaca je privremena. Ciljane mere poput unapređenja skrininga, edukacije i prevencije deficita gvožđa mogu smanjiti broj nepotrebnih odbijanja. Ključno je kako se postupa sa odbijenim davaocima gde su empatija i jasna komunikacija od presudnog značaja za njihovo vraćanje i očuvanje stabilnih zaliha krvi.
Ključne reči: donori krvi; bezbednost krvi; izbor donora; utvrđivanje podobnosti; faktori rizika

Introduction

Blood donation represents a cornerstone of modern healthcare and is essential for a wide range of life-saving medical interventions, including surgical procedures, trauma care, management of anemia, hematologic and oncologic malignancies, and pregnancy-related complications [1]. Ensuring a safe and adequate blood supply remains a critical and continuous challenge for transfusion services worldwide. These services must carefully balance two often competing priorities: maintaining sufficient blood inventory to meet clinical needs while rigorously safeguarding the health of both recipients and voluntary donors [2]. A key mechanism for achieving this balance is meticulous donor selection through pre-donation screening. This process, guided by national and international standards, results in the temporary or permanent deferral of individuals who do not meet established eligibility criteria [3]. Donor deferral is indispensable for minimizing the risk of transfusion-transmissible infections and for protecting donor health, particularly among

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those who may be vulnerable to adverse events during or after donation [4]. However, deferral also poses a substantial operational challenge. High deferral rates reduce the availability of blood units, increase operational costs, and lead to inefficient use of resources [5]. Additionally, deferral can negatively affect donor motivation; many individuals perceive the experience as discouraging, which may decrease their willingness to donate again and thereby undermine donor pool stability [6]. Patterns and causes for deferral vary considerably across regions and populations. These differences reflect the local epidemiology of infections, genetic factors, socio-cultural practices, and differences in regulatory frameworks [7,8]. As such, regional assessment of deferral patterns is essential. Identifying the predominant causes of deferral within a specific population enables transfusion services to optimize donor education, refine recruitment strategies, and implement targeted interventions aimed at reducing avoidable deferrals while upholding safety standards [9]. This study aims to provide a comprehensive analysis of blood donor deferrals at the Blood Transfusion Institute of Vojvodina. The primary objectives are to determine the overall deferral rate, identify the most common reasons for temporary and permanent deferral, and evaluate key demographic characteristics of deferred donors, including age, gender, and donor status. By identifying the main sources of donor loss, the study seeks to generate evidence-based recommendations to minimize unnecessary deferrals, improve donor retention, and ultimately strengthen the sustainability and resilience of the regional blood supply system.

Material and Methods

Study Design and Setting

A retrospective cross-sectional study was conducted using records of all voluntary blood donor presentations at the Blood Transfusion Institute of Vojvodina from January 1 to December 31, 2024. The institute serves as a tertiary-level center responsible for blood collection and distribution across the entire Vojvodina region.

Study Population and Donor Screening

The study population included all individuals who presented as voluntary blood donors during the study period. Each donor underwent standardized pre-donation screening in accordance with the Serbian Ministry of Health's *Rulebook on Blood and Blood Component Donors*. This multi-step process included:

1. Registration: Documentation of basic demographic information.

2. Health History Questionnaire: A self-administered form covering medical history, current health status, lifestyle factors, risk behaviors (e.g., travel, tattoos, piercings), and medication use.

3. Preliminary Health Check: Measurement of hemoglobin concentration, blood pressure, and pulse.

4. Physician Examination: A final evaluation performed by a qualified physician, including auscultation of the heart and lungs, to determine final eligibility for donation.

Data Collection and Analysis

De-identified data were extracted from the Institute's electronic database. Variables included donor demographics (age, gender, residence), donor status (first-time vs. repeat), and documented reasons for temporary or permanent deferral. Data analysis was performed using Microsoft Excel. Descriptive statistics were used to summarize the dataset. Categorical variables (e.g., deferral reasons, gender) were expressed as frequencies and percentages, whereas continuous variables (e.g., age) were described using mean and standard deviation. Associations between categorical variables – including gender, donor status, and deferral reasons – were examined using the Chi-square (χ^2) test of independence. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

As the study utilized pre-existing, anonymized programmatic data, informed consent was waived. The study protocol adhered to the principles of the Declaration of Helsinki and received approval from the institutional ethics committee (Approval No. 12-09/2025).

Results

During the study period, a total of 15,791 individuals presented for voluntary blood donation. Of these, 13,834 (87.61%) were eligible and successfully donated blood, while 1,957 (12.39%) were deferred based on established criteria.

Demographic Characteristics of Deferred Donors

Among the 1,957 deferred individuals, 56.41% were male and 43.59% were female. Ages ranged from 18 to 65 years, with a mean age of 37.03 ±13.02 years. The highest portion of deferrals occurred in the 18-25 age group (497 donors, 25.40%), followed by the 36-45 age group (481 donors, 24.58%). A detailed age distribution is provided in **Table 1.**

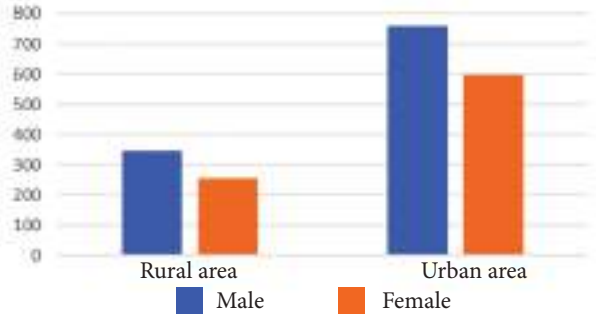
Most deferred donors resided in urban areas (1,356 donors, 69.29%), whereas 600 (30.66%) were from rural areas (**Graph 1).**

Table 1. Demographic characteristics of deferred blood donors

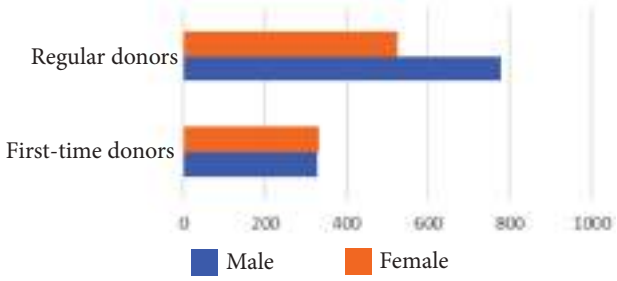
Age Group (Years)	Male	%	Female	%	Total	%
18-25	196	10.02	301	15.38	497	25.40
26-35	256	13.08	169	8.64	425	21.72
36-45	286	14.61	195	9.96	481	24.58
46-55	231	11.80	122	6.23	353	18.04
>56	135	6.90	66	3.37	201	10.27
Mean Age	39.05		34.40		37.03	
Standard Deviation	±12.70		±12.97		±13.02	

Table 2. Frequency of temporary and permanent blood donor deferrals

Type of Deferral	Male	%	Female	%	Total	%
Temporary	1,020	52.12	788	40.27	1,808	92.39
Permanent	84	4.29	65	3.32	149	7.61



Graph 1. Demographic characteristics of deferred donors by place of residence



Graph 2. Distribution of deferred donors by donor status

Donor Status and Type of Deferral

Repeat donors accounted for the majority of deferrals (1,302 donors, 66.53%), while first-time donors represented 655 (33.47%) of deferred individuals (**Graph 2**). Most deferrals were temporary (1,808 donors, 92.39%), while permanent deferrals comprised 149 cases (7.61%) (**Table 2**).

A Chi-square analysis showed no statistically significant association between gender and deferral type ($\chi^2 = 0.00$, df = 1, $p = 1.00$), indicating that males and females were similarly represented among temporary and permanent deferrals.

Reasons for Donor Deferral

The distribution of deferral causes is shown in **Table 3**. The most common reason for deferral was low hemoglobin, accounting for 706 cases (36.08% of all deferrals). This reason was significantly more frequent in women (20.64%) than in men (15.43%). A Chi-square test confirmed a strong association between gender and low hemoglobin deferral ($\chi^2 = 359.44$, df = 1, $p < 0.001$).

Medication use was the second most common cause (347 donors, 17.73%). Acute infections accounted for 225 deferrals (11.50%). Chronic diseases – primarily bronchial asthma and Hashimoto's thyroiditis – were the leading cause of permanent deferral, affecting 149 donors (7.61%). Other notable deferral reasons included risky behaviors (71 donor, 3.63%), hypotension (50 donors, 2.55%), and hypertension (50 donors, 2.55%).

Discussion

Ensuring a safe and adequate blood supply requires transfusion services to maintain a delicate balance between rigorous donor screening and the preservation of a sufficient donor pool. The deferral rate observed in this study – 12.39% – highlights this challenge and aligns closely with findings from Pakistan (12.9%) and several Southeast Asian countries, where rates range from 8.1% to 18.8% [2,7]. Such consistency across diverse settings underscores that donor deferral is an intrinsic component of blood collection systems worldwide. Although the specific causes vary by region, deferral patterns are shaped by local epidemiology, regulatory framework, and donor demographics [8–10].

One of the most notable finding in our study is the high portion of deferred donors in the 18-25 age group (25.40%). This pattern is widely reported internationally [2,5,6,11] and is particularly concerning because young donors form the foundation of a sustainable long-term blood supply. Deferral at a first donation attempt – often for temporary and reversible reasons – can discourage young individuals from becoming lifelong do-

Table 3. Criteria for temporary and permanent deferral of blood donors

Reason for Deferral	Male	%	Female	%	Total	%
Low hemoglobin levels	302	15.43	404	20.64	706	36.08
Medication use	239	12.21	108	5.52	347	17.73
Acute infections	157	8.02	68	3.47	225	11.50
Chronic diseases*	84	4.29	65	3.32	149	7.61
Risky behaviors**	51	2.61	20	1.02	71	3.63
Hypotension	11	0.56	39	1.99	50	2.55
Hypertension	33	1.69	17	0.87	50	2.55
Repeated serological testing	35	1.79	13	0.66	48	2.45
Recent surgery	27	1.38%	19	0.97%	46	2.35
Previous donation <12/16 weeks	29	1.48	11	0.56	40	2.04
Donor withdrawal	25	1.28	7	0.36	32	1.64
Tattoo/piercing	17	0.87	10	0.51	27	1.38
Menstruation	0	0.00	21	1.07	21	1.07
Insufficient body weight	0	0.00	13	0.66	13	0.66
Endoscopic procedures	9	0.46	4	0.20	13	0.66
Acupuncture	4	0.20	0	0.00	4	0.20
Recent vaccination	1	0.05	0	0.00	1	0.05
Other***	80	4.09	34	1.74	114	5.83

*Chronic diseases include bronchial asthma and Hashimoto's thyroiditis; ** Risky behaviors include: recent unprotected sexual contact with a new partner, history of sexually transmitted infections (STIs), multiple sexual partners, and intravenous drug use.; ***Other reasons include: travel to endemic areas, pregnancy termination, tooth extraction.

nors [6]. Thus, of the implications extend beyond a single missed donation and emphasize the need for targeted youth-centered donor engagement strategies.

Contrary to the common assumption that first-time donors are most frequently deferred, our data showed that established repeat donors accounted for the majority of deferrals (66.53%). This counterintuitive finding may be interpreted in two ways. On the one hand, it could reflect a highly effective pre-screening and education process for new donors. On the other, it highlights a key vulnerability within the donor pool: regular donors are more prone to transient health issues. Conditions such as temporary medication use, seasonal infections, or fluctuating hemoglobin levels – particularly among otherwise healthy and committed donors – represent a recurrent operational challenge. These findings shift the focus from recruitment alone to the proactive health monitoring and retention of existing donors, who constitute the most valuable and reliable component of the blood supply system.

Low hemoglobin emerged as the predominant cause of deferral in our study (36.08%), with a pronounced gender disparity affecting female donors. This is a near-universal finding, firmly established in the literature from India to Brazil [9,12–15]. Physiological factors associated with menstruation and childbirth, combined with nutritional iron deficiency, places women at increased risk [13]. This represents a clear opportunity for targeted intervention. Donor-centered health initiatives, including education on iron-rich diets and consideration of prophylactic iron supplementation for high-risk groups (particularly young women), could directly address this single largest barrier, converting a significant portion of temporary deferrals into successful donations [9,13]. In our study, gender was significantly associated with low hemoglobin deferral, reaffirming previous reports that female donors are more vulnerable to anemia-related deferrals. Conversely, no association was found between gender and the type of deferral. These findings suggest targeted nutritional support and screening for female donors could reduce avoidable deferrals and increase long-term donor retention.

Other common temporary deferral categories, such as medication use (17.73%) and acute infections (11.50%), further emphasize need for enhanced donor education. Many of these deferrals could be prevented through clearer communication of eligibility criteria, particularly regarding common over-the-counter medications and minor illnesses. Delivering this information in advance – through digital platforms, or informational leaflets – could empower donors to self-assess

and schedule donations appropriately, thereby reducing frustration and improving workflow efficacy [16].

The overwhelming predominance of temporary deferrals in this study (92.39%) is a highly encouraging finding, consistent with international data [17-20]. It demonstrates that the vast majority of deferred individuals are not permanently lost to the system and remain potential future donors. This highlights the critical importance of positive and informative deferral experience. A clear explanation of the deferral reason, respectful interaction, and specific guidance on when the donor may return are central to maintaining donor trust and willingness to return. This study should be interpreted in the light of its limitations. Additionally, as a single-center study conducted in the Vojvodina region, the findings may not be fully generalizable to other populations with different genetic, health, or socioeconomic profiles.

Conclusion

This study demonstrates that most blood donor deferrals arise from temporary and preventable health conditions, with low hemoglobin – especially among younger and female donors – representing the most frequent cause. The unexpected high proportion of deferrals among repeat donors underscores that donor retention requires more than recruitment alone; it demands meaningful donor engagement. To reduce avoidable deferrals and safeguard the donor pool, transfusion services must adopt a proactive approach: educate, pre-screen, and support. Perhaps most critically, the way deferred donors are treated today affects their willingness to return tomorrow. Every missed donation is an opportunity not just to restore supply, but to rebuild trust.

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Rad je primljen 6. XI 2025.
Recenziran 18. XI 2025.
Prihvaćen za štampu 4. XII 2025.
BIBLID.0025-8105:(2025):LXXVIII:5-8:148-152.