

Original article

Blood Donor Deferral and Its Major Causes Before and After Donation: A Retrospective Analysis from the Central Blood Bank in Tobruk, Libya

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Email: fatma.abad@tu.edu.ly**Keywords.**

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Abstract

Blood transfusion is a lifesaving therapy that requires an adequate and reliable supply of safe blood. The selection of appropriate blood donors is a critical requirement for ensuring the quality and safety of blood and blood products. Through the donor selection process, some individuals may be deferred from donating blood, either temporarily or permanently, based on specific eligibility criteria. This study was carried out to analyze registered donor profiles and to identify the most common temporary and permanent deferral causes at the Central Blood Bank in Tobruk, Libya, over the period from January 2023 to August 2026. Data from 36,708 donor registrations were analyzed to assess demographic characteristics, donor types, and overall deferral rates. Pre- and post-donation deferral records (n = 6,406) were evaluated for temporary and permanent causes. Male donors accounted for 98.59% (n = 36,189) of total registrations, while females comprised 1.41% (n = 519). Replacement donors predominated (66.18%, n = 24,295), with voluntary non-remunerated donors making up 33.82% (n = 12,413). The overall deferral rate was 17.4% (n = 6,406). Temporary deferrals dominated (84.09%, n = 5,387) over permanent deferrals (15.91%, n = 1,019). Medical and surgical causes constituted the largest broad category of deferrals (71.78%, n = 4,598). Among specific temporary causes, hypotension was the most common (n = 1,898; 29.63%), followed by hypertension (n = 892; 13.92%) and recent drug intake (n = 689; 10.75%). High-risk drug-use history was the leading contributor to permanent exclusion categories (n = 330; 5.15%), followed by high bilirubin (n = 300; 4.68%) and insulin-dependent diabetes (n = 76; 1.19%). Serological reactivity rates were highest for HBsAg (n = 43; 0.67%), HCV (n = 27; 0.42%), syphilis (n = 22; 0.34%), and HIV (n = 3; 0.05%). Deferrals are predominantly temporary and are driven by actionable clinical parameters such as hypotension, hypertension, and medication use. Targeted public awareness campaigns and pre-screening education can reduce preventable deferrals, improve donor retention, and strengthen the blood supply chain.

Introduction

Blood transfusion is an essential, lifesaving therapy for managing various medical and surgical conditions. A vital responsibility of blood banks, particularly blood transfusion services (BTS), is to supply recipients with safe, quality blood and blood products promptly (1). This process is carried out through the collection of blood from donors who are at low risk of infectious diseases that could be transmitted through transfusion and who are unlikely to jeopardize their own health by donating blood. Ensuring the timely availability of high-quality blood products for patients in need remains a persistent challenge for blood transfusion services (2).

Blood donor screening is an important aspect of transfusion safety, as it protects donor health and reduces the risk of transfusion-transmitted diseases among recipients. Based on screening results, potential donors may be subject to temporary or permanent deferral. Temporary deferral applies for a defined period, after which donors are asked to return; for example, donors with abnormal alanine aminotransferase (ALT) levels may be temporarily deferred. Permanent deferral means the donor is not eligible to donate blood for others at any time. All individuals with a history of a transfusion-transmissible infection such as HIV, hepatitis B, hepatitis C, or syphilis are permanently deferred (3).

Although blood banks and blood transfusion services worldwide face persistent operational challenges in maintaining a safe and adequate blood supply, accurate and effective donor selection remains a critical component of transfusion safety. The World Health Organization (WHO) has developed strategies for evaluating donor suitability to support blood transfusion services in countries seeking to establish or strengthen national systems for the selection and recruitment of blood donors (4).

According to information provided by 164 countries to the WHO Global Database on Blood Safety, more than 92 million blood donations are collected annually worldwide. However, an estimated 1.6 million donated blood units are rejected because of markers of transfusion-transmissible infections (TTIs). In addition, approximately 13 million prospective donors are deferred from blood donation because of anemia, underlying medical conditions, or the potential risk of transfusion-

transmissible infections (5). The prevalence of deferral causes varies by region. Understanding the frequency of various deferral causes in a given population helps to focus the selection process and to create a safe blood donor pool. This study was therefore carried out to analyze registered donor profiles and to determine the most common temporary and permanent deferral causes at the Central Blood Bank in Tobruk, Libya, between January 2023 and August 2026.

Materials and Methods

Study design

A retrospective study.

Study setting and duration

The study was conducted at the Central Blood Bank in Tobruk, Libya, covering the period from January 2023 to August 2026.

Sampling method

All available case records, including donor registers and completed donor selection forms containing donor type (voluntary/replacement), donor details, pre-donation questionnaires, counseling details, and medical examination findings, were analyzed, organized, and compared with similar studies.

Selection criteria

Inclusion criteria

Donors who donated blood at the Central Blood Bank were included, provided they met the following eligibility criteria:

- Donor age 18–65 years; regular donors may be accepted up to 65 years of age.
- Body weight ≥ 50 kg and hemoglobin level ≥ 12 g/dL for females and ≥ 13 g/dL for males.
- Pulse rate 50–100 beats/min with no irregularities.
- Previous blood donation not less than 3 months ago for males and 4 months ago for females.
- No signs or history of acute or chronic disease.
- Not taking any medication listed among the causes for deferral.
- No history of vaccination with a vaccine requiring temporary deferral within the specified deferral period.
- Female donors who are not pregnant, lactating, or post-abortion.
- No history of blood transfusion in the last 12 months.
- No history of major surgery in the last 12 months, or minor surgery in the last 6 months.
- Free from any disease transmissible by blood transfusion.
- Not fasting before blood donation.
- Females are temporarily deferred during menstruation.

Exclusion criteria

Any individual who came for blood donation but did not meet the inclusion criteria was excluded from the study.

Statistical analysis

Statistical analysis was performed using SPSS version 27 and Microsoft Office Excel 365. Data were summarized using frequencies and percentages.

Results

Donor demographics and registration types

A total of 36,708 donor registrations were analyzed. Males constituted the vast majority of registered donors ($n = 36,189$; 98.59%), whereas female donors accounted for 1.41% ($n = 519$). The most common age group was 25–44 years, and the smallest group was younger than 18 years. Regarding donor classification, replacement donors accounted for nearly two-thirds of total registrations ($n = 24,295$; 66.18%), while voluntary donors comprised 33.82% ($n = 12,413$).

Table 1. Distribution of registered donors by gender

Gender	Total number of registrations	Percentage (%)
Male	36,189	98.59%
Female	519	1.41%
Total	36,708	100.00%

Table 2. Distribution of registered donors by age group

Age group	Total number of registrations	Percentage (%)
< 18	66	0.17%
18–24	8,824	24.04%
25–44	21,470	58.49%
45–64	6,188	16.86%
> 64	160	0.44%
Total	36,708	100.00%

Table 3. Distribution of registrations by donor type

Donor type	Number of registrations	Percentage of total registrations
Voluntary	12,413	33.82%
Replacement	24,295	66.18%
Total	36,708	100.00%

Overall deferral rates and classification

Out of the 36,708 registrations, 6,406 deferral events were recorded, yielding an overall deferral rate of 17.4%. Temporary deferrals comprised the overwhelming majority

(n = 5,387; 84.09%), while permanent deferrals accounted for 15.91% (n = 1,019).

Table 4. Distribution of blood donation deferrals by type

Deferral type	Number of deferral events	Percentage of total deferrals
Temporary	5,387	84.09%
Permanent	1,019	15.91%
Total	6,406	100.00%

Analysis of deferral causes

Across 6,406 recorded deferral reasons in the pre- and post-donation records, medical and surgical conditions represented the largest broad category of deferrals (n = 4,598; 71.78%), followed by medication use (n = 738; 11.52%), high-risk history (n = 425; 6.63%), other reasons (n = 272; 4.25%), underweight/underage status (n = 235; 3.67%), and anemia (n = 138; 2.15%).

Table 5. Distribution of blood donation deferrals by cause

No.	Causes	Number of recorded reasons	Percentage (%)
1	Anemia	138	2.15%
2	Underweight and underage	235	3.67%
3	Medical and surgical causes	4,598	71.78%
4	High-risk history	425	6.63%
5	On medication	738	11.52%
6	Others	272	4.25%
	Total recorded cause occurrences	6,406	100.00%

Temporary deferral categories

Temporary deferral categories totaled 5,387 occurrences (84.09% of all recorded reasons). Hypotension was the most common reason (n = 1,898; 29.63%), followed by hypertension (n = 892; 13.92%) and recent drug intake (n = 689; 10.75%). Other temporary causes included cupping (n = 582; 9.08%), surgery or invasive procedures (n = 483; 7.54%), underweight/underage status (n = 235; 3.67%), recent donation (n = 150; 2.34%), anemia (n = 138; 2.15%), fatigue (n = 127;

1.98%), chronic respiratory disease (n = 63; 0.98%), fever or viral infection (n = 54; 0.84%), fasting (n = 36; 0.56%), skin lesions or tattoos (n = 19; 0.30%), lipemic blood (n = 16; 0.25%), and leukopenia/thrombocytopenia (n = 5; 0.08%).

Table 6. Causes corresponding to temporary deferral categories

No.	Causes	Number of cases/occurrences	Percentage within source dataset
1	Recent drug intake	689	10.75%
2	Anemia	138	2.15%
3	Underweight/underage	235	3.67%
4	Skin lesion/tattoo on skin	19	0.30%
5	Hypertension	892	13.92%
6	Fever/viral infection	54	0.84%
7	Surgery/invasive procedures	483	7.54%
8	Recent donation	150	2.34%
9	Recent cupping	582	9.08%
10	Hypotension/low pulse	1,898	29.63%
11	Chronic respiratory disease	63	0.98%
12	Leukopenia/thrombocytopenia	5	0.08%
13	Fasting	36	0.56%
14	Fatigue	127	1.98%
15	Lipemic blood	16	0.25%
	Pre-donation source subtotal	5,371	83.84%
	Post-donation source subtotal	16	0.25%

Permanent deferral categories

Permanent/exclusion categories totaled 1,019 occurrences (15.91% of all recorded reasons). High-risk drug-use history was the leading contributor in this group (n = 330; 5.15%), followed by high bilirubin (n = 300; 4.68%). Other causes included insulin-dependent diabetes (n = 76; 1.19%), cardiac disease (n = 51; 0.80%), medication use (n = 49; 0.76%), epilepsy (n = 41; 0.64%), vitiligo (n = 39; 0.61%), thyroid disease (n = 27; 0.42%), donor age >65 years (n = 8; 0.12%), and severe bronchial asthma on treatment (n = 3; 0.05%). Regarding transfusion-transmitted infections, HBsAg was the most frequently recorded serological deferral (n = 43; 0.67%), followed by HCV (n = 27; 0.42%), syphilis (n = 22; 0.34%), and HIV (n = 3; 0.05%).

Table 7. Reasons corresponding to permanent/exclusion categories

No.	Causes	Number of cases/occurrences	Percentage within source dataset
1	Diabetes on insulin	76	1.19%
2	Severe bronchial asthma on treatment	3	0.05%
3	High-risk drug-use history	330	5.15%
4	Epilepsy	41	0.64%
5	Cardiac disease	51	0.80%
6	Thyroid disease	27	0.42%
7	On medication	49	0.76%
8	Donor age >65 (regular donor)	8	0.12%
9	Vitiligo	39	0.61%
10	High bilirubin	300	4.68%
11	HBV (repeatedly reactive/borderline HBsAg)	43	0.67%
12	HCV (repeatedly reactive/borderline HCV)	27	0.42%
13	HIV (repeatedly reactive/borderline HIV)	3	0.05%
14	Syphilis (repeatedly reactive/borderline)	22	0.34%
	Pre-donation source subtotal	624	9.74%
	Post-donation source subtotal	395	6.16%

Discussion

Blood transfusion is an essential lifesaving therapy for the management of various medical and surgical conditions, and the selection of suitable donors is critically important for the safety and health of both recipients and donors. Through the donor

selection process, persons who are temporarily or permanently deemed unqualified to donate blood are referred to as deferred donors. The deferral process is essential not only for protecting donors from possible adverse reactions but also for avoiding negative experiences that may affect their motivation to donate in the future. Blood donors are the foundation of a safe and effective blood transfusion system. Consequently, strict donor selection and eligibility criteria are important to protect donors from possible adverse effects and, most importantly, to reduce the risk of blood-borne pathogen transmission to recipients.

During the study period, 36,708 individuals came to donate blood at the Central Blood Bank in Tobruk, Libya. The donor deferral rate in our study was 17.4% of registrations, which aligns with previous studies: Grant et al. (2025) (6), Thaikruea et al. (2008), who reported a deferral rate of 18.8% (7), Choudhary et al., who reported 16.4% (8), and Custer et al., who reported 13.6% (9). In contrast, Jethani et al. reported a deferral rate of 2.6% (10), and Kumar et al. (2022) reported a rate of 1.99% (11), both lower than in our study. These differences in donor deferral rates may be attributed to variations in donor selection criteria, donors' lack of awareness regarding the importance of blood donation and of the essential selection criteria and reasons for deferral, and differences among study populations.

In our study, the majority of donors were male ($n = 36,189$; 98.59%), while women accounted for only 519 (1.41%); similar very low proportions of female donors have been reported in other studies (11). Regarding age, the donor population covered a wide range, from younger than 18 years to older than 64 years, with the majority aged 25–44 years; this group also donated most frequently. Regarding donor classification, the largest proportion were replacement donors (66.18%), while voluntary donors represented the smaller group (33.82%).

In the present study, temporary deferrals greatly outnumbered permanent deferrals (84.09% vs. 15.91%). These findings are consistent with studies by Shah et al. (87.55% vs. 12.45%) (12) and Sundar et al. (84% vs. 16%) (13). Temporarily deferred donors can be returned to the donor pool through appropriate counseling, follow-up, and management of the underlying cause of deferral.

The most frequent temporary deferral causes among blood donors in this study were hypotension and low pulse (29.63%), followed by hypertension (13.92%) and recent drug intake (10.75%). Similar findings were reported in a study from King Fahd Hospital of the University, Saudi Arabia, where hypotension was a leading reason, followed by hypertension, while medication use was the most frequent overall cause; that study also included low pulse rate as a temporary deferral cause (14). Other studies found hypertension to be the most common reason (15–17). However, in another study, the most common causes for temporary and short-term deferral were alcohol consumption, low hemoglobin level, and low body weight (18). All individuals who are temporarily deferred should be informed about the cause and duration of their deferral and provided with appropriate counseling to encourage them to return for blood donation when they become eligible.

The most common causes of permanent deferral were high-risk drug-use history (5.15%), followed by high bilirubin (4.68%) and insulin-dependent diabetes (1.19%). A previous study by Kala et al. (2007) on high-risk behavior among healthy donors reported that 12.3% of donors admitted to high-risk behavior (19). Similar studies have recognized insulin-dependent diabetes as a significant reason for permanent donor deferral. In addition, a history of jaundice and abnormal bilirubin levels has been noted among the main reasons for donor deferral, underscoring the significance of liver-related abnormalities in donor screening.

Conclusion

This study provides insight into the numerous causes of blood donor deferral in Tobruk. The findings emphasize the importance of applying appropriate strategies to retain donors, particularly by recalling temporarily deferred donors after resolution of the underlying cause. The analysis may also help in refining donor screening procedures and eligibility criteria, thereby improving the efficiency and safety of blood transfusion services and ensuring an adequate pool of eligible blood donors. Furthermore, the results highlight the need for greater public education regarding factors and practices that may lead to donor deferral and the importance of encouraging increased participation among female donors.

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Conflict of interest

The authors declare that they have no conflict of interest.

Data availability

The raw data will remain confidential. Any further inquiries may be directed to the corresponding author, Asmai S. H. Mohammed.

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