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Pattern and Causes of Blood Donor Deferral: A Two-Year Retrospective Study at a Tertiary Care Blood Centre.

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Abstract

Background

Donor selection protects donors and recipients, but deferral also removes motivated individuals from the donor pool. Local deferral patterns show which barriers to donation are reversible.

Aim: To determine the frequency, pattern, and causes of pre-donation blood donor deferral at a tertiary care blood centre.

Materials and methods

This retrospective, record-based study reviewed all 5,254 prospective whole-blood donors registered at the Blood Centre of a tertiary care teaching hospital in Jammu and Kashmir, India, from January 2022 to December 2023. Age, sex, eligibility status, nature of deferral, and documented reason were extracted. The primary outcome was the overall deferral rate. Sex-specific rates were compared using Pearson's chi-square test, and relative risk (RR) with 95% confidence interval (CI) was calculated. A two-sided p-value <0.05 was considered significant.

Results

Of 5,254 prospective donors, 326 were deferred (6.20%). Females were deferred more often than males (55/576, 9.55% vs 271/4,678, 5.79%; χ^2=12.43, p<0.001; RR 1.65, 95% CI 1.25–2.17). Temporary deferrals made up 267/326 (81.90%) and permanent deferrals 59/326 (18.10%). Low haemoglobin was the leading temporary cause (53.18%), followed by mild infection (14.61%), alcohol intake (7.87%), and recent tattooing (6.74%). Insulin-treated diabetes mellitus (55.93%) and uncontrolled hypertension (32.20%) were the most frequent permanent deferral categories.

Conclusion

Most deferrals were temporary, so most deferred donors were potentially recoverable. Low haemoglobin dominated the temporary deferral profile, and women had a significantly higher deferral rate than men.

Recommendation

Blood centres should give deferred donors cause-specific counselling, refer donors with low haemoglobin for clinical evaluation, and recall temporarily deferred donors once they are eligible again. Donors registered as permanently deferred for uncontrolled hypertension should be reassessed against current criteria.

Keywords: *Blood donor; Donor deferral; Donor selection; Haemoglobin; Temporary deferral; Donor retention*
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Introduction

Safe blood begins with appropriate donor selection. Pre-donation assessment is intended to protect the donor from avoidable harm and to reduce risks to the recipient by identifying medical, physiological and behavioural conditions that make donation unsuitable at a particular time. Donor selection standards therefore form an essential part of a blood centre's quality and safety system [1,2].

Deferral, however, has a second consequence that is easy to overlook. A person who presents for donation has already crossed several barriers to participation, and deferral temporarily or permanently removes that motivated individual from the donor pool. This is particularly relevant for temporary deferral, because the underlying reason is often reversible. Previous work has shown that temporarily deferred donors may be less likely to return after the deferral period than donors who were eligible at their initial visit, making the manner in which deferral is communicated important for future donor retention [3].

The frequency and causes of deferral vary between blood centres because donor populations, recruitment settings and health profiles differ. Indian studies have reported overall deferral rates ranging from approximately 6% to more than 20%, with low haemoglobin repeatedly emerging as an important cause and women often experiencing higher deferral rates than men [4–8]. Such variation makes local surveillance useful as it shows where donor loss is occurring and which causes may be amenable to counselling, treatment, planned recall or better pre-donation information.

The present study examined two years of donor selection records at a tertiary care blood centre in Udhampur, Jammu and Kashmir. Rather than treating deferral simply as a count of unsuccessful donations, the analysis was designed to describe who was being deferred, whether the deferral was temporary or permanent, and which conditions contributed most to the loss of prospective donors.

Aim and objectives

The study aimed to evaluate the pattern and causes of pre-donation blood donor deferral among prospective whole blood donors.

- To determine the overall donor deferral rate during the study period.
- To describe the age and sex distribution of deferred donors.
- To determine the proportions of temporary and permanent deferrals.
- To identify the major causes of temporary and permanent deferral.

Materials and methods

Study design and setting

This retrospective, record-based observational study was conducted at the Blood Centre, Department of Immunohematology and Blood Transfusion, Government Medical College (GMC) and Associated Hospital, Udhampur, Jammu and Kashmir, India. Records covering a 24-month period from January 2022 through December 2023 were reviewed.

GMC Udhampur is a government medical college in Udhampur town, Udhampur district, in the Jammu division of the Union Territory of Jammu and Kashmir. Established in 2023 under a centrally sponsored scheme of the Government of India, it is affiliated to the University of Jammu, recognised by the National Medical Commission, and admits 100 MBBS students each year. Its associated hospital is a 300 bedded facility and one of the largest in the district. It serves as a tertiary referral institution for Udhampur district and its catchment area includes Ramnagar, Panchari and other areas of difficult terrain within the district. The hospital provides outpatient, inpatient and 24-hour emergency services across the major clinical specialties, including general medicine, general surgery, obstetrics and gynaecology, paediatrics, orthopaedics, otorhinolaryngology, ophthalmology, dermatology, psychiatry, anaesthesiology and radiodiagnosis, supported by pathology, microbiology and biochemistry laboratories. The Blood Centre, run by the Department of Immunohematology and Blood Transfusion, is licensed for whole blood only and functions round the clock. It supplies blood to patients of the associated hospital and collects approximately 2,500 units of whole blood each year from both voluntary and replacement donors at the centre and at outreach voluntary blood donation camps.

Study population and eligibility criteria

All prospective whole-blood donors who presented for donation at the blood centre or at blood donation camps during the study period constituted the study population. A total of 5,254 prospective donors were registered. All records meeting the eligibility criteria below were evaluated, so no sampling procedure was applied.

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Inclusion criteria

- Individuals who registered as prospective whole-blood donors at the blood centre or at outreach camps between 1 January 2022 and 31 December 2023.
- Aged 18–65 years, as permitted under the national donor selection criteria by DGHS and departmental SOP.
- Underwent routine pre-donation screening and counseling with the eligibility decision recorded in the donor register.

Exclusion criteria

- Donors with incomplete records, in which the eligibility decision or, for deferred donors, the reason for deferral was not documented.
- Duplicate entries identified in the study records.
- Individuals presenting for procedures other than routine voluntary or replacement whole-blood donation, such as therapeutic phlebotomy, where these were recorded in the same register.

Donor assessment and data collection

Prospective donors underwent routine pre-donation assessment according to the donor-selection criteria followed by the blood centre during the study period. Information was retrieved from donor registration records, donor questionnaires and the donor deferral register. Variables extracted for the present analysis were age, sex, donor eligibility, temporary or permanent nature of deferral, and the documented reason for deferral.

Haemoglobin was estimated as part of routine pre-donation screening, and prospective donors with a haemoglobin below 12.5 g/dL were deferred, in accordance with the national donor-selection criteria .

Records with insufficient information to establish donor eligibility or the documented reason for deferral would have been excluded from the relevant cause-specific analysis. In the available aggregated dataset, the recorded temporary and permanent causes reconciled completely with the 326 deferrals.

Study variables and outcomes

The independent variables were age and sex of the prospective donor. Deferral status was classified as accepted or deferred. Deferrals were further classified as temporary (ineligible for a defined period, after which the donor may be reassessed) or permanent (ineligible indefinitely), as recorded under the donor-selection criteria applied at the time of screening [2].

Primary outcome

The overall pre-donation deferral rate, defined as the number of deferred donors divided by the total number of prospective donors, expressed as a percentage.

Secondary outcomes

• Sex-specific deferral rates and the association between sex and deferral status.
• The proportions of temporary and permanent deferrals.
• The distribution of causes of temporary deferral and of conditions recorded as permanent deferral.
• The age distribution of deferred donors.

Statistical analysis

Categorical data were summarised as frequencies and percentages. The overall deferral rate was calculated using all prospective donors as the denominator, and sex-specific rates used the corresponding number of male or female prospective donors. Pearson's chi-square test was used to assess the association between sex and deferral status. Relative risk with a 95% confidence interval was calculated for female compared with male prospective donors. 95% confidence intervals for deferral rates were calculated using the Wilson score method. A two-sided p value <0.05 was considered statistically significant.

Age was analysed descriptively among deferred donors. An age-specific deferral rate or statistical association between age and deferral was not calculated because the age distribution of all 5,254 prospective donors was not available.

Ethical considerations

This study was a retrospective analysis of anonymised data that are routinely recorded in the donor registers of the Blood Centre as part of standard donor-selection procedures. No intervention was made, no donor was contacted, no personal identifiers were extracted, and data were analysed only in aggregate. Formal ethical approval was therefore not required, consistent with the provisions for exemption from review for research using anonymised, routinely collected records under the ICMR National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (2017). For the same reason, individual informed consent was not required. Confidentiality of donor records was maintained throughout, and the study was

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conducted in accordance with the principles of the Declaration of Helsinki.

Results

During January 2022–December 2023, 5,254 prospective donors presented for blood donation. Of these, 326 were deferred, corresponding to an overall deferral rate of 6.20%. The remaining 4,928 (93.80%) were eligible to proceed with donation.

Table 1: Sex-Wise distribution and donor deferral rate

Sex	Prospective donors, n	Deferred, n	Accepted, n	Deferral rate, %
Male	4,678	271	4,407	5.79
Female	576	55	521	9.55
Total	5,254	326	4,928	6.20

Note. Deferral rate = deferred donors ÷ prospective donors × 100 within each row.

Female prospective donors had a higher deferral rate than males (9.55% versus 5.79%; Figure 1). The association between sex and deferral status was statistically significant (χ^2=12.43, df=1, p<0.001). The risk of deferral among females was approximately 65% higher than among males (RR 1.65, 95% CI 1.25–2.17).

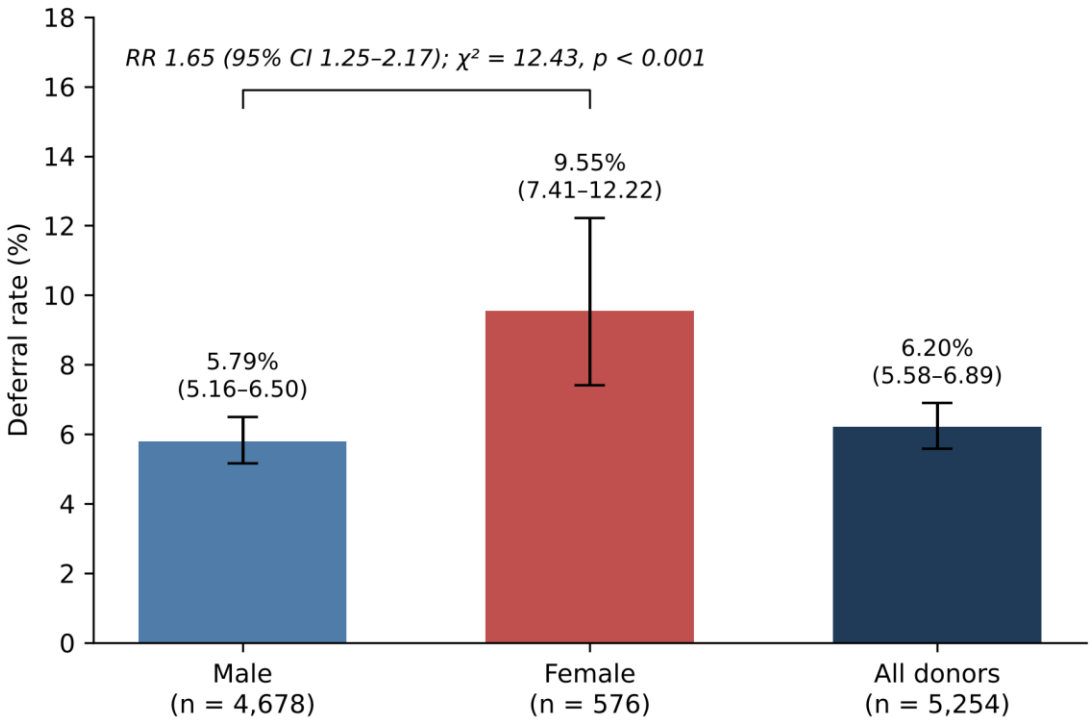


Figure 1: Deferral Rate Among Prospective Whole-Blood Donors by Sex, January 2022 to December 2023

Note. n = 5,254.

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Bars show the deferral rate; error bars show 95% confidence intervals (Wilson score method). Female prospective donors had a significantly higher deferral rate than males (RR 1.65, 95% CI 1.25–2.17; $\chi^2 = 12.43$, $p < 0.001$). RR = relative risk; CI = confidence interval.

Table 2: Age distribution of deferred donors

Age group, years	Deferred donors, n	% of all deferred donors
18–37	176	53.99
38–47	91	27.91
48–57	43	13.19
58–65	16	4.91
Total	326	100.00

Note. n = 326. Age groups are presented as recorded in the blood centre register; the first category spans a wider age range than the others. Percentages describe the composition of the deferred population, not age-specific deferral risk.

The largest share of deferred donors belonged to the 18–37-year group (53.99%), followed by 38–47 years (27.91%). These percentages describe the composition of the deferred population.

Temporary conditions accounted for more than four-fifths of all deferrals (81.90%), whereas 18.10% were recorded as permanent deferrals (Figure 2).

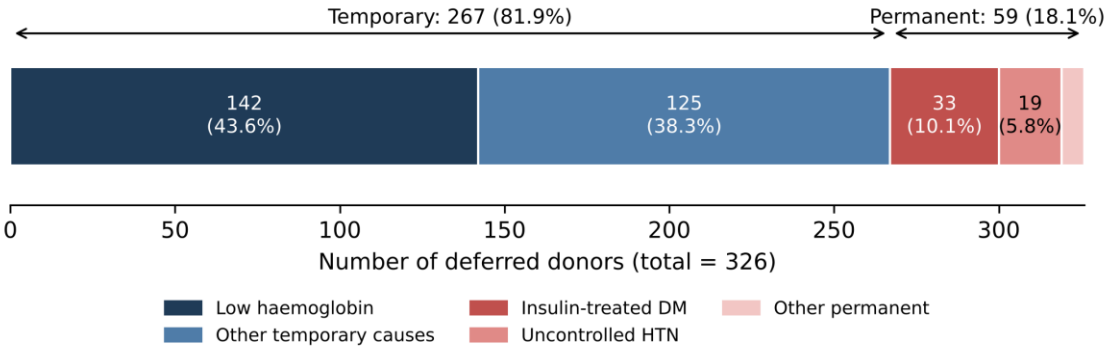


Figure 2: Composition of all donor deferrals by nature and leading cause

Note. n = 326.

Temporary deferrals accounted for 267 (81.9%), of which low haemoglobin made up 142 (43.6% of all deferrals).

Permanent deferrals accounted for 59 (18.1%), led by insulin-treated diabetes mellitus (33; 10.1%) and uncontrolled hypertension (19; 5.8%). "Other permanent" includes cardiac disease (5), history of neurosurgery (1), and epilepsy (1). DM = diabetes mellitus; HTN = hypertension.

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Table 3: Causes of temporary donor deferral

Cause	n	% of temporary deferrals	% of all deferrals
Low haemoglobin	142	53.18	43.56
Mild infection	39	14.61	11.96
Alcohol intake	21	7.87	6.44
Recent tattoo	18	6.74	5.52
Underweight	11	4.12	3.37
Inadequate sleep	9	3.37	2.76
Dog/pet bite	7	2.62	2.15
Menstruation	6	2.25	1.84
Anxiety/unwillingness or pressure to donate	5	1.87	1.53
Skin infection	4	1.50	1.23
Recent donation	4	1.50	1.23
Typhoid	1	0.37	0.31
Total	267	100.00	81.90

Note. n = 267. Percentages may not total 100 because of rounding.

Low haemoglobin was the dominant temporary cause (Figure 3), accounting for 53.18% of temporary deferrals and 43.56% of all deferrals. Mild infection was the second most frequent temporary reason (14.61%), followed by recent alcohol intake (7.87%) and tattooing (6.74%).

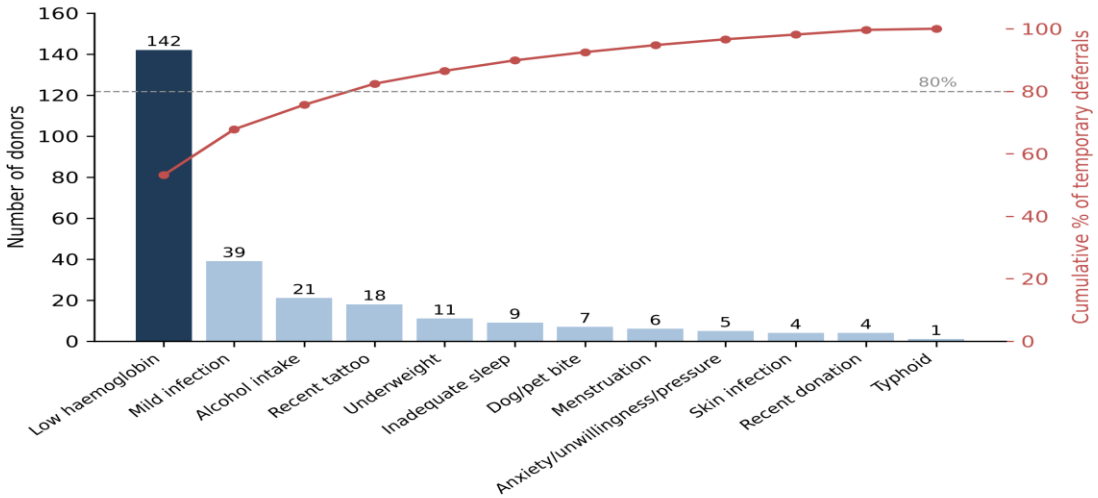


Figure 3: Causes of temporary deferral in descending order of frequency
Note. n = 267.

Bars show the number of donors deferred for each cause; the line shows the cumulative percentage of temporary deferrals. Low haemoglobin alone accounted for 53.2%, and the four leading causes (low haemoglobin, mild infection, alcohol intake and recent tattoo) together accounted for 82.4%.

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Table 4: Conditions recorded as permanent donor deferral

Condition	n	% of permanent deferrals	% of all deferrals
Insulin-treated diabetes mellitus	33	55.93	10.12
Uncontrolled hypertension	19	32.20	5.83
Cardiac disease/issues	5	8.47	1.53
History of neurosurgery	1	1.69	0.31
Epilepsy	1	1.69	0.31
Total	59	100.00	18.10

Note. n = 59. Percentages may not total 100 because of rounding.

Insulin-treated diabetes mellitus constituted 55.93% of conditions recorded as permanent deferral, followed by uncontrolled hypertension (32.20%). Together, these two categories accounted for 88.14% of recorded permanent deferrals.

Discussion

The present study found that 6.20% of prospective donors were deferred during the two-year period. This figure sits close to the 5.84% reported by Sundar et al. in a South Indian blood centre [4], while Agnihotri reported a higher overall deferral rate of 11.6% in Western India [5]. More recent Indian data also demonstrate substantial centre-to-centre variation [6]. Such differences are expected because a deferral rate reflects not only donor-selection standards but also the demographic profile, health status, recruitment setting and referral patterns of the population presenting to a particular blood centre.

A notable finding was the sex difference in deferral. Although women constituted only 10.96% of prospective donors in the present cohort, 9.55% of female candidates were deferred compared with 5.79% of males. This was statistically significant, and females had 1.65 times the risk of deferral. The direction of this association agrees with earlier Indian studies. Sundar et al. reported a deferral rate about five times higher in women than in men (19.85% vs 4.06%), with low haemoglobin and low body weight among the principal contributors [4], while Agnihotri found 53.5% of female and 6.9% of male prospective donors deferred [5]. The difference in the present study was considerably smaller (9.55% vs 5.79%; RR 1.65), which illustrates why local data should be preferred over assumptions based on another centre's donor population.

Just over half of the deferred donors in our study were 18–37 years old. This should not be interpreted as evidence that younger donors were more likely to be deferred. The denominator required for such a conclusion, that is, the total number of prospective donors in each age group, was unavailable. The finding therefore describes the age composition of deferrals rather than age-specific risk. This distinction is important because younger adults may simply constitute a larger share of the population presenting for donation.

Temporary deferrals accounted for 81.90% of all deferrals. The predominance of temporary causes is consistent with earlier Indian reports, in which temporary conditions such as low haemoglobin were the leading reasons for deferral [4–6], and is operationally important because these donors remain a potentially recoverable part of the donor pool. Malhotra and Negi, analysing donor deferral at an Indian tertiary care institute, similarly emphasised the value of understanding locally prevalent causes for donor management [6]. Temporary deferral should therefore trigger an explanation of why donation cannot proceed, how long the restriction is expected to last, and when reassessment may be appropriate.

The need for active management of temporary deferral is supported by evidence on subsequent donor behaviour. Custer et al. found that temporarily deferred donors were less likely to return than donors who were eligible at their index visit [3]. Deferral is therefore not a neutral event. A donor who receives an unclear or discouraging explanation may be lost even after the medical reason for deferral has resolved. This makes respectful counselling and a clear pathway back to eligibility part of donor retention rather than an optional courtesy.

Low haemoglobin was the single largest contributor in our study, accounting for 53.18% of temporary deferrals and 43.56% of all deferrals. This pattern is well established in Indian donor populations [4–8]. Agnihotri reported low haemoglobin in 55.8% of deferred donors [5], and Shah et al. found it to be the leading reason for temporary deferral among both first-time and repeat voluntary donors [9]. Studies focused specifically on haemoglobin-based deferral have also highlighted anaemia as an important and potentially remediable reason for loss of prospective donors

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[7]. The screening method also matters: Mathur et al. found that more than one-third of donors deferred by the copper sulphate method had an acceptable haemoglobin when re-tested with a digital haemoglobinometer [8]. The finding has implications beyond collection targets: haemoglobin screening is a donor-safety measure, and a low result may identify an individual who would benefit from further assessment.

The appropriate response to low-haemoglobin deferral is therefore not simply to reject the donation. This matters for retention: in a cohort of Australian whole-blood donors, Hillgrove et al. found that deferral for low haemoglobin delayed return, reduced the frequency of subsequent donation and increased later drop-out, although the effect was smaller among donors who returned promptly once eligible [10]. Donors should receive an understandable explanation of the finding and, where appropriate, advice for clinical evaluation and correction of the underlying cause. At the same time, the blood centre should avoid assuming that every low haemoglobin value represents iron deficiency or prescribing treatment without appropriate assessment. A structured pathway for counselling and subsequent reassessment is more defensible and more useful to the donor.

Mild infection was the second most frequent temporary reason (14.61%), followed by recent alcohol intake (7.87%) and tattooing (6.74%). These causes differ in mechanism but share an important operational feature: most are time-limited. Clear pre-donation information, particularly before organised camps, may prevent some avoidable presentations during periods of temporary ineligibility and can help donors understand when they may safely return.

The smaller categories also provide useful information. Inadequate sleep, recent donation, menstruation, recent animal bite, skin infection and anxiety or unwillingness each contributed relatively few cases, but together they illustrate the breadth of issues encountered during donor selection. Of particular importance are the five prospective donors recorded as anxious, unwilling or donating under pressure. Blood donation must remain voluntary [1,2]. An individual who is reluctant to proceed should be able to withdraw without persuasion or embarrassment, and collection targets cannot supersede donor autonomy.

Among the 59 donors recorded as permanently deferred, insulin-treated diabetes mellitus was the most frequent category (55.93%), followed by uncontrolled hypertension (32.20%). These findings should be interpreted in the context of the donor-selection criteria used during the study period. Because this was a retrospective analysis of aggregated records, the present study reports the classifications made at the time rather than attempting to reconstruct clinical eligibility from limited diagnostic labels. Uncontrolled hypertension is usually regarded as a temporary condition under current donor-selection criteria, as donors may become eligible once their blood pressure is controlled. Its classification as a permanent deferral in the register may therefore overstate permanent donor loss, and such donors could be considered for reassessment.

Taken together, the findings show why a deferral register can be more than an administrative record. In this cohort, more than four in five deferrals were temporary and over half of those temporary deferrals were attributable to low haemoglobin. These are identifiable groups for whom cause-specific counselling and planned reassessment may preserve future donor participation. The aim, however, should not be indiscriminate reduction of the deferral rate [1,2]. A low rate is not inherently evidence of better practice. The appropriate objective is correct donor selection: deferring when safety requires it, avoiding unnecessary exclusion, and giving temporarily deferred donors a realistic route back to donation.

Generalizability

The findings apply most directly to government blood centres in north India that recruit a predominantly male adult donor population, both in-house and at outreach camps, and that follow the national donor-selection criteria [2]. Several features limit external validity. The data came from a single centre, women made up only 10.96% of prospective donors, and the age, donor-type and venue profile of the full donor population was not available. Absolute deferral rates depend on local recruitment practice, the haemoglobin screening method, the criteria in force and the health profile of the community, so the overall rate of 6.20% should not be assumed for other centres. The broader pattern is more transferable: the predominance of temporary deferral, low haemoglobin as the leading cause and a higher deferral rate among women agree with reports from several Indian centres [4–8] and are likely to hold in comparable settings. Multicentre studies with donor-level data would allow firmer generalisation.

Conclusion

The overall pre-donation deferral rate was 6.20% over the two-year study period. Female prospective donors had a significantly higher deferral rate than males, while temporary conditions accounted for 81.90% of all deferrals. Low haemoglobin was the predominant temporary cause,

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contributing to more than half of temporary deferrals. Among conditions recorded as permanent deferral, insulin-treated diabetes mellitus was most frequent.

The practical message is not simply that donors were lost to deferral, but that most were deferred for potentially time-limited reasons. Systematic counselling, appropriate referral for reversible health problems and clear communication about re-eligibility may help retain these motivated individuals while preserving the safety standards on which donor selection depends.

Limitations

- The retrospective design restricted the analysis to information documented in routine blood-centre records, and some clinical categories could not be further subclassified.
- The age distribution of the complete prospective donor population was unavailable; therefore, age-specific deferral rates and an age–deferral association could not be calculated.
- Information on first-time versus repeat donor status, donation venue, subsequent return after temporary deferral and longer-term donor retention was not available.
- As a single-centre study, the observed pattern reflects the local donor population and donor-selection practices and should not be generalised uncritically to other settings.

Recommendations

Based on these findings, the following measures are recommended for the blood centre and for comparable settings:

- Every deferred donor should receive a clear explanation of the reason for deferral, its expected duration and the date from which they may be reassessed, preferably in writing.
- Donors deferred for low haemoglobin should be advised on the finding and referred for clinical evaluation of the cause, rather than simply turned away.
- A recall system (telephone or text message) should invite temporarily deferred donors back once the deferral period ends and their return should be tracked.
- Pre-donation information before organised camps should cover common temporary causes such as recent alcohol intake, tattooing, recent infection and inadequate sleep, to reduce avoidable presentations.
- Donors registered as permanently deferred for uncontrolled hypertension should be reviewed against current criteria and reassessed once their blood pressure is controlled.
- Prospective, multicentre studies should examine the return rates of temporarily deferred donors and the causes behind the higher deferral rate among women.

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List of abbreviations

CI: Confidence interval
df: Degrees of freedom
DGHS: Directorate General of Health Services
SOP: Standard Operating Procedures
DM: Diabetes mellitus
GMC: Government Medical College
HTN: Hypertension
ICMR: Indian Council of Medical Research
IHBT: Immunohematology and Blood Transfusion
RR: Relative risk
χ^2: Chi-square statistic

Funding

No external funding was reported for this study.

Conflict of interest

The authors declare no conflict of interest.

Ethics approval and consent to participate: Formal ethical approval was not required for this retrospective study of anonymised, routinely collected blood centre records, and individual informed consent was not required (see Ethical considerations).

Data availability

The aggregated data supporting the findings of this study are presented in the tables and figures of this article. De-

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identified record-level data are available from the corresponding author on reasonable request, subject to approval by the institution.

Author contributions

Lubna Naseer (LN) conceived and designed the study, collected the data from the blood centre records, performed the statistical analysis and wrote the first draft of the manuscript. Saadat Nazir Shah (SNS) contributed to the study methodology, checked the data and analysis, and critically revised the manuscript. Qurat Ul Ain Chowdhary (QUAC) carried out the literature review, contributed to the interpretation of findings on donor counselling and referral, and critically revised the manuscript. Ritika Basnotra (RB) contributed to the interpretation of the data and the discussion, and critically revised the manuscript. All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Author biographies

Dr Lubna Naseer is an Assistant Professor in the Department of Immunohematology and Blood Transfusion, Government Medical College & Associated Hospital, Udhampur, Jammu and Kashmir, India. Her work in the blood centre covers donor screening, donor selection and the supervision of blood collection at the centre and at outreach camps. Her research interests include blood donor deferral, adverse reactions in whole-blood donors, donor safety and retention, and quality systems in transfusion services.

Dr Saadat Nazir Shah is an Assistant Professor in the Department of Immunohematology and Blood Transfusion (IHBT), Government Medical College, Baramulla, Jammu and Kashmir, India. The department provides blood centre services including donor recruitment and selection, blood component preparation, and compatibility testing. Professional interests include donor selection practices, transfusion safety and the organisation of blood centre services in Jammu and Kashmir.

Dr Qurat Ul Ain Chowdhary is a General Practice (GP) Registrar at Sunny Meed General Practice, Surrey, United Kingdom, training in primary care within the National Health Service. She brings a primary care perspective to this study, particularly on the evaluation and follow-up of donors deferred for reversible conditions such as low haemoglobin, and has an interest in preventive health and community-based care.

Dr Ritika Basnotra (MBBS, MD Immunohematology and Blood Transfusion) is Assistant Professor in the Department of Immunohematology and Blood Transfusion, Bharati Vidyapeeth Deemed University Medical College, Hospital & Research Centre, Pune, India. Her areas of interest include blood donor management, immunohaematology and transfusion safety.

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