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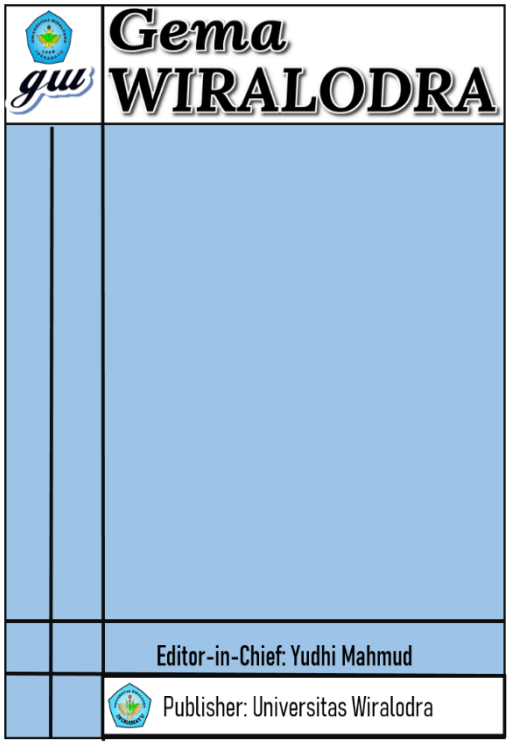

Comparative Analysis of Blood Donor Deferral Factors by Gender

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Orginal Article

Comparative Analysis of Blood Donor Deferral Factors by Gender

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Abstract
Blood donor assessment is essential for protecting donor health and maintaining blood component quality. Individuals who fail to meet eligibility requirements may be temporarily deferred. This study examined the association between gender and blood donor deferral reasons at the Indonesian Red Cross Blood Donation Unit (UDD PMI), South Sulawesi Province. An analytical cross-sectional study was conducted between April and May 2026, involving 100 deferred prospective donors selected through consecutive sampling. Data were collected from donor screening records and structured questionnaires. Descriptive statistics and the Pearson Chi-Square test were used for analysis, with Fisher's Exact Test applied because 64.3% of cells had expected counts below five. Statistical significance was established at $p < 0.05$. Among the participants, 42 (42.0%) were male and 58 (58.0%) were female. Low hemoglobin was the leading cause of deferral among females (44.8%), whereas high hemoglobin was predominant among males (47.6%). The distribution of deferral reasons differed significantly by gender ($\chi^2 = 21.347$, df = 6, $p = 0.002$), with Fisher's Exact Test confirming this association ($p = 0.001$). Gender was significantly associated with blood donor deferral reasons. Gender-responsive pre-donation education and health counseling may improve donor preparedness and minimize preventable deferrals.
Keywords: Blood Donor, Donor Deferral, Gender, Hemoglobin, Blood Donation

1. Introduction

Blood is a life-saving biological product that plays a vital role in healthcare by supporting the treatment of various diseases, managing life-threatening emergencies, and maintaining patients' health status (Dewi et al., 2022). One of the primary applications of blood is through blood transfusion services, which involve the therapeutic use of human blood exclusively for humanitarian purposes rather than commercial interests. To ensure optimal clinical outcomes, blood and blood components must comply with established safety and quality standards, thereby protecting both blood donors and transfusion recipients (Supadmi & Nur'aini, 2019).

Ensuring the availability of a safe blood supply is a fundamental responsibility of every Blood Donation Unit (BDU). Therefore, all prospective blood donors are required to undergo a donor selection process before blood donation. Donor selection aims to assess donor eligibility through health history questionnaires and basic physical examinations to ensure that the donation process does not compromise donor health while providing safe blood components for recipients (Armayanti et al., 2023; Basri & Sitti, 2025). This screening process is an essential component of blood transfusion services because it identifies medical conditions that may jeopardize donor safety or compromise the quality and safety of donated blood.

The increasing utilization of blood transfusion in healthcare facilities has created a greater demand for blood availability across the world. To fulfill these needs, the World Health Organization (WHO) suggests that annual blood collection should account for approximately 2% of a country's population (WHO, 2022). Based on Indonesia's population of approximately

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277.75 million in 2022, the country's annual blood requirement was estimated at 5.56 million units (Data Indonesia, 2023). However, ensuring a sufficient and continuous blood supply remains a major challenge, as a proportion of individuals willing to donate are considered ineligible following the screening procedure. Under the provisions of Indonesian Ministry of Health Regulation No. 91 of 2015, blood donor eligibility is determined by several health-related requirements, such as age, body weight, blood pressure, and hemoglobin concentration. Individuals who fail to fulfill these standards may be classified as temporarily or permanently deferred from donating blood (Ministry of Health of the Republic of Indonesia, 2015).

Previous studies have identified low or high hemoglobin levels, abnormal blood pressure, low body weight, medication use, and temporary medical conditions among the factors associated with blood donor deferral. However, many studies have primarily described the overall distribution of donor deferral factors without specifically examining whether these factors differ according to gender. This is an important consideration because male and female donors may differ in physiological characteristics and health-related factors that can influence donor eligibility. Therefore, examining the distribution of deferral factors according to gender may provide additional information beyond the overall frequency of donor deferral.

Previous research has indicated that the causes of blood donor ineligibility may differ between male and female individuals. Findings from Dr. Sardjito General Hospital in Yogyakarta showed that reduced hemoglobin levels were more frequently identified among female donors, while elevated hemoglobin concentrations were predominantly observed in male donors (Triyono et al., 2023). Another investigation at the Indonesian Red Cross Blood Donation Unit in Bekasi Regency identified menstruation as a contributing factor to temporary donor exclusion among women (Sahruni & Dewi, 2024). Collectively, these findings indicate that donor deferral profiles may be influenced by gender-related characteristics. Therefore, investigating these variations across different blood donation services is important to obtain a more comprehensive understanding of gender-related donor eligibility patterns.

Despite these findings, research exploring gender-related differences in blood donor deferral remains scarce in Indonesia, especially within the blood donation services of UDD PMI South Sulawesi Province. Most existing investigations have concentrated on identifying the overall reasons for donor ineligibility and describing donor characteristics, with relatively little attention given to how gender relates to specific deferral categories identified during pre-donation assessment. This limitation indicates the need for further studies across various regional and blood donation service settings to generate context-specific evidence and improve understanding of the factors influencing donor eligibility.

To address the identified research gap, the present study focuses on individuals who were classified as ineligible for blood donation after undergoing routine screening at the Indonesian Red Cross Blood Donation Unit (UDD PMI) in South Sulawesi Province. Rather than merely presenting the overall frequency of donor deferrals, this investigation explores the distribution of specific deferral reasons across gender groups. The analysis is directed toward identifying whether the factors preventing prospective donors from proceeding with donation differ between male and female individuals. Through this approach, the study is expected to contribute locally relevant findings on gender-related variations in blood donor eligibility.

The findings may have practical implications for UDD PMI South Sulawesi Province by identifying the most frequent and gender-related factors contributing to donor deferral. Such information can be used to strengthen pre-donation education and health counseling, improve donor preparedness before attending blood donation sessions, and support the development of more targeted donor recruitment and retention strategies. By identifying potentially preventable causes of donor deferral, the findings may also help the UDD develop interventions aimed at improving donor eligibility and supporting a more sustainable blood supply.

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In light of the identified research gap, this investigation was designed to determine whether gender is associated with the reasons for temporary blood donor deferral among prospective donors at the Indonesian Red Cross Blood Donation Unit (UDD PMI), South Sulawesi Province. The results are anticipated to enrich the local evidence base concerning differences in donor deferral patterns between men and women. Furthermore, the findings may serve as a scientific basis for designing more targeted donor awareness programs, health counseling, and preparatory interventions before blood donation.

2. Methods

Study Design and Setting

A cross-sectional analytical approach was adopted for this investigation, which took place at the Blood Donation Unit (UDD) of the Indonesian Red Cross (PMI), South Sulawesi Province, Indonesia, during the period of April–May 2026.

Population, Sample Size, and Sampling Technique

The research involved individuals who came to donate blood at the Blood Donation Unit (UDD) of the Indonesian Red Cross (PMI), South Sulawesi Province, during April–May 2026. As part of the routine donation procedure, each individual underwent preliminary screening consisting of a health history questionnaire and physical assessments. These examinations covered body weight, body temperature, hemoglobin levels, and relevant medical history. Individuals identified as not fulfilling the established donor eligibility requirements were classified as deferred donors and formed the population of interest in this investigation.

Since the total number of individuals expected to experience donor deferral throughout the research period could not be established beforehand, the population size was treated as unknown. Accordingly, the required sample was calculated using the Lemeshow formula (1997), which is applicable to populations of undetermined size. The calculation incorporated a 95% confidence level ($Z = 1.96$) and a 10% allowable error ($d = 0.10$), resulting in a minimum requirement of 96.04 participants. This figure was rounded up to 97, while the actual enrollment target was increased to 100 participants to facilitate statistical analysis and exceed the minimum sample requirement.

Participant enrollment followed a consecutive sampling approach. Under this procedure, individuals who fulfilled the predetermined research eligibility requirements were enrolled sequentially throughout the data collection period until the target of 100 participants was achieved.

Participants were considered eligible for inclusion if they met all of the following conditions: (1) attended UDD PMI South Sulawesi Province for blood donation between April and May 2026; (2) completed the routine donor screening procedure; (3) were classified as deferred because they failed to satisfy the applicable blood donation eligibility standards; (4) agreed to take part in the investigation; and (5) provided complete responses to the research questionnaire.

Individuals were excluded from the analysis if they (1) submitted an incomplete questionnaire; (2) had missing information concerning the variables under investigation; or (3) decided to discontinue their participation.

Following the application of these selection criteria, 100 prospective donors who experienced deferral and fulfilled the research requirements were retained for the final analysis.

Data Collection

Data for this study were obtained from routine donor screening activities and a structured research questionnaire. Before proceeding with blood donation, all prospective donors were required to complete a donor health questionnaire and undergo preliminary health assessments.

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The screening examinations comprised measurements of body weight, body temperature, and hemoglobin concentration, as well as a review of relevant medical history.

Individuals who failed to satisfy the established donor eligibility requirements were classified as deferred donors. These individuals were subsequently approached to participate in the study and were asked to complete the research questionnaire after the study objectives and procedures had been explained and their informed consent had been obtained.

The information gathered consisted of participants' gender and the factors contributing to donor deferral, such as body weight below the required threshold, low hemoglobin concentration, abnormal blood pressure, medication use, and temporary medical conditions. Data derived from the screening process and completed questionnaires were subsequently organized based on the study variables and prepared for analysis.

Data Analysis

Descriptive analysis was conducted to provide an overview of participant characteristics and the frequency distribution of blood donor deferral categories. Categorical data were reported in the form of absolute frequencies and percentages. To examine the relationship between gender and the reasons for donor deferral, the Pearson Chi-Square test was initially applied. However, when the required assumptions for this test were violated, specifically when more than 20% of the contingency table cells had expected frequencies below five, Fisher's Exact Test was performed as an alternative statistical procedure. Statistical significance was determined at a *p*-value of less than 0.05. All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version XX.

3. Results and Discussion

Results

A total of 100 prospective donors who were deemed ineligible to donate blood following the screening procedure at the Indonesian Red Cross (PMI) Blood Donation Unit, South Sulawesi Province, participated in this study. The distribution of donor deferral categories across male and female participants is summarized in Table 1.

Table 1.
Distribution of Blood Donor Deferral Factors by Gender

Deferral Factors	Male (n=42)	Female (n=58)	Total (N=100)	overall *p*-value
Low body weight	0 (0.0%)	4 (6.9%)	4 (4.0%)	
Low hemoglobin	8 (19.0%)	26 (44.8%)	34 (34.0%)	
High hemoglobin	20 (47.6%)	6 (10.3%)	26 (26.0%)	
Hypertension	7 (16.7%)	6 (10.3%)	13 (13.0%)	<0.001
Hypotension	1 (2.4%)	6 (10.3%)	7 (7.0%)	
Medication use	6 (14.3%)	8 (13.8%)	14 (14.0%)	
Influenza	0 (0.0%)	2 (3.4%)	2 (2.0%)	

Table 1 indicates a statistically significant association between gender and the distribution of blood donor deferral reasons (Fisher's Exact Test, $p = 0.001$). Among female participants, low hemoglobin concentration represented the leading cause of deferral, observed in 26 individuals (44.8%). Other reasons included medication use (13.8%), hypertension (10.3%), hypotension (10.3%), and insufficient body weight (6.9%). A different pattern was observed among male participants, for whom elevated hemoglobin concentration was the predominant reason for deferral, accounting for 20 cases (47.6%). This was followed by low

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hemoglobin concentration (19.0%), hypertension (16.7%), medication use (14.3%), and hypotension (2.4%).

Low body weight and influenza-related deferrals were observed only among female prospective donors, whereas high hemoglobin was substantially more common among male prospective donors. Overall, low hemoglobin was the most frequently reported deferral factor (34.0%), followed by high hemoglobin (26.0%), medication use (14.0%), hypertension (13.0%), hypotension (7.0%), low body weight (4.0%), and influenza (2.0%). These findings indicate a statistically significant association between gender and the distribution of blood donor deferral factors.

Discussion

The findings revealed a statistically significant relationship between gender and the distribution of blood donor deferral reasons ($p < 0.001$). This suggests that donor deferral patterns may vary according to gender-related characteristics. Such variations may be associated with differences in physiological conditions, health profiles, and lifestyle factors between men and women, which can influence their eligibility to donate blood. In this regard, applying uniform strategies for donor screening and pre-donation education may not adequately address the different factors contributing to donor deferral. A more tailored approach that considers gender-related needs may therefore be beneficial in improving donor preparedness.

Female participants represented the larger proportion of deferred donors in this study, comprising 58% (58/100) of the total sample, whereas males accounted for 42% (42/100). A comparable pattern was described by Soundharya et al. (2024) in Chennai, India, where females represented 54.5% of deferred donors, compared with 4.5% among males. The greater proportion of female deferrals in these findings may reflect physiological differences that influence donor eligibility. One factor supporting this observation was body weight, as every deferral attributed to inadequate body weight involved a female participant. This pattern may be related to differences in average body composition and lean body mass between women and men. The minimum weight criterion serves to ensure that the volume of blood collected remains within a safe proportion of the donor's total circulating blood volume. Compliance with this requirement is important to reduce the potential occurrence of vasovagal reactions and hemodynamic disturbances after donation (Hartini et al., 2025).

Reduced hemoglobin concentration emerged as the most frequent reason for temporary donor deferral among female participants. This observation is in line with previous investigations conducted by Triyono et al. (2023), Lutfiyatuzzainiyyah et al. (2025), and Kumari et al. (2020), all of which identified anemia or hemoglobin levels below the required threshold as a major contributor to donor ineligibility among women. Several physiological conditions may explain this pattern, including menstrual blood loss, increased iron demand during reproductive years, and lower iron reserves compared with men (Novita & Yosepin, 2024). Differences in body composition, particularly lower muscle mass and smaller average body size, may also be associated with relatively lower baseline hemoglobin concentrations in women (Hartini et al., 2025). These findings highlight the importance of preventive strategies to support female donor eligibility. Such efforts may include encouraging the consumption of iron-containing foods, considering iron supplementation for individuals with an identified risk of iron deficiency, and providing appropriate guidance on donation timing in relation to menstruation.

Conversely, elevated hemoglobin concentration was the most frequently reported reason for deferral among male participants. This finding is consistent with the studies of Triyono et al. (2023) and Lutfiyatuzzainiyyah et al. (2025), which also identified high hemoglobin levels as an important contributor to donor ineligibility among men. The difference may partly be

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explained by physiological characteristics, as testosterone promotes erythropoiesis and is associated with higher hemoglobin concentrations in males. Other factors, including cigarette smoking, inadequate fluid intake, and certain lifestyle habits, may also influence hemoglobin measurements. Carbon monoxide exposure from cigarette smoke, for example, can interfere with oxygen transport and stimulate compensatory erythrocyte production, potentially resulting in increased hemoglobin concentrations (Novita & Yosepin, 2024). Deferring individuals with hemoglobin levels above the permitted range is therefore important to ensure compliance with donor eligibility standards and to identify individuals who may require further health assessment (Rini & Ratu, 2025).

Blood pressure variations represented another factor contributing to temporary donor deferral in this study. The findings showed that hypertension occurred more frequently among male participants, whereas hypotension was more commonly identified among females. A similar distribution was reported by Duraiprabhakaran et al. (2026), who observed a greater occurrence of hypertension-related deferral among men and hypotension-related deferral among women. Several factors may be associated with these patterns. In men, elevated blood pressure may be related to smoking habits, excessive sodium consumption, central obesity, and occupational stress. Meanwhile, lower blood pressure among women may be associated with differences in body size and circulating blood volume, although these factors require further investigation. The presence of either hypertension or hypotension is relevant to donor eligibility because blood pressure outside the acceptable range may increase the likelihood of adverse reactions during the donation procedure (Armayanti et al., 2023).

Beyond the physiological conditions discussed above, medication use and influenza were also recorded as reasons for temporary donor deferral. Individuals taking certain medications may need to postpone donation depending on the type of medication, its indication, and the applicable donor eligibility guidelines. This precaution is intended to minimize potential risks associated with medication exposure through transfused blood components and to ensure that the donor's health condition is suitable for donation. Similarly, prospective donors experiencing acute infections, including influenza, are generally advised to defer donation until they have recovered and meet the required eligibility criteria. These temporary restrictions form part of the measures used to protect donor well-being and maintain the safety and quality of blood products for transfusion recipients (Armayanti et al., 2023).

Overall, the findings of this study demonstrate distinct gender-specific patterns of blood donor deferral. These results suggest that pre-donation education should no longer adopt a one-size-fits-all approach. Educational interventions for female donors should emphasize anemia prevention through adequate iron intake, appropriate timing of blood donation, and regular hemoglobin monitoring. In contrast, education for male donors should focus on lifestyle modifications, including smoking cessation, adequate hydration, sufficient sleep before donation, and regular health monitoring. Implementing gender-responsive donor education and screening strategies may reduce the incidence of preventable donor deferrals, improve donor eligibility, and ultimately contribute to a safer and more sustainable blood supply.

4. Conclusion

The results of this investigation revealed a significant relationship between gender and the distribution of blood donor deferral reasons among prospective donors at the Indonesian Red Cross Blood Donation Unit (UDD PMI), South Sulawesi Province. Low hemoglobin concentration was the most frequently identified reason for deferral among female participants, while elevated hemoglobin concentration was predominant among male participants. This variation suggests that differences in physiological conditions and health-related characteristics between men and women may be associated with their eligibility to donate blood.

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The present study contributes to the understanding of gender-related patterns in blood donor deferral within the Indonesian donor population. The findings highlight the need to consider differences in donor characteristics when developing screening and educational interventions. Implementing gender-responsive approaches through pre-donation information, individualized health counseling, and appropriate screening strategies may help minimize avoidable deferrals, enhance donor preparedness, and support the availability of a safe and sustainable blood supply.

Further investigations are encouraged to involve larger participant groups and multiple blood donation centers to assess whether the observed patterns are consistent across different settings. Future research should also examine additional factors potentially associated with donor deferral, such as nutritional status, body mass index, smoking behavior, iron consumption, physical activity, and other lifestyle characteristics. Applying multivariable analytical methods would provide a more comprehensive understanding of the independent contributions of these factors to blood donor eligibility.

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Declarations

Author Contribution : Author 1 : Conceptualization, Investigation, Data Curation, Formal Analysis, Visualization, Writing – Original Draft Preparation. Author 2 : Methodology, Formal Analysis, Writing – Review & Editing. Author 3 : Validation, Investigation, Writing – Review & Editing. Author 4 : Supervision, Validation, Writing – Review & Editing. Author 5 : Supervision, Project Administration, Writing – Review & Editing. (https://www.elsevier.com/authors/policies-and-guidelines/credit-author-statement).

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Conflict of Interest:

The authors declare that there are no financial or personal relationships that could be perceived as influencing the findings or conclusions presented in this manuscript.

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