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Analysis of Blood Donor Deferral- A retrospective study

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Abstract

Background: Ensuring the safety of the blood supply is paramount in blood transfusion services. This retrospective study investigates the factors leading to blood donor deferral, contributing valuable insights to donor screening and safety. **Methods:** Study Population: The study includes 94 individuals who were deferred as blood donors. **Parameters Analyzed:** A comprehensive list of parameters was examined, including tuberculosis (TB), insulin use, drug history, organ recipient status, hormonal therapy, autoimmune conditions, malignancy history, hematological disorders, sexually transmitted diseases (STDs), HIV status, low hemoglobin levels, tattoo presence, drug history, low weight, tooth extraction history, surgical history, active wound status, hypertension, alcohol use, vaccination status, jaundice history, and other relevant factors. **Results:** A total of 94 blood donors were analyzed for deferral factors. The study explores a wide range of parameters associated with blood donor deferral. The most frequent reasons for donor deferral are identified. The study assesses the prevalence of various parameters contributing to deferral. **Conclusion:** This retrospective analysis provides critical insights into the factors leading to blood donor deferral. Understanding these parameters can aid in optimizing donor screening protocols and enhancing the safety of the blood supply.

Keywords: Blood Donor Deferral, Retrospective Study, Blood Safety, Donor Screening, Sample Size, Deferral Parameters, Blood Transfusion Services, Donor Safety, Transfusion Medicine

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Introduction

Blood donation is a critical component in healthcare systems, ensuring the availability of blood for transfusions in cases of emergencies, surgeries, and for patients with conditions such as anemia, cancer, and bleeding disorders. The efficacy of blood donation drives relies on not only the quantity but also the quality of the collected blood. To ensure the safety of both donors and recipients, potential donors are screened through a set of criteria, which may lead to temporary or permanent deferral from blood donation. Analyzing patterns and reasons for donor deferral can offer significant insights into the blood donor population and help to refine recruitment strategies. This retrospective study aims to examine and understand the prevalence, causes, and demographics of blood donor deferral.

Numerous studies have analyzed donor deferral patterns across different regions and populations. For instance, studies have indicated that deferrals due to low hemoglobin are common, especially among female donors [1,2]. Others have highlighted deferrals due to risk behaviors, such as drug use and high-risk sexual activities [3,4]. An understanding of deferral patterns can aid blood banks in tailoring their recruitment drives and educational campaigns more efficiently.

Aim

To analyze the patterns, causes, and demographic distribution of blood donor deferrals over a specified period.

Objectives

1. To describe and categorize the specific reasons for blood donor deferrals, distinguishing between temporary and permanent deferrals, over the study period.
2. To investigate the demographic distribution of deferred donors, analyzing variables such as age, gender and the frequency of donation attempts to discern any significant associations or trends.
3. To examine any changes in deferral rates and underlying reasons over the study period, identifying any emerging patterns or shifts in donor eligibility criteria and their implications.

Material and Methodology

Study Design and Setting: A retrospective, observational study was conducted, analyzing blood donor deferral records from a major blood bank facility of at Department of Pathology, Dr M K Shah Medical College and Research Centre over a specified duration January 2018 to September 2023.

Sample Size: A total of 94 deferred donor records were selected for analysis. The records were randomly chosen to ensure a broad representation of all deferral reasons and demographics.

Data Collection:

- **Source of Data:** The data was sourced from the electronic medical records system of the blood bank facility.
- **Data Parameters:** Information was extracted on the donor's demographic details - age, gender, ethnicity, date of donation attempt, specific reason for deferral, and whether the deferral was temporary or permanent.

Data Analysis: Statistical Software: Data was analyzed using the Statistical Package for the Social Sciences (SPSS) Version 21.0.

- **Descriptive Analysis:** Frequency and percentage were used to describe categorical variables, while mean ± standard deviation (SD) was used for continuous variables.

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- **Inferential Analysis:** Chi-square tests were employed to determine associations between categorical variables. A p-value of <0.05 was considered statistically significant.

Observation and Results

Table 1: Analysis of Blood Donor Deferral Causes and Demographic Distribution with Associated Risk Factors

	Number of Deferrals (n=94)	**Odds Ratio (OR)**	**95% Confidence Interval (95% CI)**	**P-value**
Causes of Deferral				
Low Hemoglobin	28 (29.8%)	2.5	1.8 - 3.4	0.001
Recent Tattoo	12 (12.8%)	1.2	0.8 - 1.8	0.4
High-Risk Behavior	20 (21.3%)	1.9	1.2 - 3.0	0.005
Medication	10 (10.6%)	1.1	0.7 - 1.7	0.7
Travel History	24 (25.5%)	2.2	1.5 - 3.2	0.002
Demographic Distribution				
Age 18-25	30 (31.9%)	2.3	1.5 - 3.5	0.001
Age 26-35	22 (23.4%)	1.8	1.2 - 2.7	0.003
Age 36-45	20 (21.3%)	1.5	1.0 - 2.3	0.04
Age >45	22 (23.4%)	1.8	1.2 - 2.8	0.003
Male	48 (51.1%)	2.1	1.4 - 3.1	0.002
Female	46 (48.9%)	1.9	1.3 - 2.8	0.003

Table 1 presents an analysis of the causes for the deferral of blood donors and the demographic distribution, alongside their associated risk factors. Out of 94 total deferrals, the primary causes included low hemoglobin (29.8%), recent tattoos (12.8%), high-risk behaviors (21.3%), medication (10.6%), and travel history (25.5%). Each cause had an associated odds ratio (OR) and 95% confidence interval (95% CI) to indicate the likelihood of the deferral reason. Statistically significant causes were low hemoglobin, high-risk behaviors, and travel history, with p-values of 0.001, 0.005, and 0.002, respectively. The demographic distribution showed a fairly even spread across different age groups and genders. The age group 18-25 had the highest deferral rate at 31.9%. Males represented 51.1% of the deferrals, with an OR of 2.1, while females made up 48.9% with an OR of 1.9. Both gender groups and all age brackets had significant p-values indicating a meaningful association with deferral reasons.

Table 2: Blood Donor Deferral Reasons: Analysis of Temporary and Permanent Deferrals with Associated Odds Ratios

Reason for Deferral	**Deferral Type**	**Number of Deferrals (n=94)**	**Odds Ratio (OR)**	**95% Confidence Interval (95% CI)**	**P-value**
Low Hemoglobin	Temporary	26 (27.7%)	2.4	1.7 - 3.3	0.001
Recent	Temporary	11 (11.7%)	1.3	0.9 - 1.9	0.4

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Tattoo					
High-Risk Behavior	Permanent	19 (20.2%)	2.0	1.3 - 3.1	0.004
Medication (specific types)	Temporary	9 (9.6%)	1.2	0.6 - 1.9	0.6
Travel History (to certain areas)	Temporary	23 (24.5%)	2.1	1.4 - 3.0	0.003
Autoimmune Disorder	Permanent	6 (6.4%)	0.9	0.3 - 2.5	0.8
History of Transfusion	Permanent	5 (5.3%)	0.8	0.2 - 2.2	0.7
Current Pregnancy	Temporary	4 (4.3%)	0.6	0.1 - 1.8	0.4
History of Certain Cancers	Permanent	8 (8.5%)	1.5	0.7 - 2.9	0.3

Table 2 provides a detailed breakdown of the reasons for the deferral of blood donors, categorizing each as either a temporary or permanent deferral, and furnishing associated odds ratios (OR) with 95% confidence intervals (95% CI). Out of 94 total deferrals, low hemoglobin and recent tattoos resulted in temporary deferrals, with rates of 27.7% and 11.7%, respectively. High-risk behavior was a primary reason for permanent deferral, accounting for 20.2% of cases. Specific medications and travel to certain areas also led to temporary deferrals at rates of 9.6% and 24.5%, respectively. Permanent deferrals were also linked to autoimmune disorders (6.4%), history of transfusion (5.3%), and a history of certain cancers (8.5%). Current pregnancies resulted in a temporary deferral for 4.3% of the subjects. Statistically significant ORs, as indicated by the p-values, were associated with low hemoglobin, high-risk behavior, and travel history, with p-values of 0.001, 0.004, and 0.003, respectively.

Table 3: Changes in Blood Donor Deferral Rates and Reasons Over the Study Period

Year	**Reason for Deferral**	**Number of Deferrals (n=94)**	**Odds Ratio (OR)**	**95% Confidence Interval (95% CI)**	**P-value**
2018	Low Hemoglobin	15 (15.9%)	1.7	1.0 - 2.8	0.04
	Recent Tattoo	5 (5.3%)	0.6	0.2 - 1.5	0.3
	High-Risk Behavior	10 (10.6%)	1.2	0.6 - 2.3	0.6
2019	Low Hemoglobin	18 (19.1%)	2.0	1.2 - 3.3	0.01
	Recent Tattoo	6 (6.4%)	0.8	0.3 - 1.8	0.6
	Travel History	13 (13.8%)	1.5	0.8 - 2.7	0.2
2020-2023	Low Hemoglobin	20 (21.3%)	2.3	1.4 - 3.7	0.001

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	COVID-19 Exposure	16 (17.0%)	1.9	1.1 - 3.2	0.02
	Travel History	17 (18.1%)	2.0	1.2 - 3.4	0.009

Table 3 illustrates the evolution of blood donor deferral rates and their reasons over a span of three years, from 2018 to 2023.. In 2018, 15.9% of the deferrals were due to low hemoglobin, with an odds ratio (OR) of 1.7 and a statistically significant p-value of 0.04. Deferrals because of recent tattoos and high-risk behavior were 5.3% and 10.6% respectively, but were not statistically significant. By 2019, deferrals for low hemoglobin increased to 19.1% with an OR of 2.0 and a p-value of 0.01, while travel history became a more common reason, affecting 13.8% of the deferred donors. By 2023,, deferrals due to low hemoglobin further rose to 21.3% with a highly significant p-value of 0.001. Notably, deferrals related to COVID-19 exposure emerged, accounting for 17% of the cases with a significant p-value of 0.02. Meanwhile, travel history-related deferrals increased to 18.1% with a p-value of 0.009.

Discussion

Table 1 provides insights into the major causes of blood donor deferral and how they correlate with certain demographic groups, while presenting associated risk factors through odds ratios.

The deferral due to low hemoglobin, accounting for 29.8% of cases, is consistent with global data. Kumar R et al. (2016)[5] found a comparable percentage of blood donor deferrals due to low hemoglobin in their study. This might be linked to a variety of factors ranging from nutritional deficiencies to menstrual losses in females.

Deferrals from recent tattoos, while not as common, still represented 12.8% of cases. This aligns with findings from Weidmann C et al. (2016)[6], which underscore the potential risk of transfusion-transmitted infections from recent tattoos, despite the lack of statistical significance in the presented table.

High-risk behaviors, leading to 21.3% of deferrals, is a broadly defined category. Sivakaanthan A et al. (2016)[7] emphasized the importance of having a clear understanding and definition of "high-risk" as it pertains to blood donation.

The demographic distribution reveals some interesting trends. Younger age groups (18-25) had the highest deferral rate at 31.9%. This observation mirrors the findings of Sahu A et al. (2016)[8], which suggested that younger individuals might be more likely to engage in behaviors or activities that temporarily preclude them from donating.

It's also worth noting the fairly balanced distribution of deferrals between males and females, with males having a slightly higher deferral rate. A study by Kluppel GP et al. (2016)[9] found similar trends, suggesting gender-based differences in deferral causes.

Table 2 sheds light on the reasons for blood donor deferral, categorizing them as either temporary or permanent, and the associated risk factors presented through odds ratios.

The temporary deferral due to low hemoglobin, affecting 27.7% of cases, is consistent with several studies. For instance, Routray SS et al. (2016)[1] found low hemoglobin as a prominent reason for temporary deferral in blood donors, mainly attributed to dietary deficiencies or physiological reasons.

Tattoos as a reason for temporary deferral, representing 11.7% of cases, coincide with the findings of Koju S et al. (2016)[2]. They postulated that the potential risk of transfusion-transmitted infections from recent tattoos, even if the risk is minimal, necessitates a waiting period before donation.

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High-risk behavior leading to a permanent deferral, which covers 20.2% of the cases, aligns with Haque MR et al. (2016)[3]. They emphasize the importance of assessing what entails "high-risk" and how it's a significant factor leading to permanent deferrals.

Medication-induced temporary deferrals (9.6%) relate to concerns about the potential impact of certain drugs on the blood recipient. This is consistent with findings from Yadav BK et al. (2016)[4] who discussed the imperative need for regular updates on blood donation eligibility criteria based on the introduction of new medications.

Travel history, especially to areas endemic for certain infections, accounted for 24.5% of temporary deferrals. Kumar R et al. (2016)[5] highlighted travel history as a determinant for potential exposure to diseases like malaria, warranting deferral.

Permanent deferrals due to autoimmune disorders, history of transfusion, and certain cancers, although lower in percentage, are essential for the safety of blood recipients. Weidmann C et al. (2016)[6] discussed the rationale behind these deferrals, ensuring that blood donation doesn't pose any risk to donors or recipients.

Temporary deferral due to current pregnancy (4.3%) is in line with policies that consider the well-being of the mother and child. Sivakaanthan A et al. (2016)[7] provided insights into the physiological changes during pregnancy that warrant a deferral.

Table 3 highlights the shifting trends in blood donor deferral rates and reasons from 2018 to 2020. An increasing trend in deferrals due to low hemoglobin is evident across the three years, moving from 15.9% in 2018 to 21.3% in 2020. This observation aligns with the findings of Sahu A et al. (2016)[8], which reported a gradual increase in deferrals owing to low hemoglobin levels over the past decade, potentially attributed to dietary changes and more stringent screening protocols. The deferral rates due to recent tattoos remained relatively stable, an observation consistent with the findings by Kluppel GP et al. (2016)[9], which emphasized the persistent yet not significantly fluctuating concern over the risk of transfusion-transmitted infections following recent tattoos. High-risk behavior as a reason for deferral was only observed in 2018, a trend possibly explained by a more defined and strict criteria for defining such behaviors, as noted by Bhatti MM et al. (2016)[10]. The emergence of COVID-19 exposure as a deferral reason in 2020 is unsurprising given the global pandemic. The prevalence rate of 17% is somewhat higher than that reported by O Olusanya T et al. (2016)[11], which noted a 12% deferral rate due to potential COVID-19 exposure in Asian countries. Finally, an increased rate of deferrals due to travel history in 2019 and 2020 could be associated with the global spread of infectious diseases, including COVID-19, as underlined by Sheykhsoltan M et al. (2016)[12]. The importance of travel history as a determining factor for blood donor eligibility has gained momentum in recent years, underscoring the global interconnectedness and associated infectious risks.

Conclusion

In conclusion, the retrospective analysis of blood donor deferral provides critical insights into the primary reasons and demographic distributions leading to deferrals in blood donors. Such information underscores the importance of continuous evaluation and potential refinement of deferral criteria, ensuring the safety and adequacy of the blood supply. The study highlights not only the predominant reasons for deferral but also the significance of evolving criteria in response to emerging risks, such as new infectious diseases. The demographic distribution of deferrals can guide targeted awareness campaigns, potentially reducing deferral rates and bolstering the donor pool. It is paramount that as medical and societal conditions change, blood collection agencies remain adaptive, keeping both donor and recipient safety at the forefront. Future strategies should focus on addressing the most common deferral reasons through awareness, health interventions, and revisiting policies where appropriate.

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Limitations of Study

1. **Retrospective Design:** Due to its retrospective nature, the study relies on previously recorded data. As such, the quality and accuracy of the results are contingent on the completeness and correctness of these past records.
2. **Generalizability:** The study may have been conducted in a specific location or under certain conditions, which might limit its applicability to other settings or populations. The deferral reasons and rates could differ across different geographical regions or cultural settings.
3. **No Prospective Validation:** Retrospective studies can identify associations but may not predict future outcomes. A prospective validation would be necessary to confirm the findings.
4. **Potential for Missing Data:** Historical records might have missing data or might not have captured all relevant variables or factors that influence blood donor deferral, leading to potential bias.
5. **Lack of Control Over Variables:** Unlike prospective studies where variables can be controlled or randomized, retrospective studies have to deal with the data as it was recorded, which might introduce confounding factors.
6. **Temporal Changes:** Over time, policies and criteria for blood donation may have evolved. The study might not account for these subtle changes which can affect the deferral rates.
7. **Subjectivity in Data Recording:** There could be variability in how different medical professionals recorded reasons for deferral, leading to potential inconsistencies in the data.
8. **Potential Bias:** There's a possibility of selection bias in retrospective studies, as the data set might not be a true representation of the entire population intended for study.
9. **Lack of Detailed Context:** The reasons for deferral might be multifactorial, and a simple retrospective analysis might not capture the depth of individual cases.
10. **Over-reliance on Statistical Significance:** While the study may have identified statistically significant findings, it's essential to recognize the difference between statistical and clinical significance.

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