

Donor Deferral Patterns at a Hospital-based Blood Bank in Saudi Arabia

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Authors' contributions

This work was carried out in collaboration between all authors. Author JCA conceptualized and designed the study, analysed and interpreted the data, drafted and critically revised the manuscript. Authors FKMA and TYA managed the acquisition and analysis of data and in drafting the manuscript. Author CPC contributed in the interpretation of data, drafting and critical revision of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study analysed the blood donors deferral patterns at a government hospital blood bank in Saudi Arabia. The proportion and reasons of deferrals were also investigated.

Methodology: Retrospective review was done using donor records in a two-year period from January 2013 to December 2014. Information including age, type of donation, cause and type of deferral, physical and medical examination, and markers for transfusion transmitted infections (TTIs) were analysed. Descriptive and inferential statistics were used as appropriate. Distribution tables were developed to compare deferrals among different ages and to show the pattern that exists. Significant level was set at 5% ($P < 0.05$).

Results: Of the 6,942 blood donors evaluated using the database, 6,644 (95.7%) were found fit for donation while 298 (4.3%) were deferred for various reasons with a mean age of 35.9 years. The majority of the deferred donors (28.8%) were between the ages of 21-30 years. Analysis of the

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deferrals showed that reactivity for the markers of TTIs was the primary reason of deferrals and likely the main cause for permanent deferrals (35.2%). Statistically, there was a significant difference among the various age groups of the deferred donor population.

Conclusion: The donor deferral rate in this study is comparably lower than in other regions of Saudi Arabia and some countries with a substantial variation in age groups among the deferred donors. Higher rate of temporary deferrals is evident among the young adult replacement donors old. Unnecessary deferrals observed in the study call for attention to their effect on donor retention.

Keywords: Blood donors; blood donation; donor deferrals; deferral pattern; blood bank.

1. INTRODUCTION

Blood bank is one of the vital pillars in modern medicine but simultaneously it carries the potential risk of transmitting lethal infectious diseases. Thus, ensuring the quality of donors and avoiding the risk of transfusion-transmitted diseases through proper screening are truly indispensable [1]. The provision of safe, sufficient and timely supply of blood and blood products is the primary responsibility of blood transfusion service [2-4].

Blood donor selection is the first crucial step in the process of ensuring blood safety as it helps to significantly reduce risk through the deferral, prior to donation, of any individuals or groups of individuals with identified risks that may be associated with infection [5,6]. Blood donors are generally perceived to be healthy. However, some donors may be unfit or unsuitable for donating blood. Therefore, it is the responsibility of Blood Transfusion Services (BTS) to identify unsuitable donors and defer them as appropriate either temporarily or permanently. Nonetheless, frequent and unnecessary donor deferral especially temporary deferment may lead to loss of potential blood donors, some of whom may be reluctant to return for future donation [2,7].

According to the WHO's Global Database on Blood Safety [8], more than 92 million blood donations are collected worldwide annually. Of these, an estimated 1.6 million units are discarded due to the presence of infectious markers for transfusion transmissible infections (TTIs) such as HIV, hepatitis B, hepatitis C and syphilis. In addition, at least 13 million prospective donors are deferred from donating blood due to anemia, existing medical conditions or the risk of infections that could be transmitted through transfusion. The scale of these discards and deferrals highlights the need for effective blood donor selection to minimize the unnecessary deferral of suitable donors, and the donation of blood by unsuitable donors that

subsequently has to be discarded, which will reduce the wastage of resources, including donor and staff time, consumables and screening tests, and also avoid needless discomfort to donors [9].

In order to maintain a balance between sufficiency, safety and emerging risks, the reasons for donor deferrals should be regularly evaluated to identify whether specific criteria necessitate elimination, modification or extension to provide improved protection of donors and recipients, and to minimize the deferral of suitable donors. Epidemiological monitoring of infection rates in blood donors, including age and gender-specific prevalence rates in new and repeat donors, contributes to a better understanding of donor behavior and assessment of risk [9].

Blood banks and transfusion services in the Kingdom of Saudi Arabia are basically hospital-based. They are responsible in the recruitment of donors; testing donated blood for infectious agents; and the preparation, storage and issue of blood components. Over the last three decades, the source of blood has shifted dramatically from imported blood to locally recruited blood donors. Currently, the source of donated blood is a combination of replacement donors, and a growing number of voluntary non-remunerated donors. The latter source is expanding rapidly through donor drives arranged by various blood banks [10,11]. In 2011, a total of 416,133 donors were recorded from all hospitals in the Kingdom including Ministry of Health (MOH), other government hospitals and government companies' hospital [12].

At present, there are very limited studies conducted with regards to donor deferrals in the region. Studies like this should be conducted in order to monitor the effectiveness of donor selection so that remedial action can be taken, where necessary. Hence, this study aims to evaluate the deferral pattern among voluntary and replacement blood donors in Hail,

Saudi Arabia. Moreover, these data on donor deferrals will enable BTS to assess the major causes of deferral, particularly those that result in the greatest numbers and those presenting high risk to patients. Likewise, this paper will indicate the competence of the staff in complying with the selection guidelines and the need for providing enhancement training and education among the stakeholders.

2. MATERIALS AND METHODS

The study was conducted at the Blood Bank Center of King Khaled Hospital, a government healthcare facility that provides specialized health services at Hail, Saudi Arabia. It is a hospital-based blood bank and extends their services to nearby hospitals. The screening criteria used were based on the accepted universal standards of blood banking practice. All blood units collected were also screened by serological testing for transfusion transmitted diseases. Prospective donors who do not meet the criteria are deferred either permanently or temporarily.

The study employed a retrospective design. Data were collected from the records maintained by the blood bank. Donor records in a two-year period from January 2013 to December 2014 were reviewed. Records of all prospective blood donors who presented and underwent donation process over the aforementioned period were obtained. A structured data gathering tool

designed was used in the study. Information including age, type of donation, cause and type of deferral, physical and medical examination, and markers for transfusion transmitted infections were analyzed.

Data were analysed using statistical tool pack in Microsoft excel version 2010. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to measure demographic variables. Inferential statistics were used as appropriate. Distribution tables were formed to compare deferrals among different ages and to show the pattern that may exist. Significant level was set at 5% ($P < 0.05$). Graphical presentations were made by using Microsoft excel.

3. RESULTS

A total of 6,942 blood donors who presented and underwent donation process at King Khaled Blood Bank from January 2013 to December 2014 were evaluated from their donor records kept by the blood bank department. Within the period under review, 6,644 (95.7%) were found to be fit for donation while 298 donors representing 4.3% of the entire donor population were deferred for various reasons (Table 1). Of which, 117 (39.2%) were temporary and 181 (60.8%) were permanent deferrals (Table 3). Replacement donors constitute 165 (55.4%) of the entire deferral population while 133 (44.6%) belong to voluntary donors (Table 2).

Table 1. Demographic characteristics of deferred blood donors

Gender	No. of registrations	No. of deferrals	Percentage n= Total deferral	Percentage n= Total population
Male	6913	286	96%	4.1%
Female	29	12	4%	0.2%
Total	6942	298	100%	4.3%

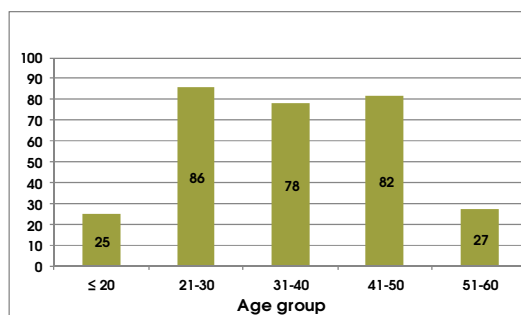
Table 2. Type of donors among the deferred population

Age group	Total		Voluntary		Replacement	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
20 and below	25	8.4%	16	5.4%	9	3%
21-30	86	28.8%	40	13.4%	46	15.4%
31-40	78	26.2%	29	9.7%	49	16.5%
41-50	82	27.5%	35	11.7%	47	15.8%
51-60	27	9.1%	13	4.4%	14	4.7%
Total	298	100%	133	44.6%	165	55.4%
Mean age	35.9		35.2		36.2	
SD	10.7		11.4		9.9	

Table 3. Frequency and percentage of donation deferrals based on age and type

Age group	Total		Temporary		Permanent	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
20 and below	25	8.4%	18	6%	7	2.4%
21-30	86	28.8%	51	17.1%	35	11.7%
31-40	78	26.2%	25	8.4%	53	17.8%
41-50	82	27.5%	20	6.7%	62	20.8%
51-60	27	9.1%	3	1%	24	8.1%
Total	298	100%	117	39.2%	181	60.8%
Mean age	35.9		30.8		39.2	
SD	10.7		9.4		10.1	

Donor population in the study was predominantly males (99.6%) while females accounted for only 0.4%. Age of deferred donors ranges from 19-56 years with a mean of 35.9 years. Majority of the deferred donors (28.8%) were between the ages of 21-30 years (Fig. 1). From the temporary deferrals, greater number (17.1%) was observed on the age group of 21-30 years while most of the permanent deferrals (20.8%) were under the age range of 41-50 years. Noticeably, deferrals among voluntary donors were mainly under the age group of 21-30 years also accounting to 13.4%. On the other hand, deferrals from replacement donors were generally under the age of 31-40 years (16.5%).

**Fig. 1. Age distribution among the deferred donors**

Analysis of the deferrals showed that positivity for the markers of TTIs were the primary reason

of deferrals from donation and likely the main cause for permanent deferrals (35.2%). Other causes for donor deferrals as presented in Table 4 were: existing medical conditions (25.5%), other reasons like poor vein, medications and adverse donor reactions, etc. (34.5%), and low hemoglobin levels (4.6%). Among the permanent causes of deferrals in the study, other major causes aside from TTIs include polycythemia (17.7%), hypertensive donors (8.8%) and diabetes (6.6%). While QNS (quantity not sufficient) due to poor vein or miscollection (53%), anemia or low hemoglobin (12%) and underweight (11.1%) were the top most reasons for temporary deferrals (Table 5). There is only a single high risk behavior (recent tattoo) noted in the study but no travel related deferral was recorded. Hepatitis B virus marker (30.2%) constituted the significant proportion among the TTIs. Others include positivity on HTLV, syphilis, malaria and brucella. There were no cases HIV and HCV recorded (Fig. 2).

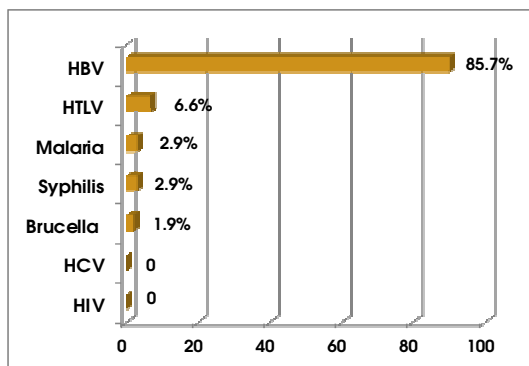
Data analysis showed that deferred donors were statistically different among various age groups. Moreover, the type of donors was found to be statistically different ($P < 0.05$) among various age groups as P values were 0.003 and 0.02 respectively. However, there was no significant difference ($P < 0.05$) that exists between the various age groups and the type of deferrals ($P=0.3$).

Table 4. Frequency and percentage of deferrals by reasons of deferral

Reasons for deferral	Frequency 2013	Frequency 2014	Total	Percentage $n = \text{Total deferrals}$
Low haemoglobin	7	7	14	4.6%
Other medical conditions	35	41	76	25.5%
TTIs	57	48	105	35.2%
Other reasons	56	47	103	34.5%
High risk behaviours	1	-	1	0.3%
Travel related	-	-	-	-
Total	155	143	298	100%

Table 5. Causes of temporary deferrals with their relative proportions

Causes	Frequency	Percentage	
		<i>n = Temporary deferrals</i>	<i>n = Total deferrals</i>
Anemia, Hb <12.5%	14	12%	4.7%
Vaccination 3 days ago	2	1.7%	0.7%
Underweight	13	11.1%	4.4%
QNS (due to poor vein, etc.)	62	53%	20.8%
Low blood pressure	7	6%	2.3%
Drug ingestions	3	2.6%	1%
Dizziness, fainted	11	9.4%	3.7%
Tattoo	1	0.8%	0.3%
High BP	3	2.6%	1%
Alcohol intake	1	0.8%	0.3%
Total	117	100%	39.3%

**Fig. 2. Frequency and percentage distribution of markers of TTIs**

4. DISCUSSION

4.1 Donor Demographics

Almost all of the donor populations in this study were males (99.6%). Only 0.4% of donors were females. In a study among the Saudi public in Central Saudi Arabia (Riyadh), a significant higher number of females reported that inability to reach blood bank and fear of anaemia were cited as reasons for not donating blood [13]. In addition, positive attitude toward blood donation was also found to be significantly lower among females. Other causes of poor female participation were no accommodation for women at the facilities, lack of female staff, social factors, awareness and beliefs [12]. Several studies reported that aside from age, gender is also an important identifier of those less willing to donate [14-16].

The mean age of the deferred donors in this study is 35.9 years. Deferrals from voluntary

donors have a mean age of 35.2 years while a mean age of 36.2 years for the replacement donors. The majority of the deferrals are classified as replacement donors accounting to 55.4%. Replacement donors are usually family members, colleagues or friends of the concerned patient. It is well established that replacement donors have a higher incidence and prevalence of TTIs among the recipients [17]. In the Kingdom of Saudi Arabia, most of the blood is provided from replacement donors instead of volunteer blood donors [10,12,18-20]. This seems to be due to misconceptions on blood donation in the Saudi population [20]. Volunteer donated blood is known to be the safest source of blood worldwide [21-24]. Methods to improve donor recruitment through retention programs for volunteers and encouragement of new donors have to be identified.

4.2 Donor Deferrals

Potential blood donors often leave with a negative feeling about themselves and to the blood banking system when being deferred or rejected. Studies have found that deferral has a negative impact on future donor return, particularly by first-time donors and those deferred for more than a year [25,26]. Deferrals for whatever reason represent loss of time and effort for both potential donors and blood bank staff.

Rate of deferrals differs from region to region and sometimes in the same region and from one center to another. The lowest deferrals rates reported are observed in the study of Alok et al. [27] (2.5%) in central India while Talonu, [28] Rabeya et al. [29] Sundar et al. [30] Halperin et al. [31] and Kwa et al. [32] reported 4 to 7.1%

deferral rates in their studies. Higher rates of deferrals are also shown in numerous studies ranging from 9% to 16.4% [33-40]. Moreover, other studies cite a very high deferral incidence in their donor populations reaching about 20% to 35.6%, [41-44] which probably reflects the regional diversity and marked variation in blood donor eligibility criteria internationally [45].

The donor deferral rate in this study is 4.3%, which is comparable to the studies with low deferral incidence as mentioned previously. Similar but very limited studies are also conducted in Saudi Arabia. The study of Bashwari [19] in Al Khobar, reports a deferral rate of 19.2%. In the donor center of King Abdulaziz University Jeddah, Qari [46] observed a deferral incidence of 12.07% in his study. The deferral rate of this present study is lower as compared to other studies across the Kingdom and to other countries as well. However, it does not signify that the donor selection criteria in the study are lenient. The differences can be attributable to variations in the donor eligibility criteria, awareness and knowledge of donors regarding the criteria for donation, greater caution among physicians in donor selection or differences in donor motivation or blood donation. Furthermore, the differences in deferral rate in relation to other studies may have been because of changes in deferral trends over the years. Thus, further studies are needed in order to evaluate deferral rates and reasons in different parts of the world for longer periods [47].

The most frequent reasons of deferrals in our study are TTIs (35.2%), other reasons (34.5%) and existing medical conditions (25.5%). Temporary deferrals in the study account for 39.2% of the deferred population with a mean age of 30.8 years while permanent deferrals constitute the majority with a rate of 60.8% and a mean age of 39.2 years. Data suggest that there is higher number of deferrals among older donors as compared to younger donors. In addition, older donors are mostly deferred permanently and less likely to younger donors. Similarly, the study of Agnihotri [35] reported that deferral percentage increases significantly as the age of the donor increases to greater than 40 years.

Noticeably, the most common cause of temporary deferrals in the study is QNS accounting to 20.8% from the entire donor deferrals and 53% from temporary deferrals. QNS is a result of poor veins, double puncture

and unsuccessful phlebotomy or even adverse donor reactions during phlebotomy which prompt the staff to discontinue the collection process. A unit of 450ml \pm 10% should be collected from the donors to ensure that the final red cell component meets specification. Other causes include anaemia or low haemoglobin (4.7%), underweight <60 kg (4.4%), adverse donor reactions (3.7%) and low blood pressure (2.3%).

The listed reasons for deferrals in this study are consistent with many other studies in various countries but with few disparities. Studies in Saudi Arabia for instance, consistently report that low haemoglobin/anaemia, underweight and low blood pressure are some of the common reasons for temporary deferrals. However, QNS and adverse donor reactions are not noted as leading causes of deferrals from those previous studies. This clearly represents loss of time and effort for the donor and staff, resources in blood bank and may even provide discomfort to donors. Blood donations should be collected only by trained and qualified blood transfusion services personnel. The high deferral percentage due to QNS in this study suggests that further venipuncture training shall be provided to staff. Nevertheless, there are recognized adverse reactions that can occur during blood donation and these can generally be minimized or avoided by appropriate donor selection and care, and appropriately trained staff [48,49]. Donors who have suffered an adverse reaction have been shown to be less likely to return to donate again [25]. Likewise, studies have shown that even temporary deferral of prospective donors can have a psychological effect [7,50,51].

This study has also shown that majority (35.2%) of the donors are deferred on account of being positive to TTI markers. TTIs also account for more than half (58%) of the permanent deferrals. Similarly, the study of Qari [46] in western region of Saudi Arabia reported that 33.83% are excluded due to positive serological tests of which HBV (56.6%) and HCV (32.4%) are the most prevalent infections. In this present study, anti-HBc seropositivity constitutes 30.2% among the seropositive markers of TTIs and account for 49.7% of permanent deferrals. However, there are no cases of HCV reported in this study. This reflects safer blood transfusion practices; surgical, dental, and procedural practices; overall improvement in sanitation and a better standard of life [52]. Other TTIs in the study include HTLV and syphilis.

Furthermore, this present study revealed that HBV infection is more prevalent among replacement blood donors than voluntary donors. This observation is consistent with the World Health Organization viewpoint that remunerated blood donors, and familial replacement donors are more likely to transmit TTIs, compared to voluntary donors [53]. The study of Abdullah [54] at Jazan region in Saudi Arabia for over a period of six years (2004-2009) reported similar observation.

The thrust of the study is confined in the assessment or evaluation of donor deferral patterns and their causes, retrospectively. Data on donor deferrals have been reviewed based only on the information available in the donor records and logbooks. Results may become assistive in identifying alarming causes of deferrals and also in recognizing areas that require strengthening in the donor selection process based on the pattern of donor deferrals. The researchers propose longer years of inclusive review so as to obtain larger representation of data.

5. CONCLUSION

The donor deferral rate in this study is comparably lower than in other regions of Saudi Arabia and some countries with a substantial variation in age groups among the deferred donors. Higher rate of temporary deferrals is evident among the young adult replacement donors. Unnecessary deferrals observed in the study call for attention to their effect on donor retention. Appropriate interventions to address the identified issues are suggested such as re-training of staff, public awareness programs related to routes of infection transmission, creation of a confidential donor deferral registry (DDR) that documents all donors who are positive for a TTIs and who have been permanently deferred, and enticing more female donors through motivational campaign and development of an evidence-based educational, cultural and religious-focused and friendly interventions.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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