Original Research Article

Analysis Of Causes And Frequency Of Blood Donor Deferral In A Tertiary Centre In North India – An Insight Into The Regional Deferral Pattern

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Received: 06-11-2021 / Revised: 22-11-2021 / Accepted: 30-12-2021

Abstract

Introduction: Blood donor screening should be done through a stringent process so that it ensures blood availability and accessibility while maintaining the blood safety at the same time. Donors who get rejected in the process are called deferred donors. We, hereby aimed to assess various reasons of deferral and their relative proportions and to categorize donors according to type of deferral, age and gender. **Method:** We performed a retrospective analysis of data of donors who presented to Department of Immunohematology and Blood Transfusion, Lady Hardinge Medical College or at VBD Camps for a period of 20 months from January 2020 to August 2021. Rate of deferral was quantified and various causes were characterised according to gender and age. **Result:** A total of 19,151(18,665 males,486 females) donors presented at our centre and VBD camps, of whom 17,632(92.07%) were accepted while 1,519 were deferred. Out of total donors accepted, 17,345 were males and 287 females. The percentage of deferred donors was 7.93%. Amongst 486 females, 199 were deferred, i.e. 40.95%, while 7.07% males were deferred amongst males(1320 out of 18665). Out of total deferrals, majority i.e. 1302(85.71%) were due to temporary reasons while 217(14.29%) were deferred permanently. Overall, most common reason for deferral was low hemoglobin(514/1519 i.e. 33.84%). Amongst temporary deferrals, most common reason overall was due to low hemoglobin (514/1302, 39.48%) with low hemoglobin also being the most common reason of temporary deferral in both males(393/1111= 35.37%) and females(121/191= 63.35%). Amongst the permanent deferrals, most common reason was due to history of High risk behaviour (46/217=21.20%). History of High risk behaviour was also the most common reason of permanent deferral in males(46/209= 22.01%) and Thyroid disorders, the most common amongst permanent deferral in females(03/08=37.5%). Majority of deferred donors belonged to the age group of 29–38 years (42.66 %). **Conclusion:** Estimation of incidence and causes of deferral is important to get better insight of the regional deferral pattern. Temporary causes account for the majority of deferral and such donors should be followed up for the maintenance of the VBD pool and ensuring the safety of both donors and recipients. **Abbreviation:** VBD= voluntary blood donation, Hb= Hemoglobin, NACO = National AIDS Control Organization,
WHO= World Health Organisation

Keywords: Deferral, blood donor, temporary, permanent.

Introduction

Blood transfusion plays a very crucial life saving role in the field of medicine, in both elective and emergency transfusion management of patients.

National AIDS Control Organization (NACO) states that annually, only 7.4 million units of blood are available in India against the requirement of 10 million units of blood[1]. World Health Organization (WHO) also states that annually there are over 81 million units of blood collected, but the developing countries contributes only one third (39%) of the safe blood where around 82% of world's population is living[2,3].

Thus it is important to maintain the pool of blood donors and also ensure blood availability and accessibility to the population in need.

So, we planned a study with the primary objective of determining the deferral rate and characterising different causes of deferral in view of changing trends of deferral worldwide. We have also attempted to review the literature regarding the rates of deferral throughout the globe. The deferral pattern also reflects the health status of the general population.

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Study Design

We performed a retrospective analysis of data on blood donors who presented to the Department of Immunohematology and Blood Transfusion, Lady Hardinge Medical College and Associated Hospitals. Ours is a 1200 bedded Hospital with an annual blood collection of approximately12000 blood units.. Data was included both for in house as well as voluntary blood donation camps for a period of 20 months from January 2020 to August 2021.

The donors are screened as per the criteria provided by the Drugs and Cosmetic Act 1940 (and second amendment in 2020) supplemented by the Guidelines of Directorate General of Health Services guidelines, Ministry of Health & Family Welfare (2003)(& 2018 in the Gazette of India), and NBTC Standards.

Donor screening was done using a bilingual medical history questionnaire followed by physical examination (including weight, pulse, blood pressure, and body temperature) & Haemoglobin estimation by Hemocue (Hb 201 and 301). The cut-off point for Hb was 12.5g/dl.

The rate of deferral was determined and various causes of deferral were analysed among the categories of male and female, temporary or permanent and various age groups.

Results

A total of 19,151 (18,665 males, 486 females) blood donors presented at our centre and the voluntary blood donation camps, of whom 17,632 (92.07%) were accepted for blood donation while 1,519 were

deferred or rejected as donors. Out of the total donors accepted, 17,345(98.37%) were males and 287 were (1.63%) females. There were 57.18% replacement donors and 42.82% voluntary donors. Amongst the replacement donors, 98.65% were males while 1.35% were females. Amongst the voluntary donors, 97.99% were males and 2.01% were females. We registered 9890 repeat donors while 7742 were first time donors. ***The percentage of deferred donors was 7.93%.*** (TABLE No. 1)

Table No. 1: Distribution of Registered, Selected and Deferred donors

Donors	Males (%)	Females (%)	Total
Registered	18665(97.46%)	486(2.54%)	19151 (100%)
Selected	17345 (98.65%)	287 (1.63%)	17632 (92.07%)
Deferred	1320(86.90%)	199(13.10%)	1519 (7.93%)
Voluntary donors	7398(97.99%)	152(2.01%)	7550 (42.82%)
Replacement donors	9946(98.65%)	136(1.35%)	10082 (57.18%)

Amongst the total 486 females, 199 were deferred, which accounts for a high deferral rate in females (40.95%) while approx. 7.07% males were deferred(1320 out of 18665). Out of total 1519 deferrals, the majority i.e. 85.71% were due to temporary reasons of deferral while 217(14.29%) were due to the permanent causes. (TABLE No. 2)

Table No. 2: Distribution of temporary and permanent deferrals

Type of deferrals	Total	Males	Females	% of deferral
Temporary	1302	1111	191	85.71%
Permanent	217	209	08	14.29%
Total	1519	1320	199	100%

Majority of deferred donors belonged to the age group of 29–38 years (648 out of 1519 = 42.66 %). (Table 3)

Table No. 3: Age group wise distribution of deferrals

AGE GROUP In Years	%TOTAL DEFERRAL [N(%)]
18-28	499(32.9)
29-38	648(42.7)
39-48	264(17.4)
49-58	89(5.9)
>59	19(1.3)
	1519(100%)

Overall, the most common reason for deferral was low hemoglobin (514 out of 1519,i.e. 33.84%). The other causes of deferral in decreasing order of frequency overall were ongoing medication(s)(7.50% %), dog bite/ animal bite (5.79%), under weight (4.28%), typhoid fever (4.15%), major, minor and dental surgeries(3.75%), increased BP (3.09%), History of High Risk Behaviour (3.03%), due to covid vaccination (2.96%), tattoo and ear piercing (2.96%) and minor allergy (2.96%). (TABLE 4a & 4b)

Table No. 4a: Various causes of temporary deferral according to number and percentage (out of total deferral) in decreasing order of frequency

Temporary causes of deferral	Male	Female	Total	%out of total deferrals
Low haemoglobin	393	121	514	33.84
Medications (antifungal, antibiotics/ antihelmenthics, antidepressants, antipsychotics, steriod injection)	114 (66+39+4+1+4)	0	114	7.50
Dog/monkey bite	82	6	88	5.80
Under wt	50	15	65	4.28
Typhoid	58	5	63	4.15
Surgeries [major surgery(<12 mts), minor surgery(<6 mts), dental surgery]	53 (20+17+16)	4 (1+2+1)	57	3.75
Increased blood pressure	45	2	47	3.09
Tattoo & ear piercing	43 (38+5)	2 (2+0)	45 (40+5)	2.96
Minor allergy	44	1	45	2.96
Covid-19 vaccine	45	0	45	2.96
History of dengue	34	3	37	2.44
Gynaecological(menses,abortion)	0	24	24	1.58
Last Whole Blood donation(<3 mts)	23	0	23	1.51
Fever	19	3	22	1.45
Piles	20	0	20	1.32
Skin allergy	16	2	18	1.18
Tb	15	1	16	1.05
Alcohol intake	14	0	14	0.92
Cold/cough	12	0	12	0.79
Rabies vaccine	9	1	10	0.66
Accident	6	0	6	0.39
Vaccine of chickenpox	4	0	4	0.27
Malaria	4	0	4	0.26

Weakness/dizziness	2	1	3	0.20
Hepatitis vaccine	2	0	2	0.13
Gout	2	0	2	0.13
Covid-19 infection	1	0	1	0.07
Underage	1	0	1	0.07
Total	1111	191	1302	85.71

Table No. 4(b): Various causes of permanent deferral according to number and percentage (out of total deferral) in decreasing order of frequency

Permanent causes of deferral	Males	Females	Total	% out of total deferral
High risk	46	0	46	3.03
High bp	36	0	36	2.37
Jaundice	22	0	22	1.45
Dm(uncontrolled)	16	2	18	1.18
Epilepsy/psychiatric	14	2	16	1.05
Heart ds	15	1	16	1.05
Miscellaneous	16	0	16	1.05
Thyroid	8	3	11	0.72
Medications(anticoagulants, anticonvulsants)	8 (4+4)	0	8	0.53
Asthma	8	0	8	0.53
Liver ds	5	0	5	3.14
Lung ds	3	0	3	0.2
Hbs +	8	0	8	0.53
Hcv +	1	0	1	0.07
Hiv +	1	0	1	0.07
Paralysis	1	0	1	0.07
Kidney ds	1	0	1	0.07
Cancer	0	0	0	0
Total	209	8	217	14.29

The various causes of temporary and permanent deferrals in decreasing order of frequency are shown in TABLE 4a & 4b with Low Hb being the most common reason amongst temporary causes (514 out of 1302= 39.48%) and History of High risk behaviour (46 out of 217, 21.20%), the leading cause of permanent deferral.
The varied reasons of temporary and permanent deferrals with percentages amongst males and females is shown in (TABLE 5a &5b)

Table No. 5a: Causes and percentage of distribution of temporary deferrals(Genderwise)

Causes of deferral in males(temporary)	No.	% out of total temporary deferrals in males	Causes of deferral in females(temporary)	No.	% out of total temporary deferrals in females
Low hb	393	35.37	Low hb	121	63.35
Medications	114	10.26	Medications	0	0
Dog/monkey bite	82	7.38	Dog/monkey bite	6	3.14
Typhoid	58	5.22	Typhoid	5	2.62
Surgeries	53	4.77	Surgeries	4	2.09
Under wt	50	4.5	Under wt	15	7.85
Increased bp	45	4.05	Increased bp	2	1.05
Covid vaccine	45	4.05	Covid vaccine	0	0
Minor allergy	44	3.96	Minor allergy	1	0.52
Tattoo & ear piercing	43	3.87	Tattoo	2	1.05
H/o dengue	34	3.06	H/o dengue	3	1.57
Last donation(<3 mts)	23	2.07	Last donation(<3 mts)	0	0
Piles	20	1.8	Piles	0	0
Fever	19	1.71	Fever	3	1.57
Skin allergy	16	1.44	Skin allergy	2	1.05
Tb	15	1.35	Tb	1	0.52
Alcohol intake	14	1.26	Alcohol intake	0	0
Cold / cough	12	1.08	Cold / cough	0	0
Rabies vaccine	9	0.81	Rabies vaccine	1	0.52
Accident	6	0.54	Accident	0	0
Malaria	4	0.36	Malaria	0	0
Vaccine of chickenpox	4	0.36	Vaccine of chickenpox	0	0
Hep vaccine	2	0.18	Hep vaccine	0	0
Weakness/dizziness	2	0.18	Weakness/dizziness	1	0.52
Gout	2	0.18	Gout	0	0
Underage	1	0.09	Underage	0	0

Table no. 5b: causes and percentage of distribution of permanent deferrals(genderwise)

Cause of deferral in males(permanent)	No.	% of total permanent deferrals in males	Cause of deferral in females(permanent)	No.	% of total permanent deferrals in females
High risk	46	22.01	High risk	0	0
High hb	36	17.22	High hb	0	0
Jaundice	22	10.53	Jaundice	0	0
Dm(uncontrolled)	16	7.66	Dm(uncontrolled)	2	25
Miscellaeous	16	7.66	Miscellaneous	0	0
Heart ds	15	7.18	Heart ds	1	12.50
Epilepsy/psychiatric	14	6.70	Epilepsy/psychiatric	2	25
Hbs +	8	3.83	Hbs +	0	0
Asthma	8	3.83	Asthma	0	0
Thyroid	8	3.83	Thyroid	3	37.50
Liver ds	5	2.39	Liver ds	0	0
Medications	8	3.83	Medications	0	0
Lung ds	3	1.44	Lung ds	0	0
Hcv +	1	0.48	Hcv +	0	0
Hiv +	1	0.48	Hiv +	0	0
Paralysis	1	0.48	Paralysis	0	0
Kidney ds	1	0.48	Kidney ds	0	0
Cancer	0	0	Cancer	0	0

Amongst female donors, *low hemoglobin* formed singlemost leading cause of deferral accounting for almost 63.35%(121/191) of the total temporary deferral in females. Out of temporary cause in males, *Low Hb* was the most common reason of temporary deferral in males as well.(35.37%=393/1111) (TABLE 5a).

History of High risk behaviour was the most common reason of *permanent deferral in males*(46/209= 22.01%) and *Thyroid disorders* being the most common reason of *permanent deferral in females*.(03/08= 37.5%). (Table 5b).

Discussion

Blood transfusion can be a life saving procedure in the management of patients. Donor deferral not only reduces the blood units needed for transfusion, but also negatively impacts donor retention and hence, Voluntary Blood Donor pool. Recruitment of temporarily deferred donors can prove to be very helpful and can be achieved by analyzing the reasons of their deferrals and attempting to reduce the causes to as minimum as possible by devising proper donor education, motivation and recruitment strategies.

In our study, total number of deferred donors were (7.93 %). Globally, the deferral rate has varied from as low as 2.5% to 30.9%[4,5]. (TABLE 6)

Table 6: Deferral rate distribution as per various studies throughout the globe

Study	Study Period Year	Total donors screened	Total Deferral rate	Country
Alok K et al[4]	19 months, 2014	10853	2.5%	India
Jethani[14]	2 years, 2016	41412	2.56%	India
Rathod[29]	2015		3.55	India
Kulkarni[20]	1 year, 2012	7025	(4.27%)	India
Girish[28]	2 year, 2012	9113	5.19%	India
Unnikrishnan et al[3]	1 year, 2011	13722	(5.2%)	India
Chauhan et al[12]	5 years, 2018	26029	5.56%	India
Rabeya et al[22]	1 year , 2008	4138	5.6	Malaysia
Chenna[24]	14 years , 2015	54653	5.6	India
Sundar[8]	3 years , 2010	16706	5.8	India
Bobati et al[11]	1 year , 2016	8894	8.62	India
Sivaramakrishnan[9]	1 year, 2020	2083	8.83%	India
Bahadur et al[7]	2 years, 2009	16694	9	India
Basavarajegowda et al[15]	1 year, 2017	30711	9.74%	S India
Lawson et al[16]	4 months, 1999	57,003	10.8	France
Gajjar et al[23]	2.6 years, 2014	34373	11.16	India
Ahmad et al[6]	7 years , 2020	7,806	12.6	India
Iqbal et al [19]	8 months, 2020	3348	12.9	Multan
Custor et al[17]	1 year, 2004	116,165	13.6	USA
Lim et al [27]	4 years , 1993	278401	14.4	Singapore
Arslan et al[13]	5 years, 2007	95,317	14.6	Turkey
Omkareshwar Patil et al[10]	1 year , 2021	9059	14.86	India
Vimal et al[21]	4 year, 2016	9557	14.87	India
Shaz[18]	5 years, 2010	586159	15.6%	United States
Taneja et al[25]	1 year ,2015	24062	17.1	India
Brijandi et al[26]	2 years , 2013	197757	25.6%	Iran
Kasraian et al[5]	2 years, 2015	141820	30.9	Iran

These variations may be due to the regional diversity, socioeconomic factors and marked difference in whole blood donor selection criteria.
Males contributed to the major chunk of donors in our study. Similar pattern was found in other studies[3,6-10].
The prevalence of deferral rate amongst females(40.95%) was higher than males(7.07%). Patil et al [10] also found that female donors (48.38%), were deferred more frequently than male donors (11.04%), which might be due to the wide prevalence of anemia, leading to rejection in female donors. Similar deferral figures were reported by Ahmad et al[6](F= 59.7%, M=10.7%) and other studies[11,12,9,5,13]. Few studies like Jethani et al[14], also reported deferral rate amongst females(20.24%) to be higher than males(1.82%), however, percentages was slightly lesser.
In our study, majority of deferred donors belonged to the age group of 29–38 years (42.7 %) while the age group >59 years (1.3%) accounted for the least deferrals.(TABLE 3) However, Ahmad et al[6]showed that most of their deferred donors belonged to age group 18-27 years(44.33%), followed by age group 28-37 yrs (34.21%). Similar results were observed by Alok K et al[4], where majority were under the age of 28 years (35.80%), followed by those aged 28-38 years (29.52%).
Infact, most of the studies, showed that volunteers in the age group of 18-30 years had highest deferral comprising of 52.34%, 54.34%, 50%, 65%, 74.33% and 89.7%, respectively[10,9,16,19,20,7]. This could be due to this age group forming the predominant group among the total donor pool in every blood donation centre.
However, we could not calculate the denominator (i.e. total age wise distribution of all the donors registered), which was a limitation for our study.
In our study the percentage of deferred donors was the least beyond 50 years age group which is similar to the study by Vimal et al(only 2.59% beyond 50 years)[21]. However, Arslan et al.[13] noted more deferrals in 50-60 age groups.
In our study, the temporary reasons accounted for the major proportion of deferrals than the permanent ones. This is similar to that found in other studies which reported very high rate of temporary deferral of 87.5%, 83.11%, 83.11%, 91.3%, 95.5% and 95.16%, respectively[14, 9, 15, 16,5,12]. Custer et al[17], Shaz et al[18], and Patil et al[10] showed similar pattern but at a slightly lower proportions of 68.5%, 65% and 71.48%, respectively.
Overall, 33.84% of the total deferrals were due to low hemoglobin(leading cause). similar to earlier studies which stated low hemoglobin as the most common causes of deferral and their percentages were 51.04%, 42.26%, 25.3% and 19.91%, respectively[19,12,11,10]. Infact most of the studies, also reported anemia as the most common cause of deferral[7,22,23,24,25,6,8,26,5,21].
Differing from the above finding, Kasarrain et al [5] reported history of high risk behaviour to be the most common cause of deferral overall. Medications intake was the leading cause of deferral in the study by Unnikrishnan et al[3].
In our study, **medications were the second most common reason** for deferral overall (7.50%). Infact, intake of medications was the most common cause in the study by Lim et al[27].
As we can see, typhoid fever was an unusually common cause in our study as compared to other studies.
Alcoholism(0.92%) remained not as common a cause of deferral as in other studies[6,7,11,18] where it was one of the leading causes. Hypertension, again was not as common as in other studies like Girish et al[28] and Rabeya et al[22] who reported it to be the most common and second most common reason of deferral, respectively and Bobati et al[11]& Taneja et al[25], where it was the third leading cause of deferral overall. In our study, deferral due to common cold was not a major cause while Arslan et al[13], reported common cold as the second leading cause. The other causes of deferral in decreasing order of frequency were **dog bite/ animal bite** (5.79%), **under weight (4.28%), typhoid fever (4.15%), major, minor and dental surgeries(3.75%), increased BP (3.09%), History of High Risk Behaviour (3.03%), due to covid vaccination (2.96%), tattoo and ear piercing (2.96%) and minor allergy (2.96%**). Comparison of leading causes of deferral in various studies is as shown in Table 7.

Table 7: Comparison of leading causes of deferral in various studies

Study	First major cause	II Leading cause	III leading cause	IV Cause
Our Study	Low Hb	Medications	Animal Bite	Under Weight
Taneja et al[25]	Low Hb	Medications	Alcoholism	Hypertension
Bobati et al[11]	Low Hb	Alcoholism	Hypertension	Increased Hb
Patil et al[10]	Low Hb	Medications	Gynaecological	Alcoholism
Iqbal et al[19]	Low Hb	HCV, HBS, Syphilis infection	Thrombocytopenia	Active Infection
Chauhan[12]	Low Hb	Alcoholism	Jaundice	Last Donation(<3 mnths)
Brijandi[26]	Abnormal BP	High Hb	Medications	Low Hb

In our study, we have categorised the causes of temporary and permanent deferral and calculated their percentages in both the genders separately (TABLE 5a &5b). For this, we have taken the denominator as total temporary or permanent deferrals in both genders separately. The comparison with most other studies is not available as they have calculated percentages out of total deferrals.
Amongst female donors, low hemoglobin formed singlemost leading cause of temporary deferral accounting for almost 63.35%(121/191) of the total temporary deferral in females. Other leading causes in our study were Gynaecological causes and under weight in our study. (TABLE 5a). Other studies like Sivaramakrishnan et al[9] reported similar findings. Taneja et al stated anemia, low weight and medications as major causes of temporary deferral in females.
Amongst the temporary causes of deferral in males, the most common was Low Hb, followed by medications, animal bite, Typhoid, under weight, increased BP, Covid Vaccine, minor allergy, tattoo & ear piercing, in decreasing order of frequency. (TABLE 5a). Differing from our findings, Sivaramakrishnan et al[9] reported very high rate of temporary deferral due to tattooing amongst males. Sivaramakrishnan et al [9] reported Hypertension followed by Tattooing and medication intake as leading causes of temporary deferral in males. Taneja et al stated anemia, medications and alcoholism as major causes of temporary deferral in males.
Out of the permanent causes of deferral in females, the leading reasons of permanent deferral were Thyroid(37.5%), epilepsy and uncontrolled Diabetes. In males, the most common reasons of permanent deferral were history of High risk behaviour(22.01%), High Hb, Jaundice and uncontrolled Diabetes in decreasing order of frequency. Other studies like Sivaramakrishnan et al[9] reported somewhat similar pattern in males but in females, asthma was most common reason for permanent deferral.
High Hemoglobin was a prominent reason for permanent deferral amongst males similar to the study by Bobati et al[11]. The other studies, however, did not report it to be a major cause.
Vimal et al[21] observed, hypertension, asthma and high risk behaviour as major permanent deferral causes in males and Heart Disease, Hypertension and seizures as major permanent deferral causes in females.
Therefore, we can see there are varied temporary and permanent causes of donor deferral with diverse distribution throughout the globe.

Conclusion

The Donor deferral rate in our study is comparable with the other studies, however, the various causes and their relative percentages differed. This may be attributed to different demographic profile, socioeconomic and educational status of the donors and different selection and deferral criteria for blood donation being implemented throughout the globe. The deferral categorisation observed in our study gives us an insight into the prevailing health problems of the particular region of Delhi in which the study was conducted. This study also highlights the significance of mass awareness and motivation about the selection criteria for blood donation especially in developing countries such as India so as to recruit more number of healthy donors, thereby resulting in decrease in deferral rate. The temporary deferrals should be followed up, motivated recruited back to expand the Voluntary blood donor pool to ensure safe and easily accessible blood units available to a larger proportion of the population in need.

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Conflict of Interest: Nil Source of support: Nil