ADVERSE DONOR REACTION PATTERN IN A TERTIARY CARE BLOOD CENTER IN SOUTH INDIA

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ABSTRACT

Aims & Objective: Primary objective is to assess the frequency and pattern of donor reaction in our blood center and secondary objective is to assess the factors associated with vaso-vagal reaction (VVR).

Materials & Methods: Retrospective observational study conducted by Blood Center of Sree Gokulam Medical College, Trivandrum. Details of the donors of the last 4 year (January 2015 to December 2019) including donor reaction details, age, gender, weight, donation status, type of donation and Blood Pressure (BP) were included in the study and were analyzed using IBM SPSS Version 21

Results & Discussion: Out of 10,647 donors, the overall donor reaction rate is 1% while in-house and camps reaction rate were 0.96% and 3.49%. Donor reaction rate in males and females were 0.99% and 1.03%. Out of 105 reactions, 70.75 % were VVR and 19 % were Hematoma. VVR rate is 0.74. Most common VVR occurred was mild type. Young age, first time donation and voluntary donation were found to be predisposing factor for VVR. VVR rate was not associated with gender, weight and Blood Pressure (BP) of the donor. VVR in post donation phase was associated with low BP and severe VVR was not associated with low BP.

Conclusion: Overall reaction rate and VVR rate were 1.0% and 0.74%. Young age, first time donation and voluntary donation were found to be predisposing factor for VVR. It is important to contact donors to report any missed delayed reaction.

KEYWORDS :**INTRODUCTION:**

Donor reaction can be defined as the clinical symptoms or signs of donor discomfort severe enough to be noticed by the donor himself or the staff, respectively¹. For whole blood donation frequency of donor reaction is 3.2 percent². This event can occur before, during or after donation. Most commonly the reaction occur during the post donation phase. Injuries related to blood donation are also included in donor reactions. Vasovagal reactions (VVR) are the most common adverse reactions and the hematoma is the most common injury related to blood donation. Most of the donor reactions are self-limiting and resolves without any sequelae. Rarely these reactions require medical attention. Early and prompt management are important in avoiding donor discomfort. Occurrence of donor reaction is a demotivating factor for the future donation. van Dongen et al. study mentioned that around 9 percent of donors who experienced donor reaction did not come forward for donation again³. In each demography causations factors are different. First time donors, female donors, last meal more than 4 hours, inadequate sleep, inattentive phlebotomist, low weight are some of the risk factors associated with donor reaction. Better understanding of the causation factors of reaction are pivotal in prevention of occurrence of future reactions.

In our blood center, 10647 units were collected in the last 4 years (January 2016 to December 2019). 99.66 percent of the collection occurred in-house. In this study we are assessing the frequency and pattern of donor reaction and trying to assess the risk factors associated with reaction in our blood center.

AIMS & OBJECTIVES:

Primary Objective is to assess the frequency and pattern of donor reaction in our blood center. Secondary Objective is to assess the factors associated with Vaso-vagal reaction in our blood center.

MATERIALS & METHODS:

This is a Retrospective Observational study conducted by Blood Center of Sree Gokulam Medical College and Research Foundation, Trivandrum after procuring permission from Institute Research Cell and Institutional Ethics Committee. All donor reactions occurred within the Blood Center in the last 4 year from January 2016 to December 2019 were included in the study. Donor reactions details were collected from Donor Reaction Register and Donor details and Clinical presentations were collected from Donor Questionnaire Forms. Various details of donors taken includes age, gender, weight, donation status, type of donation and Blood pressure were entered in proforma. Data cleaning was done by the principal investigation. In this study, the outcome variable is the severity of VVR in blood donors. Data entry was done in Microsoft Excel and analyzed using IBM SPSS

Version 21. Univariate and bivariate analysis was done. Cross tabulation was done for bivariate analysis.

RESULTS:**Assess The Frequency And Pattern Of Donor Reaction**

During the study period, there were 10,647 collections. Out of them 10,504 (98.4%) were in-house and 143 outside collections (1.6%). 9775 (91.8%) were males and 872 (8.2%) were females. Out of 10647 donors, 8662 (81.3 %) were replacement donors and 1985 (18.7%) were voluntary donors. Among total donors, 8005 (75.2%) were repeat donors and 2642 (24.8%) were first time donors. Mean age and weight of donors were 31.0 ± 9.1 and 69.34 ± 13.31 respectively. Average Systolic and Diastolic BP were 124.8 ± 13.8 and 76.5 ± 9.4 mm Hg respectively.

Adverse Reactions

Out of 10,647 donors, reactions were observed in 105 donors thereby giving an overall incidence of 1%. Out of the 105 reactions, 100 developed in-house while 5 reactions occurred in camps. Frequency of donor reaction in in-house and camps are 0.96% and 3.49% respectively. Out of 105 reactions, 96 were males and 9 were females. Frequency of donor reaction in males and females are 0.99% and 1.03% respectively. Out of 105 reactions, 76 reactions (72.4%) occurred in post donation phase, 28 (26.7%) reaction occurred during donation and 1 (0.9%) occurred before donation. Out of the 105 reactions, 75 (70.75 %) were VVR, 20 were Hematoma, 3 were Thrombophlebitis, 4 were Excessive Pain over the phlebotomy site and 2 were delayed bleeding and 1 was localized edema. Out of the 75 VVR occurred 46 were mild, 19 were moderate and 10 were severe. (See Figure 1)

Figure 1: Percentage Of Reported Adverse Reactions In Donors

Demographic Characteristics Of Donors Who Had Reaction

The total numbers of donor reactions were 105. Mean age of the donors was 24.49 ± 6.58 years, with a range of 18–48 years. Mean age of male donors was 25.09 ± 5.87 (range 18–42) years and female donors 29.67 ± 11.51 (range 19–48) years. Majority of the donors were in 18–24 years age group 55.2% (58), 42.9% (45) in 25–44 years age group and only 1.9% (2) were in 45–64 years age group. The mean weight of the donors was 69.53 ± 11.07 kg, with the weight ranging from 50 to 114 kg. The mean weight of male donors was 69.85 ± 11.18 kg (range 50–114 kg) while, the mean weight of female donors were 66.11 ± 9.85 kg (range 50–86 kg). Majority of the donors were repeat donors while only 29.5% were first time donors. Among female donors, majority were first time donors and 44.4% were repeated donors. Among male donors, 73% were repeat donors whereas gender, weight and Blood Pressure (BP) of the donors were not found to be associated with the VVR rate.

Factors Affecting VVR In Blood Donors

For further analysis, 75 donors who had VVR were selected. Around 79% of the VVR occurred after donation, 20% occurred during blood donation and only one donor had VVR before blood donation. VVR rate in donors was found to be 0.74 percent.

Age

Mean age of donors with VVR was 25.29 ± 6.35 . Sixty one percent of donors in 18–24 years age category had mild VVR and 11.9% had severe VVR. In 25–44 years category, 61.3% donors had mild VVR while 22.6% had moderate VVR. Half of the donors in more than 45 years category reported mild VVR and other half reported moderate vasovagal reaction. (See Table 1)

Gender

VVR rate in females and males were found to be 0.57 % and 0.72% respectively. Among males, sixty percent of donors had mild VVR, 25.7% moderate VVR and 14.3% reported severe VVR. Among females, 80% had mild VVR and 20% had moderate VVR. (See Table 1)

Weight

Mean weight of donors with VVR was 68.83 ± 10.5 . Majority of donors are falling between weights of 60–79 kg. Nineteen percent of the donors are falling in range of 50–59 kg and 16 % are having weight 80 kg or above. (See Table 1)

Table 1: Distribution Of VVR Based On Age, Gender, Time Of Reaction And Weight Of Donor

Variables	Categories	Vasovagal Reaction		
		Mild (%) n = 46	Moderate (%) n = 19	Severe (%) n = 10
Gender	Male	42 (91.3%)	18 (94.7%)	10 (100%)
	Female	4 (8.7%)	1 (5.3%)	0 (0%)
Age group	18–24 years	26 (56.5%)	11 (57.9%)	5 (50%)
	25–44 years	19 (41.3%)	7 (36.8%)	5 (50%)
	45–64 years	1 (2.2%)	1 (5.3%)	0 (0%)
Time of reaction	After donation	32 (69.6%)	18 (94.7%)	9 (90%)
	During donation	1 (2.2%)	0 (0%)	0 (0%)
	Before donation	13 (28.3%)	1 (5.3%)	1 (10%)
Weight of the donor	50–59 kg	9 (19.6%)	3 (15.8%)	2 (20%)
	60–79 kg	28 (60.9%)	14 (68.4%)	8 (80%)
	80–120 kg	9 (19.6%)	3 (15.8%)	0 (0%)

Figure 2: Distribution Of VVR Based On Donation Status

Donation Status

VVR rate in first time and repeat donors is 0.91% and 0.64 % respectively. Most of the first time donors had mild VVR, 25% had moderate and 12.5% of donors had severe VVR. Around sixty percent of the repeated donors had mild VVR, 25.5% had moderate VVR while 13.3% had severe VVR. (See Figure 2)

Type of donation

VVR rate in Voluntary and repeat donors were 0.91% and 0.66 % respectively. On examining the voluntary and replacement donations with VVR, compared to voluntary donations, replacement donations reported more donor reactions. Among donors who had severe reaction, Eighty percent were replacement donors. (See Table 2)

Table 2: Distribution Of VVR Based On Type Of Donation

Type of blood donation	Vasovagal Reaction		
	Mild (%) n = 46	Moderate (%) n = 19	Severe (%) n = 10
Voluntary	12 (26.1%)	4 (21.1%)	2 (20%)
Replacement	34 (73.9%)	15 (78.9%)	8 (80%)
Total	46 (100%)	19 (100%)	10 (100%)

Blood pressure

Mean Systolic and Diastolic BP of donors with VVR were 120.3 ± 9.73 and 77.1 ± 9.05 mm Hg respectively. Most patients who had mild, moderate and severe reactions reported systolic blood pressure less than 120. P value is reported as 0.48. Seventy five percent of the donors who had severe reaction had BP less than 120. On examining the relationship between diastolic pressure and donor reaction, seventy percent of the donors who had diastolic blood pressure more than 70 mm Hg reported severe VVR. The p value was found statistically significant. (See Table 3)

Table 3: Distribution Of BBR Based On BP

Blood Pressure	Mild VVR (%) n=46	Moderate VVR (%) n=19	Severe VVR (%) n= 10	P value
Systolic blood pressure				0.48
Less than 120 mmHg	29 (63%)	14 (73.7%)	8 (80%)	
More than 120 mmHg	17 (37%)	5 (26.3%)	2 (20%)	
Diastolic blood pressure				0.04*
Less than 70 mmHg	22 (47.8%)	3 (15.8%)	3 (30%)	
More than 70 mmHg	24 (52.2%)	16 (84.2%)	5 (70%)	
Total	46 (100%)	19 (100%)	10 (100%)	

*p<0.05 is considered significant

DISCUSSION:

In the study average collection per annum is 2612. Majority of the collection (98.4%) eventuated in-house. In our blood center outdoor collection drive was initiated only 10 months back. Majority (91.8%) of the donors were male donors and majority (81.3 %) were replacement donors. In Indian scenario majority of donors are male^{4,5}.

In our study, donor reaction rate was found to be 1.0%. Various studies from India showed reaction rate varying from 0.36 to 8.3 percent.^{2,5-8} Pre-donation hydration of donors, interaction between the phlebotomist and donors during donation may be the contributing factors for this.⁹

Donor reaction rate for outdoor collection was higher (3.49%) compared to in-house. (0.96%). Desai et al. also reported higher reaction rate in blood donation camps.³ Overcrowding, prolonged pre-donation phase, shortened observation time to donors, decreased phlebotomist to donor ratio, non-ambient temperature, and limited privacy to phlebotomists and donors may be the factors contributing to it.

In our study, majority of reactions (72.4%) occurred in post donation phase. Hemodynamic instabilities may be contributing factor. Most common reaction and injury transpired was VVR and Hematoma⁵. Desai et al. also reported similar results in their donor reaction study⁵.

In the study, VVR rate in donors was found to be 0.74 %. Majority of the VVR were mild type. Various Indian studies showed VVR rate from 0.2 to 5 percent.^{2,5-8}

According to our study younger population is prone for donor reaction as Mean age of donors with VVR was less compared to the Mean age of donors. Almutairi et al. reported similar results.¹⁰

VVR rate of female donors was less than that of male donors. Most of the studies concluded that females are prone for donor reaction compared to males.^{10,11} In our center 350 ml is collected from female donors irrespective of the donor weight. Pre-donation hydration is strictly followed for female donors. This may be an attributing factor. In our study, VVR rate among first time donors (0.91%) is significantly higher than repeat donors. (0.66) First time donors being young and apprehensive may be the contributing factor. Agnihotri and Almutairi et al. also concluded that first times donors are prone for VVR similar result.^{10,11}

In our study, VVR rate is slightly higher in voluntary donors (0.91%) than replacement donor (0.64). Higher VVR rate in Voluntary Blood donation dives may be the contributing factor. Agnihotri et al. mentioned that VVR rate is less in Voluntary donors than replacement donors.¹¹

From our study, it is shown that there was no difference in VVR rate with weight of the donor. Only 350 ml was collected from donors less than 55 kg while 450 ml was collected from donors with weight more than 55 kg. Agnihotri and Almutairi et al. reported that low weight is a pre-disposing factor for VVR.^{10,11}

In our study, there was no significant difference between the mean diastolic and systolic BP of donors and donors with VVR. Majority of the VVR due to low BP occurred during post donation phase. Majority of donors with VVR had Systolic BP less than 120. Majority of donors with severe VVR had Diastolic BP more than 70mm Hg. Severe VVR may be linked to triggering factors other than BP fall. Agnihotri et al. showed that donors with low BP are prone for reaction.¹¹

Some of the delayed donor reaction may be missed as there was no routine follow up of the donors. Following the study, Our center recently implemented contacting blood donors through phone the next day of donation. Pre-donation hydration, attentive trained phlebotomists, ample counselling time for first time donors and implementing donor feedback or suggestions are some of strategies implemented in our center to reduce reaction.

CONCLUSION:

Overall reaction rate and VVR rate in our blood center were 1.0% and 0.74% respectively. Young age, first time donation and voluntary donation were found to be predisposing factor for VVR. It is important to contact donors to report any missed delayed reaction.

REFERENCE:

1. Rutman RC, Dpasuale-Barrios S. Donor reactions. In: Green TS, Steckler D, editors. Donor Room Policies and Procedures. Arlington: American Association of Blood Banks; 1985. p. 81-90
2. Agarwal RK, Periyavan S, Dhanya R, Parmar LG, Sedai A, Ankita K, *et al.* Complications related to blood donation: A multicenter study of the prevalence and influencing factors in voluntary blood donation camps in Karnataka, India. *Asian J Transfus Sci* 2016;10:53-8
3. van Dongen A, Abraham C, Ruiter RA, Veldhuizen JJ, The influence of adverse reactions, subjective distress, and anxiety on retention of first-time blood donors. *Transfusion* 2013;53:337-43
4. Jain R, Gupta G. Family/friend donors are not true voluntary donors. *Asian J Transfus Sci.* 2012;6(1):29-31
5. Desai PD, Navkudkar AA, Rajadhyaksha SB. On-site and off-site adverse donor reactions in voluntary whole blood donors: A study from a tertiary care oncology center. *Glob J Transfus Med* 2019;4:28-32
6. Eder AF, Dy BA, Kennedy JM, Notari EP, Strupp A, Wissel ME, *et al.* The American Red Cross donor hemovigilance program: Complications of blood donation reported in 2006. *Transfusion* 2008;48:1809-19
7. Newman BH, Pichette S, Pichette D, Dzaka E. Adverse effects in blood donors after whole-blood donation: A study of 1000 blood donors interviewed 3 weeks after whole-blood donation. *Transfusion* 2003;43:598-603
8. Dogra A, Sidhu M, Dogra M, Raina TR. Study of adverse whole blood donor reactions in normal healthy blood donors: experience of tertiary health care centre in jammu region. *Indian J Hematol Blood Transfus.* 2015;31(1):142-145
9. France CR, Ditto B, Wissel ME, *et al.* Predonation hydration and applied muscle tension combine to reduce presyncopal reactions to blood donation. *Transfusion.* 2010;50(6):1257-1264
10. Almutairi H, Salam M, Alajlan A, Wani F, Al-Shammari B, Al-Surimi K. Incidence, predictors and severity of adverse events among whole blood donors. *PLoS One.* 2017;12(7):e0179831.
11. Agnihotri N, Marwaha N, Sharma RR. Analysis of adverse events and predisposing factors in voluntary and replacement whole blood donors: A study from north India. *Asian J Transfus Sci.* 2012 Jul;6(2):155-60.