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Original Research Article

PRE-DONATION HYDRATION AND MUSCLE TENSING EXERCISES TO REDUCE DONOR ADVERSE REACTIONS DUE TO BLOOD DONATION

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ABSTRACT

Blood Donors are the backbone of a Blood Transfusion service. Since blood donors are considerate volunteers, they should be encouraged, motivated and should be safe without any adverse reactions. As the quote says , people who have not donated have never been asked for Post donation well being and donors being fine fettle will definitely have implications on blood donor return rate .voluntary repeat donations should be encouraged. If the donors are ensured of a pleasant experience, they will be motivated to become regular repeat donors. This can be accomplished by preventing adverse reactions during and post donation. **Objectives:** To study the frequency of occurrence of adverse reactions in voluntary whole blood donors. To evaluate the efficacy of pre donation hydration and muscle tensing exercises in preventing adverse donor reactions. **Methodology:** Study duration: 3 months. Total of 800 donors will be included in the present study, of which 200 will in the standard group and 600 (200 each) in intervention group. Randomly donors will be assigned to one of four groups: standard donation, Leg exercise prior to Donation (venipuncture/Phlebotomy)**.** Pre-donation water (500 ml of bottled water consumed 20 to 30 minutes before donation), Pre-donation water combined with leg exercise during donation**. Statistical analysis:** Analyzed using SPSS 19.0 software. All data will be entered in Excel and further analyzed. **Results:** There was significant reduction in the vasovagal reaction (VVR) in group 3 and 4 when compared to group 1 and 2.Anxiety was more in group 1 and 2.we found that pre donation exercise was not acceptable/ tolerated by many donors and they became more restless / showed anxiety when compared to group 3 .there was no much difference between group 3 and group 4 with respect to VVR. Pre donation hydration and muscle exercise were associated with significantly lower VVR.

Key Words: Pre donation Hydration, Muscle tensing exercises, donor adverse reactions.

INTRODUCTION

Blood Donors are the backbone of a Blood Transfusion service. Ensuring the safety of Blood Donors is of utmost importance as ensuring safe blood to the recipient. Since blood donors are considerate volunteers, they should be encouraged, motivated and should be safe without any adverse reactions. **Quote says People who have not donated have never been asked for**. But once we have motivated them for blood donation it is the utmost responsibility of us to make the whole process comfortable. Many a time first time donors do not return for donation due to occurrence of adverse reactions in the previous donations. Post donation well being and donors being fine fettle will defiantly have implications on blood donor return rate .voluntary repeat donations should be encouraged. If the donors are ensured of a pleasant experience they will be motivated to become regular repeat donors and

thus add to Donor Pool. This can be accomplished by preventing adverse reactions during and post donation. Previous research revealed that several donor characteristics are associated with donor return behaviour. Factors such as a higher donation frequency in previous years [1], a higher lifetime number of donations [2], and a short interval between two donations[3] positively affect donor return. The donation experience itself also affects return behaviour. Being deferred or experiencing a physical reaction has a deterrent effect on subsequent donations [4,6,7]. First year donation patterns predict long-term commitment for first-time donors[8].Blood should be accepted only from voluntary non-remunerated, low risk, safe and healthy donors. Definitions Related to Blood Donors/ Donations [5]

METHODOLOGY

Subjects of the study include Voluntary whole blood donors who donated in the Blood centre& in out-door camps.**Donor selection procedure**: Donors were selected as per the Drugs & Cosmetic rules(1945) of the Government of India and the National Aids Control Organization (NACO) guidelines for donor eligibility and deferral were followed (the Gazette of India: ministry of health and family welfare Notofication New Delhi 11th March 2020). Donors were addressed respectfully and passionately at the reception and those in the age group of 18-65 years were registered. Donors screening was done meticulously and informed consent for donation and testing of collected blood was obtained in writing on the donor form. Donor's medical history was elicited by the Medical officer. Few donors were deferred based on weight and Hb criteria levels, responses ,donor questionnaire and medical history. Donors fulfilling all criteria with : Pulse rate 60 -100 beats/min and regular rhythm , Blood pressure in the range of 100/60 to 180/100 mm Hg, Respiratory rate between 16 to 20 per minute, Body temperature between 98.4 to 99.5 * F and with no skin lesions at the venipuncture site (cubital fossa) were certified to be fit for blood donation by the Medical Officer. In any case, the Medical Officer's decision was final. The eligible donors were given a unique donor number and the same was entered in the donor form; relevant entries were made in the donor register and the donor's signature obtained in the register also. The donor number was entered on the blood bag along with the date of collection. Standard 350ml / 450 ml blood bags with 49ml /63 ml of anticoagulant (CPDA1) with or without SAGM were used .Blood bags chosen were either single (Vary rarely) / double / triple/quadruple depending on blood centre requirement .

BLOOD COLLECTION PROCESS: The donor was requested to lye down on donor couch. The donor couch with a head-up tilt and facility to raise the foot end was used in the Blood bank and a flat couch was used at out-door blood collection sites. Randomly donors were assigned to one of the four groups:

1) standard donation,
2) leg exercise (muscle tensing) prior to venipuncture
3) pre-donation water (500 mL of bottled water consumed 20 to 30 minutes before donation),
4) pre-donation 500 ml water combined with leg exercise during donation

Exercises:

1. Alternate lifting of legs for 20 times
2. Cross right calf over left, sqeezing the thighs together , tensing the stomach . hold in this position for few seconds ,then relax and repeat the process 5 times. Followed by same procedure on the other side. After verifying the donor identity as per the entries on the donor form and blood bag,. The donor arm was scrubbed with a suitable disinfectant (Povidone iodine or isopropyl alcohol) after applying the BP cuff . The BP cuff was inflated to about 60 mm Hg and the donor was made to squeeze a soft rubber ball (placed in the palm of the limb to be venipunctured) so that the veins would become prominent . The blood bag was placed in the Blood Collection Monitor. The antecubital vein was identified and the phlebotomy performed aseptically. Once the blood started flowing down the tubing, the BP cuff pressure was reduced and the donor was instructed to squeeze the soft ball intermittently and gently to increase the rate of flow. The donor was distracted from the blood collection

process by keeping him engaged in a conversation with the phlebotomist. Once 350ml /450 ml of blood got collected as shown by the display on the blood collection monitor, the squeeze ball was removed from the donor's palm and the BP cuff completely deflated and removed.

A sterile cotton was placed over the venipunctured site and the donor asked to flex his / her elbow. The donor was instructed not to getup from the donor couch until instructed. After collecting blood samples in pilot tubes and uniform mixing, the blood bags were sealed using a di-electric tube sealer and placed in the transport box (at camp sites). Once the blood stopped oozing from the venipunctured site, a band-aid was applied. After about 10 min of observation, the donors were instructed to get down from the couch and requested to sit down in the refreshment area. The donors were given juice and water if needed and were instructed to remain there for atleast 20 to 30 minutes. The donors were given post donation instructions, Appriciation for the nobel cause was given in the form of Appriciation certificate . The donors were instructed to report to the Blood Bank Medical officer if they experienced any adverse reaction like dizziness, fainting, convulsions, hematoma, bruise, any tingling sensation in arms or fatigue.

PROCESS OF OBSERVATION : Throughout the Procedure – donors were closely observed for the following signs and symptoms of an adverse reaction : Anxiety, increased rate of respiration / tachypnoea, pallor, sweating, dizziness, continuous yawning, nausea or vomiting, fainting, slow pulse rate, convulsions, abnormal movements and hematomas. Emergency drugs and Oxygen cylinder are always kept ready for use in case of any emergencies.

RESULTS

All Data were entered in Excel sheet and analyzed using SPSS version 21 and Chi square test. The first step in data analysis was to look into the descriptive statistics and base line variables of the participants. A total of 800 donors were included in the present study of which 200 were in standard donation group and 200 each in intervention groups, with mean age of 28 years and male to female ration of 8:1. (Table 1)

Total No of donors	**800**
Mean age	28 years
Males	713
Females	87
M:F ratio	8:1

The following variables were noted down **(Table 2)**

VARIABLES	**G1** **Standard donation**	**G2:** **Pre donation exercise**	**G3:** **Pre dona** **Tion** **500ml water**	**G4 pre donation 500ml water with exercise during donation** **(water + exer)**
Mean Age	29	26	29	29
Male	186	182	172	173
Female	14	18	28	27
M:F ratio	13:1	10:1	6:1	6:1
first time donors	146	131	131	141
Anxiety (pre donation)	18 (9%)	**25 (12.5%)**	12 (6%)	15 (7.5%)
No reaction	165(82.5%)	169 (84.5%)	**185(92.5%)**	**186(93%)**
Vasovagal reaction	**18 (9%)**	**15(7.5%)**	8 (4%)	7 (3.5%)
Other Reactions				
Phlebotomy site reaction	**4 (2%)**	3 (1.5%)	2(1%)	2(1%)
Pain	**5 (2.5%)**	4(2%)	2(1%)	2(1%)
fatigue	**8 (4%)**	**9(4.5%)**	3(1.5%)	3(1.5%)
Rare but expected reactions	1 (sever radiating pain at venepuncture)	1 (hyperventilation)	-	-
overall satisfaction	195	191	**197**	**197**

P value comparison for Vasovagal reaction (VVR) between (Table 3)

Standard donation and Pre donation exercise

standard and pre donation hydration

standard and predonation water + exercise was done

P value for other reactions like **pain, phlebotomy site reaction , fatigue** was compared with standard donations (table 4)

V V R	standard (18cases - 9%)	Pre donation exercise (15 cases - 7.5%)	P VALUE >0.02 (NOT SIGNIFICANT)
V V R	STANDARD (18 CASES - 9%)	PRE DONATION HYDRATION (8CASES - 4%)	**P VALUE** <0.02 **(SIGNIFICANT)**
V V R	STANDARD (18 CASES - 9%)	WATER + EXERCISE (7CASES - 3.5%)	**P VALUE** <0.02 **(SIGNIFICANT)**

STANDARD 17 CASES - 8.5%	PRE DONATION EXERCISE 16CASES - 8%	P VALUE >0.02 NOT SIGNIFICANT
STANDARD 17 CASES - 8.5%	PRE DONATION HYDRATION 7 CASES -3.5%	P VALUE >0.02 NOT SIGNIFICANT

STANDARD	HYDRATION + EXERCISE	P VALUE
17 CASES - 8.5%	7 CASES - 3.5%	>0.02 NOT SIGNIFICANT

Pre donation **anxiety** in standard donations was compared with other groups (table 5)

STANDARD	**PRE DONATION EXERCISE**	**PVALUE**
18 DONORS : 9%	**25 DONORS : 12.5%**	**>0.02** **NOT SIGNIFICANT**
STANDARD	PRE DONATION WATER	**>0.02**
18 DONORS : 9%	12 DONORS :6 %	NOT SIGNIFICANT
STANDARD	WATER + EXERCISE	**>0.02**
18 DONORS : 9%	15 DONORS : 7.5%	NOT SIGNIFICANT

Vasovagal raction compared between group 3 and 4 **(pre donation hydration and hydration with exercise) (Table 6)**

VVR	**PRE DONATION HYDRATION**	**WATER + EXERCISE**	**P VALUE**
	8 **(4%)**	7 **(3.5%)**	>0.02 **NOT SIGNIFICANT**

DISCUSSION

Radiating pain after nerve injury

Venepuncture is one of the most commonly performed , minimally invasive procedures, however it may lead to peripheral nerve injury rarely.vein in the antecubital

fossa is one of the first choices for routein blood sampling, however is a complex area in which the neurovascular structure may lie very close to each other, making the nerves vulnerable to injury. more over the anatomical variations in this region between individuals add to the risk of nerve injury. It is important that the phlebotomist be aware of this , and if injury occurs it has to be reported immediately and donor to be referred to Neurophysecian for the proper care to allevate the pain and shorten the course of injury with proper timely / necessary treatment/ nerve blocks.we at our centre had a single case of nerve injury in which donor immediately felt the paint and tingling senstation. Phlebotomy was stopped, donor was reassured , referred to Physician ,was followed up and donor is doing well.

Hyperventilation

Abnormal breathing that involves rapid and deep breathing. It's also called over-breathing.can happen due to stress or anxiety. Hyperventilation creates a low level of carbon dioxide (respiratory alkalosis) This leads to the constriction (narrowing) of blood vessels, including brains. When these blood vessels constrict, it causes a cascade of symptoms such as dizziness, a pounding heartbeat and feelings of breathlessness.15 Most people with hyperventilation syndrome don't realize they're breathing abnormally. They just notice the symptoms that hyperventilation causes.

Treatment Reassurance and breathing retraining , breath through pursed lips. Rebreathing into paper bags is still followed at many places but is no longer recommended.

Major observations

There was significant reduction in the VVR in group 3 and 4 when compared to group 1 and 2**.** Anxiety was more in group 1 and 2**.** we found that pre donation exercise was not acceptable/ tolerated by many donors and they became more restless / showed anxiety when compared to group 3. There was no much difference between group 3 and group 4 with respect to VVR.

From the donors perspective

Pre donation hydration and muscle exercise were associated with significantly lower VVR. But the donor did not show much interest in doing exercise during donation. Hydration before donation was found to have protective role in preventing VVR. This is in agreement with the studies done by Wiersum osselton J et al, Lu CC et al. New man B et al, Van den berg K et al and Vijayalakshmi kuttath et al.[5-9] According to christopher et al predonation hydration and a combination of hydration and leg exercise may help attenuate presyncpal reaction in relatively novice donors [10], But according to our study there was no statistical difference between pre donation hydration alone and hydration with leg exerciser during donation. Manual physical exercise can be replaced by electronic massager for calf muscles that can reduce the risk of fainting among the blood donors [11] The massager has a programmable circuit that can control the vacuum pump so that it can inflate and deflate the cuffs synergistically. It can relax the blood donor thereby reducing anxiety prior to blood donation,improve peripheral blood circulation there by improving return to the heart, thus reduces the risk of vasovagal reactions.This massager could be used along with Pre donation Hydration in effectively tackling the VVR.

More studies are needed to see the efectiveness of this on preventing VVR. Though exercise promote blood pressure increase leading to less chances of VVR and fainting , many donors are emotional and become more panic to do the manual exercise before or during donations. Hydration and muscle exercise promote blood pressure increases through different physiological mechanisms.[12,13] Water absorption can occur as soon as 5 minutes after ingestion and peaks around 20 minutes after ingestion. Drinking water can help normalize your blood pressure. It is possible that either intervention alone can elicit a sufficient pressor response to maintain blood pressure at or above normal resting levels and in so doing help to avert presyncopal reactions. Use Calf muscle compressor (battery operated) during blood donations might help .It can relax the blood donors there by reducing anxiety during blood donation, improves peripheral circulation, thereby improving the blood circulation return to heart. But again further studies involving large number of donors is required to see the effectiveness , weather donors would tolerate this and usefulness of this device. Further more we feel that this is much more needed in outdoor camps where we do not have donor couch (which provides a comfortable position to the donor and also wedge shaped arm rest promotes comfortable venepuncture facilitating optimal blood flow during the blood donation process,Based on homo dynamic principles. (Donor's head can be lowered immediately And legs can be lifted above heart level so that blood can flow back to the brain And other vital organs, in case of vasovagal attack).

CONCLUSION

According to our study we found that, Best ,feasible,easy, economical, tolerable way to prevent donor adverse reactions both In house as well as out door camps was to ask the donor to drink 500ml of water 15 to 20 minutes before donation , which will reduce the chances of VVR .This makes the donor more confident and happy so that they will be motivated to become repeat donor and add to our Donor pool. Present study did not show additive benefit of combining muscle exercise with hydration. But further studies are needed to see the effects of combining predonation water with exercises before or during donations.

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