www.ajbrui.org

Afr. J. Biomed. Res. Vol. 20 (September, 2017); 261- 265

Research Article

Prevalence of Adverse Reaction to Whole Blood Donation Among Voluntary Donors in Asaba, Nigeria

Eluke B.C[1], Okonji C.U[2], Ukaejiofo E[1], Eluke C.C, Uchendu K.I[1] & Ibeagha I

Departments of [1]Medical Laboratory Science and , Faculty of Health Sciences and Technology , College of Medicine University of Nigeria , Enugu Campus

[2]Department of Haematology, Federal Medical Center, Asaba Delta State, Nigeria

Department of Morbid Anatomy, College of Medicine, University of Nigeria Teaching Hospital, Ituku Ozalla Enugu Nigeria

ABSTRACT

Fear of donation and adverse reaction to donation can lead to reduction in subsequent donations. The present study is designed to determine the incidence and the association of some predictive risk factors like age, sex, blood group, donation status, donors full blood count to adverse reaction during donation in Asaba Nigeria. Four hundred and fifty-nine (459) voluntary (non-remunerated) blood donors in Federal Medical Center, Asaba participated in the research from August 2015 to January 2016. The subjects consisted of 413 (90%) males and 46 (10%) females. Their blood samples were analyzed by standard techniques. All adverse reactions observed were classified and recorded. The overall incidence of adverse donor reaction was observed to be 2.18% for needle injuries and 2.83% for vasovagal reactions. Dizziness a (mild vasovagal reaction) and bruising/hematoma were the most frequent complications associated with blood donation. The frequency of adverse reactions was higher in younger donors and female donors. Blood group B had a higher predictive value (Odd Ratio 1.112 (0.810-1903) for the association of risk factors to adverse donation. More first-time donors 8(1.74%) compared to 3(0.66%) periodic donors experienced more adverse events. The mean values of electrolytes (Na+, Cl- and $HC0_3$-) post donation was significantly different ($p < 0.05$) from pre-donation values. The prevalence of adverse events to blood donation in Asaba is low for vasovagal and needle injuries. Blood donation is safe. However, this can be made even safer by counseling donors before donation to promote better donor turnout.

Keywords: Blood Donation, Adverse Reaction, Nigeria, Blood Group

*Author for correspondence: *E-mail*: blessingeluke@gmail.com; Tel: +23408032641174

Received: February, 2017; Accepted: June, 2017

Abstracted by:

Bioline International, African Journals online (AJOL), Index Copernicus, African Index Medicus (WHO), Excerpta medica (EMBASE), CAB Abstracts, SCOPUS, Global Health Abstracts, Asian Science Index, Index Veterinarius

INTRODUCTION

Blood donation and transfusion are essential part of our healthcare system (Urmi *et al* 2016). Blood arguably a scare resource, is sourced from apparently healthy voluntary donors (Ukaejiofo 2009, WHO 2012, Odajima *et al* 2016). In view of this, more commercial or remunerated donors are now used as blood become scarce and the economic condition becomes dire. Blood shortages occur usually due to lack of awareness and motivation especially in developing countries. Creating an enabling donor satisfaction and care may initiate donors return. Despite the fact that blood donation is a relatively safe procedure, studies have shown that a percentage of donors experience adverse reactions (Sadia *et al* 2016). The adverse reactions can be mild (nausea and vomiting), moderate or severe (tonic–clonic spasms, arrhythmia, tachycardia).

Adverse reactions to whole blood donations can cause anxiety, discomfort and embarrassment to donors. This can create a negative experience for the donors as well as reducing the donor return rate. Previous studies have shown that the rate to be 2-5%, (Pathak *et al* 2011, Newman 2004), however in some centers it was as high as 36% (Newman 2003) this rate is variable. There is paucity of data on the prevalence of adverse reaction to whole blood donation among voluntary blood donors in Asaba, Delta State. This study was aimed at determinining the prevalence of adverse reactions to whole blood donation among voluntary donors at Federal Medical Centre (FMC) Asaba, Delta State with a view to determine the frequency of the adverse reactions among whole blood donors,

ascertain the types and patterns of occurrence of adverse reactions and determine the association of some factors like age, sex, ABO blood group, donation status, full blood count (FBC) and some electrolytes levels to the occurrence of adverse reactions.

MATERIALS AND METHODS

The study adopted the survey design. It was carried out in Asaba, Delta State over a period of six (6) months from August 2015 to January 2016. The study was approved by the Ethical Committee of Federal Medical Center (FMC) Asaba, permission was also obtained from the Head of Department, Medical Laboratory Services FMC Asaba. Informed consent was obtained from all the donors and handled according to recommendation as stated by the Helsinki declaration. Details of adverse reactions to whole blood donations were also obtained. Four hundred and fifty-nine (459) voluntary donors consisting of 413 males and 46 females who donated 450mls of blood participated in this study. Information on each paticipants was collected with self-administered questionnaires. The questionnaire was divided into four sections. Section A contained questions on demographic (personal data), section B contained questions on the subject anthropometric measurement, section C contained questions on donation status while section D contained questions on health history. Blood samples (3mls) Pre-and 30 minutes post-donation blood samples were collected by venipuncture into ethylene diamine tetracetic acid and heparin bottles for the estimation of FBC:-haemoglobin (Hb), packed cell volume (PCV), Total White Blood Cell Count (WBC),differential white cell count and platelet count and electrolytes- sodium (Na^+), potassium (K^+),chloride (Cl^-) and bicarbonate (HCO_3^-). All tests were analyzed by standard by manual techniques (Baker *et al* 1985, Burtis *et al* 2012).

Statistical techniques

All data obtained was analyzed with statistical package for social sciences (SPSS IBM version 20). Results obtained were expressed as mean $\pm$ standard deviation. Test of significance for the differences between the means of pre-and post-donation for FBC and electrolytes was assessed using the paired t-test while Chi-square and logistic regression were used to test for association between the dependent and independent variables. Variables such as age, sex, donation status, blood group type, levels of haematological variables and electrolytes were used in a logistic regression model based on univariate association with adverse reaction. Odds ratios and confidence intervals were calculated where appropriate; data was analyzed at 95% confidence interval and probability values less than 0.05 were considered statistically significant.

RESULTS

The incidence of adverse reaction to whole blood donation was 2.18% for needle injuries and 2.83% for vasovagal reactions. The pattern of occurrence for needle injuries was hematoma/bruising 1.53%, extravasations 0.44% and injury to nerve 0.22%. Vasovagal reactions pattern of occurrence was: mild, 0.24% had increased perspirations, 1.31% had dizziness while 0.44% had nausea/vomiting. For moderate vasovagal, 0.44% had fainting episodes while 0.22% had a severe vasovagal reaction characterized by rigidity/tremor of extremities Table 1and 2.

Table 1
Complication rates of allogeneic whole blood donations

Type A Complications (Needle injuries)	**No of donors**	Percentage (%) of donors
Haematoma/bruise	7	1.53
Extravasation	2	0.44
Injury to nerve	1	0.22
Total	10	2.18
Type B Complications	**(Vasovagal Syncopal type)**	
Mild	10	2.18
Moderate	2	0.44
Severe	1	0.22
Total	13	2.83

Table-2
Types and patterns of occurrence of adverse reaction

Mild Vasovagal Reaction	No of donors	Percentage (%) of donors
Increased perspiration	2	0.44
Dizziness	6	1.31
Nausea/vomiting	2	0.44
Moderate Vasovagal Reaction		
Shallow Respiration	-	-
Fainting		0.44
Prolonged recovery (>15mins)	2	-
Severe Vasovagal Reaction		
Rigidity/Tremor of extremities	1	0.22
Inconsistency of urine	-	-

Among the different age-groups, donors aged 18-25yrs had the highest numbers 1.53% had a vasovagal reaction of which 1.31% was mild while 0.22% was moderate. 0.22% aged 46-55yrs had mild reactions and 0.22% had a severe reaction. Among the sexes, more females 1.33% had adverse reaction compared to 1.31% males. Among the different ABO blood groups, blood group B donors has the highest number of donors that reacted (1.31%) of which 1.09% was mild and 0.22% was severe, 2.18% of first time donors reacted more than 0.66% of the repeat donors as shown in table 3.
The results of pre- and post-donation FBC results comprising of Hb, PCV, Total WBC, differential white cell count and platelet count result were not significantly altered ($p > 0.05$). Pre-and post-donation Na^+ and Cl^- were significantly decreased ($p < 0.05$) when compared among those that had vasovagal reaction against those that did not have vasovagal reaction. HCO_3^- was significantly increased($p < 0.05$) when

compared among those that had vasovagal reaction against those that did not have vasovagal reaction. Pre-and post donation K^+ was not significantly altered(Table 4).

The associations of blood group B (odds ratio = 1.110), first time donations (odds ratio = 1.114) and post-donation Na^+(odds ratio = 1.117) and HCO_3^-(odds ratio = 1.555) was higher at predicting the risk of adverse reaction to whole blood donation than the other variables which are age, sex and post-donation K^+values.(Table 5) .

Table 3
Vasovagal Reaction Rates Among the First-Time and Repeat Donors.

	First-time		Repeat	
	No of donors	% of donors	No of donors	% of donors
Mild	8	1.74	2	0.44
Moderate	2	0.44	-	-
Severe	-	-	1	0.22
Total	10	2.18	3	0.66

Table 4
Pre- and Post-Donation Electrolyte in Donors with Adverse Reaction

	Pre-donation (mmol/l)	Post donation (mmol/l)	P-Value
Sodium (Na^+)	146±2.0	33±5.0	p < 0.05
Potassium (K^+)	3.8±0.7	3.8±0.3	P > 0.05
Chloride (Cl^-)	95±5.0	98±6.9	p < 0.05
Bicarbonate (HCO_3^-)	22±3.7	2.6±6.5	p < 0.05

DISCUSSION

Voluntary donors expect normalcy during blood donation. However, donor adverse reaction to donation continues to affect the donor's subsequent return rate. We studied the prevalence of adverse reaction in this part of Africa and contributing factors that may be implicated. In this study, more incidences of adverse reactions to blood donation was observed for needle injuries (categorized type A) followed by for vasovagal reactions (categorized type B). The needle injury donor events were experienced by ten donors while other donors had hematoma, extravasations of needles, and injury to the nerve. The frequency of injury to the nerve had the least prevalence. These were observed within 30mins post-donation. Needle injuries observed were less than that reported by Abhishekeh *et al*. in (Abhishekeh *et al* 2013 and Crocco *et al* 2007). The decrease less needle injuries observed may be likely due to the training and carefulness of the blood collection staff.

The patterns of occurrence of the 13(2.83%) donors who experienced vasovagal (syncopal-type) reaction were: 10 (1.74%) mild, 4(0.22%) moderate and 1(0.22%) donor experienced severe donor reaction. This rate has been similarly documented by Crocco *et al* 2007. Vasovagal reactions were experienced more than other types. 7(1.53%) female donors had a vasovagal reaction in contrast to 6(1.31%) male. Most of these reactions were mild. This is represented by other works (Narbey *et al* 2016). However, lower percentages have been reported by others (Mahbub-ul-Alam *et al* 2007, Ashu *et al* 2016). Vasovagal reaction is caused by involuntary reflex that affects the heart and the vagus nerves resulting in a plethora of situations like fainting, (vasovagal syncope), seizures and dizziness.

Table 5
Adverse Donor Reactions and Associated Risk Factors

Risk factors	N	p-value	Odds Ratio (95% C.1)
Sex	459	0.707	0.716(0.126-4077)
Age	459	0.548	0.974(0.895-1.061)
Blood Group A	459	1.000	0.871(1.09-3.014)
Blood Group B	459	0.000	1.110(0.810-0.901)
Blood Group O	459	1.000	0.542(1.350-2.904)
PCV	459	0.214	0.858(0.674-1.092)
Donation Status (first Time)	459	0.049	1.114(0.0422-0.696)
Donation Status (repeat)	459	0.889	1.106(0.276-4.431)
Post Donation Na^+	459	0.125	1.117(0.90-1.287)
Post Donation K^+	459	-0.003	0.011(0.001-0208)
Post Donation Cl^-	459	0.071	0.850(0.713-1.14)
Post Donation $HC0_3$	459	0.021	1.555(1.069-2.251

Independent variables that were considered are those thought to relate to adverse reaction. R^2 (R-square)= 0.23.

Severe donation reaction was observed only in a male donor. Severe adverse donation is higher in males that in females (France *et al* 2012) and could be attributed to more attention of the phlebotomist or less anxiety by the female donor. Furthermore, this may be because the males donate more than females. (Damulak *et al* 2015)

10(2.18%) first time donors compared to 3(0.66%) periodic donors experienced a vasovagal reaction. First time reacted more than repeat donors. This may possibly due to seeing the large volume of blood for the first time. Vasovagal reactions include sweating, nervousness and agitation. Some first time donors are already presenting with some of these prior to donation. Mahbab-ul-Alam and his colleagues observed that the number of prior donations was inversely proportional to the risk of reactions as donor who reacted were less likely to return (Mahbub-ul-Alam *et al* 2007).

The result of the analysis of the pre- and post- donation full blood count showed no statistical difference ($p < 0.05$). However, other authors from previous research found that blood donation could cause immune modulation leading to a decrease in the lymphocyte subset population (the natural killer cells).(Lange *et al* 1996). Furthermore, when donors pre- and post- electrolytes (Na^+, K^+, Cl^- and HCO_3^-) results were compared, Na^+ was significantly decreased in the donors that had adverse reaction ($p < 0.05$) when compared to the donors that did not react. Sodium plays a role in maintenance of electrolyte balance and proper functioning of the nerves and

muscles. The level is controlled by the hormone aldosterone and made by the adrenal glands. This may probably be the reason Custer and his colleagues had proposed that the ingestion of a salty snack with fluid within 30mins post-donation.(Custer *et al* 2008, Hanson and France 2004, Ven denBerg 2012, Tomasulo *et al* 2011). Potassium (K^+) level was not significantly altered ($p = 0.717$) in contrast with the work by some authors who observed an increase in potassium post donation and attributed it to the increase muscle tensing, that helps to increase blood flow to the brain in order to prevent fainting (Newman *et al* 2006,Ditto *et al* 2007, Ditto *et al* 2003)]. Chloride (pre- and post- donation) showed a significant modest correlation. Chloride usually fluctuates with Na^+ and is usually increased following lung disease and prolonged vomiting. Pre- and post donation bicarbonate (HCO_3^-) levels were significantly altered ($p < 0.05$) probably due to its ability to maintain a stable pH and electrical neutrality.

The results obtained shows that donor reactions to whole blood donation may not be solely psychological as proposed by Ingrid in 2013(Ingrid 2013) and France *et al*(France *et al* 2013). It is possible that physiological factors may have played a role. In the analysis of vasovagal complications of whole blood donation, it was observed that more donors 6(1.31%) experience dizziness. Dizziness/ lightheadness could be caused by a wide range of factors and could lead to faintly episodes or headaches (Wiltbank *et al* 2008).

In conclusion, this study has helped to determine the frequency of adverse reaction to whole blood donations, to evaluate the various types and their patterns of occurrence and to correlate some of the predictive factors that may be associated with these reactions at FMC, Asaba. The vast majority of the adverse events are mild, this rate compares favorably with that of other blood donation centers. However, some rare complications are severe especially that related to vasovagal reactions caused by accidents and nerve injuries with long lasting symptoms. These can have serious consequence for the donor and can impact on his or her daily life.

REFERENCES

Abhishekeh B., Mayodevi S., Usha K.C. (2013): Adverse reactions to blood donation.Innovative. *Journal of Medical and Health Science*. 3,158-160.

Ashu Dogra., Meena Sidhu., Mitu Dogra, Tilax Raj Raina (2015): Study of Adverse whole blood donor reactions in normal healthy blood donors: experience of tertiary health care centre in Jammu region. Indian Journal of Hematology and blood Transfusion. 31(1), 142-145.

Baker F.J and Silverton R.E. (1985): Introduction to Medical Laboratory Technology. 6th edition.Butterworths, London. 310 – 334.

Burtis C.A, Ashwood E.R., Bruns D.E. (2012): Selection and Analytical Evaluation of methods with Statistical Techniques.Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Elsevier. 7 -47.

Crocco A., Elia. D. (2007): Adverse reactions during voluntary donations of blood or blood components.A statistical-epidemologicalstudy. *Blood Transfusion*. 5(5), 143-152.

Custer B., Giordon G., Karnel H., Tomasulo P., Witbank T. (2008): Preventing Adverse Donor Reactions; European HaemovigilanceSeminar.*United Blood Service.*10, 12-24.

Damulak OD,Egesie OJ,Chetle L, Thomas M. (2015): Adverse Effects of Whole Blood Donation among Voluntary Blood Donors in Jos, Nigeria. *Clinical Medicine Research.* 4 (1), 6-10.

Ditto B., France C.R., Lavoie P., Roussos M., Adler P.S.J. (2003): Reducing reactions to blood donation with applied muscle tension: a randomized controlled trial. *Transfusion.*;*43*(9), 1269-1275.

Ditto B., France C.R., Albert M., Byrne N. (2007): Dismantling applied tension: mechanisms of atreatment to reduce blood donation-related symptoms. *Transfusion.* 47, 2217-2222.

Eder A.H., Hillyer C.D., Dy B.A., Notari, E.P., Benjamin, R.J. (2008): Adverse reactions to allogeneic whole blood donation by 16- and 17-year-olds. *JAMA.* 299(19), 2279-2286.

Eder A.F., Dy B.A., Kennedy S.M. (2011): Improved safety for young blood donors with new selection criteria for total estimated blood volume. *Transfusion.* 51, 1522-1531.

Eder A.F., Dy B.A., Ralston J., Kennedy J.M., Demaris P., Procaccio A., Benjamin R.J. (2009): Effective reduction of donor reactions on high school drives with standard work guidance. *Transfusion.* 49(Suppl3), 518A.

France C.R., France J.L., Kowalsky J.M., Ellis G.D. (2012): Assessment of donor fear enhances prediction of presyncopal symptoms among volunteer blood donors. *Transfusion.* 52, 375-380.

France C.R., France J.L., Himawan L.K., Stephens K.Y., Frame-Brown T.A., Venable G.A., Menitove J.E. (2013): How afraid are you of having blood drawn from your arm? A simple fear question predicts vasovagal reactions without causing them among high school donors. *Transfusion.* 53, 315-321.

Hanson S.A., France C.R. (2004): Predonation water ingestion attenuates negative reactions to blood donation. *Transfusion. 44*(6), 924-928**.**

Ingrid V. (2013): Psychology behind blood donation; European Blood alliance. *Sanquin Blood Supply.* 1: 11-29 based on 1000 interviewed whole blood donors. *Transfusion*. 45: 1715- 1721.

Lange S., Riggert J., Humpe A., Dittmann J., Simson G., Kohler M. (1996): Immunological effect of blood donation. Transfusion Medicine. 33: 93-97.

Mahbub-ul-Alam M., Hyder M.S., Khan M.B.K.(2007): Adverse donor reaction during and immediately after venessection. .*Blood Transfusion*. 20, 39-47.

Narbey D., Filet AM, Jbilou S., Tiberghien P, Djoudi R. (2016): Case control study of immediate and delayed vasovagal reactions in blood donors. *Von Sang*. 111:257-265.

Newman B.H., Pichette S., Pichette D. (2003): Adverse effects of blood donation. *Transfusion*. 43, 598-603

Newman B.H.(2004): Blood donor complications after whole blood donation. *Current Opinion in Haematology*. 11, 339-345.

Newman B.H., Roth A.J.. (2005): Estimating the probability of a blood donation adverse event. *Transfusion*. 45, 1715-1721.

Newman B.H., Newman D.T., Ahmad R., Roth A.J. (2006): The effect of whole blood Donor Adverse events on blood donor returns rates. *Transfusion.* 46, 1374-1379.

Odajima T., Takunashi M., Sugimori H., Tanba T., Yashinaga K., Motoji T., Munakata M., Nakajima K., Minami M.(2016):Impact of elevated hemoglobin and serum protein on vasovagal reaction from blood donation. *PLos One*. 19:11(2):e0148854.

Pathak C., Pujani M., Pahuja S. (2011): Adverse reactions in whole blood donors: an Indian scenario. *Blood Transfusion*. 9, 46-49**.**

Sadia Sulton, Mohammad Baig, Syed Mohammed Irfan, Syed Ijlal Ahmed, Syeda Faiza Hasan. (2016): Adverse reactions in allogeneic blood donors: A tertiary care experience from a developing country. *Oman Medical Journal.* 31(2), 124-128

Tomasulo P., Kamel H., Vravo M., James R.C., Custer B.(2011): Interventions to reduce the vasovagal reaction rate in young whole blood donors. *Transfusion.* 51, 1511-1521.

Ukaejiofo E.O.(2009): Criteria for Recruitment as a Blood Donor. Blood Transfusion in the Tropics. Salem Media Ltd. Ibadan Nigeria. 4,129-132.

Urmi Charkravaty –Vartak, Rohini Shewale, Shailesh Vartak, Felice Faizal, Nikhil Majethia. (2016): Adverse reactions of blood transfusion: A study in a tertiary care Hospital. *International Journal of Scientific Study.* 4(2), 90-94

Ven den Berg K., Lam J., Bruhn R., Custer B., Murphy E.L. (2012): Water administration and the risk of syncope and presyncope during blood donation: a randomized clinical trial. *Transfusion.* 52, 2577-2584.

Wiltbank T.B., Giordano G.F., Kaniel H. (2008): Faints and pre-faints reactions in whole blood donors: an analysis of pre-donation measurements and their predictive value. *Transfusion.*48, 1799-1808.

World Health (2012): Organization, Guidelines on Assessing Donor Suitability for Blood Donation. Blood Donor Selection. 2012.