PRE-DEPOSIT AUTOLOGOUS BLOOD DONATION AS A TOOL FOR REDUCING RISKS ASSOCIATED WITH ALLOGENEIC BLOOD TRANSFUSION IN NIGERIA: IS IT WORTH NURTURING?

Dr. Joseph Aondowase Orkuma.

Corresponding Aurthor.

Dr .Joseph Aondowase Orkuma.

Department of Haematology, College of Health Sciences, Benue State University, Makurdi-Nigeria

+234(0)8057372640 orkumajoseph@yahoo.com

Abstract:

Background: *Pre-deposit autologous blood donation (PAD) wherein patient's own blood is collected over a period of time in the lead up to a planned transfusion to the same patient may be a viable alternative to reducing the known and unknown risks often associated with allogeneic blood.*

Objectives: *To assess the practice of pre-deposit autologous blood donation at a hospital-based blood bank unit in north central Nigeria over a four year period.*

Materials and method : *This cross sectional study retrospectively assessed blood transfusion documents and records at the blood bank unit of Federal Medical Centre, Makurdi from 2009 to 2012.Information on pre-deposit autologous and allogeneic blood donations, types of blood donors and components or products utilized from the records and documents were analysed for proportions using Microsoft Excel and manual methods.*

Results: *Pre-deposit autologous blood donation was generally low (average 0.40%) and showed a gradual decline over the years; 0.79, 0.31, 0.27 and 0.21 percent in comparison with allogeneic blood donation (76.71, 78.21, 84.76 and 80.36%) average 80.02% and 22.50, 21.49, 14.95 and 19.44 average 19.60% for family replacement and VNRBDs respectively in the years 2009, 2010, 2011 and 2012 respectively. Whole blood and packed red cells transfusions were the predominant blood products utilized over the years with 96.64, 99.04, 97.83 and 98.18% (average 98.32)transfusedas whole blood while 2.57, 0.65, 1.90 and 1.61% (average 1.68%) was transfused as packed cells respectively. All the pre-deposit autologous donations and over 95% of all allogeneic blood donations were transfused as whole blood over the study period.*

Conclusion: *Pre-deposit autologous blood donation is hardly practiced in a setting of high risk and unsafe allogeneic blood due to inadequate implementation of practice guidelines by practitioners.*

Recommendation: *Further researches are needed to improve the overall safety of pre-deposit autologous blood donation especially in a weakened centrally controlled blood system existent in Nigeria.–It may be pertinent to provide adequate knowledge, reassess and develop existing guidelines for the practice of PAD in*

Nigeria

.***Key words:*** *Pre-deposit autologous donation; allogeneic blood donation; hospital blood bank; north-central Nigeria;*

Introduction.

The problems of blood transfusion safety are profound in many resource-limited settings and have culminated in increasing refusal to accept allogeneic blood transfusion in both religious and non-religious adherents. These concerns seem to be reinvigorating researches in autologous blood therapy in recent times. (1) Autologous blood donation (ABD) or "auto donation" describes the collection of blood from a particular individual for transfusion back to self. Allogeneic blood donation on the other hand is the collection of blood from another individual for the transfusion of another person. (2)

Earlier, clinical works and animal experiments by Dr. James Blundell pioneered ABD but, it was the later publications by William Highmore in 1874 that unveiled this largely unknown therapy. amidst the potential allogeneic blood risks like transfusion transmissible HIV infection(TT-HIV) with the HIV epidemic in the early 1980s (3)(4) following these early strides, ABD gradually started witnessing more research interests.

Many benefits of ABD have been advanced including; reduced risk of transfusion transmissible infections (TTIs) transfusion reactions, safer transfusion outcomes in patients with rare blood groups and multiple auto-antibodies, elimination of immunosuppression, red cell alloimmunization and immunization of HLA antigens.(3) Additional advantages include reduced risks of transmitting immunological diseases like asthma and urticaria as well as reduction in graft versus host disease.(3) Besides, some religious adherents like the patients who are Jehovah's Witness may accept this practice. Additionally, cross-matching is not usually required while allogeneic blood is conserved for those ineligible for ABD and those who need it, particularly for emergency interventions. (5) There are also reports suggesting that, ABD improves the safety and availability of blood and averts liabilities incident to healthcare practitioners and the hospitals arising from malpractice or negligence attributable to risks inherent in allogeneic blood transfusion.(3)(6) On the other hand, there are concerns of its limited applicability in clinical settings and not being sufficient in sustaining the overall blood needs of the hospital, high wastage rates, fear of bacterial contamination and fluid overload as well as clerical errors and increased overall possibility of needing a transfusion (allogeneic or autologous). (4) These concerns in addition to the fact that, many developed countries have adopted strict donor selection criteria, advanced screening technologies and appropriate clinical use of blood that have significantly scaled down the overall risks associated with allogeneic blood donation affected the expected growth of ABD globally.

Three basic techniques for ABD are recognized including; Cell salvage where blood shed at surgery or in similar circumstance is harvested from suction, surgical drains, or both and re-infused back to the patient immediately or after concentration and

purification.; acute normovolaemic haemodilution (ANH) where blood is collected immediately prior to surgery and blood volume replacement done by crystalloid or colloid and the blood re-infused towards the end of surgery once haemostasis is achieved-(1,3, 4, 7)

In hospital-based blood banks, the storage of PAD is the backbone of autologous blood donations and forms a majority of the technique of ABD in practice. Some unique advantages of pre-deposit autologous blood donation over other methods of autologous donation includes; stimulation of bone marrow cells proliferation by repeated phlebotomies,-erythrocyte regeneration, increase haematopoietic function in patients after surgery,– primary wound healing and reduced chances of infection caused by immunoreaction from allogeneic blood transfusion. Additionally, it has a favourable predisposition to reducing the adverse reactions of blood transfusion, maintaining normal blood indexes, improving abnormal blood rheology and alleviating the lack of blood supply. (1) However, its limitations in clinical practice includes; the method of storage, risk of anaemia in donors, its application mainly in elective surgery and the fact that it's best applied in the young patients but not the old. (1) Besides, it is also feared expensive, its benefits difficult to assess, and its increasing popularity raising many difficult ethical issues, such as whether the benefit of allogeneic transfusion supports its additional expense especially with the introduction of recombinant human erythropoietin to stimulate red blood cell production before autologous donation and helping to decrease the need for transfusion post donation. (8)(4) Birkmeyer et al (9) also lamented on its low cost-effectiveness in comparison with most accepted medical practices and advised on improvement by avoiding over collection and over transfusion. (9) In spite of these debates, PAD has been deployed in decreasing patient's exposure to allogeneic blood (10) and has successfully found application in patients undergoing elective cardiac surgery, (10)(11)(12) spinal and neurosurgery, (1)(13) orthopaedic surgery, (6)(9)(14)(15)(16) obstetrics (17)(18)(19) and paediatrics practice in different parts of the world. (20)

For hospital-based blood banks in resource-limited settings of Nigeria, there exist inherent challenges of safety necessitating research on viable approaches to practice improvement and in the development of viable less risk alternatives or interventions. This study therefore, sought to assess the practice of PAD with reference to allogeneic blood donations at the blood bank unit of Federal Medical Centre, Makurdi in north central Nigeria over a four year period.

Methodology:

This cross sectional study retrospectively assessed blood transfusion documents and records at the blood bank unit of Federal Medical Centre, Makurdi in north central Nigeria from 2009 to 2012. Federal Medical Centre Makurdi is a 400 bed hospital located in makudi metropolis of Benue State. It is a tertiary health care facility serving as a referral centre for other hospitals in Benue and parts of her neighboring states of Nassarawa, Kogi, Taraba and Cross River including. The Data inclusion criteria included – all blood donations and utilizations in the hospital over the period [those sourced from the NBTS regional blood transfusion centres in Jos and Lokoja or were donated at the unit as voluntary non remunerated blood donations (VNRBDs)], Pre-deposit autologous blood donations by patients prior to their surgeries or planed treatments within the hospital, Family donations by relations/ spouses or friends prior to particular patients' treatment or family replacements where donations were made to replace blood units earlier assessed by a patient as

"loan" without prior donation. In the absence of existing strict criteria applied to autologous donation at the time, all blood donors included (allogeneic and autologous) fulfilled the minimum criteria to donate blood in Nigeria. Paid blood donations and blood transfers from other hospitals were excluded. The study involved retrieving relevant information on autologous and allogeneic blood donations, types of blood donors and type of component or product utilized from the records and documents over the four year study period.

Data was entered into Microsoft Excel and analysed for simple proportions Ethical clearance for the study was obtained from the ethics review committee of Federal Medical Centre Makurdi.

Results: Results narrative

Table 1: Pre-deposit autologous and allogeneic blood donations at Federal Medical Centre Makurdi between 2009-2012.

TYPES OF BLOOD DONOR	**2009**	**2010**	**2011**	**2012**
AUTOLOGOUS	12 (0.79%)	8 (0.31%)	9 (0.27%)	6 (0.21%)
ALLOGENEIC				
1. VNRBDs	342 (22.50%)	558 (21.49%)	497 (14.95)	566 (19.44%)
2. FBD/FRD.	1166 (76.71%)	2031 (78.21%)	2818 (84.78%)	2340 (80.36%)
TOTAL	**1520 (100%)**	**2597 (100%)**	**3324 (100%)**	**2912 (100%)**

KEY: VNRBD= Voluntary Non Remunerated Blood Donors; FBD≥Family Blood Donors; FRD≥Family Replacement Blood Donors

Table 2: Types of blood componentstransfusedat the Federal Medical Centre Makurdi between 2009-2012.

Type of component donated	2009	2010	2011	2012
1) Whole Blood	12 (0.79%)	8 (0.31%)	9 (0.27%)	6 (0.21%)
a. Autologous	1469 (96.64%)	2572 (99.04%)	3252 (97.83%)	2859 (98.18%)
b. Allogeneic				
2) Packed Red cells	0	0	0	0
a. Autologous	39 (2.57%)	17 (0.65%)	63 (1.90%)	47 (1.61%)
b. Allogeneic				
3) Washed red cells	0.0 0	0.0 0	0.0 0	0.0 0
4) Platelet concentrates .	0.0 0	0.0 0	0.0 0	0.0 0
5) Other components/products	0.00	0.00	0.00	0.00
TOTAL	**1520 (100)%**	**2597 (100)%**	**3324 (100)%**	**2912 (100)%**

DISCUSSION

Pre-deposit autologous blood donation(PAD)in this study was low (average 0.40%) and showed a gradually decliningtrend over the years in comparison with allogeneic blood donations(average 80.02% and 19.60%) for family replacement and VNRBDs respectively and showing unpredictable distribution patterns over the yearsas indicated in table 1. This low practice of PAD is similar to that widely reported in many developed economies where allogeneic donations are continually made safer with the practice of PAD becoming increasingly unnecessary.Given thiscircumstance, some developed countries have either reduced the practice to cases of absolute necessity or have out rightly withdrawn from its practice as a national proclamation. (4)(13)(21)(22)(23)

While advancements of safe transfusion practices are appreciative in developed countries including the adoption of strict donor selection, successful screening for transfusion transmissible infections and using advanced technologies like NAAT, pathogens inactivation, effective clinical use of blood and rapidly evolving evidence-based best practices including screenings for many emerging TTIs, adoption of leuco-depleted and component specific transfusion practices in cost saving approaches, less developed countries like ours are still struggling to overcome inadequate donor recruitment and poor quality blood transfusion.

The hospital-based blood banking system in Nigeria is yet to adopt deeply rooted safe transfusion systems via allogeneic blood donations; blood is scarce, strict donor selection is not absolute and characterized by paucity of VNRBDs andwith heavy dependence on

family and replacement donors,weak potentials for intersecting TTIs (routine and emerging pathogens) and whole blood transfusion being used as the default rather than component-specific transfusions for only deserving patients. These high risk factors prevail in this study where majority of the blood donors were family and replacement donors(80.02%) rather than VNRBDs(19.60%) respectively over the study period as seen in table 1.

Relatedly, leuco-depletion and component specific therapy aimed at reducing sensitization, immunomodulation and immunoparesis as a risk of allogeneic blood transfusion is at the lowest ebb of practice as demonstrated in table 2. In this study, whole blood and packed red cells transfusions were 98.32% and 1.68% respectively with 100% autologous and 95% of and allogeneic donations transfused as whole blood.

Additionally, Nucleic Acid Amplification testing (NAAT), commonly deployed in securing allogeneic blood donations in developed countries is not universally available in Nigeria. Therefore, screening for TTIs at hospital-based blood banks (majority of which are resource constrained, autonomous and self-funding) is done deploying rapid antibody and rarely combined antigen-antibody based tests which often demonstrate high false negative results that culpably disseminate TTIs to allogeneic blood recipients. (24) These prevailing risks in our study negate that obtained in developed countries where the practice is reported low and suggest the likely transmission of pathogens in rapid kits screened false negative blood units.

Another consideration of possible causes of our low findings in this study may relate to existent knowledge gap of physicians who are expectedly drivers of the practice in hospital setting.The practice of PAD rests on a tripod; on one stand is the patient, on the second the referring physician and on the third a Haematologistwho evaluates the patient before his or her PAD sessions. It is often the responsibility of the physician or surgeon intending to utilize this practice to educate the potential pre-deposit autologous donor and then refer him or her to the blood bank unit where he or she is expected to interact with the transfusionist, beevaluated for safety to donate in line with hospital-based or hospital domesticated guidelines,gives informed consent and donates his pre-deposit autologous blood. (3) The physician as a major component in the clinical and laboratory aspects of PAD must be guided with sufficient knowledge on current practice domesticated in the hospital for PAD. Where gaps in knowledge exist arising most commonly from inadequate or non-availability of guidelines that precisely guide the practice, pre-deposit autologous blood donation may be lightly practiced as observed in this study. The absence of domestication of existing national guidelines on autologous blood donation practice warranted inappropriate adoption of the guidelines applied in allogeneic blood donation for all pre-deposit donors in our centre. (7)(25) To this effect, the non-adoption of practice guidelines for autologous blood donation in Nigeria's hospital based blood bank by physicians rather than a high level of safety of allogeneic blood seem to have contributed to the low record of PAD in this study.

While it is true that, PAD cannot be applicable to all patients especially those requiring blood in emergency it will however reduce the demand on allogeneic blood which should be aptly applied tomeet emergency transfusion needs. Additionally, PAD guidelines could be modified to allow donations not used for particular donors, deployed to improve the overall blood pool of the hospital in critical areas of need. The practice of PAD may also provide links between the hospital-based blood

bank, autologous donors and the national blood transfusion service. This link could be explored or targetedfor voluntary blood donor motivation, education, recruitment and retention.

Conclusion:

Pre-deposit autologous blood donation is undeveloped in our hospital-based blood bank. We also conclude that appropriate clinical use of blood is poorly practiced in our setting where donated blood is mainly from allogeneic replacement donors.

Recommendation: Further researches are needed to improve the overall safety of pre-deposit autologous blood donation especially in a weakened centrally controlled blood system existent in Nigeria. It may be pertinent to provide adequate knowledge, reassess and develop existing guidelines for the practice of PADin Nigeria

Acknowledgement: I greatly appreciate Drs Ndubisi, and Gomerep SS for their encouragements towards the production of this manuscript. I am also grateful to Mrs Monica Ugoh and Mr Godwin Udende for assisting in the data collection.

Conflict of interest: There is no conflict of interest involving the author in this work

References

1. J Z. A review of the application of autologous blood transfusion. Braz J Med Biol Res. 2016;49(9):e5493.
2. Ajit Walunj, Anna Babb RS. Autologous blood transfusion BJA Education. Contin Educ Anaesthesia, Crit Care Pain. 2006;6(5):192-6.
3. Slater N. Autologous Blood Transfusion. Malaysian J Pathol. 1991;13(2):67-73.
4. Minck S, Spigiel T. Australian Red Cross BLOOD SERVICE: What is preoperative autologous donation?? Transfusion. 2013;5(2):64.
5. Adias, Teddy Charles, Zacheus Jeremiah EU and OE. Autologous blood transfusion-a review. SAJS. 2006;44(2):70-3.
6. Goodnough LT. Autologous blood donation. Crit Care [Internet]. 2004;8 Suppl 2(Suppl 2):S49-52. Available from: /pmc/articles/PMC3226143/?report≥abstract
7. Inc. AS of BT. Topics in Transfusion Medicine: Guidelines for Autologous Blood Collection. Vol. 9. 2002. p. 1-54.
8. RE D. Preoperative autologous blood donation clinical, economic, and ethical issues. Cleve Clin J Med. 1996;63(5):295-300.
9. Birkmeyer JD, Goodnough LT, AuBuchon JP NP and LB. The cost-effectiveness of preoperative autologous blood donation for total hip and knee replacement. Transfusion. 1993;33(7):544-51.
10. I D Graham, D Fergusson, H Dokainish, J Biggs LM and AL. Autologous versus allogeneic transfusion patients' perceptions and experiences. CMAJ. 1999;160(7):989-95.
11. J Y Duuis GB and JR. Transfusion practices among patients who did and did not predonate autologous blood before elective cardiac surgery. CMAJ. 1999;160(7):997-1002.
12. JF B. Autologous blood donation with recombinant human erythropoietin in cardiac surgery the Japanese experience. Semin Hematol. 1996;33(2 suppl 2):64-7.
13. N W. [Current situation and issues in preoperative autologous blood donation in Japan]. Nihon Geka Gakki Zasshi. 205AD;106(1):23-30.
14. Biggan DP, Czysz C, Manuel T. Autologous Blood Transfusion During Emergency Trauma Operations. Arch Surg. 2010;145(7):690-4.
15. Bou Monsef J, Figgie MP, Mayman D, Boettner F. Targeted pre-operative autologous blood donation: A prospective study of two thousand and three hundred and fifty total hip arthroplasties. Int Orthop. 2014;38(8):1591-5.
16. Churchill WH, McGurks S, Chapman RH, Wallace EL, Bertholf MF, Goodnough LT, Kao KJ, Olson JD WR and SD. The Collaborative Hospital Transfusion Study variations in use of autologous blood

account for hospital differences in red cell use during primary Hip and Knee Surgery. Transfusion. 1998;38(6):530-9.
17. McVay PA, Hoag RW, Hoag MS, Toy PTCY. Safety and use of autologous blood donation during the third trimester of pregnancy. Am J Obstet Gynecol [Internet]. 1989;160(6):1479-88. Available from: http://www.embase.com/search/results?subaction≥viewrecord&from≥export&id≥L19171156
18. Zipparo JG and L. Autologous Predeposit Blood Donation in Pregnancy ? a Perspective - Gibson - 1993 - Australian and New Zealand Journal of Obstetrics and Gynaecology - Wiley Online Library. Austrlian New Zeal J Obstet Gynaecol. 1993;33(3):267-79.
19. Kruskall MS, Leonard S, Klapholz H. Autologous blood donation during pregnancy: analysis of safety and blood use. Obstet Gynecol. 1987;70:938-41.
20. Luban LD and NL. Autologous Blood Transfusionin Pediatrics. Pediatrics. 1990;85(1):125-8.
21. AA. VE and P. Autologous transfusion and other approaches to reduce allogeneic blood exposure. Baillieres Best Pr Res Clin Haematol. 2000;13(4):533-47.
22. Schved JF. [Do we need autologous blood donation]. Ann Fr Anesth Reanim. 2004;23(5):468-73.
23. Pambrum C. Preoperative Autologous Donation. In: SERVICES CB, editor. in Clinical Guide to transfusion. 2017. p. 1-2.
24. Orkuma JA, Egesie JO, Banwat EB, Ejele AO, Orkuma JH. Hospital-based Human Immunodeficiency Virus antibody screening of blood donors in Nigeria?: how adequate?? Int JournL Infect Trop Dis. 2014;1(2):77-86.
25. Abuja N. Operational Guidelines for Blood Transfusion Practice in Nigeria. 2007. p. 72-4.