Nigerian Medical Journal
NIGERIA MEDICAL ASSOCIATION
Print ISSN 0300-1652, E-ISSN 2229-774X

Original Research

Blood usage among orthopedic patients at the Rivers State University Teaching Hospital, Port Harcourt, Nigeria

Friday Enwumelu Aaron[1], *Rex Friday Ogoronte Alderton Ijah[1], Hannah E. Omunakwe[2], Mike T. Achor[1]

[1]Department of Surgery, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.
[2] Department of Hematology and Blood Transfusion, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.

Abstract

Background: Blood transfusion holds a significant place in the practice of surgery, including orthopaedic surgeries. The aim of this study was to evaluate the intraoperative use of blood and blood products among orthopaedic patients operated at the Rivers State University Teaching Hospital from January 2021 to December 2021, focusing on the demographics of patients, number and type of surgeries needing a blood transfusion, and the number of blood transfusions.
Methodology: A retrospective observational study was carried out at the operating theatre of a referral tertiary hospital using a designed proforma to extract data from the registers of operated orthopaedic patients.
Results: There were 168 males and 145 females who were operated on, and 43 (13.74%) of them had intra-operative blood transfusion. Patients between 41 to 50years and 51 to 60 years dominated the distribution with a total of 20 (46.5%), out of 59 blood transfusions carried out. The surgical condition requiring the highest number of blood transfusions was fractures (29), followed by foot gangrene (17) occasioned by diabetes mellitus and peripheral vascular disease. Open reduction and internal fixation for fractures (18) constituted the highest single type of surgery carried out within the study period.
Conclusion: A bimodal age distribution was observed in intraoperative blood transfusion requirements. The orthopaedic intraoperative blood transfusion burden was 13.74%, mainly for open reduction and internal fixation for fractures.

Keywords: *Blood Transfusion; Orthopedic Patients; Theatre; RSUTH; Port Harcourt; Nigeria.*

***Correspondence:** Dr Rex Friday Ogoronte Alderton Ijah. Department of Surgery, Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria. E-mail: rexijah@gmail.com

How to cite: Aaron FE, Ijah RO, Omunakwe HE, Achor MT. Blood usage among orthopedic patients at the Rivers State University Teaching Hospital, Port Harcourt. Nigeria. Niger Med J 2024;65(6):1062-1069.https://doi.org/10.60787/nmj.v65i6.427.

Quick Response Code:

Introduction

Blood transfusion holds a significant place in the practice of surgery, including orthopedic surgeries.[1, 2] In orthopedic practice, tumor surgeries, pelvic surgeries, and arthroplasties are often associated with heavy blood loss, although efforts are made to conserve blood loss.[3-6] Recommendations for the implementation of a patient blood management program were based on three laudable pillars of optimizing patient's erythropoiesis, minimizing blood loss, and optimizing tolerance of anemia.[7, 8] The modern trend in the use of blood is that of limiting the indications as much as possible to specific blood components needed by the patient. However, whole (fresh) blood transfusion may be indicated in some extreme and austere circumstances, and also when conventional component therapy is unavailable.[9] This same vital circulating fluid that carries oxygen and nutrients to the cells of the body for usage and delivers carbon dioxide and other waste products of metabolism for excretion from the body, is held sacred by some,[10-12] and prohibited for transfusion by some,[13, 14] yet life-saving and still in use.[15-17]This calls for sensitivity of practitioners in its use, and adherence to best practices when usage is indicated.

The use of specific blood components is the recommended best approach; however, blood component separation machines / equipment is not available in most service centers. Additionally, although the use of blood - whole blood, packed cells, red blood cells, etc. - has been categorized by the World Health Organization as part of essential drugs,[18, 19] availability of these blood products has been limited by non-availability of blood component separation machine/equipment, thereby affecting compliance. There are global challenges of insufficiency of blood and its products, among others, across the globe, especially in low and middle-income countries.[20, 21] Recently, the issue of blood deserts has become topical,[22] where the clinical need for blood transfusion in certain geographical areas are unmet in at least 75% in a timely and affordable manner. The need for innovations and the use of certain strategies have therefore been reported including the use of walking blood banks, intraoperative blood transfusion, and drone-based blood delivery.[22] Challenges are boundless, as could be seen in a recent report from Colombia in South America which suggested that there was improper prescription of the use of red blood cell transfusion.[23]

In Africa and Nigeria in particular, the challenges are enormous. Whole blood/fresh whole blood was reported as the most commonly transfused among children receiving chemotherapy in a tertiary hospital in Uyo, Nigeria.[24] A report across Nigeria also that 78% of hospitals were unable to regularly transfuse blood due to scarcity, as 45% were able to provide packed red blood cells, and only one center was able to provide leukocyte-depleted blood.[25] We do not have a facility for component separation at our center, and we do not also have information on the burden of blood transfusion among orthopedic cases in our area of practice hence the study. Additionally, there are no previously published data on blood transfusion indices among orthopedic patients. The aim of this study was to evaluate the intraoperative use of blood and blood products blood among orthopedic surgical patients operated at the Rivers State University Teaching Hospital from January 2020 to December 2021, focusing on the demographics of patients, number and type of surgeries needing blood transfusion and the number of blood transfusions.

Methodology

Research Design: A retrospective observational study was carried out.
Study Area: The study was conducted in Port Harcourt, the capital city of Rivers State, Nigeria.
Study Sites: The orthopedic theatre of the Rivers State University Teaching Hospital was used for the study.
Study Population: All patients who underwent emergency and elective orthopedic surgical procedures at the orthopedic theatre of the Rivers State University Teaching Hospital formed the study population.
Study Instrument*:* A proforma was developed for this study to capture data from the operating theatre register on blood transfusion for emergency and elective orthopaedic cases.

Variables of Interest: Patients' demographics, total number of operated patients, total number of patients transfused, indications for surgeries involving blood transfusions, type of surgery done.
Blood Transfusion Indices: Crossmatch to transfusion ratio (C: T ratio) refers to the number of units cross-matched divided by the number of units transfused. A value of < 2.5 is considered efficient blood use.[26] Transfusion Index (TI) refers to the number of units transfused divided by the number of patients cross-matched. A TI value of >0.5 is indicative of significant blood utilization. Transfusion Probability (TP %) is the number of patients transfused divided by the number of patients cross-matched, and the value multiplied by 100. When the value is ≥30% it is considered as significant blood usage.[26]
Data Analysis: Data was entered in an Excel spreadsheet and exported to SPSS version 23.0 for analysis. Data was expressed as percentages of mean ± standard deviation.

Results

Table 1 shows the sex distribution of operated patients and those who had an intraoperative blood transfusion within the study period. A total of 313 orthopaedic patients were operated on, and 43 (13.74%) of them had an intraoperative blood transfusion. There were 168 males and 145 females. Patients within 41 to 50, and 51 to 60 years dominated the distribution with a total of 20 (46.5%), and patients within 71-80 years were 9 in total amounting to 20.9%.

Table 1: Socio-demographics of patients and frequency of blood transfusion

Sex distribution for all study subjects		
Male		168
Female		145
Total		313
Sex distribution and frequency for subjects who had blood transfusion		
Male		18 (5.75%)
Female		25 (7.98%)
Total		43 (13.74%)
Age distribution of study subjects		
S/N	Age Range (Years)	Number
1	<1	0
2	1 - 10	2
3	11 - 20	3
4	21 - 30	1
5	31 - 40	2
6	41 - 50	12
7	51 - 60	8
8	61 -70	2
9	71 - 80	9
10	81 - 90	3
11	> 90	1
Mean Age (54.1Years)		

Table 2 shows orthopaedic surgical conditions and number of pints of blood transfusions Per Case. A total of 59 blood transfusions were carried out for 43 orthopaedic cases. The surgical condition requiring the highest number of blood transfusion was fractures (29), followed by foot gangrene (17) occasioned by diabetes mellitus and peripheral vascular disease. Foot gangrene also accounted for the second prevalent operated surgical condition needing blood transfusion. The total number of units of blood transfused was 59, and the total number of patients transfused was 43, giving a Transfusion Index of 1.37.

Table 2: Surgical Conditions and Number of Pints of Blood Transfusions Per Case (n = 43)

S/N	Orthopedic Conditions	Number of Pints Transfused Per Case										Total
		1	2	3	4	5	6	7	8	9	10	
	Congenital											
1	Polydactyly	1	-	-	-	-	-	-	-			1
	Trauma											
2	Humeral Fracture	1	3	2	1	-	-	-	-	-	-	6
3	Pelvic / Iliac Bone Fracture	2	-	-	-	-	-	-	-			2
4	Femoral Neck Fracture	1	1	1	2	1	1	1	-	-	-	8
5	Inter-trochanteric Fracture	2	-	-	-	-	-	-	-	-	-	2
6	Femoral Shaft Fracture	2	1	1	1	1	1	-	-	-	-	7
7	Tibia / Fibula Fracture	1	1	2	-	-	-	-	-	-	-	4
	Metabolic											
8	Severe Hip Arthritis	1	-	-	-	-	-	-	-			1
9	Gangrene (Diabetic / Peripheral vascular Disease)	1	1	2	2	2	2	4	1	1	1	17
	Infective											
11	Cellulitis / Foot Ulcer	1	1	1	1	1	1	1	1			8
12	Chronic Osteomyelitis	1	-	-	-	-	-	-	-			1
	Neoplastic											
13	Synovial Sarcoma	2										2
Total number of Pints of Blood Transfused												**59**

The type of surgery done and intra-operatively blood transfusions given is shown in Table 3. Open reduction and internal fixation for fractures (18) constituted the highest single type of surgery carried out within the study period. This is closely followed by below knee amputation and hemi-arthroplasty.

Table 3: Type of Surgery and Intra-operatively Blood Transfusions Given (n = 43)

S/N	Surgery	Number of Cases	Number of Pints of Blood Transfused
1	Wound Debridement	4	5
2	Skin Grafting	1	1
3	Excision Biopsy	1	1
4	External Fixation	1	1
5	Plate Removal for Previous Open Reduction and Internal Fixation (ORIF)	1	2
6	Removal of Extra Digit	1	1
7	Hemi-arthroplasty	7	10
8	ORIF for Humeral Fracture	2	4

9	ORIF for Humeral and Tibial Fractures	1	2
10	ORIF for Inter-trochanteric Fracture (Femur)	1	2
11	ORIF for Femoral Shaft Fractures	7	8
12	ORIF for Tibial and Fibula Fractures	2	2
13	Above Knee Amputation	5	7
14	Below Knee Amputation	9	13
Total		**43**	**59**

Discussion

The use of blood and blood products in surgical practice is almost like inseparable twins even in the best centers, hence its safety and availability are critical issues to the World Health Organization.[27] This study focused on the total number of orthopedic patients transfused, indications for surgeries involving blood transfusions, and the type of surgeries done. Only whole blood and sedimented cells were transfused in this study, and out of 313 orthopaedic patients operated on, 43 (13.74%) of them had an intra-operative blood transfusion, and the male: female ratio was 1.4:1. The implication of this finding is that blood transfusion is needed in approximately 14% of orthopaedic surgeries for which males relatively dominated for both emergency and elective surgeries. This information could be a useful guide to the blood bank in making preparation for orthopaedic surgical practice in our environment. A multicentre study carried out in four Canadian hospitals revealed the use of red blood cells among 10.3% of operated orthopaedic patients, however, there was variation in rate depending on the type of surgery considered.[28] Our study differs from the Canadian study in that red blood cells were used in that study. In this study, it was predominantly used of allogeneic whole blood and sedimented cells.

Patients between the ages of 41 to 50, and 51 to 60 years were more involved in orthopaedic intra-operative blood transfusion, amounting to 46.5% of the total number. This was closely followed by patients in their seventies. The likely explanation for this observation could be that patients in this age range are those who in society were the active population engaged in several occupations involving going out to work to care for their families. This reasoning is further strengthened by the fact that trauma / open reduction and internal fixation were the most prevalent conditions/surgeries requiring intraoperative blood transfusion in our setting. Patients in their seventies were more likely to have metabolic orthopaedic conditions - diabetes mellitus and peripheral vascular disease/hypertension that account for cases of foot gangrene requiring amputations. The dominance of males in the demographics of this study is similar to findings of 66.3% among operated orthopaedic patients in Kenyatta National Hospital Nairobi in Kenya.[29] However, in the Kenyan study, the mean age of patients was 35.39years and the majority of the patients were 26 to 30 years. This differs from our finding of a mean age of 54.1years, although the Kenyan study reported on blood transfusion in elective orthopaedic surgery while this study described both elective and emergency surgeries. Our study shares similarities with the age range of General Surgery patients from the same centre who received an intraoperative blood transfusion.[30]

Fifty-nine pints of blood were transfused to 43 orthopaedic patients (TI = 1.4)over a year period in this study, which is similar to the observation of 224 units transfused to 146 orthopaedic patients (TI = 1.5) in Dar-es-salaam.[31] There is also some similarity with the 109 units of blood transfused to 82 patients (TI = 1.3) reported in a study on the rate of blood usage among orthopaedic patients in Zarqa, Jordan.[32] While a study had questioned the routine use of blood transfusions in orthopaedic surgeries highlighting wastages,[33] another author advocated Patient Blood Management Program in orthopaedic surgery

involving meticulous surgical technique, optimal surgical blood-saving techniques, standardised transfusion triggers, and detection and treatment of pre-operative anaemia.[34]

ORIF for fractures constituted the highest single type of surgery carried out followed by below-knee amputation and hemiarthroplasty. Our finding differs from the observations in Canadian hospitals where knee arthroplasty, hip arthroplasty, and hip fracture surgery were the most commonly performed surgeries.[28] Our finding is in agreement with previous observations in Sub-Saharan Africa where the greatest need for blood transfusion was following road traffic accidents (RTA), communal clashes, insurgency, and others (malaria, malnutrition, pregnancy-related complications, and a heavy burden of infectious diseases).[35] Road traffic accidents (RTA), communal clashes, and insurgency may have accounted for the high prevalence of ORIF done among orthopaedic surgeries in this study. These occurrences have been reported in our region of practice. [36-40] Blood transfusion indices in our study revealed a transfusion index (TI) of 1.37. This value is greater than 0.5, indicating significant blood utilization.[26] Our value is lower than that observed in an Iranian study in the operating room in a general hospital where a value of 2.49 was reported.[41] However, this value is higher than a TI of 0.7 reported for spine surgeries in a regional trauma center in Nigeria.[42] One reason why the intraoperative blood transfusion burden is relatively high could be possibly due to preoperative anemia, which was not evaluated in this study. This study therefore opens an opportunity for further research on the preoperative anemia status among orthopedic patients in our environment. "Patients' Blood Management Program" may be helpful among these patients.

Study Limitations: Data collected on the use of blood products was limited to usage intraoperatively. We are unable to calculate the Crossmatch to Transfusion Ratio (C-TR), and the Transfusion Probability (TP) absence of data on a total number of units of blood cross-matched specific for orthopedic surgery.

Conclusion

A bimodal age distribution was observed in intraoperative blood transfusion requirement for patients between 41-60years (trauma), and patients between 71-80years (metabolic diseases). of the observed orthopaedic intraoperative blood transfusion burden of 13.74% observed, open reduction and internal fixation for fractures was the highest single type of surgery carried out.

Acknowledgement: Dr. Peace Udoka Augustine, a House Officer in the Surgery Department, searched the records of the operations to extract data used for this study. We wish to acknowledge her contributions.

Study Funding: The study was self-funded by researchers.

References

1. Stoicea N, Bergese SD, Ackermann W, Moran KR, Hamilton C, Joseph N, et al. Current status of blood transfusion and antifibrinolytic therapy in orthopedic surgeries. Frontiers in surgery. 2015;2(3):1-4.doi: 10.3389/fsurg.2015.00003
2. Lemos MJ, Healy WL. Current concepts review blood transfusion in orthopaedic operations. JBJS. 1996;78(8):1260-1271.
3. Toy P, Kaplan E, McVay P, Lee S, Strauss R, Stehling L. Blood loss and replacement in total hip arthroplasty: a multicenter study. The Preoperative Autologous Blood Donation Study Group. Transfusion. 1992;32(1):63-67.
4. Sambandam B, Batra S, Gupta R, Agrawal N. Blood conservation strategies in orthopedic surgeries: a review. Journal of Clinical Orthopaedics and Trauma. 2013;4(4):164-170.
5. Watts C, Pagnano M. Minimising blood loss and transfusion in contemporary hip and knee arthroplasty. The Journal of Bone and Joint Surgery British volume. 2012;94(11_Supple_A):8-10.

6. Jiang J, Zhou R, Li B, Xue F. Is deliberate hypotension a safe technique for orthopedic surgery?: a systematic review and meta-analysis of parallel randomized controlled trials. Journal of Orthopaedic Surgery and Research. 2019;14(1):1-14.
7. Hofmann A, Farmer S, Shander A. Five drivers shifting the paradigm from product-focused transfusion practice to patient blood management. The oncologist. 2011;16(S3):3-11.
8. Vaglio S, Prisco D, Biancofiore G, Rafanelli D, Antonioli P, Lisanti M, et al. Recommendations for the implementation of a Patient Blood Management programme. Application to elective major orthopaedic surgery in adults. Blood Transfusion. 2016;14(1):23-65.
9. Repine TB, Perkins JG, Kauvar DS, Blackborne L. The use of fresh whole blood in massive transfusion. Journal of Trauma and Acute Care Surgery. 2006;60(6):S59-S69.
10. Machingura F, Museka G. Blood as the Seat of Life: The Blood Paradox among Afro-Christians. Perichoresis. 2016;14(1):41-62.
11. Meyer M. Thicker than water: The origins of blood as symbol and ritual: Routledge; 2014.
12. Weddle C. The sensory experience of blood sacrifice in the Roman imperial cult. Making Senses of the Past. Toward Sensory Archaeology 2013:137-59.
13. Sarteschi L, editor Jehovah's Witnesses, blood transfusions and transplantations. Transplantation proceedings; 2004: Elsevier.
14. Singelenberg R. The blood transfusion taboo of Jehovah's Witnesses: origin, development and function of a controversial doctrine. Social science & medicine. 1990;31(4):515-523.
15. Elder L. Why some Jehovah's Witnesses accept blood and conscientiously reject official Watchtower Society blood policy. Journal of Medical Ethics. 2000;26(5):375-380.
16. Rakhimovna KD. Modern view on emergency caesarean section. ResearchJet Journal of Analysis and Inventions. 2022;3(06):113-6.
17. Organization WH. World patient safety day goals 2021-2022: safe maternal and newborn care. 2021.
18. Organization WH. The selection and use of essential medicines: report of the WHO Expert Committee, 2015 (including the 19th WHO Model List of Essential Medicines and the 5th WHO Model List of Essential Medicines for Children): World Health Organization; 2015.
19. Barro L, Drew VJ, Poda GG, Tagny CT, El-Ekiaby M, Owusu-Ofori S, et al. Blood transfusion in sub-Saharan Africa: understanding the missing gap and responding to present and future challenges. Vox Sanguinis. 2018;113(8):726-736.
20. Roberts N, James S, Delaney M, Fitzmaurice C. The global need and availability of blood products: a modelling study. The Lancet Haematology. 2019;6(12):e606-e15.
21. Vrielink H, Smid WM. Blood transfusion systems in various middle income countries over the world. Transfusion and Apheresis Science. 2023;62(5): 103796.
22. Raykar NP, Raguveer V, Abdella YE, Ali-Awadh A, Arora H, Asamoah-Akuoko L, et al. Innovative blood transfusion strategies to address global blood deserts: a consensus statement from the Blood Delivery via Emerging Strategies for Emergency Remote Transfusion (Blood DESERT) Coalition. Lancet Global Health. 2024;12(3):e522-e9.
23. Mejia A, Calderón-Vargas C, Echeverri T, Muñoz-Castaño J, López-G J. Indication of Red Blood Cell Transfusion in a Third-Level Hospital in Bogotá, Colombia. J Comm Med and Pub Health Rep. 2021;2(2). doi.org/10.38207/jcmphr20210024
24. Bassey E, Akpan I, Nnoli C, Oghenedoro O. Transfusion of Blood Products in Children Receiving Chemotherapy for Childhood Cancers in a Nigerian Tertiary Healthcare Centre. Journal of Cancer and Tumor International. 2024;14(4):51-7.
25. Diaku-Akinwumi IN, Abubakar SB, Adegoke SA, Adeleke S, Adewoye O, Adeyemo T, et al. Blood transfusion services for patients with sickle cell disease in Nigeria. International health. 2017;8(5):330-335.

26. Feyisa T, Tesfaye Kiya G, Maleko WA. Assessment of recipients' characteristics, transfusion appropriateness, and utilization pattern of blood and blood products in Jimma Medical Center, Jimma, Ethiopia. Plos one. 2021;16(4):e0250623.
27. Organization WH. Global status report on blood safety and availability 2021. 2022.
28. Blankstein AR, Houston BL, Fergusson DA, Houston DS, Rimmer E, Bohm E, et al. Transfusion in orthopaedic surgery: a retrospective multicentre cohort study. Bone & Joint Open. 2021;2(10):850-857.
29. Muriithi MP. Blood Transfusion in Elective Orthopaedic Surgeries At The Kenyatta National Hospital: University of Nairobi; 2013.
30. Ijah R, Iroegbu-Emeruem L, Aaron F, Wakama I, Omunakwe H. Blood Transfusion Burden of General Surgical Diseases at The Rivers State University Teaching Hospital, Port Harcourt, Nigeria. Adv Clin Med Res. 2024;5(3):1-10.
31. Mwambashi J, Muhamedhussein M, Haonga B. Blood utilization practice in elective orthopaedic surgeries at Muhimbili Orthopedic Institute, Dar-es-salaam. Tanzania Journal of Health Research. 2024;25(3):1085-1093.
32. Jbarat AM, Obeidat MM, Etaiwi MM, Alzubi MN, Altarawneh BM. Rate of blood products requests for orthopedic surgical procedures at Prince Hashem Hospital-RMS. Rawal Medical Journal. 2018;43(4):698-701.
33. Hasan O, Khan EK, Ali M, Sheikh S, Fatima A, Rashid HU. "It's a precious gift, not to waste": is routine cross matching necessary in orthopedics surgery? Retrospective study of 699 patients in 9 different procedures. BMC health services research. 2018; 18:1-7.
34. Theusinger OM, Kind SL, Seifert B, Gerber C, Spahn DR. Patient blood management in orthopaedic surgery: a four-year follow-up of transfusion requirements and blood loss from 2008 to 2011 at the Balgrist University Hospital in Zurich, Switzerland. Blood Transfusion. 2014;12(2):195-203.
35. Erhabor O, editor Challenges of Blood Transfusion Service Delivery in Sub Saharan Africa. 2nd International Conference on Haematology and Blood Disorders, Baltimore; 2014.
36. Nwaogu N, Lawal O. Community Attributes and Impact of Cult Related Activities across Selected Communities in the Niger Delta.International Journal of Ground Sediment & Water. 2020; 10(0): 573-590. DOI: 10.5281/zenodo.4029800
37. Godbless DD. Cultism and its Implication on Development: A Case Study of Rivers State from 2003-2019. KIU Journal of Social Sciences. 2020;5(4):159-66.
38. Alabi A, Harcourt SL, Ijah OA, Friday R, Aaron FE. Gunshot Injuries in Port Harcourt, Nigeria: The University Teaching Hospitals' Experience. International Journal of Tropical Disease& Health. 2021:1-7.
39. Okanezi, Ibradouyeiyalagha B. An overview of the effects of school crime of violence in the 21 st century Nigeria. Multi-disciplinary journal of research and development perspectives. 2019;8(2):87-97.
40. Uduji JI, Okolo-Obasi EN, Asongu SA. Cult violence in Nigeria and corporate social responsibility in oil-producing communities. Local environment. 2023;28(5):619-644.
41. Sezaneh Haghpanah M, Shima Miladi M, Leila Kasraian M. Blood Transfusion Practice in Operating Rooms in Nemazee Hospital in Southern Iran. Age.55(18.23):54.23-56.7.
42. Nwosu AD, Enweani UN, Okwesili IC, Tekwunife R, Anagor AA, Ekwedigwe HC. Audit of blood transfusion practice during anaesthesia for spine surgeries in a regional trauma centre in Nigeria. Orient Journal of Medicine. 2015;27(3-4):65-70.