**Original Research Article**

**BLOOD TRANSFUSIONS IN THE CHILDREN EMERGENCY UNIT OF A TERTIARY HOSPITAL IN SOUTHERN NIGERIA**

**ABSTRACT**

**Background**

Anaemia is a major cause of morbidity and deaths in children resident in many countries of the sub-Saharan region. Blood transfusion in the emergency units, is an important intervention in the management of many of these children. Some deaths occur even before these transfusions can be initiated. It is important to identify the prevalent causes of childhood anaemia necessitating urgent blood transfusions in various localities. Identified causes would guide proactive policies on preventive measures for such illnesses, as well as blood transfusion practices to curb avoidable deaths.

**Methods**

A six-month retrospective study of all children aged two months to less than 18 years, admitted to the Children Emergency Unit of the University of Uyo Teaching Hospital, (UUTH), Uyo, Nigeria and given a blood transfusion within 24 hours of admission as part of their clinical management. The indications for admission, packed cell volume before transfusion, type of blood product given and outcome were documented for each child.

**Results**

Of the 446 children admitted within the six-month period, 65 (14.6%) received a blood transfusion within 24 hours of admission. There were 31 males (47.7%) and 34 females (52.3%), with a median age of 4 years. The most common indications for an emergency transfusion, included severe malarial anaemia, complications of sickle cell anaemia and severe sepsis. The mean packed cell volume (%) before transfusion was 16.73 (± 5.59). Settled (or sedimented cells) was mostly used in 36 (55.4%), and fresh whole blood in 29 (44.6%) of transfusions. The outcome was good, with 84.6% of the transfused children being discharged in satisfactory condition.

**Conclusion**

The greatest indications for transfusion of blood in the children emergency unit of this hospital were severe malarial anaemia, complications of sickle cell anaemia and severe sepsis. Children under five years were the greatest recipients of blood and settled cells was the most used product. The outcome of the transfused children was good. It is important that health facilities caring for children be equipped with adequate facilities to aid the provision of safe blood whenever needed. This would improve treatment outcomes and childhood deaths from anaemia.

**Key words:** Blood, children, emergency unit, transfusion, Nigeria.

**INTRODUCTION**

Transfusion of blood in the Children Emergency Unit (CHEU), is a life-saving intervention in the management of many childhood illnesses of haematologic, infective and other varied aetiology. In many sub-Saharan countries, blood is generally a limited and scarce resource. The indications for blood transfusion in Children Emergency Units would likely vary between different countries, regions and communities worldwide. This expectedly would be so, depending on prevailing disease conditions and illnesses in the area of study.1-4 The availability of blood, efficiency of blood transfusion services, transfusion protocol and clinical expertise of the managing health-care team, all play a role in observed transfusion practices and clinical outcome.1-4

Some reports have shown, that in many low-income countries, there are no stringent nor standardized guidelines for children receiving a blood transfusion, and many patients requiring blood do not receive it in the appropriate way or time.1-5 Thus the availability of blood for transfusion in emergencies remains a challenge in many developing countries, and as a result children presenting with anaemia and needing a transfusion may die without being transfused.1-5

In sub-Saharan Africa, the demand for blood transfusion in children is high, with most given as emergency interventions. There is still a need for research to assess the different aetiologic reasons for transfusions, safety of blood and clinical outcome of transfused children. Indications for blood transfusions, and audits of transfusion practices are advocated and data obtained would be beneficial in improving hospital transfusion policies and patient management outcome.

The blood transfusions instituted in children managed at the Children Emergency Unit of this Teaching Hospital has not been previously studied. This report seeks to evaluate the various indications for blood transfusions in children presenting from this locality, the blood products most used, and eventual outcome of their hospitalization. The results from this study could serve as a useful guide in promoting proactive measures for the prevention and prompt treatment of some common disease conditions that precipitate childhood anaemia and necessitating emergency unit transfusions. It could also guide relevant blood transfusion policies essential in prioritizing the blood treatment needs and services for children in this locality.

**METHODS**

A six-month retrospective study from May to October 2024, of all children two months to less than 18 years of age, admitted to the Children Emergency Unit (CHEU) of the University of Uyo Teaching Hospital (UUTH) Uyo, Nigeria and given a blood transfusion within 24 hours, as part of their clinical management.

The University of Uyo Teaching Hospital (UUTH) Uyo, is a referral hospital located in the south-south region of Nigeria. The clinical management of these admitted children included the transfusion of blood carried out by experienced clinical teams. Few of the children, had need for subsequent transfusion of blood after the initial 24-hour period, to properly stabilize their clinical state. Each child admitted into the emergency room was ensured to be stabilized, before discharge or transfer to the paediatric medical or surgical ward for continuation or completion of treatment. Thereafter, proper discharge by different managing clinical teams to the follow-up clinic would be done. For the purpose of this study, children whose blood transfusions were initiated within a 24-hour period of hospital admission were included. The medical records of each transfused child were reviewed and relevant information extracted. The following variables were retrieved: Age, gender, clinical diagnosis/indication for transfusion, pre-transfusion packed cell volume, type of blood product used, total number of transfusions received and outcome of clinical treatment.

Transfusion decision on each child, was based on a packed cell volume < 12% (Hb ˂4.0g/dl), or packed cell volume between 12 to 21% (Hb 4.0 - 7g/dl), or higher packed cell volumes in the presence of shock, clinically detectable dehydration, impaired consciousness, respiratory acidosis revealed by deep laboured breathing, heart failure, more than 20% of red blood cells parasitized by malaria parasite, or continuous bleeding with estimated blood loss of 20–30% blood volume.6,7 The aforementioned signs or complications, with considerations of the primary diagnosis and clinical status of the child guided the blood transfusion decisions.6 In almost all children transfused, blood was obtained from related or non-related donors recruited by patient’s relatives. Screening for HIV, syphilis, Hepatis B Virus and Hepatitis C Virus was carried out routinely in the blood bank before any blood donation. Settled (or sedimented) cells was produced by settling whole blood in the blood bag by simple gravity.1,8

Informed consent was not required for this study since it was retrospective and done by a chart review without any potential risk implicated upon the patients. Confidentiality and anonymity of personal data were strictly maintained through all stages of data handling. Data retrieved were entered into an Excel spreadsheet, and thereafter analyzed using the Microsoft Excel 2017 package. Descriptive statistics were presented as frequency and percentages. Quantitative variables were presented as mean and standard deviation or median and range as appropriate.

**RESULTS**

Four hundred and forty-six children were admitted into the Children Emergency Unit (CHEU) within the six-month study period. Of these, sixty-five (14.6%) received a blood transfusion within 24 hours of admission. The age range of children transfused was 2 months to 17 years, with a median age of 4 years. There were 31 males (47.7%) and 34 females (52.3%).

Table 1 shows that children under five years of age constituted more than half (58.5%) of the blood recipients. The common indications for blood transfusions were severe malarial anaemia (30.0%), complications of sickle cell anaemia (21.0 %) and severe sepsis (18.0 %) -Table II.

The mean packed cell volume (%) before transfusion was 16.73 (± 5.59). Settled (or sedimented) cells 42 (64.6%) was the most frequent blood product utilized. Of the 65 children transfused, 8 (12.3%) had multiple transfusions (>3 within five days). A total of 55 children (84.6%) were transferred to the children’s ward or discharged home directly from the emergency room, in satisfactory condition, six (9.2%) left against medical advice (LAMA), while 4 (6.2%) children died (Figure 2).

**Table 1:** Age range of transfused children

|  |  |
| --- | --- |
| **Age range (Years)** | **Number (%)** |
| < 1 | 12 (18.5) |
| 1 – 5 | 26 (40.0) |
| 6 – 10 | 9 (13.8) |
| 11 -15 | 12 (18.5) |
| >15 | 6 (9.2) |
| **TOTAL** | **65 (100.0)** |

**Table II :** Various diagnostic indications for blood transfusion

|  |  |
| --- | --- |
| **Indications for transfusion** | **Number (%)** |
| Severe Malarial Anaemia | 20 (30.8) |
| Sickle Cell Anaemia complications | 14 (21.5) |
| Severe sepsis | 12 (18.5) |
| Oncological emergencies | 4 (6.2) |
| Surgical emergencies | 3 (4.6) |
| Paediatric HIV | 3 (4.6) |
| Meningitis | 3 (4.6) |
| Glucose-6-phosphate dehydrogenase deficiency | 2 (3.1) |
| Road traffic accident (RTA) | 2 (3.1) |
| Acute glomerulonephritis | 1 (1.5) |
| Chronic Kidney Disease (CKD) | 1 (1.5) |
| **TOTAL** | **65 (100.0)** |

The pre-transfusion packed cell volume (%) ranged between 6 and 29, with a mean of 16.73 ± 5.59. Settled (or sedimented) cells constituted the most blood product type used for transfusion, in 36 (55.4%) then fresh whole blood in 29 (44.6%) of transfusions. Other blood products were not utilized during this period of study. Figure 2 shows that the highest frequency of donor blood group utilized for transfusion was the 0 type, n=48, followed by blood groups A and B respectively.

**Figure 1:** Donor Blood group transfused

Of the 65 transfused children, 55 (84.6%), were transferred to the ward or discharged in satisfactory condition, six (9.2%) left against medical advice (LAMA) and four (6.2%) died as depicted in Figure 2.

**Figure 2:** Outcome of transfused children

**DISCUSSION**

Transfusion of blood in a Children Emergency Unit serves as an important clinical management decision for the treatment of childhood anaemia. The choice of this intervention by emergency managing teams depends on underlying primary aetiology, severity of clinical signs and symptoms, including associated complications. Notwithstanding, in all cases of severe or life threatening anaemia, blood transfusion remains the most critical and beneficial lifesaving intervention which significantly improves outcome.1-7

In this study setting, the burden of emergency blood transfusions was greatest in children under five years of age. This observation is similar with reports from other centres within Nigeria, and the sub-Saharan region, which documented that children under five years of age have a high demand for blood and are the main users of blood for transfusion in these settings, largely due to severe anaemia secondary to infection and sickle cell anaemia.1-5 On the contrary, studies from developed countries found oncological emergencies and surgical emergencies as top-ranking indications for childhood transfusions.1,4

Blood has remained a scarce resource in most developing countries and this shortage significantly affects blood transfusion practices in these regions.1,2,8,9 Blood transfusion requirements and indications vary from country to country and between regions within the same country. A report documented that less than 5 units of blood were donated per 1000 population far below the recommended requirement of 20 units/1000 per year in sub-Saharan regions.1 Young children were noted as the major population needing blood for transfusion in these regions, mostly due to severe anaemia secondary to infections and sickle cell anaemia.1,2,4,5,8 This report is similar to observations from present study.

The commonest indications for transfusion in this study centre were severe malarial anaemia, complications of sickle cell anaemia and severe sepsis respectively. These observed aetiologic indications for blood transfusions in the emergency unit are very similar to other Nigerian studies and reports from other sub-Saharan countries.8-15 While complications of inherited haemoglobinopathy ranked higher in some studies, many others had malarial anaemia as top-ranking diagnosis and indication for emergency room transfusions.1,2,4,5,8-11 An erstwhile study from present study centre noted also severe malarial anaemia, as top-ranking diagnosis for transfusions in children seen in the post-neonatal wards.16 Other diagnoses from present study needing urgent transfusions in the emergency unit included oncological and surgical emergencies, HIV/AIDS and complications of acute or chronic illnesses arising from various systemic diseases.

Settled cells was the most used blood product in this study’s emergency setting, and while some authors noted same pattern, few others reported fresh whole blood as the highest used blood product, especially in developed countries.1-3,7 Settled (or sedimented) cells was produced by settling whole blood in the blood bag by simple gravity.1,8 This again brings to fore some unique challenges with availability of blood products for transfusion yet to be fully addressed in the sub-Saharan Africa, especially with respect to component preparation.1-5

The mean pre-transfusion packed cell volume varied between various studies, with some children transfused at higher haemoglobin values,5,8 and others at similar mean pre-transfusion values used for this study.4 Considering however, the overall state of recipients from these studies, the blood transfusions were needed due to decompensating cardiac status and other associated morbid clinical conditions identified in these children.5-7,8-11,13-18 There is therefore the need for sustained education of emergency health-care provider teams on proper clinical selection of children needing an emergency transfusion. This would ensure that the limited blood supply in such centres, can be delivered to every child needing this resource.

ABO and Rhesus D blood grouping showed O positive was the most transfused blood group, followed by A positive then the B group. This was similar to other authors’ observation.4,17 Severe anaemia accounted for 6.2% of hospital deaths, slightly lower than some authors’ observations9,18 but also comparable to others11,19 The few deaths which occured in these children, could mostly be attributed to delay in presentation at the emergency units, and further delays at accessing needed blood. This is a frequent scenario in many resource-poor countries and centres caring for children. 8-14,20-24

The immediate and remote causes for these are that the infrastructure for collecting, processing, and distribution of blood to where it is needed in these settings are often weak and ineffective, with most probable reasons being both individual provider and health-care system factors.1,2,20,21

The outcome of transfused children in present study was good. Studies have shown that blood transfusion is most beneficial when given early and that delayed transfusion leads to increased mortality.5 Prompt administration of blood in study setting played a positive role to good discharge outcome. It has also been documented that with delay in treatment of severe anaemia, irreversible tissue damage can occur and patients may suffer morbidity that can persist for months after their initial treatment.5 Therefore, early recognition and treatment of children with severe anaemia is vital to optimizing outcomes.1-5

**CONCLUSION**

Transfusion of blood in children emergency settings, is a necessary life-saving intervention in the management of children with anaemia of various aetiology. Severe malaria, complications of sickle cell anaemia and severe sepsis played leading roles in the aetiology of anaemia. Children under five years were the greatest recipients of blood, and settled (or sedimented) cells was the most used product. The outcome of the transfused children was good.

It is imperative that health care facilities caring for children emergency needs, be well equipped with necessary laboratory infrastructure essential for prompt provision of safe blood when needed. This goes a long way towards improved treatment outcomes and reduction of childhood deaths from anaemia. Sustenance of community measures for malaria and infection control/prevention are expedient, in reducing avoidable deaths and morbidity from anaemia in Nigerian children.

**LIMITATIONS**

It is possible that some severely anaemic children with indications for a blood transfusion and a transfusion order did not receive any transfusion, either due to patient or systemic factors, which led to their exclusion from the study. This factor would result in an underestimation of the overall childhood anaemia and blood transfusion burden in our study population.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**REFERENCES**

1. Uyoga S, Maitland K. Use of whole blood as the routine transfusion product in Africa. ISBT Science Series. 2019; 0, 1–8. Published by John Wiley & Sons Ltd on behalf of International Society of Blood Transfusion DOI: 10.1111/voxs.12507
2. [Hassall](https://www.researchgate.net/scientific-contributions/Oliver-Hassall-39302252) O, Bates I, M’baya B. Blood Transfusion in Resource-Limited Settings. January 2020 In: Hunter's Tropical Medicine and Emerging Infectious Diseases;pp.153-158)DOI:[10.1016/B978-0-323-55512-8.00019-3](http://dx.doi.org/10.1016/B978-0-323-55512-8.00019-3).
3. World Health Organization. The Clinical Use of Blood Handbook. Blood Transfusion Safety GENEVA. 2001. Accessed 12/1/25
4. Al-Saqladi AWM, Albanna TA. A study of blood transfusion I Pediatric patients at a Teaching Hospital, Aden, Yemen. Int J Clin Transf Med. 2021:9;1-9. <https://doi.org/10.247/IJCTM.S293720>
5. Shari CR, Sawe HR, Murray BL, Mwafongo VG, Mfinanga JA, Runyon MS. Emergency blood transfusion practices among anaemic children presenting to an urban emergency department of a tertiary hospital in Tanzania. [BMC Hematology](https://www.researchgate.net/journal/BMC-Hematology-2052-1839) 2017(1):19. DOI: [10.1186/s12878-017-0091-y](http://dx.doi.org/10.1186/s12878-017-0091-y)
6. World Health Organization (WHO): The prevention and management of severe anaemia in children in malaria-endemic regions of Africa: A review of research. In. Geneva: WHO, 2001.
7. World Health Organiization. Pocket book of hospital care for children. Guidelines for the management of common illnesses. 2nd ed. Geneva. World Health Organization; 2013.
8. Sawadogo S, Nébié K, Kafando E, Millogo T, Ouattara S, Dahourou H *et al*. Preparation of red cell concentrates in low-income countries: efficacy of whole blood settling method by simple gravity in Burkina Faso. Int J Blood

Transfus Immunohematol. 2016;6:20-29. Doi.10.5348/ijbti-206-25-OA-5

1. Sawadogo S, Nébie K, Millogo T, Kafando E. Blood transfusion requirements among children with severe malarial anemia: a cross-sectional study in a second level reference hospital in Burkina Faso. Pan Afr Med J 2020:1;37:108.

Doi:10.11604/pam.2020.37.108.22384

1. Onyearugha CN, Okoronkwo NC, Onyemachi PE. Blood transfusion: Prevalence, Indicatons and associated factors in children presenting to a tertiary health institution in southeast Nigeria. April 2021;7(2):53 Am J Pediatr. DOI 10.11648/j.ajp.2021702.

1. Abhulimhen-Iyoha BI, Israel-Aina YT [Emergency Blood Transfusion in Children in a Tertiary Hospital in Nigeria: Indications, Frequency and Outcome.](https://pubmed.ncbi.nlm.nih.gov/29607473/).West Afr J Med. 2018;35(1):20-24.
2. Mulumba LL, Wilson L Sickle cell disease among children in Africa: An integrative literature review and global recommendations. Int J Afr Nursing Sci 2015; 3:56-64. Doi 10.1016/J.IJANS.2015.08.002
3. [Reggiani](https://onlinelibrary.wiley.com/authored-by/Reggiani/Giulia) G, [Muhelo](https://onlinelibrary.wiley.com/authored-by/Muhelo/Arlindo) A, [Cavaliere](https://onlinelibrary.wiley.com/authored-by/Cavaliere/Elena) E, [Pizzol](https://onlinelibrary.wiley.com/authored-by/Pizzol/Damiano) D, [Frigo](https://onlinelibrary.wiley.com/authored-by/Frigo/Anna+Chiara) AC, [Da Dalt](https://onlinelibrary.wiley.com/authored-by/Da+Dalt/Liviana) L. Emergency paediatric blood transfusion practices in Mozambique. Transfus Med 2020;30(6):505-507. Doi:10.1111/tme.12720.
4. [Ahmed](https://pubmed.ncbi.nlm.nih.gov/?term=%22Ahmed%20MAA%22%5BAuthor%5D) MAA, [Al-Nafeesah](https://pubmed.ncbi.nlm.nih.gov/?term=%22Al-Nafeesah%20A%22%5BAuthor%5D) A, [Al-Wutayd](https://pubmed.ncbi.nlm.nih.gov/?term=%22Al-Wutayd%20O%22%5BAuthor%5D) O, [Mahgoub](https://pubmed.ncbi.nlm.nih.gov/?term=%22Mahgoub%20HM%22%5BAuthor%5D) HM, [Adam](https://pubmed.ncbi.nlm.nih.gov/?term=%22Adam%20I%22%5BAuthor%5D) I. Severe childhood anemia and emergency blood transfusion in Gadarif Hospital, eastern Sudan. PLoS One. 2019 Dec 3;14(12):e0225731. doi: [10.1371/journal.pone.0225731](https://doi.org/10.1371/journal.pone.0225731)
5. Kiguli S, Maitland K, George EC, Olupot-Olupot P, Opoka RO, Engoru C, et al. Anaemia and blood transfusion in African children presenting to hospital with severe febrile illness. BMC Med 2015;13:21 doi:10.1186/s12916-014-0246-7.
6. Ino-Ekanem MB, Bassey EU.Overview of blood transfusion in a Paediatric medical setting of a tertiary hospital in south-south Nigeria. Int Health Sci Res*.* 2016; 6(7):47-51.
7. Mohsen MM, Gamal AH, Abood AM. Prevalence of blood groups in Aden population. Univ Aden J Natl Appl Sci*.* 1998;3(2):147–152.
8. Ogunlesi T, Fetuga B, Olowonyo M, Adekoya A, Adetola O, Ajetunmobi A. Severe Childhood Anaemia and Blood Transfusion in a Nigerian Secondary Level Facility. J Trop Paed 2016;62(2):107-115. doi: 10.1093/tropej/fmv083
9. [Ikhurionan](https://pubmed.ncbi.nlm.nih.gov/?term=Ikhurionan+PE&cauthor_id=37678218) PE, Bell NVT, Ofovwe GE. Outcome of Emergency Blood Transfusion in Children Seen at a Tertiary Children's Hospital in Freetown: A Descriptive Cross-sectional Study Pediatr Emerg Care. 2024;1;40(5):400-405. DOI: [10.1097/PEC.0000000000003035](https://doi.org/10.1097/pec.0000000000003035)
10. Thomas J, Ayieko P, Ogero M, Gachau S, Makone B, Nyachiro W et al. Blood transfusion delay and outcome in county hospitals in Kenya. Am J Trop Med Hyg. 2017;96(2):511-7. doi: [10.4269/ajtmh.16-0735](https://doi.org/10.4269/ajtmh.16-0735)
11. Muoneke VU, Ibekwe RC, Nebe-Agumadu HU, Ibe BC. Factors associated with mortality in under-five children with severe anaemia in Ebonyi, Nigeria. Indian Pediatr. 2012;49(2):119-23. DOI: [10.1007/s13312-012-0026-4](https://doi.org/10.1007/s13312-012-0026-4)
12. Guilla R, Arlindo M, Elena C, Damiano P, Anna CF, Liviana DD. Emergency Paediatric blood transfusion in Mozambique. Transfus Med 2020: 30(6): 505-507.  DOI: [10.1111/tme.12720](https://doi.org/10.1111/tme.12720)
13. Chao DL, Oron AP, Chabot-Couture G, Sopekan A, Nnebe-Agumadu U, Bates I, Piel FB, Nnodu O. [Contribution of malaria and sickle cell disease to anaemia among children aged 6-59 months in Nigeria: a cross-sectional study using data from the 2018 Demographic and Health Survey.](https://pubmed.ncbi.nlm.nih.gov/36385021/) BMJ Open. 2022 Nov 16;12(11):e063369. doi: 10.1136/bmjopen-2022-063369.

1. Umar G, Abdulqadir I, Ugwu N, Adeyemo T, Yau N, Hassan A et al. [Blood donation practices, processing and utilisation of blood components in government tertiary hospitals in Nigeria: a multicentre cooperative study.](https://pubmed.ncbi.nlm.nih.gov/37956086/) Int Health 2024;16(6):636-641. doi: 10.1093/inthealth/ihad105.