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Blood Transfusions in Children in a Regional Hospital Setting In Cameroon: Prevalence, Profile of Patients and Hospital Outcome

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Abstract

Introduction: Blood transfusion according to WHO, is the process of transferring blood or blood products from a donor into the recipient's circulatory system. Severe anemia in children is a major cause of hospital admissions and mortality in sub-Saharan Africa. Blood transfusion is a life-saving treatment for severely anemic children in both developed and developing countries.

Aim: To determine the prevalence of pediatric blood transfusions at the Bamenda regional hospital, identify the profile and outcome of the transfused children.

Materials and methods: A retrospective cohort study was conducted over a 5 year period; 1st January 2019 to 31st December 2023. Available medical records of children admitted were collected using a pre-defined questionnaire designed for this study; including demographic, clinical and transfusion-specific information. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 27. Ethical clearance was obtained from the institutional review board of the University of Bamenda.

Results: Out of the 6599 children admitted, 316 were transfused giving a prevalence of 4.8%. The highest number of transfusions were for children aged 1-3 years (30.8%). The most common underlying condition was sickle cell disease (22.08%). The majority (71.8%) presented with fever and the most common clinical sign was pallor (65.26%). The mean hemoglobin value was 5.7±1.7 g/dL and 30% had levels ≤5 g/dL. The most common etiology of anemia was malaria (44.5%). Almost all patients (96.8%) received whole blood transfusions and the mean duration of Nasopharyngeal Carcinoma (NPC); Histopathological type; Radiotherapy; Concurrent chemotherapy admission was 6.45 days.

Conclusion: This study showed that the prevalence of children presenting with severe anemia and requiring blood transfusions is quite high. Most of the children are under-fives, and malaria and sickle cell anemia are the most frequent etiologies. Following treatment, most were discharged alive with no complications.

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Introduction

Blood transfusion involves transferring blood or blood products from a donor to a recipient according to the World Health Organization (WHO). This is usually accomplished by inserting an intravenous needle or catheter and providing the blood products. Blood transfusions are necessary for many different medical reasons, including managing diseases such as hemophilia, cancer, thalassemia, and severe anemia, treating severe injuries from accidents, and facilitating surgical procedures. 118.5 million units of blood are donated annually worldwide; about 60% of these donations take place in low- and middle-income countries, where children under the age of five receive up to 65% of the transfusions, mostly for the treatment of severe anemia [1].

The World Health Organization defines anemia as the presence of hemoglobin less than 11 gm/dL for children below 6 years and less than 12 gm/dL for children more than 6 years of age; Anemia is defined by a decrease in red blood cells or a decrease in the amount of hemoglobin in the blood [2]. Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. Preschool-age children (47.4%) have the highest prevalence, while men (12.7%) have the lowest prevalence [3]. In both emerging and developed countries, it is a major public health problem [4]. The anemia rate among children under five is 46-66% in developing countries, with the African and Asian regions being the major contributors to this high global burden of the condition [5].

Globally, the most significant contributor to the onset of anemia is iron deficiency [4]; However, other factors include severe blood loss during menstruation, parasite infections (e.g., hookworms, ascaris, and schistosomiasis), acute and chronic infections (e.g., malaria, cancer, TB, and HIV), and deficiencies in other micronutrients (e.g., vitamins A and B12, folate, riboflavin, and copper). Additionally, in certain groups, the effect of hemoglobinopathies on the prevalence of anemia must be taken into account [3].

There is an increased risk of neurologic complications, low birth weight, infection, and heart failure, as well as an increased mortality associated with anemia [5]. Severe anemia causes dyspnoea, tachycardia, and exhaustion in its acute phase. If anemia is not treated, heart failure, hypotension, and mental disorientation may ensue. Redistribution of blood to the brain and heart in critically anemic patients diverts oxygen delivery from less vital organs and may cause gut ischemia with subsequent bacterial translocation, which can result in multiple organ failure [6].

A study in China found that the prevalence of blood transfusion among pediatric patients was 8,8% with a male predominance at 63,4%; the most common indications were hematologic and oncologic diseases [7]. Another study in Yemen found a prevalence of 6,13% with male predominance, the most common indications being oncologic and congenital disease [8]. However in African countries, higher prevalences of blood transfusion were found; 17.1% in Gabon with the commonest cause of transfusion being malaria and 45% in Kenya, Uganda and Tanzania with the commonest indication equally being malaria [9,10].

In Cameroon, very few studies have been done on blood transfusion profile of pediatric patients. Nevertheless, in a study conducted in Cameroon, it was found that Paediatric patients received transfusions of 63.5% of all blood used in the Yaounde Central Hospital with the indications being; malaria in 38.7% of cases, sickle cell anemia in 35.5% of cases and nutritional anemias in 11.6% of cases, [11]. Another study carried out in Yaoundé, Cameroon illustrated that the primary reason for blood transfusions was malaria, accounting for 68.8% of cases [12]. Furthermore, the most common factors associated with mortality after blood transfusion were inadequate treatment of malaria, malnutrition, meningitis, and the transfusion of whole blood rather than specific blood components [11].

This study had as purpose to determine the prevalence of blood transfusions, the profile and the outcome of children transfused at the Bamenda Regional Hospital (BRH).

Materials and Methods

Study design: It was a descriptive retrospective cohort study

Study period: This study was on files of children admitted from 1st January 2019 to 31st December 2023 in the pediatric ward of the Bamenda Regional Hospital (BRH).

Setting: Bamenda, is a town and capital of the North West region of Cameroon. The Bamenda regional hospital (BRH) is the main referral hospital for the North West Region.

The Pediatric unit of the BRH admits children for various pathologies that come from the town and also all over the region. It has 35 beds. The staff comprises 3 pediatricians, 3 medical doctors, 10 nurses, and 1 cleaner.

Study population and sampling: The study was done on the files of all hospitalized children aged 1 month to 15 years who received a blood transfusion during the study period. A consecutive sampling method was used to recruit every file of children admitted in this facility within the study period. Files of children with incomplete medical records were excluded.

Study procedure: All relevant administrative authorizations were obtained, as well as ethical clearance from the Institutional Review Board of the Bamenda regional hospital. Following this approval, patient file details were gathered and coded, and identification information was handled discreetly using a computer password that was only known by the lead investigator.

The following information was retrieved from the files: demographic data, clinical and para clinical profile of the child, diagnosis, type and number of transfusions, complications during and after transfusion and status at discharge. Data was extracted using a pre-designed anonymous data collection sheet (questionnaire).

Data analysis: Data was inputted and analyzed using the Statistical Package for Social Sciences (SPSS) version 27.

Results

Prevalence of blood transfusions: From 1st January 2019 to 31st December 2023, 6599 children were hospitalized at the pediatric unit of Bamenda Regional Hospital. Among them, 316 received at least one blood transfusion. A total of 8 files were excluded (from those of the transfused children), due to lack of information and 308 files were retained and analyzed. The overall prevalence of blood transfusions was 4.8%.

In 2019, there were 51 blood transfusions, accounting for 16.56% of the total; the number of transfusions increased to 71 (23.05%) in 2020, which was the peak year; after 2020, the number of transfusions decreased gradually, with 62 (20.13%) in 2021, 68 (22.08%) in 2022, and 56 (18.18%) in 2023 (Figure 1).

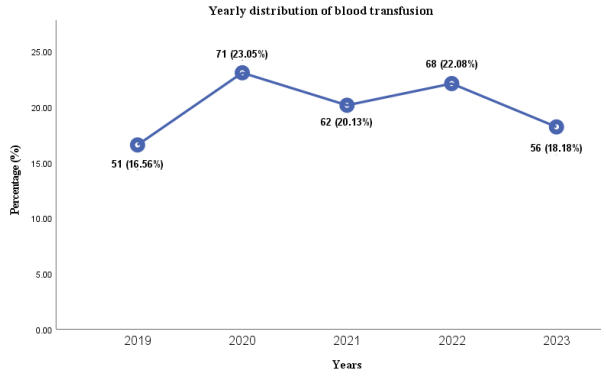

Figure 1: Yearly distribution of the blood transfusions.

Monthly distribution of transfusions showed the highest number of transfusions occurred in April and May, each accounting for 46(14.9%) of the total; other high-volume months included July with 34 transfusions (11.0%) and August with 29 transfusions (9.4%) (Figure 2).

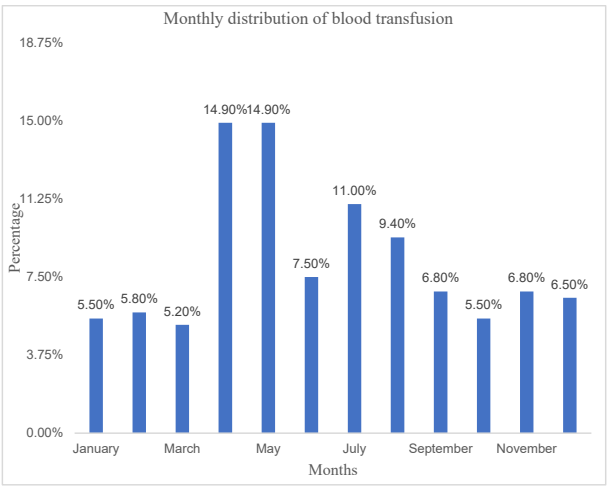

Figure 2: Monthly distribution of the blood transfusions.

Socio demographic characteristics: The majority of transfused children 95(30.8%) were in the age range of [1-3 years]; the next largest age groups were [1-12 months] with 63(20.5%), and [7-10 years] with 62(20.1%). In terms of gender, the sex ratio was 1.3 with 172(55.8%) of the transfused children being male and 136(44.2%) being female. Regarding residency, a larger proportion of the transfused children (57.8%) were from urban areas, while 42.2% were from rural areas (Table 1).

Table 1: Age distribution, gender and residency of the children.

Variable	Number (N=308)	Percentage (%)
Age		
[1-12 months[	63	20.5
[1-3 years[	95	30.8
[3-7years[	60	19.5
[7-10 years[	62	20.1
[10-15 years]	28	9.1
Gender		
Male	172	55.8
Female	136	44.2
Residency		
Urban	178	57.8
Rural	130	42.2

Past history of the patients: The most common underlying medical condition was sickle cell disease, affecting 22.08% of the patients; other less prevalent conditions included HIV infection (2.27%), tuberculosis (1.62%), cancer (1.62%) and chronic kidney disease (1.3%).

The most commonly used medication were paracetamol (7.14%), folic acid (6,17), penicillin (4.22%), and non-steroidal anti-inflammatory drugs (3.25%).

Only 9.4% of the patients had received a blood transfusion before the current episode

Clinical presentation of the patients: The most common presenting complaint was fever, which was reported in 221(71.8%) patients; other prevalent complaints included asthenia reported in 129 (41.9%) patients (Table 2).

Table 2: Presenting complaints on admission*.

Presenting complaint on admission	Number (N=308)	Percentage (%)
Fever	221	71.8
Asthenia	129	41.9
Joint pain	45	14.6
Vomiting	41	13.3
Cough	38	12.3
Watery stool	32	10.4
Convulsion	29	9.4
Abdominal pain	16	5.1
Bleeding	11	3.6
Dyspnoea	10	3.2
Weight loss	6	1.9
Hematuria	5	1.6
Dysuria	3	0.9
Referred for anemia	3	0.9
Body swelling	3	0.9
Jaundice	3	0.9

*One patient might have had more than one presenting complaint.

Clinical signs on admission: The most common clinical sign observed was pallor, which was present in 201(65.26%) patients; other prevalent signs included tachycardia 197(63.96%) and cold extremities 108(35.06%) patients (Table 3).

Table 3: Clinical signs on admission.

Clinical signs on admission	Number (N=308	Percentage (%)
Pallor	201	65.26
Tachycardia	197	63.96
Cold extremities	108	35.06
Tachypnoea	98	31.82
Hepatosplenomegaly	79	25.65
Lethargy	59	19.15
Shortness of breath	36	11.68
Signs of dehydration	31	10.06
Respiratory distress	29	9.41
Oedema	13	4.2
Cyanosis	9	2.92

*One patient might have presented more than one clinical sign

Paraclinical investigations: The mean hemoglobin value was 5.7±1.7g/dL with extremes of 1.1g/dL and 11.9g/dL; the MCV and MCHC was also reported with mean value for each respectively 69.44±10.762 fL and 35.62 ±6.868 g/dL 30% of transfused patients had an Hb level inferior or equal to 5g/dL (Table 4).

Table 4: Profile of the full blood counts of patients.

Elements of the FBC*	Mean	Standard deviation	Minimum	Maximum
White Blood Cells(/mm^3)	15730.345	2843.412	2960	28500
Hemoglobin(g/dL)**	5.739	1.7066	1.1	11.9
Haematocrit(%)	27.35	4.109	16.8	37.9
MCV(fL)***	69.44	10.762	38	108
MCHC(g/dL)****	35.62	6.868	19	55
Platelets(×10^9/L)	236.67	65.55	96	453

*Full Blood Count, **30% of transfused patients had an Hb level inferior or equal to 5g/dL.
Mean Cell Volume, * Mean Cell Hemoglobin Concentration.

Etiological diagnosis of anemia: Malaria was the most common etiological diagnosis, accounting for 44.5% of the cases; it was followed by sickle cell disease at 16.2%, sepsis was diagnosed in 11.0% of the patients.

Transfusion modalities: A total of 298 patients (96.8%) received transfusion of whole blood while 10 patients (3.2%) received transfusion of packed red blood cells.

The majority of patients 175(56.8%) received one transfusion, followed by 91(29.5%) receiving two transfusions. The mean number of transfusion was 1.59±0.792.

Post transfusion reactions developed: Urticaria 27(8.8%) was relatively common, followed by febrile reactions 15(4.9%).

Outcome of patients: After hospitalization, the outcomes were as follows: 271 patients (87.9%) were discharged alive, 8 patients (2.6%) were discharged against medical advice, and 1 patient (0.3%) was referred to another health facility; the mortality rate was 9.4% (Table 5).

Table 5: Outcome after hospitalization.

Clinical status at discharge	Number (N)	Percentage (%)
Managed and discharged	271	87.9
Dead	28	9.4
Discharged against medical advice	8	2.6
Referred	1	0.3

The majority of patients, 51.9%, stayed in the hospital for 3 to 5 days, followed by 20.5% who stayed for 1 to 3 days. A smaller percentage, 14.9%, had a hospital stay lasting from 5 to 10 days, while 12.7% were hospitalized for more than 10 days. The mean duration of hospitalization was 6.45±6.266 days.

Discussion

The prevalence of blood transfusions in our study was 4.8%. This was similar to the findings of studies done in Kenya and the United States [13,14], but less than the 12.3% and 17.1% obtained in studies conducted in Ghana and Gabon [9,15]. These high prevalences could be explained by differences in methodology in these studies.

The peak rate of transfusions was corresponding to the month of April and May with an overall prevalence of 29%. This is similar to the high prevalences obtained in other studies done in Cameroon and Gabon [9,16] during the same period(April, May and June). This period corresponds to the rainy season during which malaria transmission is high [16].

The majority of children transfused 95(30.8%) were in the age range of [1-3 years]; this was similar to findings in another study in Cameroon [17] both corresponding to the report by WHO database [18]; There was a male predominance of 55.8% with a sex ratio of 1.3; This was also similar to other studies done in Cameroon, Ghana and Ethiopia [15,17,19], but contrary to a study done in Yemen where there was no gender difference [14].

A total of 57.8% of transfused children were leaving in an urban centre, this is because the Bamenda regional hospital is situated in an urban area.

In our study, the most common presenting complaint was fever, which was reported in 71.8% of the patients. It was comparable to the findings of a study in Ghana [15]. The most common clinical sign observed was pallor, which was present in 65.26% of the patients; this is similar to a study reported in Kenya, Uganda, Tanzania [10].

The mean hemoglobin value in our study was 5.739±1.7066g/dL with extremes of 1.1 and 11.9g/dL which is comparable with a mean hemoglobin of 5.1 g/dL and 5.6g/dl obtained in Gabon and Congo-Kinshasa respectively [9,20].

Hemoglobin level less than 5g/dL was found in 30% of the patients, the mean MCV and MCHC was 69.44fL and 35.62g/dL. Same findings were noted in other areas in Africa [10].

Malaria was the most common etiological diagnosis, accounting for 44.5% of the cases closely followed by sepsis at 34.7% and sickle cell disease at 16.2%. In three other studies done in Cameroon, malaria equally ranked as the most common etiology; 36.5% of malaria, 18.3% of cancers and 16.7% of sickle cell disease; 68.8% of malaria and sepsis in 27.1%; 38.7% of malaria and sickle cell disease in 35.5% of cases respectively [11,12,17]. The differences in the reported proportions can likely be attributed to variations in the study sites, health facilities, and study populations involved. Furthermore, it is well-established that severe anemia is a common complication in children with malaria [21]. This close association between malaria and severe anemia may have contributed to the higher proportion of malaria cases (44.5%) identified as the leading cause of blood transfusions in the current study.

In other African countries, malaria was also found as the leading cause of blood transfusions [9,10,13]. Out of Africa, for instance, a study conducted in Yemen found that hemoglobinopathies accounted for 43.2% of the cases requiring blood transfusions, while malignancies were present in 25.3% of patients [7]. This difference can be explained by the relatively low burden of malaria in countries outside of Africa, compared to the high burden of hemoglobinopathies and cancers in these settings. The epidemiological profile of the dominant health conditions drives the etiological factors contributing to the need for pediatric blood transfusions.

In our study, 298 patients (96.8%) received whole blood transfusions while 10 patients (3.2%) received packed RBC transfusions; this is comparable with 97% of whole blood and 1% of packed RBC transfusions found in a study in Yaounde, Cameroon [17]. This is contrary to a study in Gabon which found

a higher percentage of PRBC administered to 99.3% of patients; this is explained by the fact that their national management protocols recommend the use of PRBCs than whole blood [9]. In our setting, more of whole blood is transfused than PRBCs probably because of its unavailability, difficulty in producing it and the cost which is higher than that of whole blood.

The majority of patients (56.8%) received only one transfusion; that was inferior to the findings in East Africa (77%) and Gabon (88.9%) [9,10]. The difference might be due to different type of blood components used for transfusion.

Urticaria (8.8%) and febrile reactions (4.9%) were relatively common as post transfusion reactions; these results are comparable with other studies [7,11].

Our mortality rate was 9.4% which was inferior to the 20% and 12% obtained in Kenya and Tanzania respectively [13,22], and greater than the 0.7% and 1.6% obtained in Gabon and Kinshasa-Congo respectively [9,20]. The differences might be explained by different sample sizes in the various studies. The average duration of hospitalization was 6.45days; slightly superior to the average of 4.7 days found in a study in Gabon [9]. This might be explained by different study sites, population and clinical practice.

Conclusion

This study showed that the prevalence of children presenting with severe anemia and requiring blood transfusions is quite high. Most of the children are under-fives, and malaria and sickle anemia are the most frequent etiologies. Following treatment most were discharged alive with no complications. We thus recommend that effective strategies be reinforced towards malaria prevention and screening of sickle cell anemia and proper follow up be effectively implemented down to the communities.

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