



## The Problem of Blood Transfusion in Children Hospitalised in the Paediatric Ward of the Macenta Prefectural Hospital (Guinea)

Camara Salématou Hassimiou<sup>1\*</sup>, Kolié Ouo Ouo<sup>1</sup>, Bangoura M'mah Aminata<sup>2</sup>, Barry Aissata<sup>1</sup>, Bangoura Kaba<sup>1</sup>, Diallo Fatoumata Binta<sup>1</sup>, Camara Emmanuel<sup>1</sup> and Diallo Mohamed Lamine<sup>1</sup>

<sup>1</sup>Department of Pediatrics, Hospital National Donka, Conakry, Guinea

<sup>2</sup>Institute of Nutrition and Child Health, Conakry, Guinea

\*Corresponding Author: Camara Salématou Hassimiou, Department of Pediatrics, Hospital National Donka, Conakry, Guinea.

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### Abstract

**Introduction:** Blood transfusion is one of the most sensitive activities in a health system. The aim of our study was to assess the problems associated with blood transfusion in children aged between 1 month and 15 years in the paediatric department of the Macenta prefectural hospital.

**Materials and Methods:** This was a dynamic descriptive study lasting twelve months, from 1 November 2019 to 31 October 2020, in the paediatrics department of the Macenta prefectural hospital. We included in the study all children aged 1 month to 15 years hospitalised for anaemia in whom a transfusion had been requested, whether or not it had been carried out.

**Results:** Out of 278 cases of anaemia identified, only 133 children were transfused, i.e. a frequency of 17%. The 0-4 year age group was the most affected (78.4%). Males predominated, with a sex ratio of 1.4. The main pathologies encountered in our patients were: severe malaria (77.33%) followed by pulmonary pathologies (43.16%), sickle cell disease (13.66%) and severe acute malnutrition (12.23%). Trauma requiring transfusion was noted in only 10 patients, a frequency of 3.59%. Haemoglobin levels before and after transfusion were systematically measured in all our patients. The mean level was 4.3g/dl, with extremes of 3 and 10.1g/dl. The problems encountered were medico-legal (parental opposition to blood transfusion: 22.7%; parental refusal to donate blood: 9.4%); medical (lack of blood in the bank: 20.1%; lack of bags: 0.7%), social (low economic level: 4.7%; parental conflicts: 0.7%; absence of the child's parents: 2.5% and absence of a family donor: 0.7%). Incidents/accidents were dominated by fever, vomiting and chills. The outcome was favourable in 62.4% of cases; twelve patients died, a rate of 9%.

**Conclusion:** The main pathology frequently encountered in anaemic children is malaria, and effective prevention and management of this condition would be very encouraging. Adverse transfusion reactions are not uncommon. This means that we need to establish the correct indication and step up transfusion monitoring in children.

**Keywords:** Transfusion; Problem; Child; Macenta

### Introduction

Blood transfusion is a therapeutic procedure involving the administration of blood or one of its cellular or plasma components, from one or more healthy subjects called "donors" to a sick subject called "recipient" [1]. It is one of the most sensitive activities in a healthcare system, due to the nature of the products used, which are of human origin (blood and blood products) on the one hand, and the quality of the recipient (the patient) on the other [2]. Transfusion safety is ensured by controlling all stages in the transfusion chain, from blood collection, preparation and biological qualification, to the performance of the transfusion procedure

[3]. Nowadays, even if screening tests are carried out for donors, they are not sufficient to guarantee transfusion safety with regard to certain viruses such as HIV, which makes blood transfusion a real public health problem [4]. In both children and adults, the indications for transfusion are based on the determination of a minimum haemoglobin level, but also on the patient's clinical condition [5]. All recipients of blood transfusions are exposed to the risk of accidents, which may occur early or late. According to the World Health Organisation, 5 to 10% of HIV infections worldwide are transmitted by blood transfusion or contaminated blood products [6]. Blood transfusion can be the cause of mechanical, immunological and in-

fectious accidents; in addition to these medical problems, there are social, medico-legal and blood bank supply problems [7]. In Africa, the organisation and operation of a blood transfusion service pose enormous problems.

Numerous obstacles arise from all sides and are essentially due to factors that are specific to African countries first and foremost, to the state of underdevelopment, and to the biological and pathological characteristics of the African population [8]. In GUINEA, according to the report presented by the national blood transfusion centre (CNTS), the number of units of blood suitable for therapeutic use that were transfused in 2020 was 61,151, of which paediatrics used 21,520 [9].

In Macenta there are no data on the epidemiology of blood transfusion in children.

Thus, the high frequency of blood transfusion in children and the difficulties associated with obtaining blood at the Macenta prefectural hospital motivated the choice of this study, the general objective of which is to take stock of the problems associated with blood transfusion in children aged between 1 month and 15 years in the paediatric department of the Macenta prefectural hospital.

**Material and Methods**

We conducted a dynamic descriptive study lasting twelve months from 1 November 2019 to 31 October 2020 in the paediatrics department of Macenta prefectural hospital. The Prefecture of Macenta is located in Forest Guinea in south-eastern Guinea, about 850 km from Conakry, with an area of 8,600 km<sup>2</sup> and a population of 297,779 inhabitants. The study included all children aged between 1 month and 15 years hospitalised for anaemia in whom a transfusion was requested, whether or not it was carried out. We did not include in our study children hospitalised for anaemia not requiring a blood transfusion and children hospitalised for other pathologies.

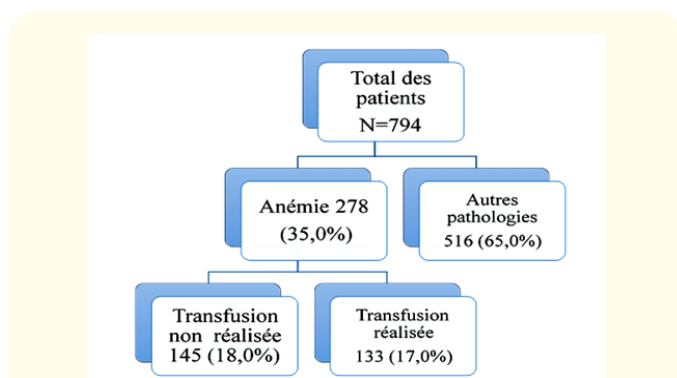
Recruitment was exhaustive and involved children who met the selection criteria. The variables studied were sociodemographic, clinical and para-clinical characteristics and problems related to blood transfusion. The data were analysed using the following software: Word, Application Kobocollect v1.25.1. Excel Office 2017.

Confidentiality of information was ensured.

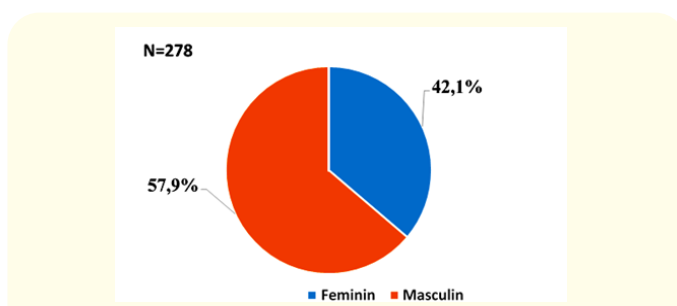
**Results**

Out of 278 cases of anaemia recorded, only 133 children were transfused, a frequency of 17%. The 0-4 age group was the most affected (78.4%). Males predominated, with a sex ratio of 1,4.

Physical signs were dominated by tachycardia (94.1%), prostration (71.2%), pallor (69.8%), systolic murmur (64%), weight



**Figure 1:** Flow chart of patients hospitalised in the paediatric ward of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.



**Figure 2:** Distribution of 278 patients hospitalised for anaemia by sex in the paediatric ward of Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

**Table 1:** Distribution of 278 patients hospitalised for anaemia by age group in the paediatric ward of Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Age groupe (year)	Head count	Percentage (%)
0-4	218	78,4
5-9	48	17,3
10-14	12	4,3
Total	278	100,0

loss (12.23%), cold extremities (10.1%), and turgidity of the jugular veins (6.8%). The main pathologies encountered in our patients were: severe malaria (77.33%), followed by pulmonary pathologies (43.16%), sickle cell anaemia (13.66%) and severe acute malnutrition (12.23%). Trauma leading to transfusion was noted in only 10 patients, a frequency of 3.59%. Haemoglobin levels before and after transfusion were systematically checked in all our patients. The mean level was 4.3 g/dl with extremes of 3 and 10.1 g/dl.

Nature of products transfused : The blood product most commonly used in our patients was packed red blood cells (PRBC) in 52.63% (n = 70), followed by fresh whole blood (FBS) in 47.36% (n = 63).

**Table 2:** Frequency of physical signs in the 278 patients hospitalised for anaemia in the paediatric ward of Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Physical signs	Headcount	Percentage (%)
Tachycardia	261	94,1
Prostration	198	71,2
Palor	194	69,8
Anaemic systolic murmur	178	64,0
Weight loss	34	12,23
Cold extremities	28	10,1
Jugular turgidity	19	6,8
Splenomegaly	12	4,3
Loss of consciousness	8	3,1
Hepatomegaly	8	3,1
Chest indrawing	4	1,4
Thoraco abdominal swing	1	0,4
Whimper	1	0,4
Longer skin recolouring time	1	0,4

**Table 3:** Frequency of the main pathologies encountered in the 278 patients hospitalised in the paediatric ward of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Pathologies	Headcount	Percentage (%)
Severe malaria	215	77,33
Lung diseases	120	43,16
Sickle cell disease	38	13,66
Severe acute malnutrition	34	12,23
Trauma	10	3,59
Malignant haemopathies	2	0,71
Heart disease	1	0,35

**Table 4:** Distribution of 278 patients hospitalised for anaemia according to THb before transfusion in the paediatric ward of the prefectural hospital of Macenta from 1 November 2019 to 31 October 2020.

Average rate 4.3g/dl Extreme rates 3 and 10.1g/dl.

Haemoglobin level (g/dl)	Headcount	Percentage (%)
< 7	172	62,1
[7 - 10]	102	36,5
[10-11]	4	1,4
Total	278	100,0

**Table 5:** Distribution of 278 patients hospitalised for anaemia according to their blood group in the paediatric department of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Blood Grouping	Headcount	Percentage (%)
O+	111	39,9
B+	99	35,6
A +	53	19,0
AB+	11	4,1
O -	4	1,4
Total	278	100,0

The problems encountered were medico-legal (parents' opposition to blood transfusion: 22.7%; parents' refusal to donate blood: 9.4%), medical (lack of blood in the bank: 20.1%; lack of bags: 0.7%), social (low economic: 4.7%; parental conflict: 0.7%; absence of the child's parents: 2.5% and absence of a family donor: 0.7%). Incidents/accidents were dominated by fever, vomiting and chills. The outcome was favourable in 62.4% of cases; twelve patients died, a rate of 9%.

**Table 6:** Frequency of problems encountered before blood transfusion in the 278 patients hospitalised in the paediatrics department of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Problems encountered	Headcount	Percentage
Medico-legal problems		
Parents' opposition to blood transfusion	63	22,7
Parents' refusal to donate blood	26	9,4
Medical problems		
Shortage of blood in the bank	56	20,1
Shortage of blood bags	2	0,7
Social problems		
Low economic level	13	4,7
Parental conflicts	2	0,7
Absence of the child's parents	7	2,5
No family donor	2	0,7

**Table 7:** Distribution of 133 patients transfused according to incidents/accidents during blood transfusion in the paediatrics department of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Transfusion incidents/accidents	Headcount	Percentage (%)
No incident/accident	113	85,0
Fever	10	7,5
Vomiting	6	4,5
Shivering	4	3,0
Total	133	100,0

We observed a decrease in haemoglobin levels in 11 patients after transfusion, a frequency of 8.3%.

**Table 8:** Distribution of 133 patients transfused according to outcome in the paediatric department of the Macenta prefectural hospital from 1 November 2019 to 31 October 2020.

Treatment outcome	Headcount	Percentage (%)
Improved	83	62,4
Discharged against medical advice	27	20,3
Deceased	12	9,0
Referred	11	8,3
Total	133	100

### Discussion

Our study is a dynamic descriptive study of children whose clinical condition required blood transfusion and who were registered in the paediatric department of the Macenta prefectural hospital. During the course of our study, we recruited 794 patients, 278 of whom (35%) were included in our study. Of the 278 cases of anaemia, only 133 patients were transfused, a frequency of 17%. Our result is lower than that of Babela J.R., *et al.* [10] who reported a frequency of 41.78%. This high frequency of anaemia in our study could be explained by the high number of malarial anaemia cases in the locality. The low transfusion rate may be due to problems encountered when offering transfusions to parents. We found a predominance of males, with a sex ratio of 1.4%. The age group most affected was 0-4 years with a frequency of 78.4%, followed by 5-9 years with 17.3%. This result is comparable to that of Rakotoarisoa., *et al.* [8], who state that the population most affected by transfusion in paediatrics is the under-5s, especially infants. Mayuku F.G., *et al.* [11] also reported in their study that children aged between 1 and 5 years were in the majority, with a sex ratio of 1.13 in favour of boys. The WHO also considers that the greatest frequency of severe anaemia occurs between 6 and 59 months of age. The high frequency in this age group could be explained by the low level of protection at this age, which predisposes children to severe malaria, and the increased frequency of malarial anaemia [11]. Tachycardia, prostration, pallor and anaemic systolic murmur were the most dominant physical signs in our study series. This may be explained by haemolysis during severe malaria and the delay in consultation. Pallor, dyspnoea and tachycardia were the main criteria for blood transfusion. These clinical signs assess the degree of decompensation of the anaemia and the individual adaptation of the organism.

In addition, we found that all children admitted during the study period with more than 4 signs of transfusion criteria and a haemoglobin level of less than 5g/dl received a blood transfusion. This can be explained by the fact that children most often come to

hospital with severe decompensated anaemia, bearing in mind that delays in diagnosis and management complicate even moderate anaemia and lead to a combination of several serious clinical signs.

The main pathologies encountered in our patients were: severe malaria (77.33%) followed by pulmonary pathologies (43.16%), sickle cell disease (13.66%) and severe malnutrition (12.23%). Our results are superior to those of Dan V., *et al.* [12] who reported that 74% of transfusion cases were related to severe malaria. According to Rakotoarisoa., *et al.* [8], the diseases most associated with transfusion were respiratory and haematological diseases, including sickle cell disease and haematological malignancies. In developing countries, the predominance of pneumopathies in children can be explained by pollution, and the frequency of iron deficiency by inadequate intake, malnutrition and recurrent inflammation [8].

Sickle cell anaemia is a haemoglobinopathy which causes haemolytic, vaso-occlusive and infectious clinical manifestations, in which transfusion, by lowering the level of abnormal haemoglobin S, is an essential therapeutic modality [13].

The haemoglobin level is usually prescribed prior to transfusion. In our series, 62.1% of children had a haemoglobin level of less than 7g/dl, with an average level of 4.3g/dl and extremes of 3 and 10.1g/dl. Our results are comparable to those of Rakotoarisoa., *et al.* [8], who found a haemoglobin level before RGC transfusion of less than 7 g/dl in 57.1% and between 7 and 10 g/dl in 41.3%. However, our results are inferior to those of Babela J.R., *et al.* [10] who reported in 2015 that THb ≤ 5g/dl was the most frequent, i.e. 70.8%, the mean THb was 4.2 g/dl, with extremes of 3 and 8.2 g/dl (Congo). In black African countries, where anaemia is mainly chronic, the transfusion threshold is an Hb level of less than or equal to 5 g/dl. Transfusion depends above all on haemodynamic and respiratory tolerance [8].

The blood product most commonly used in our patients was packed red blood cells (PRBC) in 52.63% (n = 70), followed by fresh whole blood (FBS) in 47.36% (n = 63). Our results are contrary to those of Mayuku F., *et al.* [11] in Congo, who noted that almost all the blood products prescribed were packed red blood cells (99.5%). The low rate of use of packed red cells was due to the lack of blood in the blood bank.

The problems encountered prior to transfusion were medico-legal (parental opposition to blood transfusion: 22.7%; parental refusal to donate blood: 9.4%), medical (lack of blood in the bank: 20.1%) and social (low economic level: 4.7%; parental conflicts: 0.7%; absence of the child's parents (2.5%) and absence of a family donor: 0.7%). The high frequency of these problems could be explained by:

- Religious considerations/customs that forbid any act of taking a part of oneself;
- Refusal out of fear of seeing their own blood and their serological status.
- Lack of information about blood donation and where to collect it,
- Lack of financial means and parental conflicts making it difficult to decide whether or not to have a transfusion.
- For others, giving blood was synonymous with death.

Transfusion was uneventful for 85.0% of our patients. Immediate adverse transfusion reactions are defined as clinical manifestations unexplained by the patient's pathology and occurring during or immediately after the transfusion procedure [8]. The immediate adverse events encountered in our study were mainly fever in 10 patients (7.5%), followed by vomiting (6 patients) (4.5%) and shivering (4 patients) (3%). Navaro, *et al.* [14] reported ten side effects in patients in their study, including non-haemolytic febrile reaction in 6 cases. Transfusion incidents/accidents are a worrying situation, which could demonstrate that blood transfusion is a medical practice that involves risks and deserves special attention throughout the transfusion chain.

We observed a decrease in haemoglobin levels after blood transfusion in 11 patients (8.3%). This decrease in haemoglobin level after blood transfusion was observed in sickle cell patients who had received whole blood (due to a lack of packed red blood cells). It should be noted that the Macenta prefectural hospital transfuses the majority of its patients with whole blood.

Of the 133 patients transfused, 83 (62.4%) were discharged with improvement, 27 (20.3%) were discharged against medical advice and 11 (8.3%) were referred. However, 12 patients died, representing a mortality rate of 9%.

## Conclusion

Our study has shown that the management of an anaemic child is a real public health problem in our hospital. The criteria for deciding to transfuse and the choice of products to transfuse must be judicious. Malaria is the most common anaemia-causing disease in children, and effective prevention and management would be very encouraging. Undesirable effects are not uncommon. This means that the indication for transfusion needs to be carefully established, and transfusion monitoring needs to be stepped up, as does the prevention of anaemia through treatment of iron deficiency.

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