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Transfusion Practicein Full-Term Newborn in a West African Teaching Hospital (Abidjan, Cote D'ivoire)

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Abstract

Introduction: *In Côte d'Ivoire, blood transfusion remains the main treatment for severe anemia during neonatal period. The current transfusion protocol is to transfuse, within the first 15 days of life, any premature less than 32 weeks old with a hemoglobin level of less than 10 g/dL twice within 12 hours. The data being rare infull-term neonates, our study aimsto analyse transfusion practice, for these newborns, in order to improve professional practice.*

Methods and patients: *Our study was held over a fourteen months period, from January 2017 to February 2018. All newborns aged more than 37 weeks old, hospitalized at the Yopougon's teaching hospital, with a hemoglobin level below 13g/dL, were included.*

Results: *During the study period, 500 newborns were hospitalized, 437 of whom were born full term.Anemia's prevalence was 17.6% and that of blood transfusion 53.2%. Pallor (p = 0.040957098008) and hemoglobin rate below 10g/dL (p = 1.9431959988505.10-7) were our significant criteria for transfusion.*

Conclusion: *We recommend blood transfusion in cases of anemia in full-term newbornwith signs of decompensation and ahemoglobin rate of less than 10g/dL. The targethemoglobin rate will be 13g/dL.*

Keywords: *anemia, full-term newborn, transfusion, Abidjan.*

Introduction

Transfusion of erythrocyte concentrates represents in important therapeutic choice in the management of severe anemia during the neonatal period in Côte d'Ivoire[1, 2, 3]. In the West, the advents of erythropoietin and transfusion savings policy have led to a considerable reduction in the number of transfusions per child in newborn[4, 5, 6]. In developed countries, the use of this therapy is frequent in low birth weight babies and mainly concerns premature babies. Indeed, studies in Canada [7] and Australia [8] reported blood transfusion rates of respectively 56% and 60%in preterm infants less than 32 weeks of age. In Côte d'Ivoire, the studies carried out observed transfusion rates of 10. 7% in low-birth-weight newborns in Bouaké [3] and 56% in premature infants in Abidjan [2, 1]. Following these studies, the current protocol in Yopougon's teaching hospital neonatology department is to transfuse within the first fifteen days of life, any premature less than 32 weeks with anemia with a hemoglobin less than or equal to 10 g / dL to reach a level of 15 g / dL if necessary in two transfusions spaced 12 hours apart [2]. However, in the full-term newborn whose anemia often occurs without signs [6], studies on blood transfusion is rare. This results in a lack of validated written procedures establishing rules for anemicfull-term newborns transfusion in our service. The aim of this study was to analyze the transfusion practice in these newborns in order to propose recommendations for the improvement of professional practice.

Methods and Patients

Patients

This is a descriptive and analytical retrospective study conducted over a period of fourteen months

(January 2017 to February 2018) in the neonatology department of Yopougon's teaching hospital, a public health facility located at the tertiary level of the sanitary pyramid. The unit receives premature or full-term newborns aged 0 to 28 days born in the institution's maternity ward and those referred from outlying centers or other regions. The neonatology department has a capacity of 29 beds and is subdivided into three major areas: emergency, intensive care and neonatal medicine. It is equipped with ten incubators, five monitors for continuous monitoring of blood pressure, heart rate and oxygen saturation, three radiant tables, three vacuum cleaners, three light therapy devices, an intensive phototherapy tunnel, blood pressure system and a wall oxygenation. The medical and paramedical team includes eleven doctors and fifty caregivers (39 midwives, 9 nurses and 9 caregivers). Reception, daily visit, permanence and guard, supervised by a senior, are carried out by the doctors registered with the diploma of specialized studies of pediatrics, assisted in their tasks by midwives and caregivers. The study population consisted of all newborns admitted to the unit during the study period. All full-term newborns, more than 37 weeks of gestational age, hospitalized, presenting anemia with a hemoglobin rate below 13g / dL at the admission or during hospitalization were included. All newborns with unusable records and those diagnosed with anemia on the basis of the physical examination alone were not included in the study.

Method

Newborns were received in the emergency unit on a heated table. After stabilization, the information was collected through parents or caregivers and the mother-child health record. At the end of a careful clinical examination, complementary exams were carried out, guided by the etiological orientation. The diagnosis of neonatal infection was retained on the basis of anamnestic and clinical data confirmed or not by bacteriology. Perinatal asphyxia was retained in front of an APGAR score of less than 7 and the existence of an anoxic context. Neonates were transfused on the basis of signs of cardiorespiratory decompensation or a haemoglobin rate less than or equal to 13. The blood product used for the transfusion was the erythrocyte concentrate which is the only blood product available in emergency in our context. The quantity to be transfused was calculated by the following formula: Quantity (ml) = 3 x weight x (theoretical Hb - Hb of the patient) without exceeding 15 ml / kg in 4 hours. A coupon was given to the parents for the purchase of the blood bag in the UHC pharmacy. The ABO-rhesus compatibility rules were respected fornewborns' transfusion[9]. Treatment associated with blood transfusion depended on the identified cause. Monitoring was done bythe doctor's or nurse's clinical observation. Epidemiological, anthropometric, clinical and laboratory data were collected on a pre-established survey form. The studied parameters concerned the newborn (age, sex, birth weight, APGAR score, clinical status, hemoglobin rate), the mother (gestity, parity, hemoglobin level), circumstances of birth (number of prenatal consultation, delivery route, existence of bleeding, placental abnormalities, concept of transfusion), transfusion (reason for transfusion, amount of blood prescribed and received, number of transfusions, post-transfusion hemoglobin rate) and evolution.

For this study, we sought and obtained administrative authorizations for the exploitation of medical records. The newborns' anonymity was guaranteed. The data were entered and analyzed with the SPSS 20. 0 software. The statistical tests used were the Khi2 or Fisher test for the qualitative data. The significiencythresholdwas set at 5%.

Results

Population's General Characteristics

During the study period, 500 newborns were hospitalized, 437 of whom were born full term. Among these newborns, 77 (47 boys and 30 girls, sex ratio1. 6%) were transfused with a hospital frequency of 17. 6%. Admission was made before the 24th hour of life in 62. 3% of cases. Neonatal antecedents revealed unspecified maternal hemoglobin rate in the health book in 75. 3% of cases. Anti-anemic prophylaxis was prescribed during prenatal consultations in 83. 1% of cases (64/77). Bleeding during labor was specified in 3. 9% of cases. The diagnosis was maternal-fetal infection in 48. 1% (Table I).

Table I. *Distribution of newborns according to diagnosis*

Retained diagnosis	Effectifs	Pourcentages
Maternal-fetal infection	37	48,1
Anemia of undetermined etiology	18	23,4
Malaria	10	13
Perinatal asphyxia	5	6,5
Pneumopathy with commonplace germs	4	5,2
Omphalitis	2	2,3
Nuclearicter	1	1,3
Total	77	100

Hemoglobin Rate

The hemoglobin rate was greater than 10 g / dL in 75. 3% (58/77) of the cases, between 8 and 10 g / dL in 16. 9% (13/77) of the cases and less than 8 g / dL in 7. 8% (6/77) of the cases. The median hemoglobin rate was 11 g / dL with extremes ranging from 4. 9 g / dL to 13 g / dL

Transfusion Practices

The blood transfusion rate was 53. 2% (41/77). The average amount of erythrocyte concentrates prescribed was 43. 5ml and that delivered was 180ml which represents a difference of 175. 5ml of blood that was not used. In 46. 3% of the cases, the transfusion was performed after the 15th day of life (19/41). The clinical criteria for blood transfusion are shown in Table II. Analysis of clinical and biological criteria for transfusion showed significant differences in pallor (p = 0. 040, Khi 2 = 4. 1) and hemoglobin rates below 10g / dL (p = <0. 001) (Table III) which represented the decisive criteria for the indication of blood transfusion in our context. The median hemoglobin level during transfusion was 9. 6g / dL. Sixty-one percent of newborns received a single transfusion during hospitalization, 34. 2% (14/77) were transfused twice and 4. 8% were transfused more than twice (2 / 77). Among the neonatestransfused several times, one was hypotrophic (birth weight <2500 grams). The average weight was 2943. 8 grams with extremes of 1800 grams and 3800 grams. There was no statistically significant link between the retransfusion rate and the birth weight (p = 1) or between the retransfusion rate and the initial hemoglobin level (p = 2. 24). The reason for the polytransfusion was low hemoglobin rate (100%). The delay between the different transfusions was less than 12 hours in 68. 8% (11/16). Post-transfusion hemoglobin rate was available in 53. 2% of cases (41/77). It was greater than 15g / dL in 19. 5% of newborns (8/41).

Table II. *Distribution of transfusion according to clinical signs*

Therapeuticchoice / Clinicalsigns	Transfused	Non transfused	Total
Pallor	22 (66,7%)	11 (33,3%)	33 (100%)
Tachycardia and polypnoea	14 (37,8%)	23 (62,2%)	37 (100%)
Others *	5 (71,4%)	2 (28,6%)	7 (100%)
Total	41 (53,2%)	36 (46,8%)	77 (100%)

*neurological disorders, lengthening of the skin recollection time, dull complexion

p = 0,040957098008 ; Khi 2 = 4,177

Table III. *Distribution of transfusion according to hemoglobin rate*

Therapeuticchoice / Hemoglobin rate	Transfused	Non transfused	Total
<10	23 (94,4%)	1 (5,6%)	18 (100%)
[10-13]	18 (34%)	35 (66%)	53 (100%)
Total	41 (53,2%)	36 (46,8%)	77 (100%)

(p <0,001; Odds Ratio = 42,65) Intervalle de confiance (95%) (IC95%) = [5,99-1873,22]

Evolution

After transfusion, 43. 9% of newborns remained anemic (18/41). No complications were noted during transfusions. The average duration of hospitalization was 7. 9 days. The overall evolution was marked by healing in 87. 01% (67/77) and death in 12. 98% (10/77).

Discussion

The objective of the study was to analyze transfusion practice in the full-term newborn in order to improve professional practice. This study shows that the prevalence of blood transfusion is 17. 6%. The median hemoglobin rate at admission was 11g / dL. Pallor and hemoglobin rate below 10g / dL were significant criteria for of a blood transfusion in the full-term newborn. This last one is transfused once in 61% with an average amount of 43. 5 ml. The multiple transfusions found in 4. 8% of cases were performed in a stationary clinical state and were neither related to birth weight nor post transfusion hemoglobin rate. Neonatal infection was the main pathology associated with anemia. The large number of missing data on maternal hemoglobin rates did not allow us to study the link between the mother's hematological status and that of her child. A recruitment bias related to the retrospective nature of the study did not allow exhaustive data collection. Despite this bias we can make the following comments:

The hospital frequency of anemia in our study is 17. 6%. This rate is lower than that found in 1998 in an unpublished study at Yopougon's teaching hospital, which reported a frequency of 26. 34%. This indicates the importance of the progress made in the prevention and management of the newborn in our context. In West Africa, the prevalence of neonatal anemia remains relatively high. In Mali, Diallo D et *al* [10] found in 1994 an anemia prevalence of 56. 8% in a maternity hospital in Bamako. A more recent study in Cameroon observes an almost identical frequency of 57. 2% [11]. Pre-existing maternal nutritional anemia may explain this situation although in our study, 83. 1% of mothers reported having taken anti-anemic prophylaxis during pregnancy. However, no objective data could attest to the effectiveness of this treatment. The link between maternal iron deficiency and the occurrence of iron deficiency anemia in newborns has already been demonstrated in Côte d'Ivoire by Sakandé et *al* [12]. For Diallo et *al* [10] in Mali, newborn's anemia was also influenced more by maternal iron deficiency than by its hemoglobin rate during pregnancy. This raises the necessityof the martial assessment in the mother duringpregnancy [13]. In fact, the most recent data show that a determination of ferritin in the first trimester of pregnancy serves as a baseline rate for the prevention and treatment of anemia in the mother [14]. The average hemoglobin level was lower than the physiological norm of 13 to 20 g / dL to be reached during the first 15 days [15]. This could be explained by blood spoliation linked to multiple sampling for diagnostic purposes and monitoring during hospitalization [16, 17, 18] aggravated by the underlying neonatal infection.

Regarding transfusion practice, the transfusion rate was 53. 2% in our series. It remains lower than that of Dick-Amon-Tanoh et *al* [2] and Lasme et *al* [1] (respectively 56% and 56. 5%) on a premature population. Yao et *al* [3] reported a prevalence of blood transfusion of 10. 7%, concerning premature babies in 70% of cases. Indeed, the premature newborn presents a haematological immaturity which makes it more susceptible to blood transfusion than the full-term newborn. Pallor and hemoglobin levels below 10g / dL were the determining criteria for transfusion in our series. This hemoglobin level was identified by several authors [19, 20, 21] as a transfusion threshold, especially if it was associated with clinical signs. In the study conducted by Lasme et *al* [1] in Côte d'Ivoire, the triad pallor, tachypnea, tachycardia associated with an increase in skin recoloration time and hemoglobin rate below 10g / dl had a significant influence on blood transfusion in premature infants. These same criteria were apparent in the study conducted by Dick-Amon-Tanoh et *al* [2]. In 1993, in the first weeks of life, it was the hemodynamic disorders that essentially made the indication of a blood transfusion in anemic neonates [16]. In 1998, in France, the investigation on transfusion practices in neonatology showed that some practitioners took into account the child's clinical condition of the child instead of the hemoglobin rate to transfuse [22]. These practices are similar to those of our service currently especially in the absence of a blood count. They reveal the necessity of a careful clinical examination in order to eliminate any other cause of pallor during the neonatal period, particularly that related to haemodynamic disorders during relative hypovolemia. The average amount prescribed was 43. 5ml with a difference between the amount of blood prescribed and the delivered quantity of 175. 5ml. This mismatch between the amount of blood prescribed and that delivered represents a considerable and detrimental loss for both patients

and the structures in charge of managing blood donation. In order to alleviate the problem labile blood products waste, pediatric bags should be made available for neonatology departments. However, this provision is not yet effective.

In our study, polytransfusion's frequency was 4. 8%. This rate, although close, remains lower than that noted by Yao et *al* [3] on a population of newborn with low birth weight and also lower than the rates found by Villeneuve et *al* [23] (70. 4%) and Dick-Amon-Tanoh et *al* (33%) [2]. This difference could be explained by the fact that these studies concerned premature newborns. The reason for polytransfusion was the low hemoglobin rate in our series as found in other studies [8, 24]. Yao et *al* [3] reported that the stationary clinical evolution was the reason for polytransfusion. There was no link between polytransfusion, hemoglobin, and birth weight in our series.

Concerning evolution, 43. 9% of newborns remained anemic (18/41) after transfusion. This result is lower than those reported by Dick-Amon-Tanoh et *al* (81%) [2] and Lasme-Guillao et *al* (80. 6%) [1] in premature infants. The hematopoietic immaturity in prematurity aggravated by neonatal infection could explain these high rates. The hemoglobin rate after transfusion was greater than 15g / dL in 19. 5% of cases. According to Simon et *al.* ,a transfusion should not correct beyond a hemoglobin rate of 15g / dL [25]. Because of the risk of vascular overload, Whyte RK et *al* advocates a target hemoglobin rate of 13g / dL [26]. If in this study no complication has been found, it should be noted that the practice of blood transfusion is not trivial. The accessible measures such as delayed cord clamping, limitation of samples reducing blood spoliation but especially prevention of newborn's anemia during pregnancy are within our reach. These measures could reduce the use of the risks of transfusion practice. Also, in our resource-poor countries, validating our transfusion criteria and establishing a transfusion protocol will reduce unnecessary transfusions.

Conclusion

Pallor and hemoglobin rates below 10g / dL were significant determinants of blood transfusion in our series. In our context made difficult by periodic unavailability of blood products, we recommend blood transfusion in the full-term newborn's anemia with signs of decompensation and a hemoglobin rate of less than 10g / dL. The target hemoglobin rate will be 13g / dL.

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