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Obstetric Emergencies and Blood Transfusion in Three Health Districts (Bamako, Ségou, Koulikoro) in Mali

Soumana Oumar Traoré*, Amadou Bocoum, Mamadou Sima, Seydou Fané, Abdoulaye Sissoko, Aminata Kouma, Saoudatou Tall, Saleck Doumbia, Fousseyni Dembélé, Niagalé Sylla, Nouhoun Diakité, Youssouf Traoré, Ibrahima Teguete, Niani Mounkoro

Reference Health Center of Commune 5 of the District of Bamako, Bamako, Mali
Email: *traoreoumar69@yahoo.fr

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Abstract

Introduction: Obstetric hemorrhage is one of the leading causes of maternal mortality and morbidity worldwide, accounting for approximately 25% of pregnancy-related deaths, particularly during the postpartum period. The objective of this study was to evaluate the role of blood transfusion in the management of obstetric emergencies. **Patients and Method:** We conducted a cross-sectional, analytical study with prospective data collection, covering the period from January 1, 2017 to December 31, 2019. Included in this study were all women in the period of pregnancy and childbirth presenting with hemorrhage and who were admitted to the gynecology-obstetrics departments of the different health districts for an obstetric emergency requiring a blood transfusion. **Results:** Blood transfusions were required in 16.3% of obstetric emergencies. The mean age of the patients was 28 ± 6.6 years, ranging from 15 to 49 years. The mean parity was 4.3, with a range from 1 to 11 children. The majority of patients (85.78%) were unpaid, and 75% had received prenatal care. Most patients (76.80%) were transferred to the hospital, often due to symptoms such as dizziness and dyspnea (42.56%). The shock index was less than 0.9 in 30.75% of patients. The main indications for blood transfusion were uterine atony, retained placenta, soft tissue tears, nutritional anemia, and malaria complicated by anemia. The most frequently requested blood types were O positive and B positive. In more than half of the cases (50.50%), the requested blood product was whole blood, while 21.20% of cases required packed red blood cells. Transfusion reactions were recorded, including acute pulmonary edema (5 cases), anaphylactic shock (4 cases), and 18 maternal deaths due to delays in obtaining blood products and/or unmet needs. **Conclusion:** Blood transfusion plays a crucial role in the management of obstetric

emergencies. The implementation of preventive measures and the continuous availability of blood products could significantly improve obstetric outcomes and reduce maternal and fetal mortality.

Keywords

Blood Transfusion, Obstetric Emergencies

1. Introduction

Obstetric hemorrhage is a major cause of maternal mortality and severe morbidity worldwide, accounting for approximately 25% of pregnancy-related deaths. According to the World Health Organization (WHO), obstetric complications are responsible for a significant proportion of maternal deaths in developing countries, where medical resources are often limited [1]. Severe hemorrhage, particularly postpartum bleeding, remains the leading cause of maternal mortality in resource-poor regions, such as sub-Saharan Africa [2].

In this region, the challenges of managing obstetric emergencies are compounded by inadequate prenatal care, limited availability of blood for transfusion, and barriers to accessing healthcare facilities. Blood transfusion, a key component in the management of obstetric hemorrhage, becomes essential when other methods of hemorrhage management fail. This procedure compensates for blood loss, optimizes tissue perfusion, and ensures better maternal survival [3]. However, despite advances in transfusion medicine, challenges remain, particularly regarding the availability of blood products, the management of transfusion risks, and associated complications. The objective of this study is to provide an overview of blood transfusion in obstetrics in three health districts of Mali. More specifically, it aims to analyze the characteristics of transfused patients, the indications for transfusions, as well as the complications and prognosis associated with this practice. Blood transfusion in obstetrics has evolved over the years, with improvements in the safety of practices and more rigorous management of blood products [4]. However, the issue of supply, stock management, and staff training remains crucial, particularly in resource-limited settings [5]. This study focuses on blood transfusion needs in the context of obstetric emergencies, taking into account the local specificities of Malian health districts. The objective was to evaluate the frequency of blood transfusions, transfusion criteria, complications, and maternal prognosis related to transfusions.

2. Methodology

This was a cross-sectional, analytical study with prospective data collection. The study was conducted in three health districts in Mali: the Bamako, Ségou, and Koulikoro districts, which are referral health facilities that receive obstetric emergencies. An obstetric emergency is defined as any clinical situation occurring dur-

ing pregnancy, childbirth, or the postpartum period that requires immediate and appropriate care to protect the health of the mother and fetus, or even to save lives. These health facilities are equipped with the technical capabilities of district hospitals, including operating rooms and a resuscitation unit. Data were collected between January 1, 2017, and December 31, 2019. Sampling was exhaustive, encompassing all patients who required a blood transfusion for an obstetric emergency. These sites were chosen based on the availability of staff for data collection and the presence of adequate medical equipment for treating obstetric emergencies.

Inclusion criteria were any pregnant or postpartum woman experiencing a hemorrhagic complication requiring a transfusion. Data were entered using Microsoft Office Word 2019 and Excel 2019. Data analysis was performed using SPSS (version 20). Statistical analyses were used to calculate odds ratios (OR) and 95% confidence intervals (95% CI). A significance level of $p < 0.05$ was set.

Ethical considerations: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Confidentiality was maintained throughout the study.

3. Results

3.1. Frequency of Blood Transfusions

In total, 647 blood transfusions were performed out of 3971 obstetric emergencies, representing a frequency of 16.3%. This high frequency can be explained by the significant prevalence of obstetric hemorrhages in low-resource countries, where care conditions are often suboptimal.

3.2. Socio-Demographic Data

Socio-demographic data from transfused patients showed that the majority (68.62%) were between 20 and 34 years old. The average parity was 4.3, with a range of 1 to 11 births. The majority of patients (85.78%) were unemployed. Married patients accounted for 88.1% of transfused cases, demonstrating a strong correlation between marital status and the need for transfusion, as shown in Table 1.

Table 1. Socio-demographic data of patients.

Age ranges (years)	Transfusion (Yes) 647	Transfusion (No) 3324	p	GOLD	IC
15 - 19	182 (28.10%)	1002 (30.14%)	0.305	0.93	[0.82 - 1.07]
20 - 34	444 (68.62%)	1186 (35.65%)	0.000	1.92	[1.79 - 2.06]
35 - 49	21 (3.28%)	1030 (34.20%)	0.000	0.10	[0.07 - 0.16]

3.3. Indications for Transfusion

The main indications for blood transfusion were: anemia following postpartum hemorrhage due to uterine atony (37.7%), nutritional anemia (15%), and retained placenta complicated by hemorrhage (13.9%). Other complications such as soft

tissue tears and coagulation disorders are also frequent causes of transfusion in obstetrics, as shown in Table 2.

Table 2. Main indications for blood transfusion.

Indication	Yes (%)	No (%)	p	GOLD	IC
Atony uterine	244 (37.7%)	1254 (37.8%)	0.000	1.00	[0.98 - 1.11]
Anemia deficiency	97 (15%)	565 (17%)	0.212	0.88	[0.72 - 1.08]
Retention placental	90 (13.9%)	462 (13.9%)	0.001	0.72	[0.59 - 0.88]
Anemia marshy	49 (7.66%)	154 (4.63%)	0.001	1.63	[1.20 - 2.23]

3.4. Products Blood Used

The most commonly used blood products were whole blood (50.5%), packed red blood cells (21.2%), and fresh frozen plasma (18.1%). Requests for massive transfusions (4 - 5 units) were made for 564 patients and were actually administered in 18.33% of cases. This underscores the importance of having sufficient quantities of blood products available to manage severe obstetric hemorrhages, as shown in Table 3.

Table 3. Nature of blood products used.

Product blood		Number (%)
Total Blood		327 (50.5%)
Red blood cell clot		137 (21.2%)
Frozen Fresh Plasma		117 (18.1%)
Red blood cell concentrate frozen plasma	**+ Fresh**	66 (10.2%)

3.5. Prognosis

The average length of stay in the service was 14.5 days with extremes of 1 and 21 days.

Maternal morbidity and mortality: We observed transfusion-related incidents: acute pulmonary edema (5 cases), anaphylactic shock (4 cases), hyperthermia-chill syndrome (3 cases), urticaria (3 cases), and lumbar pain (2 cases). We recorded 18 maternal deaths during this study. These deaths were related to either the absence of blood, insufficient blood, or delayed blood acquisition. **Perinatal and neonatal mortality:** out of a total of 231 newborns, we recorded 77 stillbirths including 12 macerated, 12 newborns with a morbid Apgar score, 9 of whom died in the neonatal period.

4. Discussion

4.1. Frequency of Blood Transfusions

The rate of blood transfusions observed in this study was 16.3%, which is similar to results reported in other studies conducted in Africa. For example, Ilunga *et al.*

[6] reported a rate of 16% in a study in the Democratic Republic of Congo, while other research in sub-Saharan Africa indicates rates ranging from 5.7% to 26.1% depending on the context. This high rate in our study can be explained by several factors: malnutrition, poor management of postpartum hemorrhage, and inadequate quality prenatal care. Blood transfusion thus becomes a necessary solution in situations where other interventions fail or are inaccessible. Furthermore, preventive management of obstetric hemorrhage, through strategies such as iron supplementation and the administration of preventive malaria treatments, would have reduced the rate of these transfusions. These results highlight the importance of more proactive obstetric care in resource-limited regions [1] [4].

4.2. Socio-Demographic Data

Socio-demographic data from the study reveal that young women, aged 20 to 34, are the most frequently transfused, representing 68.62% of cases. Transfusions primarily affected patients engaged in non-income-generating activities ($p = 0.000$; OR = 1.29; CI = [1.24 - 1.34]), those with no formal education ($p = 0.51$; OR = 1.01; CI = [0.98 - 1.04], and especially those who were married ($p = 0.000$; OR = 3.52; CI = [3.30 - 3.76]). Ilunga N.H. [6] reports that 60% of transfused patients had a secondary education. This finding is consistent with previous studies, notably that of Ilunga *et al.* [6], who observed a similar prevalence in this age group. The high parity of the patients (mean of 4.3) indicates that women who have already had several children are more likely to experience major obstetric complications requiring blood transfusions. Women engaged in non-income-generating activities Paid women (85.78%), primarily from lower socioeconomic backgrounds, are also more affected. This factor could reflect inequalities in access to healthcare, particularly prenatal care. Married women (88.1%) also represent a significant proportion of transfused patients, which could be linked to social and cultural factors influencing access to care. The management of obstetric emergencies in these populations requires particular attention to improving access to care in rural and less accessible areas [7] [8].

4.3. Indications for Blood Transfusion

Uterine atony (37.7%) remained the leading cause of blood transfusion in this study. This condition, which often occurs after delivery, is a major cause of postpartum bleeding and one of the most frequent obstetric emergencies. Previous studies also report this indication as the most frequent in sub-Saharan Africa [4] [9], confirming the importance of active management of postpartum hemorrhage. Retained placenta (13.9%) and nutritional anemia (15%) were also common indications. Anemia, in particular, represents a major health problem, affecting a significant number of pregnant women in developing countries, where iron and folic acid supplementation is often insufficient. The results also highlight that coagulation-related complications, such as bleeding due to coagulation disorders, require transfusions of plasma and specific blood products. Previous studies, such as that

by WHO/CDC [10] and Boukooungou [11], indicate that the management of postpartum hemorrhages by transfusion of blood products adapted to the clinical situation improves the obstetric and maternal prognosis.

4.4. Nature of Blood Products Used

Whole blood was used in 50.5% of patients, while packed red blood cells were administered in 21.2% of cases. Fresh frozen plasma was used in 18.1% of cases, reflecting appropriate management of blood product requirements based on clinical indication. The diversity of transfused products underscores the importance of appropriate blood stock management in hospitals, particularly in resource-limited settings where the availability of specific blood products may be restricted. Previous studies [12]-[14] have also highlighted that using blood products tailored to each patient's condition not only improves clinical outcomes but also reduces the risk of transfusion complications. More rigorous blood stock management, coupled with improved training for medical staff, could further enhance the effectiveness of blood transfusion in obstetrics.

4.5. Maternal-Fetal Prognosis

Maternal prognosis is a key indicator in the management of obstetric emergencies, particularly those requiring blood transfusion. In this study, a number of maternal complications were observed, including transfusion reactions and maternal deaths. Despite efforts to meet transfusion needs, maternal mortality remains a major problem in settings with limited access to care. The observed transfusion reactions included cases of acute pulmonary edema (5 cases), anaphylactic shock (4 cases), and hyperthermia-shivering syndrome (3 cases), as well as other minor adverse reactions. These complications are related to factors such as the quality of blood products used, transfusion management, and medical staff training [10]. Proper management of blood products and the implementation of rigorous transfusion protocols are essential to minimize these risks. Regarding maternal mortality, this study recorded 18 deaths, representing approximately 2.78% of transfused patients. These deaths are primarily linked to the complete absence or inadequacy of blood transfusions, or to delays in providing the necessary blood products. This finding aligns with results observed in other African studies, where maternal mortality due to obstetric hemorrhage remains high in the absence of adequate and timely blood transfusions [4] [9] [15]. Rapid and effective management of severe hemorrhage is crucial for maternal survival. Improved blood stock management, optimized transfusion procedures, and ongoing training for healthcare teams could significantly reduce maternal mortality rates. Prompt and appropriate management of obstetric emergencies could also reduce the risk of transfusion reactions and improve the prognosis. Fetal prognosis is also severely affected by maternal complications, particularly severe hemorrhage requiring blood transfusions. This study revealed a neonatal mortality rate of 9 neonatal deaths among 231 newborns, representing a neonatal mortality rate of 3.89%. Furthermore, 77

stillbirths were recorded, 12 of which were macerated, indicating that delayed or inadequate management of obstetric emergencies also has a direct impact on fetal prognosis. Newborns of mothers who received transfusions for severe obstetric hemorrhages generally have an increased risk of neonatal complications, particularly due to adverse conditions related to prematurity, infections, and hypoxia [16]. Factors associated with these adverse outcomes include delayed management of maternal hemorrhage, lack of availability of blood products, and transfusion complications, which can lead to circulatory instability in the mother, directly affecting the fetus [14]. The results of this study highlight the importance of continuous monitoring of mothers and newborns after blood transfusions to prevent fetal complications. Improved management of obstetric complications, combined with preventive interventions and rigorous postpartum follow-up, can reduce these risks.

5. Conclusion

The results of this study highlighted blood transfusion practices in the management of obstetric emergencies in three health districts of Mali. The findings demonstrate that blood transfusion is essential in the management of obstetric hemorrhages and underscore the importance of blood product availability and rigorous stock management to meet the growing needs of obstetric services. Strengthening access to prenatal care, improving the management of postpartum hemorrhages, and promoting preventive measures, such as iron supplementation and malaria prevention, are crucial to reducing the frequency of blood transfusions and improving patient outcomes.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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