



**Original article**

**Post-operative morbidity and mortality in sickle cell patients treated in the intensive care unit of the Angré University Hospital**

Morbidité et mortalité post-opératoire chez les patients drépanocytaires pris en charge au service de réanimation du CHU d'Angré

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**Résumé**

Introduction : la drépanocytose est la première maladie génétique en Afrique noire entraînant un remplacement de l'hémoglobine A normale par une hémoglobine anormale S responsable d'une augmentation significative du taux des complications postopératoires et il a été prouvé qu'elle était associée à des longs séjours hospitaliers prolongés.

Le but de notre étude est donc de déterminer l'incidence des complications postopératoires ; la morbi-mortalité et d'identifier les facteurs de mauvais pronostic chez les patients drépanocytaires opérés admis en réanimation au centre hospitalier universitaire d'Angré.

Méthodologie : il s'agit d'une étude observationnelle, rétrospective, transversale, à visée analytique réalisée dans le service d'anesthésie-réanimation du CHU d'Angré sur une durée de 3 ans, qui s'étend du 1<sup>er</sup> janvier 2022 au 31 décembre 2024. Notre étude

avait pour cible tous les patients drépanocytaires admis en réanimation dans le post-opératoire.

Ont été inclus pour l'étude tous les patients drépanocytaires de tous âges et sexes.

Les informations provenant de l'enquête ont été codées puis traitées à l'aide des logiciels IBM SPSS<sup>®</sup> Statistiques 26.0.0.0 et Microsoft Word 2019. Le test du  $\chi^2$  de Pearson pour comparer les proportions et le test de Student pour comparer les moyennes. Une valeur p inférieure à 0,05 a été considérée comme statistiquement significative.

Résultats : l'âge moyen de nos patients était de 27,88 ans. Les comorbidités étaient retrouvées chez 35 patients. Les différentes spécialités incriminées étaient essentiellement les pathologies gynéco-obstétricales, en grande partie des césariennes ; les traumatologies orthopédiques et de la chirurgie digestive. Les complications étaient dominées par les crises vaso-occlusives, suivies du STA, et de l'hémolyse aiguë.

Le taux de mortalité retrouvé était de 38,5%.

Conclusion : au terme de notre étude, nous avons pu mettre en évidence que le post-opératoire des patients drépanocytaires était émaillé de différentes complications rendant difficile la prise en charge, compte tenu du faible niveau socioéconomique des parents et du faible niveau du plateau technique.

Mots-clés : drépanocytose, morbi-mortalité post-opératoire, réanimation.

## Abstract

Introduction: Sickle cell disease is the first genetic disease in sub-Saharan Africa resulting in the replacement of normal hemoglobin A by abnormal hemoglobin S, responsible for a significant increase in the rate of postoperative complications, and it has been proven to be associated with prolonged hospital stays.

The aim of our study is therefore to determine the incidence of postoperative complications; morbidity and mortality and to identify the factors of poor prognosis in sickle cell patients operated on and admitted to intensive care at the Angré University Hospital.

Methodology: This is an observational, retrospective, cross-sectional, analytical study carried out in the anesthesia and intensive care unit of the University Hospital of Angré over a period of 3 years, from January 1, 2022 to December 31, 2024. Our study targeted all sickle cell patients admitted to intensive care in the post-operative period.

All sickle cell patients of all ages and sexes were included in the study.

The survey data were coded and then processed using IBM SPSS © Statistics 26.0.0.0 and Microsoft Word 2019 software. Pearson's chi-squared test was used to compare proportions, and Student's t-test was used to compare means. A p-value less than 0.05 was considered statistically significant.

Results: The mean age of our patients was 27.88 years. Comorbidities were found in 35 patients. The various specialties involved were primarily gynecological and obstetric pathologies, largely

cesarean sections; orthopedic trauma; and digestive surgery. Complications were dominated by vaso-occlusive crises, followed by acute chest syndrome (ACS), and acute hemolysis. The mortality rate was 38.5%.

Conclusion : at the end of our study, we were able to highlight that the post-operative period for sickle cell patients was marked by various complications making management difficult, given the low socioeconomic level of the parents and the low level of the technical platform.

Keywords: sickle cell disease, postoperative morbidity and mortality, intensive care.

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## Introduction

Sickle cell disease is the most widespread hemoglobinopathy in the world. The United Nations General Assembly has recognized sickle cell disease as a global public health problem due to the morbidity and mortality caused by the disease as well as the significant impact of the resulting social and economic consequences [1].

In Côte d'Ivoire, the prevalence of the sickle cell gene varies from 12% [2]. According to the WHO, up to 2% of newborns there are born with the most severe form of the disease, among whom 50 to 75% die before the age of 5 without appropriate care [2,3]. The high frequency of postoperative complications compared to non-sickle cell subjects is estimated at 20-30% even with good adherence to the required precautions. This risk depends on the level of complexity and invasiveness of the surgery and increases depending on whether the surgery is minor, moderate, or major [4].

The data available in our setting are limited and often come from studies on children or different clinical contexts; carried out mainly in hematology or urology departments; which makes it necessary to conduct specific research on sickle cell patients who have undergone surgery and are admitted to intensive care. The aim of our study is therefore to determine the

incidence of postoperative complications; morbidity and mortality and to identify the factors of poor prognosis in sickle cell patients operated on and admitted to intensive care at the Angré University Hospital.

## Methodology

This is an observational, retrospective, cross-sectional, analytical study carried out in the anesthesia and intensive care unit of the University Hospital of Angré over a period of 3 years, from January 1, 2022 to December 31, 2024. Our study targeted all sickle cell patients admitted to intensive care in the post-operative period.

Sampling was accidental. It involved the successive recruitment of sickle cell patients who met our inclusion criteria. All sickle cell patients of all ages and sexes who underwent surgery and who, in the immediate postoperative period or up to 15 days postoperatively, experienced a deterioration in their baseline physiological condition and were admitted to intensive care were included in the study.

We used medical records, hospitalization records, and anesthesia and surgery reports.

The different variables studied were:

### • **Complications**

#### \* *Acute chest syndrome*

The presence of at least two of the following respiratory signs led to the diagnosis of chest syndrome.

- Dyspnea with a respiratory rate of at least 20 cycles per minute ( $RR > 20$  cpm).
- The presence of desaturation:  $SpO_2 \leq 92\%$
- The presence of infiltrates on chest X-ray
- The presence of a temperature rise:  $T^\circ \geq 38.2$
- The presence of hyperleukocytosis in the complete blood count: leukocytes  $\geq /mm^3$ .

#### \* *Vaso-occlusive crises*

We have defined as a manifestation of a vaso-occlusive crisis any painful manifestation not related to the surgical site and which persists for more than 30 minutes.

### \* *Stroke*

Any neurological manifestation with a deficit appearing post-operatively has been suggested as being related to a stroke.

Or in whom a brain CT scan has revealed a recent abnormality of ischemic or hemorrhagic nature

### \* *Acute anemia*

- A hemolytic crisis was considered when a sudden drop in hemoglobin levels was observed, accompanied more or less by signs of poor tolerance of anemia.
- This diagnosis was further supported when there was an elevation in bilirubin or LDH levels.

**Outcome :** Survival or death in intensive care

**Types of surgery.** Different post-operative complications.

### **Occurrence of post-operative deaths**

#### **Different forms of sickle cell disease**

The survey data were coded and then processed using IBM SPSS Statistics 26.0.0.0 and Microsoft Word 2019. The data were analyzed using SPSS Statistics 26.0.0 and Microsoft Excel 2019. Pearson's chi-squared test was used to compare proportions, and Student's t-test to compare means. A p-value less than 0.05 was considered statistically significant.

### **Ethical considerations**

Given its retrospective nature, consent was not required. To ensure the confidentiality of patients' personal information, the data was collected anonymously. Authorization to conduct the study was obtained from the medical and scientific management of the Angré University Hospital.

### **Results**

During our 3-year study period, from January 2022 to December 2024, we recruited 52 sickle cell patients admitted in the post-operative period.

The average age was 27.88 years, with an age range of 17 to 53 years. The majority of patients were between 19 years old (59%).

There is a female predominance with a sex ratio of 0.06 (M/F).

Table I: Distribution of patients according to origin

Origin	Frequency	Percentage
Op block	51	98.1
Private clinic	1	1.9
Total	52	100.0

Almost all of our patients came from the operating room of the Angré University Hospital (51 patients, or 98.1%).

Table II: Distribution of patients according to the ASA classification

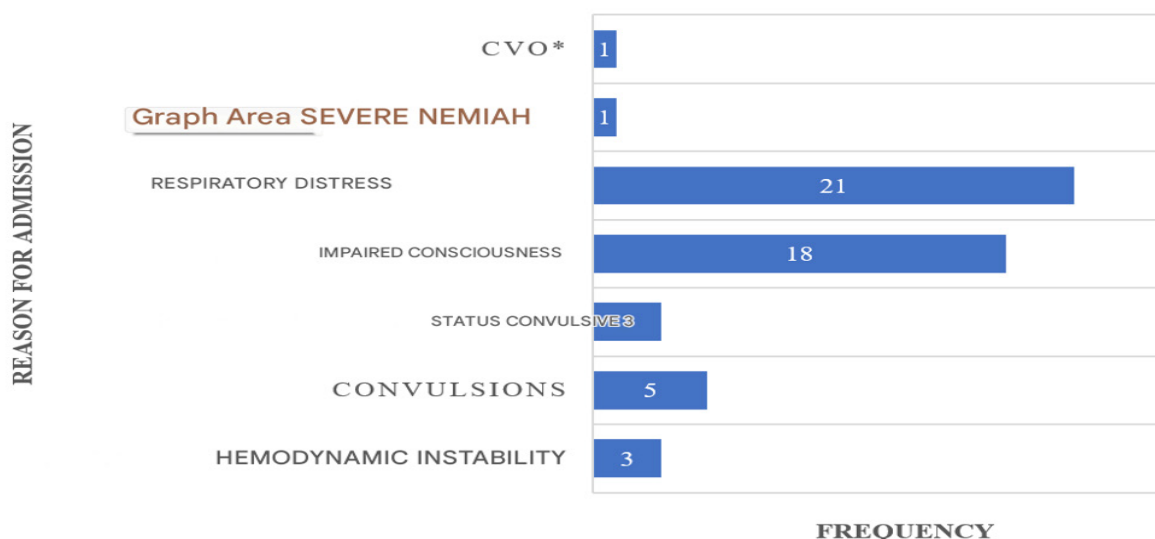
Score	Frequency	Percentage
≥3	30	57.7
2	22	42.3
Total	52	100.0

In our study population, the majority of our patients had an ASA score greater than or equal to 3, i.e. 57.7%.

Table III: Distribution of patients according to surgical procedure

Type of surgery	Frequency	Percentage
Gynecology-Obstetrics	46	88.5
Orthopedics and Traumatology	5	9.6
Digestive Surgery	1	1.9
Total	52	100.0

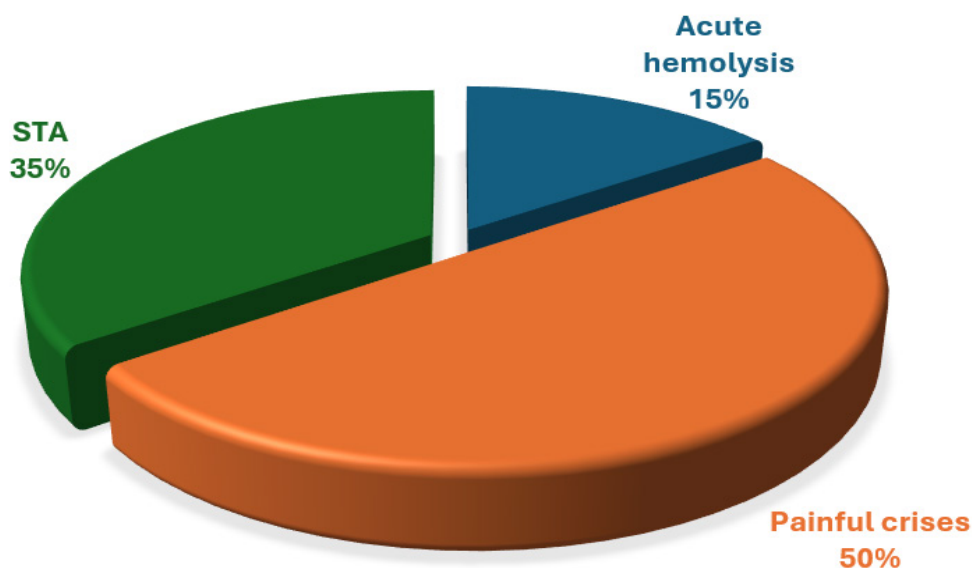
In our study, gynecological and obstetric pathologies were the most represented, accounting for 88.5%.



CVO\*: vaso -occlusive crisis

Figure 1: Distribution of patients according to reason for admission

In our study population, the reasons for admission were dominated respectively by respiratory distress and disorder of consciousness, with 21% and 18% respectively.



STA\*: acute chest syndrome

Figure 2: Specific complications of sickle cell disease

In our study population, the specific complications of sickle cell disease were represented by painful crises, acute chest syndrome, and hemolysis.

Table IV: Distribution of patients according to discharge method

Settings	Frequency	Percentage (%)
Deceased	20	38.5
Gynecology and Obstetrics	31	59.6
Medicine	1	1.9
Total	52	100.0

More than half (59.6%) of our patients were transferred to the gynecology-obstetrics department, with a death rate of 38.5%.

Table V: clinical -epidemiological factors and mortality

Settings	Deceased	Survivors	p value	Odd Ratio	Confidence Interval
SSF2 Phenotype	8	9	0.374	0.587	[0.180-1.912]
SCF2 Phenotype	2	8	0.182	3,000	[0.567-15.867]
SFA2 Phenotype	5	8	0.624	1,000	[0.275-3.634]
AS phenotype	5	7	0.795	0.840	[0.226-3.126]
Hematology Follow-up	12	23	0.374	1,704	[0.523-5.549]
Hydroxy-urea intake	7	12	0.855	1,114	[0.348-3.571]
Pregnancy	17	28	0.797	1,235	[0.246-6.203]
ASA $\geq 3$	15	15	0.046	3,400	[0.996-11.602]
Disorder of consciousness	18	19	0.018	6,158	[1,216-1,188]
Vaso -occlusive crises	3	23	0.076	0.069	[0.016-0.294]
Acute Chest Syndrome	10	8	0.065	0.333	[0.102-1.092]

We observed that the following factors were associated with mortality: patients with ASA greater than or equal to 3; the presence of impaired consciousness and respiratory distress; and also patients in a state of hemolysis.

Table VI. Correlation between hemoglobin levels, therapeutic strategies, and mortality

Settings	Deceased	Survivors	p value	Odd Ratio	Confidence Interval
HB* $\leq 7$ preoperatively	14	8	0.001	7,000	[2,012-24,358]
Preoperative transfusion	11	12	0.216	0.491	[0.158-0.527]
HB $\leq 7$ in intensive care	11	4	0.001	8,556	[2,177-33,629]
Transfusion in intensive care	18	15	0.002	0.098	[0.019-0.494]
Sedation	17	3	0.000	0.018	[0.003-0.01]
Mechanical ventilation	17	3	0.000	0.018	[0.003-0.01]
Use of amines	14	4	0.000	0.061	[0.015-0.253]

HB\* hemoglobin level

A hemoglobin level of 7 g/dL or lower was a poor prognostic factor (before or after surgery); similarly, preoperative transfusion was associated with a favorable outcome, unlike transfusion in the intensive care unit. Other poor prognostic factors included therapeutic sedation, the use of vasopressin amines, and mechanical ventilation.

## Discussion

This was a retrospective, cross-sectional, observational study with analytical aims, conducted over a 3-year period from January 2022 to December 2024. We collected data from a total of 1212 patients, of whom 52 sickle cell patients were admitted after the postoperative period, representing 4.3% of patients admitted to intensive care during the study period. This rate is lower than the frequency reported in the literature, which states that the prevalence of the sickle cell gene in Côte d'Ivoire varies from 14% [2]. A nearly identical rate was also found in Mali by Tembiné . Kalba [5] of 8.2%; on the other hand, a significantly lower rate of 0.41% is found in Chad by Rimtebaye [6].

The patients in our study were predominantly young, with a mean age of 27.88 years, ranging from 17 to 53 years. A nearly identical rate was observed in a study by Tembiné. Kalba [5].

The predominance of women and the perinatal context are also found in the literature [3,7,8]. Indeed, this female predominance is thought to be related to pregnancy, which constitutes a factor in the decompensation of sickle cell disease [7].

In our context, the pre-anesthetic consultation was carried out in all our patients; it was generally scheduled in 55.8% and was carried out urgently in 44.2%. At the end of this consultation, 57.7% of patients had an ASA score of 3 or higher, and 42.3% had an ASA score of 2. In his study, Kalba Tembine [5] also found the following comorbidities: hypertension 3.7% (n=1), diabetes 3.7% (n=1), and asthma 3.7% (n=1). Five patients had a history of transfusion (18.5%). Tamchom DD et al. [9]; CPA had been performed in all patients; and the patients were classified as ASA 2 (81.5%) versus ASA 3 (18.5%).

The various specialties involved were primarily gynecological and obstetric pathologies (88.5%), cesarean sections; trauma and orthopedic procedures (9.6%) and a single case of digestive surgery. These results are consistent with those of Kamble et al. [10], who found gynecological and obstetric pathologies

to be the most common (hysterectomy), followed by appendectomy and knee joint replacement (prosthesis).

Complications in our study occurred in half of our patients; predominantly vaso -occlusive crises (50%), followed by acute chest syndrome (ACS) (35%) and acute hemolysis (15%). Kembiné K [8], in his study, found a lower complication rate (12.4%), with vaso -occlusive crises predominating in 85.2% of cases and ACS (37%). The same observation is made by almost all authors [3-11].

The mortality rate found in our study was 38.5%. This rate is higher than that found in Kalba 's study. Tembine [8] who found a mortality rate of 22.2% (n=6).

This could be explained by the fact that our study only concerned sickle cell patients who underwent surgery, a condition still considered more serious due to the coexistence of complications related to both the surgery and the sickle cell disease itself. In American series, even lower rates are found (less than 1%) in the study by Brumm and colleagues [4].

## Conclusion

At the end of our research study which focused on postoperative morbidity and mortality in sickle cell patients, we were able to determine the parameters of postoperative morbidity and mortality in sickle cell patients treated in the intensive care unit at the University Hospital of Angré .

We wanted to assess the importance of sickle cell disease complications in an intensive care unit dedicated to the management of severe forms.

The postoperative period for sickle cell patients was marked by various complications, making management difficult, given the low socioeconomic status of the parents and the limited availability of surgical equipment. The average age of our patients was 27.88 years. Comorbidities were found in 35 patients. The various specialties involved were primarily gynecological and obstetric pathologies, largely cesarean sections; orthopedic trauma; and

digestive surgery. Complications were dominated by vaso-occlusive crises, followed by acute chest syndrome (ACS), and acute hemolysis. The mortality rate was 38.5%.

### Authors' Contribution

Each author contributed to the following sections:

Koffi Loes, Ahouangansi Sêtonджи Emmanuel Raymond, Bahouadi Christian: conception of the research work, critical reading and approval of the final version.

Gnemagnon Mahi Éric Constant, Achio Donald, N'Cho Arthur Nicaise, Gore Yves Landry, Kouadio François: data collection and analysis, bibliographic research and writing.

Okay Yikpé D Denis: critical reading and approval of the final version.

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**Conflict of interest :** None

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