# Obstetrics Outcomes of Women with Sickle Cell Disease in a Tertiary Hospital in Ibadan, Nigeria: A 10-Year Review

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## ABSTRACT

**Background**: Pregnancy in sickle cell disease (SCD) patients is associated with increased risk of fetomaternal morbidity and mortality. With improvements in management, education, awareness, and nutrition, more patients with SCD are maximizing their reproductive potential. **Objectives:** This review examined the pattern of complications and obstetrics outcomes of patients with SCD in a tertiary health facility. **Materials and Methods:** A descriptive retrospective study of 106 pregnant SCD patients who delivered at the University College Hospital, Ibadan between 1st January 2008 and 31st December 2017. Information on their demographic, medical and obstetrics characteristics, complications and outcome were obtained from their case notes using a pre-designed proforma. Data were analyzed using SPSS version 23. **Results:** Of the 106 cases reviewed, 64 (60.38%) had sickle cell anaemia (haemoglobin SS), 39 (36.79%) had haemoglobin SC and 3 (2.83%) had haemoglobin CC. The mean maternal age was 29.6±4.7 years. Majority, 83(78.3%), booked for antenatal care at mean gestational age (GA) of 19.4±8.7 weeks while the mean GA at delivery was 39.0±1.73 weeks. Bone pain crisis (38.8%) was the commonest non-obstetrics complication with 63.2% occurring among the HBSS genotype. The common obstetrics complications were preterm contraction, intrauterine fetal death (IUFD), and preeclampsia (each occurring among 27.3%). Overall, there were 84.9% live births and the overall fetomaternal outcome was satisfactory in 38.7%. **Conclusion:** Sickle cell disease in pregnancy has remained associated with increased risk of bone pain crises as well as preterm contractions, IUFD and preeclampsia. A multidisciplinary team approach is essential in ensuring a positive pregnancy outcome.

**Keywords:** Complications, Haemoglobinopathies, Obstetrics, Outcomes, Sickle Cell Disease

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## INTRODUCTION

Haemoglobinopathies are a set of conditions that affect the haemoglobin molecule in its structure, production, or function.[1] Sickle cell disease (SCD), a common haemoglobinopathy is a group of inherited single-gene autosomal recessive disorders caused by the 'sickle' gene and is associated with increased maternal and fetal morbidity and mortality.[2,3] SCD has its origins in sub-Saharan Africa and the Middle East hence, it is most prevalent among Ibadan individuals of African descent as well as in those from the Caribbean, Middle East, parts of India, Mediterranean, South and Central America.[3 – 5] SCD includes sickle cell anaemia (HbSS) and the heterozygous conditions of haemoglobin S and other clinically abnormal haemoglobins - haemoglobin C (HbSC), beta thalassaemia (HbSB thalassaemia), haemoglobin D, E or O-Arab. It is one of the most common inherited conditions worldwide with about 300,000 children born each year with the disease; out of which two-thirds are in Africa. [6-9] The fundamental pathophysiology is the increased rate of collapse of the fragile sickle-shaped red cells with resultant haemolytic anaemia and vaso-occlusion in small blood vessels, which causes acute painful crises among other complications.[10-12] Pregnancy has been noted to increase the risk of sickle cell crises while their state of chronic anaemia jeopardizes the survival of both the mother and the baby with the baby having greater risk of intrauterine growth restriction (IUGR) and/or intrauterine fetal death (IUFD) from poor utero-placental vascular supply. [1-4, 8-10, 14-17]

With improvement in diagnostic skills and management protocol, many patients with SCD are able to fulfil their reproductive potentials. [3,13, 14] Therefore, there has been a marked increase in the number of SCD pregnant women presenting for obstetric care compared to earlier values of between 1 in 50,000 reported from Enugu and 3.2 per 1000 reported from Jos. [1,3, 4,12-16] With these higher numbers and even higher parity, it becomes pertinent to evaluate the commonly associated materno-fetal complications with the view of developing interventions in a multidisciplinary approach and improving their obstetrics outcome.

In the University College Hospital, (UCH), the management of SCD during pregnancy is multidisciplinary. Patients are routinely educated, assessed and managed by the obstetric-haematology care team as high-risk pregnancies using the antenatal management protocol and during acute admission with early detection, prompt and aggressive management of complications during pregnancy and the postpartum period. This study was aimed at determining the obstetrics outcomes in the different groups of sickle cell diseases in pregnancy among women presenting for care at the University College Hospital, Ibadan.

## MATERIALS AND METHODS

### Study design and location

This was a descriptive retrospective study of pregnant women with SCD who enrolled for antenatal care at the University College Hospital, Ibadan between 1st January 2008 and 31st December 2017.

University College Hospital, a tertiary health institution with 1000-bed spaces, is located in Ibadan, the capital of Oyo State and serves as a major referral hospital for communities from different parts of Nigeria. The Feto-maternal Medicine unit of the Department of Obstetrics and Gynaecology provides specialist care for most high-risk pregnancies and an average of 200 women register for antenatal care (ANC) monthly.

All cases of haemoglobinopathy that presented in pregnancy, labour, and were delivered in the hospital during the study period were identified following a manual search of the antenatal, labour and delivery records of the obstetrics unit. Medical records of all those who met the inclusion criteria were retrieved, reviewed and analysed.

### Inclusion and Exclusion Criteria

The inclusion criteria included pregnant women with SCD (HbSS, HbCC, or HbSC) diagnosed before or in index pregnancy, that gave birth in the hospital where the study was conducted, had singleton pregnancy, and no evidence of structural congenital malformation.

Exclusion criteria were multiple gestations, and missing or non-availability of medical data.

**Study Protocol**

For this study, booked pregnant women were those who registered for antenatal care and had at least 2 clinic attendances before delivery. A proforma was used to obtain information on the patients' demographic and obstetrics characteristics, genotype, complications (obstetrics and non-obstetrics), and fetal and maternal outcomes. The obstetrics outcomes considered included the mode of delivery, gestational age at birth, need for blood transfusion, antenatal admission or intensive care admission, birth weight, IUGR, live birth, and perinatal death. In addition, occurrence of pregnancy-related complications such as preterm contractions, hypertensive disorders of pregnancy, gestational diabetes, malaria in pregnancy, urinary tract infection and upper respiratory tract infection as well as sickle cell-related complications (bone pain crises, acute chest syndrome, sequestration crisis, vaso-occlusive crisis, hyperhaemolytic syndrome, anaemia) and maternal death were also noted. The outcome was defined as satisfactory when patients delivered a live birth with a normal birth weight and no form of complications. Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 23.0 and presented as descriptive statistics with means and percentages.

## RESULTS

There were 21,200 obstetrics admissions during the study period out of which 127 women had sickle cell disease in pregnancy implying an incidence of 5.99 per 1000. Of these, 106 met the inclusion criteria and their data were analyzed. The mean maternal age (SD) was 29.6± 4.7 years and the majority, 99(93.4%) were married. A higher proportion, 100(94.3%), were gainfully employed and about two-thirds, 69(65.1%) had tertiary education (Table 1).

The pre-delivery median parity was one child and more than half of them had, at least, one child before the current pregnancy. Three-fifths of the patients, 64(60.4%), had sickle cell anaemia (haemoglobin SS), while 39(36.8%) had haemoglobin SC and 2.8% had haemoglobin CC. The majority of the patients, 83(78.3%), booked for ANC at UCH while 48(45.3%) of them had access to Haematology care at the hospital prior to booking. For the booked patients, the mean gestational age at booking was 19.4±8.7 weeks with about a third of them, 25(30.1%), booking during their first trimester (Table 2).

As stated in tables 3 and 4, non-obstetrics complications were documented in 49(46.2%) while obstetrics complications were documented in about one-fifth, 22(20.8%), of the patients. Vaso-occlusive crisis (VOC) was the most common non-obstetrics complication occurring in 78.6% of patients with Sickle cell anaemia while preterm labour (27.3%), preterm delivery (27.3%), and IUGR (27.3%) were the most common obstetrics complications among them. Fifty of the patients were transfused out of which two-thirds had sickle cell anaemia while 60% of those with HBSC were admitted into the intensive care unit (ICU).

The mode of delivery was via caesarean at term (mean GA of 39.0± 1.73 weeks) among all the HBCC patients while both the HBSS and HBSC groups were delivered at an average GA of 36 weeks. However, babies of the HBCC women were all small for gestational age while two-thirds of women with HBSS genotype had babies with normal weight. There was no stillbirth or early neonatal death (ENND) among the HBCC patients unlike the HBSS group with a higher proportion of stillbirths (61.5%) and ENND (66.7%); (Table 5). When the overall fetomaternal outcome was considered, only 38.7% were found to be satisfactory with mother and baby having no form of complications (Fig. 1).

**Table 1: Sociodemographic characteristics of the patients**

| Variable | Frequency (n=106) | Per cent (%) |
|---|---|---|
| **Age (Years)** | | |
| 15-19 | 2 | 1.9 |
| 20-29 | 54 | 51.0 |
| 30-39 | 47 | 44.3 |
| 40-49 | 3 | 2.8 |
| Mean age±SD | 29.6±4.7 | |
| **Occupation** | | |
| Employed | 100 | 94.3 |
| Not employed | 6 | 5.7 |
| **Marital status** | | |
| Married | 99 | 93.4 |
| Single | 7 | 6.6 |
| **Education** | | |
| Primary | 6 | 5.7% |
| Secondary | 31 | 29.2 |
| Tertiary | 69 | 65.1 |

**Table 2: The patients' obstetrics and Sickle Cell Disease characteristics.**

| Variable | Frequency (n=106) | Per cent (%) |
|---|---|---|
| **Parity** | | |
| 0 | 39 | 36.8 |
| 1 | 27 | 25.5 |
| ≥2 | 40 | 37.7 |
| Mean ± SD | 1.3 ±1.5 | |
| **Number of living children** | | |
| 0 | 50 | 47.2 |
| 1 | 40 | 37.7 |
| 2 | 14 | 13.2 |
| ≥3 | 2 | 1.9 |
| **Distribution of Sickle Cell Disease Variants** | | |
| HBSS | 64 | 60.4 |
| HBSC | 39 | 36.8 |
| HBCC | 3 | 2.8 |
| **Ever attended haematology clinic** | | |
| Yes | 48 | 45.3% |
| No | 58 | 54.7 |
| **Booking status in UCH** | | |
| Yes | 83 | 78.3 |
| No | 23 | 21.7 |
| **Gestational age at booking in weeks (n=83)** | | |
| <13 | 25 | 30.1 |
| 13-26 | 42 | 50.6 |
| >26 | 16 | 19.3 |
| **Mean pack cell volume at booking(%± SD)** | 26.1±4.2 | |
| **Required antenatal admission** | | |
| Yes | 16 | 15.1 |
| No | 90 | 84.9 |

**Table 3: Documented Non-obstetrics complications according to the patients' sickle cell genotype*.**

| Complications | N=49 | HBSS(n=32) | HBSC(n=16) | HBCC(n=1) |
|---|---|---|---|---|
| Acute chest syndrome | 2(4.1%) | 1(50.0) | 1(50.0) | 0(0.0) |
| Vaso-occlusive crisis | 14(28.6%) | 11(78.6) | 3(21.4) | 0(0.0) |
| Anaemia | 7(14.3%) | 4(57.1) | 2(28.6) | 1(14.3) |
| Sequestration crisis | 3(6.1%) | 1(33.3) | 2(66.7) | 0(0.0) |
| Bone pain crisis | 19(38.8%) | 12(63.2) | 7(36.8) | 0(0.0) |
| **Others | 4(8.2%) | 3(75.0) | 1(25.0) | 0(0.0) |

**Note: there were multiple complications among the patients*

***Others=malaria in pregnancy, upper respiratory tract infection, urinary tract infection, hyperhaemolysis*

**Table 4: Documented Obstetrics complications according to the patients' sickle cell genotype*.**

| Complications | N=22 | HBSS(n=16) | HBSC(n=5) | HBCC(n=1) |
|---|---|---|---|---|
| Preterm contractions | 6(27.3%) | 5(83.3) | 1(16.7) | 0(0.0) |
| Preterm labour | 2(9.1%) | 2(100.0) | 0(0.0) | 0(0.0) |
| IUFD | 6(27.3%) | 4(66.7) | 2(33.3) | 0(0.0) |
| Preterm delivery | 1(4.5%) | 1(100.0) | 0(0.0) | 0(0.0) |
| Preeclampsia | 6(27.3%) | 3(50.0) | 2(33.3) | 1(16.7) |
| IUGR | 1(4.5%) | 1(100.0) | 0(0.0) | 0(0.0) |

**Note: there were multiple complications among the patients*
***IUFD=intrauterine fetal death, **IUGR= intrauterine growth restriction*

**Table 5: Comparison of maternal-fetal outcome across the patients' sickle cell genotype**

| Variable | HBSS(n=64) | HBSC(n=39) | HBCC(n=3) |
|---|---|---|---|
| **Blood Transfusion (n=50)** | 34(68.0) | 14(28.0) | 2(4.0) |
| **ICU admission (n=10)** | 4(40.0) | 6(60.0) | 0(0.0) |
| **Mode of delivery** | | | |
| SVD | 12(57.1) | 9(42.9) | 0(0.0) |
| EMCS | 21(58.3) | 14(38.9) | 1(2.8) |
| ELCS | 11(55.0) | 7(35.0) | 2(10.0) |
| AVD | 5(69.7) | 1(33.0) | 0(0.0) |
| **Mean GA at delivery ±SD (weeks)** | 36.2±2.9 | 36.3±2.2 | 39.0±1.7 |
| **Birth weight (kg)** | | | |
| <2.5 | 27(54.0) | 20(40.0) | 3(6.0) |
| 2.5 – <4.0 | 22(66.7) | 11(33.3) | 0(0.0) |
| ≥4.0 | 15(65.2) | 8(34.8) | 0(0.0) |
| **Fetal outcome** | | | |
| Live birth | 54(60.0) | 33(36.7) | 3(3.3) |
| Still birth | 8(61.5) | 5(38.5) | 0(0.0) |
| ENND | 2(66.7) | 1(33.3) | 0(0.0) |
| **Maternal outcome** | | | |
| Satisfactory | 21(51.2) | 18(43.9) | 2(4.9) |
| Non-satisfactory | 43(66.2) | 21(32.3) | 1(1.5) |

*ICU=intensive care unit, ENND=early neonatal death, SVD=spontaneous vaginal delivery, EMCS=emergency caesarean section, ELCS=elective caesarean section, AVD=assisted vaginal delivery GA=Gestational Age*

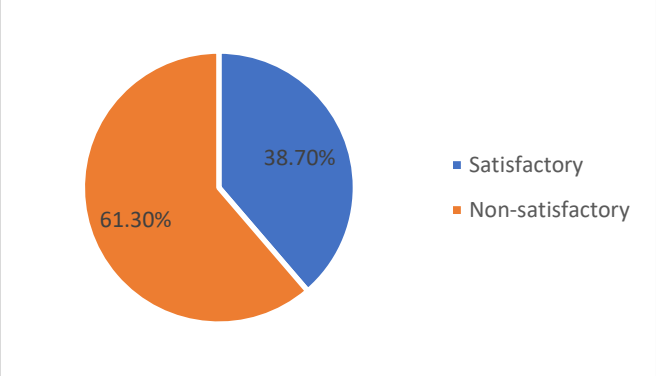


**Figure 1: Overall fetomaternal outcome**

## DISCUSSION

The current study found that there are 5.99 SCD patients per every 1000 pregnant women presenting for care at the University College Hospital, Ibadan in this this 10-year review which is in tandem with the report of 5.9/1000 from Abuja in 2021 by Isah [12] although much lower than previous reports of 8.7/1000 reported

from Benin by Omo-Aghoja and Okonofua in 2007 and 6.9/1000 reported by Nwafor *et al.* from Abakaliki while it is much higher than the earlier reports from previous 5-year review of 4.9/1000 and 3.2/1000 SCD pregnant women in tertiary health facilities of Ibadan and Jos, Nigeria respectively.[3,16 –18] A much lower number of 1 in 5000 was documented in 2007 out of over 50,000 deliveries within a period of thirty years in Enugu, Nigeria. [8]

The mean age of the patients was 29.6years which is a little higher than some previously reported mean ages; [3, 16-18] and is a confirmation of the fact that more patients with SCD are growing older enough to fulfil their reproductive potentials although this mean age is however lower when compared with higher income countries such as Switzerland. [19] It was also shown that quite a commendable proportion booked during the first trimester as opposed to the findings of Olugbenga *et al*. in which none of the participants booked during the first trimester. [5] However, about half of the patients booked in the second trimester in this study. This finding may explain the rate of antenatal admissions which is similar to previous studies in Jos, Lagos, Osogbo, Abuja, Ibadan, and Enugu in Nigeria. [3-5,8,12,18] The unbooked patients in this study presented near term (close to 37 weeks gestation) or in labour with more obstetrics complications ranging from prolonged labour, and IUFD to medical complications like anaemic heart failure, hypertensive heart diseases and urinary tract infections.

From this study, there was a higher rate of non-obstetric complications in those with HBSS than HBSC genotype and the commonest were bone pain crisis, vaso-occlusive crisis and anaemia requiring blood transfusion which is in tandem with previous reports. [3,15-17,20-22] However, urinary tract infection was the commonest complication reported by Elenga et al and it was primarily among the HBCC genotype patients.[21] The probable reasons for the increased non-obstetrics complications are stress, dehydration, increase metabolic state, hypercoagulability, and worsening anaemia from the increased iron requirements, and increase risk of infection.

Preeclampsia, preterm contractions, and IUFD were the major obstetric complications noted among the patients reviewed in this study. These complications were also higher in women with HBSS genotype which is comparable to some studies. [14, 21] Other complications recorded were IUGR, preterm contractions, labour and delivery. The mean packed cell volume at booking in this study was 26.1% which is similar to the booking packed cell volume of a sickle cell patient with twin gestation in a previous study in Ibadan. [23]

About three-quarters of the patients had caesarean delivery (CS) either electively or as an emergency. This high CS rate has been observed globally even among women with low-risk pregnancies. Similarly, studies have reported CS as the most common mode of delivery among those with haemoglobinopathy majorly with the aim of reducing the rate of labour-induced complications to either the mother or the baby.[1,12,21,24] Overall, obstetrics outcomes were worse among those with HbSS genotype when compared with HbSC and HbCC. This may be due to the behaviour of SC and CC genotypes which are often mild and may sometimes be diagnosed first in adult life.

There were three maternal deaths of which two were unbooked and the third was referred on account of tuberculous infection in the third trimester. All of them had severe anaemia with one being complicated with anaemic heart failure. A range of 7 - 12% of maternal deaths has been reported among women with SCD in pregnancy in low-income countries which is much higher than the 2.8% in the current study. [29]

The perinatal mortality and morbidity rates noted in this study are similar to the rates previously documented across different countries. [2,4,8,18, 23,30-32] It is a known fact that there is a high risk of adverse pregnancy outcomes for women with SCD [2-5,33] and this was also shown in this present study. The poor outcome may still be related to the late presentation of some of the patients for antenatal booking as shown in this study in which many

presented for care only during the second and third trimesters. Among this group of women, there is still a possibility of a low level of awareness of the risks associated with
their pregnancy status. This, therefore, calls for the need to intensify awareness and education.

This study was limited by its retrospective nature and being a single, hospital-based study especially with some medical records being unavailable for review. Irrespective of this limitation, the recent findings buttress the need to continuously emphasize the significance of early presentation for antenatal care to these groups of patients so that antenatal complications can be identified and managed promptly. Moreover, this study has been able to compare variances between different haemoglobinopathies (HBSS, HBSC and HBCC) in respect of pregnancy outcomes.

## CONCLUSION

**S**ickle cell disease in pregnancy has been remained associated with increased risk of bone pain crises as well as preterm contractions, IUFD and preeclampsia. A multidisciplinary team approach is essential in ensuring a positive pregnancy outcome. The results from this study should give credence to the development of evidence-based multi-specialist services for patients with Sickle cell disease while providing baseline for a prospective study of their Obstetric outcomes. It is recommended that efforts be geared towards public education and awareness of sickle cell disease including its prevention and management. There is a need for training and retraining of healthcare workers with more emphasis on preconception care, early booking, and close monitoring during the antenatal, labour and puerperal periods while emphasizing the advantage of using appropriate contraceptive option. Preconception care, early presentation, appropriate antenatal, intrapartum and postpartum care with a multidisciplinary team approach in health facilities that can manage both
obstetrics and non-obstetrics complications remain inevitable in ensuring a positive pregnancy outcome among women with SCD.

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**Author contributions:**

MFO, OOB and TAO conceptualized and designed the study. MFO and OOB contributed to implementation of the project while TAO contributed to the statistical analysis. All authors were involved in the writing and revision of the manuscript. All authors read, approved the final manuscript and agreed to be accountable for all aspects of the work.

**Data availability**: The data used to support the findings of this study are available from the corresponding author upon reasonable request.

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**Ethical approval:** This study was approved by the UI/UCH Institutional Ethics Committee.

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