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Original Article

Pregnancy Outcomes of Mothers with Sickle Cell Disease: A Retrospective Review of Patients Seeking Delivery Services in a Regional Referral Hospital, Western Kenya

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ABSTRACT

Background: Western Kenya has a high burden of sickle cell disease (SCD) with 4.5% of children born with sickle cell disease. We aimed to describe the demographic characteristics and pregnancy outcomes of women with SCD at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH). **Methods:** The hospital records department retrieved all files they could identify of women who were known to have SCD and had delivered at the hospital between October 2017 and December 2022. Data was analyzed using STATA version 16.0. **Results:** Thirty files were retrieved representing 30 women who delivered in the hospital. The mean age was 26 (18 to 36) years. Most 14 (46.7%) had a term delivery. The maternal mean haemoglobin level was 8.72g/dl (range 5.6-13.5). Twelve (40%) had moderate hemoglobin concentration (8-10g/dl) and only 3 (10%) had severe anemia with HB below 6.5g/dl. A majority (76. %) had normal vaginal delivery. The Caesarean section rate was 23%. There was no maternal mortality; one pregnancy was a multiple birth resulting in 31 babies. Nearly all (93%) of the babies had an APGAR score of more than 7 at five minutes, 5 (16.67%) required NBU admission for various reasons, while one (3.33%) of the babies died within 24 hours of birth. Three of the women used Hydroxyurea at some point in their pregnancies and all had morphologically normal babies. **Discussion:** Our study findings are comparable with other case series; no maternal death was documented; however, we noted fetal outcomes which are comparable to the regional indices. **Conclusion:** Though pregnancy in SCD is fraught with adverse outcomes, our series demon strates that good outcomes are feasible.

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INTRODUCTION

Sickle-cell disease (SCD) is a genetic disorder characterized by abnormal haemoglobin (1). It's one of the most common monogenic disorders in the world with more than 75% of the global burden of SCD in sub-Saharan Africa (2). In Kenya, a majority of these cases are found in the western parts of Kenya where 4.5 % of children are born with SCD (3)

Sickle cell disease is associated with chronic anaemia which results from hemolytic and sequestration crises, thus, requiring frequent transfusions (4). Both anaemia and pregnancy are high cardiac output states. Their coexistence exerts extra physiological pressure on the patient with the potential for negative maternal and neonatal outcomes (5). Preventive measures such as the use of hydroxyurea, folic acid, proguanil pneumococcal vaccine and judicious transfusions have been shown to improve quality of life amongst people with SCD. Thus, the use of such interventions in pregnancy except hydroxyurea which is considered teratogenic is considered beneficial in pregnancy (6).

Pregnant women with SCD are at increased risk of hypertensive disorders, venous thromboembolism, preterm labour and pregnancy losses (7). Babies born to such mothers are also prone to such complications as prematurity, low birth weight, small for gestational age and perinatal mortality (8).

Sickle cell disease crises make the experience of pregnancy worse for women with SCD (10). Antepartum interventions such as daily low doses of Acetylsalicylic acid (ASA) folic acid supplementation, malaria prophylaxis with proguanil and prophylactic transfusions have been reported to improve pregnancy outcomes. (11).

Counties in western Kenya are among those with high maternal mortalities in Kenya with Kisumu reporting 495 deaths per 100,000 live births against a national mortality rate of 362 deaths per 100,000 live births (12). Sickle cell disease being prevalent in the county confers an additional negative pressure on pregnancy indicators. To ensure positive outcomes, women with SCD are often referred to the regional referral hospital for care which has a multi-disciplinary team and a wider range of services including availability of blood products and comprehensive maternal care services.

Data on pregnancy outcomes of such patients seeking delivery services at the facility are yet to be documented thus we conducted a retrospective quantitative cross-sectional review whose main objective was to describe select socio-demographic characteristics and pregnancy outcomes amongst

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women with SCD who sought delivery services in the regional referral hospital.

METHODOLOGY

Sample size: A request was made to the records department to avail all the delivery files of SCD patients who delivered in the facility within the study period.

Study design: This was a retrospective quantitative study involving the retrieval of all files of pregnant women who were known to have delivered at the facility and had SCD between October 2017 and December 2022.

Study setting: This review was domiciled in Jaramogi Oginga Odinga Teaching and Referral Hospital, a tertiary facility in western Kenya.

Data collection: Data from pregnant women with SCD was abstracted from patients' case notes using Google Forms that had been pre-tested. Maternal variables collected were age, occupation, marital status, the highest level of education, parity, gestational age, predelivery haemoglobin level, mode of delivery and maternal status at discharge, whether alive or dead. Neonatal variables were birth weight, APGAR scores, admission to the newborn unit and status at discharge whether alive or dead.

Data analysis: The data was downloaded to an Excel spreadsheet**.** The data was cleaned by running frequencies and consistency checks, duplicates were removed and the data was transferred to STATA version 16.0. It was analyzed by proportions and descriptive statistics are presented using narrative charts and graphs

Ethical consideration: There was no direct contact with patients Permission to conduct the study was obtained from the institutional ethics review board. **ISERC/JOOTRH/661/22**

RESULTS

Cumulative Frequency of SCD Amongst Women Seeking Delivery Services at JOOTRH

Over the study period, there were 28,328 deliveries. A search of the admission and delivery registers was conducted of which only 30 (0.11%) files of SCD could be traced and their records are summarized in Table 1.

Table 1: Incidence of SCD Amongst Women Seeking Delivery Services at JOORTH

Year	No. of Deliveries	CF deliveries	No. of Parturient with SCD	CF of Women with SCD	Annual Incidence of Births in Women with SCD
Oct-Dec 2017	2863	2863	9	9	Not calculated
2018	5280	8143	6	15	0.11
2019	5213	13356	3	18	0.05
2020	5620	18976	2	20	0.04
2021	5543	24519	3	23	0.05
2022	3809	28328	7	30	0.18

Socio-demographic Characteristics of the Mothers

The ages of women with SCD who sought delivery services at the facility ranged between 18-36 with an interquartile range of 7, Q3 as 29, Q1 as 22 and a median of 27. The highest level of education of most, n=10 (33.33), women was secondary with 9 (30.0) attaining tertiary level. Table 2 summarizes the socio-demographic characteristics of these patients.

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Table 2: Individual and Socio-demographic Characteristics of the Mothers

Characteristic		n (%age)
Age	Median	27
	Interquartile Range	7
Marital status	Married	17 (56.67)
	Single	8 (26.67)
	Not documented	5 (16.7)
Occupation	unemployed	11(36.67)
	Informal employment	11(36.67)
	Formal employment	4(13.33)
	Not documented	4(13.33)
Mother's education	primary	7(23.33)
	secondary	10(33.33)
	Tertiary	9(30.00)
	Not documented	4(13.33)

Neonatal Outcomes

Table 3 stratifies neonatal outcomes by birth weight with the majority n = 20 (66.67) having normal weight and only one baby having very low birth weight.

Table 3: Birth weight

Birth weight	Values in grams	%(n)
Normal	2500-3500	66.67% (20)
Low birth weight	1500-2499	30% (9)
Very low birth weight	1000-1499	3.33% (1)

Clinical characteristics

Most babies, n = 28 (93.33), had an Apgar score that ranged between 7 and 10 in the 5th minute with only 2 (6.67) scoring between 0-3. A day post-delivery majority of the babies n = 24 (80) were alive and well with 3 (10) early neonatal deaths reported. Table 4 summarizes these clinical outcomes.

Table 4: Neonatal Clinical Characteristics

	Frequency	Percentage
	N	%
Apgar score		
At 5th minute:		
0-3	2	6.67
7-10	28	93.33
Condition after 24hrs post delivery		
Alive and well	24	80
Alive with complications (low birth weight)	1	3.33
Fresh stillbirth	2	6,67
Perinatal death	1	3.33
Mode of delivery		
Cesarean delivery	7	23.33
Spontaneous vertex delivery	21	70
Assisted Vaginal delivery	2	6.67
Admission to NBU		
Yes	25	83.33
No	5	16.67

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Mother's History of Prevailing Conditions and Obstetric Characteristics

As depicted in **Table 5** majority (40%, n=12) of the women were Primigravida. Six (20%) had a prior pregnancy loss. By admission status, half of them were walk-ins (n=15) 50%, referrals from other facilities (n=8) 26.67% and (n=7)23.33% were referrals from the Antenatal Clinic. The average gestational age of the women was 36.47 weeks with half being below 37 weeks. A majority (90.0%, n=27) of the women's haemoglobin level before delivery was found to be below 12.1 g/dl while 10% (n=3). Of the total records, 9 (30.0%) had complications prior to the date. Spontaneous vertex delivery accounted for 21 (70.0%) of the births 7 (23.33%) were delivered through cesarean and 2 (6.67%) had assisted vaginal delivery.

Table 5: Mother's History of Prevailing Conditions and Obstetric Characteristics (N=30)

	Frequency (N)	Percentage (%)
Gravidity (n=30)		
Primigravida	12	40.00
Gravida 2	7	23.33
Gravida 3	7	23.33
Gravida 4	3	10
Gravida 5	1	3.33
Mode of delivery (n=30)		
Assisted Vaginal Delivery	2	6.67
Cesarean delivery	7	23.33
Spontaneous Vertex Delivery	21	70
Gestation at time of delivery (n=30)		
Term	15	50
Pre-term	15	50
Maternal condition 24hrs postpartum		
Alive and well	29	96.67
Alive with complications (low birth weight)	1	3.33%

Maternal Hemoglobin Level Before Delivery

Most of the mothers n = 13 (43.33) had hemoglobin levels ranging between 7-9g/dl while n = 4 (13.33) had normal hemoglobin. **Table 6** provides this summary.

Table 6: Mother's Hemoglobin Level Before Delivery

Severity	Values	%(n)
Normal	>11g/dl	13.33% (4)
Mild	9-11g/dl	23.33 % (7)
Moderate	7-9g/dl	43.33% (13)
Severe	4-7g/dl	20 % (6)

Antenatal SCD Related Medications

Most of the respondents 56.66 % (n=17) were on proguanil and folic acid, 33.33% (n=10) were on folic acid only and 10% (n=3) were on folic acid and hydroxyurea. A majority, 70 % (n=21) had uneventful pregnancy. The rest, 30% (n=9) of the pregnancies were complicated with preeclampsia and breech with one of the twin pregnancies.

DISCUSSION

Of the 28,328 deliveries only 30 (0.11%) were identified to have SCD, this is a low prevalence

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compared to the birth incidence of 4.5%, this implies that many females with sickle cell disease are not surviving to the age of childbearing and perhaps those who do are shying away from parenthood. The trends over the years do not show a discernible pattern, however, the prevalence in 2022 (0.18%) seems much higher than the period average. Our study revealed a low birth weight rate of 33.33%. The prevalence of low birth weight in Kenya is estimated at 11% by WHO and UNICEF (13). This could be attributed to various adverse conditions the fetus faces in utero such as hypoxia of the fetoplacental unit (14).

Babies born to women with SCD are predisposed to hypoxic conditions and obstetric difficulties including prolonged labour (16). This explains the admission of some of the babies to the newborn unit for further management. Unlike other studies that showed Poor APGAR scores at one and five minutes, this study showed relatively good APGAR scores (15). The newborn unit admission according to this study was 16.67%. Infants born to women with SCD tend to be delivered at an earlier gestation in addition to the distress they go through in utero and during delivery (17).

Seventy percent of women with sickle cell disease in this study delivered via spontaneous vertex delivery. Brazil reported a 41% caesarian section rate (18) and in Brazzaville, caesarean section was most often prophylactic, and without obstetric indication (19). In Brazzaville, studies - (19) showed the average gestational age at delivery to be 35 weeks for women with sickle cell disease. This was slightly lower than this study's findings, 36.47. In sickle cell mothers, the chance of premature delivery is particularly significant. These rates can be explained by a number of etiologies. One known cause of "spontaneous" preterm is infection experienced during pregnancy. Additionally, the incidence of non-reassuring fetal status predelivery is high. (18,20)

The study also indicated that 86.7% of the sickle cell disease women had mild to severe anaemia at admission. Anaemia in the mother impairs placental perfusion, which decreases the delivery of oxygen and nutritional substrate to the fetus. A higher incidence of Intrauterine Growth Restriction (IUGR) in SCD pregnancy is linked to all of this. (21). Negative perinatal outcomes are significantly impacted in low-income countries by additional variables like poverty, multiparity, and limited access to health care. (1).

Our findings are remarkable for not having described a case of maternal mortality, in studies done in Brazil and the USA, cases of maternal mortality between 1999 and 2008 were between 7.2 and 16.0 deaths per 10,000 SCD pregnant mothers (22). The perinatal mortality rate in this study was 10%. This is relatively higher as compared to a study done in London which reported a perinatal death of 1% (23).

Folic acid has been the drug of choice in pregnancy for most sickle cell patients because of its reduced adversities. Proguanil and hydroxyurea were also found to be used for management of the sickle cell women. However, a study done in the USA reports 22.2% (394) miscarriages and 2.2% (40) stillbirths associated with hydroxyurea use in pregnancy. (24). Sickle Cell Disease Implementing Consortium reported that 15.9% of pregnant mothers who were on hydroxyurea had adverse birth outcomes such as miscarriages, abortions and stillbirths (24). In our study, three of the women used Hydroxyurea at some point in their pregnancies and all had morphologically normal babies.

Despite fears of negative maternal-fetal outcomes amongst pregnant women with SCD, our case series though with a small sample size paints a hope of positive outcomes in this category of patients. Record keeping in the hospital is paper-based, and some of the registers were torn and misplaced, it is possible that records for patients with SCD could have been missed however the long study counters this limitation. This however remains the most comprehensive review in the facility to date.

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CONCLUSION

This study aims to describe the demographic characteristics and pregnancy outcomes of women with SCD at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) where the prevalence of SCD is high. Notably, the association of pregnancy and SCD has mostly resulted in adverse outcomes, which in part is invalidated by this study that otherwise shows more positive outcomes. Proper care in prenatal, intranatal and postnatal stages of pregnancy in SCD patients has otherwise demonstrated better outcomes for both the mother and the baby as illustrated by the studies**.**

Authors' Statement

All the authors listed have participated in conceptualizing and drafting the paper. They have read and approved this version of the manuscript, in conducting this research and writing this paper the authors have adhered to ethical standards. This manuscript is our original work and has not been submitted for publication elsewhere. The authors declare no conflict of interest.

No conflicts of interest to declare.

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