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Research Article

Socio-Demographic Characteristics of Children with Sickle Cell Disease Presenting to Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

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Abstract

Introduction: Sickle cell disease (SCD) is a major public health challenge particularly in sub Saharan Africa. It is one of the most common genetic diseases in the world.

Objectives: The aim of this study was to investigate the socio-demographic distribution of children with sickle cell disease presenting to the Paediatric Department of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

Materials and method: The current study included 60 consecutively recruited children with SCD [30 in vaso-occlusive crisis (VOC) and 30 on steady state] aged 1 - 14 years who were admitted to UDUTH. Socio-demographic characteristics of the children were collected using a questionnaire.

Results: Result from this study indicated that majority of the participants were aged 5 years. Gender distribution indicated an equal distribution of males and females (50%) among subjects in steady state group but a slight increase of females than males in VOC group (56.7%). Ethnic distribution indicated that a significant number of the SCA subjects (steady and VOC) were of the Hausa/Fulani ethnic group (90%). Distribution based on educational status of paternal parents indicated that a significant number of fathers of subjects in the steady patient were educated up to the tertiary level (56.7%) while majority of the paternal parents of children in vaso-occlusive crisis were educated up to secondary school (36.7%). Most of the maternal parents were either secondary school leavers (40.0% for steady, 33.3% for VOC) or had no formal education (23.3% for steady and 33.3% for crisis). Distribution of the SCD subjects based of school attendance indicated that majority of the subjects in the steady state (73.3%) attend school while a significant 53.3% of those in VOC did not attend school (53.3%). In terms of position of the child in the family, most of SCD subjects in the steady state were in position 1 - 5 (66.7%) while majority of the subject in VOC were (46.7%) were ≥ 6^{th} position. In terms of the number of wives in the family, most of SCD subjects in the steady state (40%) and VOC (43.3%) were from monogamous families. Distribution of the subjects based on the occupation of the fathers indicated that majority of the fathers of the subjects in the steady (53.3%) and VOC (53.3%) were business men. Distribution of the subjects based on the occupation of the mothers indicated that majority of the mothers of the subjects in the steady (66.7%) and VOC (76.7%) were farmers. Distribution of the subjects based on the income of the fathers indicated that majority of the fathers of the subjects in the steady state (50%) earned > 100,000 naira while majority of the fathers of subjects with VOC (43.3%) earned < 18,000 naira. Distribution of the subjects based on the income of the mothers indicated that majority of the mothers of the subjects in the steady state (53.5%) and VOC (83.3%) earned < 18,000 naira. Distribution based on presence of plasmodium parasitaemia indicated that 23.3% of SCD subjects in the steady state had malaria infection compared to 76.7% among those with VOC. Distribution based on presence of infection indicated that 36.7% of SCD subjects in the steady state had infection compared to 60% among those with VOC.

Conclusion: This study confirms that sociodemographic variables play a role in hospitalization of SCA children to hospital. Socio-demographic characteristics should be considered seriously in the management of SCD patients. Carrier detection and genetic counselling through antenatal and newborn screening, couple/premarital screening, and other forms of population screening should be implemented. There is need for the provision of a holistic care that takes into consideration the sociodemographic status of the patient in a bid to ensuring optimum outcomes and to reduce SCD -related hospitalizations and mortality.

Keywords: *Socio-Demography; Children; Sickle Cell Disease; Usmanu Danfodiyo University Teaching Hospital; Sokoto; Nigeria*

Introduction

SCD is a genetic disorder associated with the production of structurally abnormal haemoglobin resulting in the episodic formation of sickle-shaped red blood cells and a wide range of clinical manifestations [1-3]. It is a haemoglobinopathy in which there is substitution of a single amino acid in the beta chain of haemoglobin resulting in haemoglobin S, C, D or E depending on the amino acid substituted. Haemoglobin S (HbS) and Haemoglobin C (HbC) are the commonest in Nigeria [4]. SCD is one of the most common genetic diseases worldwide and its highest prevalence occurring in Nigeria, the Middle East, the Mediterranean regions and Southeast Asia [1]. In sub-Saharan Africa, an estimated 300,000 infants are born with major haemoglobin disorders and about 2% of all children have SCD. The World Health Organization in 2016 declared SCD to be a problem of major public health significance and a burden that must be addressed to consolidate improvements in overall child health and survival [5]. It affects approximately 5-7% of the world's population [6]. It affects about 10% of the population in Ghana while in Nigeria approximately 25% of the population of 198 million has sickle cell trait and 3% has SCD [7].

There is growing prevalence of SCD worldwide with the burden on sub Saharan Africa expected to increase to 88% of cases by 2050 [8,9]. Nigeria is about the most populous Black nation in the world with an estimated population of over 180 million people and known to bear the highest burden of SCD in the world and therefore in urgent need of policies for prevention and management of SCD [10].

SCD is estimated to be the sixth leading cause of death in children aged less than 5years in Nigeria and approximately 150,000 Nigerian children are born each year with SCD, making the country one with the largest burden of SCD in the world [11,12].

In Sokoto North Western Nigeria, 12.5% of patients attending paediatrics clinic in Usmanu Danfodio University Teaching Hospital (UDUTH) Sokoto, North Western Nigeria have SCD [13] and accounts for up to 20% of neonatal mortality [14].

Health, social, and economic outcomes in children with SCD are heavily influenced by biological, social, and environmental exposures. Socioeconomic status (SES) is associated with health-related quality of life (HRQOL) for children with SCD. Families of lower SES may experience challenges and stress from hospitalizations in different ways compared to those of higher SES [15].

In paediatrics, the roles of sociodemograpgy; poverty and the social determinants of health are being increasingly recognized as vital to improving health outcomes, especially as disparities widen for many conditions [16-18]. Sociodemographic characteristics can have a significant effect on the development of SCD complication and hospitalization [19].

There is paucity of data on socio-demographic characteristic of sickle disease patients presenting to hospital with ill health and VOC. The present study evaluated the socio-demographic characteristic of sickle disease subjects presenting to hospital with ill health and VOC.

Materials and Methods

Study area

The study was carried out in the Paediatric Outpatient Department of Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto and Specialist Hospital Sokoto. The hospitals are located within the Sokoto metropolis, in Sokoto State. Sokoto State occupies 25,973 square kilometers and is situated along latitude $13^0 3' 39$ N and longitude 5^0 14' 2^0 E. The state is located in the extreme North Western corner of Nigeria near the confluence of the Sokoto River and the Rima River. It shares borders with Niger Republic to the North, Zamfara State to the East, Kebbi State to the South-East and Benin Republic to the West. The major indigenous tribes in the state are the Hausa and Fulani and other groups such as Gobirawa, Zabarmawa, Kabawa, Adarawa, Arawa, Nupes, Yorubas, Igbos and others. The Majority of the Hausas' are farmers while Fulanis are nomadic and are engaged in animal rearing. Sokoto is a very hot area located in the dry Sahel, surrounded by sandy savannah and isolated hills, with an annual average temperature of 28.3°C (82.9°F). However, during the dry season daytime temperature is between 40^0C (104.0^0F) and 45^0C (113.0^0F). With annual growth rate of 3%, Sokoto state has a population of 4.2 million as of 2006 [20]. The calculated projected population for Sokoto State is now standing at around 5.3 million. The state is a major commerce center in leather, crafts and agricultural products.

Sample size calculation

The sample size was determined using the formula (z^2 pq/d^2)

n = minimum sample size

z = standard normal deviation and probability.

p = prevalence or proportion of value to be estimated from previous studies.

q = Proportion of failure (= 1 - P)

d = precision, tolerance limit, the minimum is 0.05.

Therefore $n = z^2 pq/d^2$

WhereZ = 95% (1.96)

P = 3% (0.03) [7]

q = 1 - 0.03 (=0.97)

d = 5% (0.05)

Therefore $n = (1.96)^2 (0.03) (0.97) / (0.05)^2$

n = 45

Study population

The study population included 60 consecutively-recruited children with SCA (30 in VOC and 30 on steady state) aged 1 -14 years as subjects. Subjects were recruited consecutively from among children presenting to the Paediatric department of UDUTH and Specialist Hospital Sokoto, North-Western Nigeria.

Inclusion criteria

Subjects with confirmed haemoglobin-SS, age (1 - 14 years) and willingness of parents/guardians to offer verbal informed consent for their ward to participate in the study.

Exclusion criteria

The following were excluded from the study:

1. Children > 14 years and < 1 year old
2. Children whose parents or guardian refused to provide verbal informed consent

Study design

This research was a case study involving 60 consecutively- children who have SCD. Socio- demographic data of the subjects was obtained by using an interviewer- administered questionnaire which included the age, gender and other socio-demographic factors.

Ethical considerations

Ethical approval was obtained from the ethical committee of Usmanu Danfodiyo University Teaching Hospital (UDUTH) and Specialist Hospital, Sokoto. Verbal informed consent was obtained from the parents or guardians of the subjects prior to the commencement of the study.

Statistical analysis

Statistical analysis was performed using statistical package for social sciences (SPSS) version 20. Frequencies and percentages were calculated. Student t- test (independent t test and paired sample t-test) and ANOVA were used for comparison of data. The results were presented as mean ± standard error of mean. A p- value of ≤ 0.05 was considered as significant in all statistical comparisons.

Results

This study included 60 children consecutively recruited children with SCD (30 in VOC and 30 on steady state. Result from this study indicated that majority of the participants were aged 5 years and above (80% in steady state). Figure 1 shows the age distribution of SCD patients presenting to hospital in steady state and VOC.

Gender distribution indicated an equal distribution of males and females (50%) among subjects in steady state group but a slight increase of females than males in crisis group (56.7%). Figure 2 shows the gender-related distribution of SCD patients presenting to hospital in steady state and VOC.

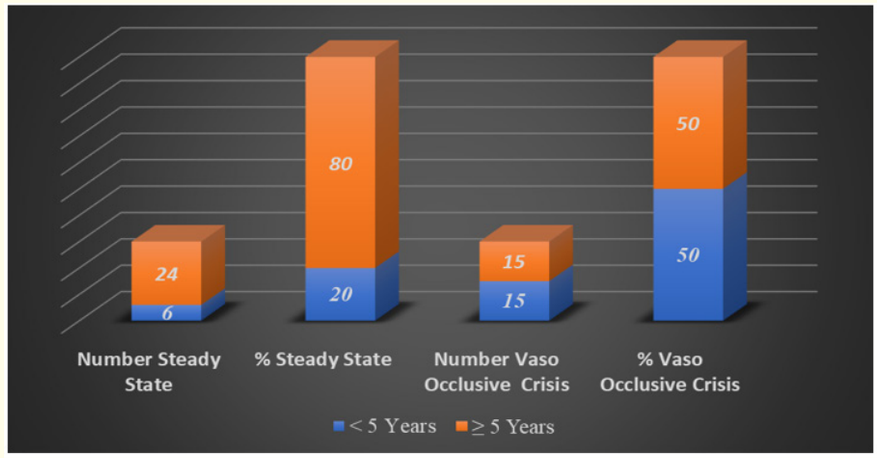

Figure 1: *Age distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC.*

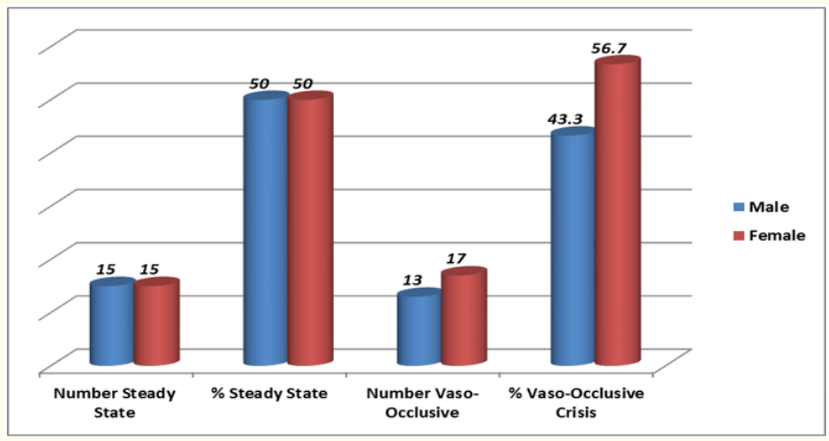

Figure 2: *Gender distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC.*

Ethnic distribution indicated that a significant number of the SCA subjects (steady and vaso-occlusive crisis) were of the Hausa/Fulani ethnic group (90%). Figure 3 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on ethnicity.

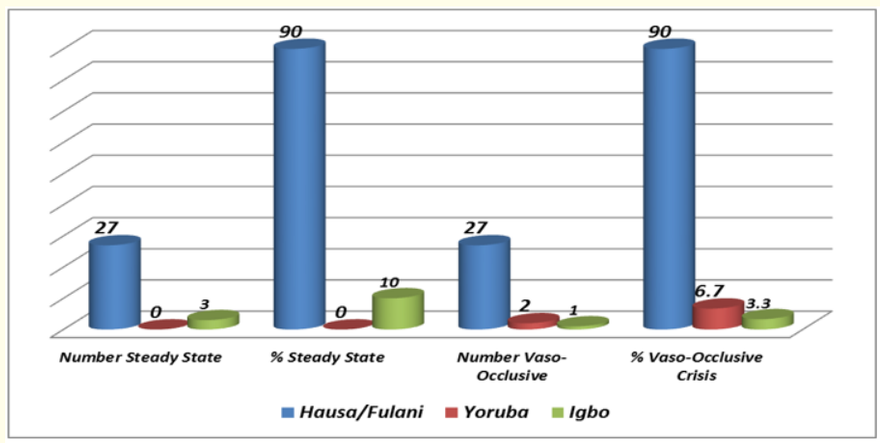

Figure 3: *Ethnic distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC.*

Distribution based on educational status of paternal parents indicated that a significant number of fathers of subjects in the steady patient were educated up to the tertiary level (56.7%) while majority of the paternal parents of children in vaso-occlusive crisis were educated up to secondary school (36.7%). Figure 4 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on paternal level of educational attainment.

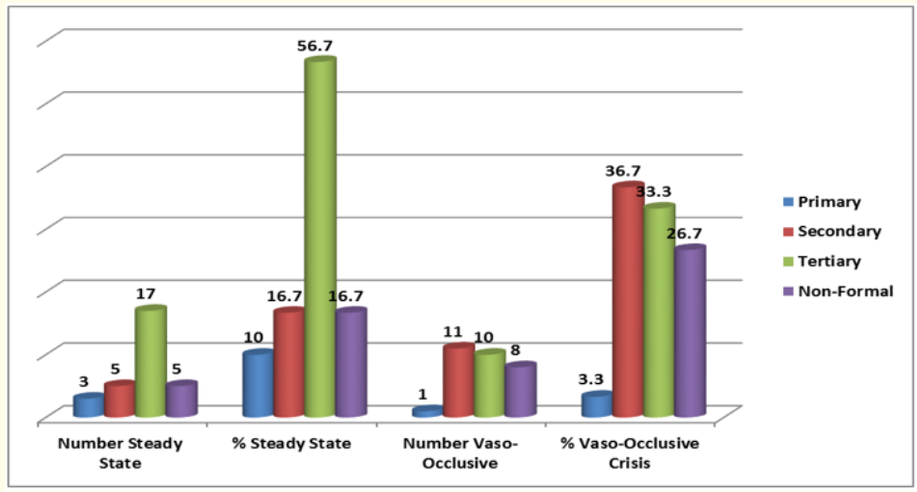

Figure 4: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on paternal educational status.*

Most of the maternal parents were either secondary school leavers (40.0% for steady, 33.3% for crisis) or had no formal education (23.3% for steady and 33.3% for crisis). Figure 5 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on mother's level of educational attainment.

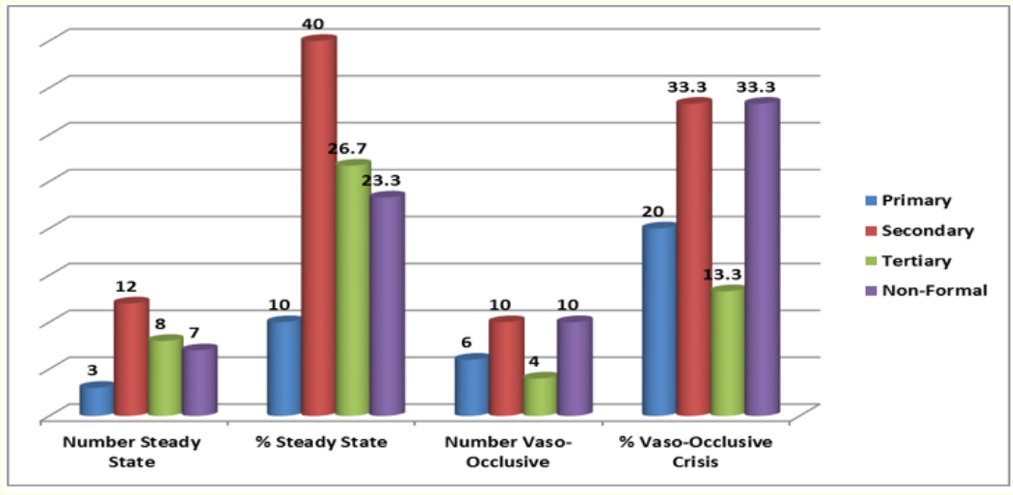

Figure 5: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on maternal educational status.*

Distribution of the SCD subjects based of school attendance indicated that majority of the subjects in the steady state (73.3%) attend school while a significant 53.3% of those in VOC did not attend school (53.3%). Figure 6 shows the distribution of SCD subjects based on school attendance.

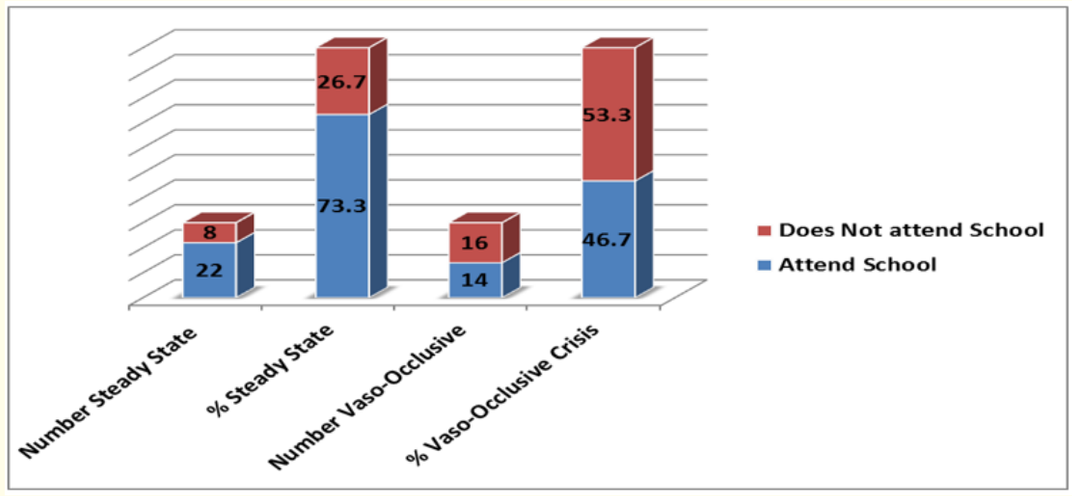

Figure 6: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on child's school attendance status.*

In terms of position of the child in the family, most of SCD subjects in the steady state were in position 1-5 (66.7%) while majority of the subject in VOC were (46.7%) were ≥ 6th position. Figure 7 shows the distribution of SCD subjects based on their position in paternal family.

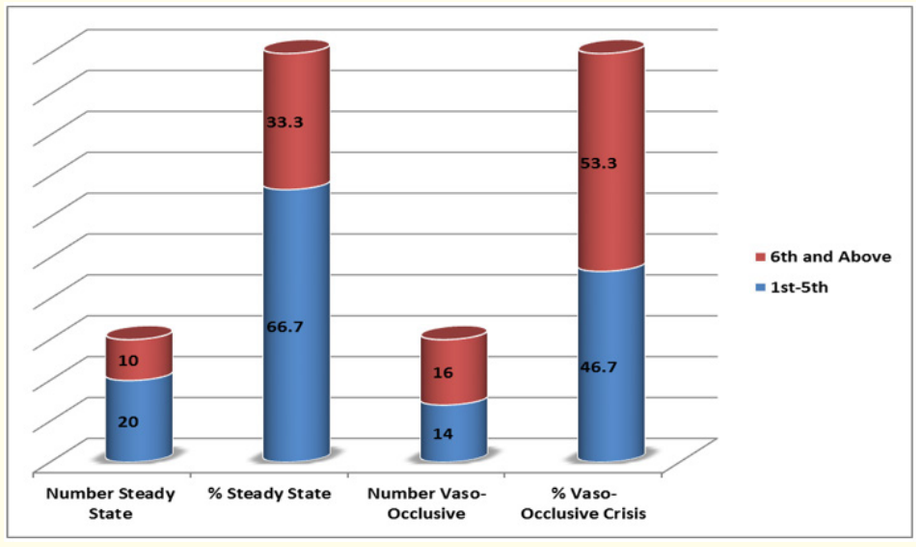

Figure 7: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on child's position in paternal family.*

In terms of the number of wives in the family, most of SCD subjects in the steady state (40%) and VOC (43.3%) were from monogamous families with one wife. Figure 8 shows the distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on number of wives in family

Distribution of the subjects based on the occupation of the fathers indicated that majority of the fathers of the subjects in the steady (53.3%) and VOC (53.3%) were business men. Figure 9 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on the occupation of the fathers.

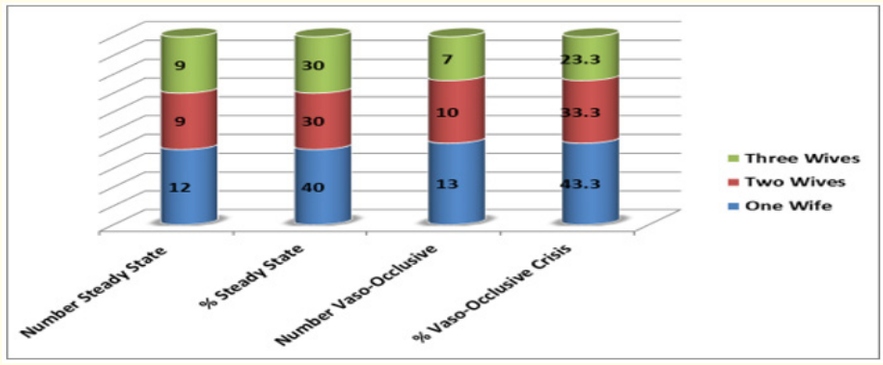

Figure 8: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on number of wives in family.*

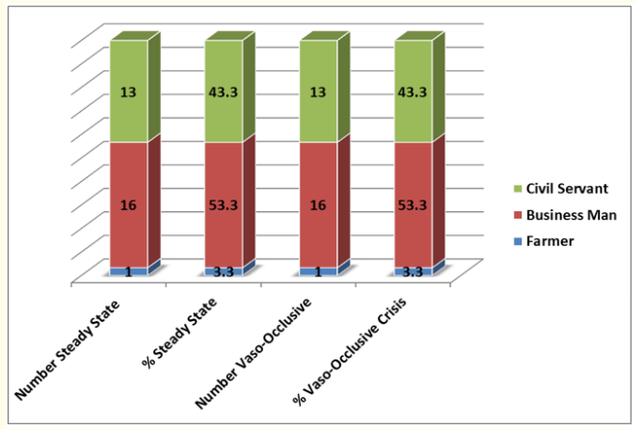

Figure 9: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on number of occupation of father.*

Distribution of the subjects based on the occupation of the mothers indicated that majority of the mothers of the subjects in the steady (66.7%) and VOC (76.7%) were farmers. Figure 10 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on the occupation of the mothers.

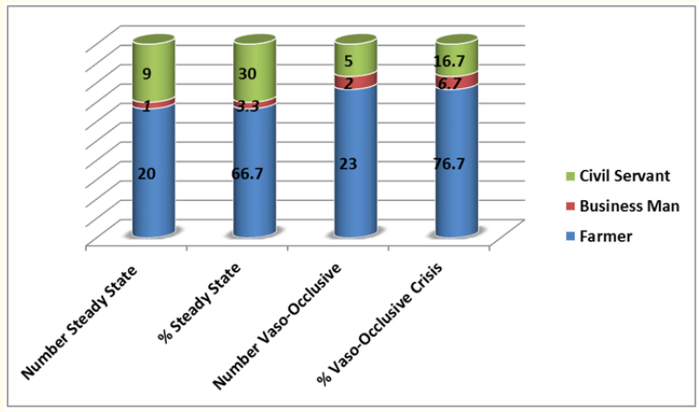

Figure 10: *Distribution of Sickle Cell Disease patients presenting to hospital in steady state and VOC based on the occupation of mother.*

Distribution of the subjects based on the income of the fathers indicated that majority of the fathers of the subjects in the steady state (50%) earned > 100,000 naira while majority of the fathers of subjects with VOC (43.3%) earned < 18,000 naira. Figure 11 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on the income of the fathers.

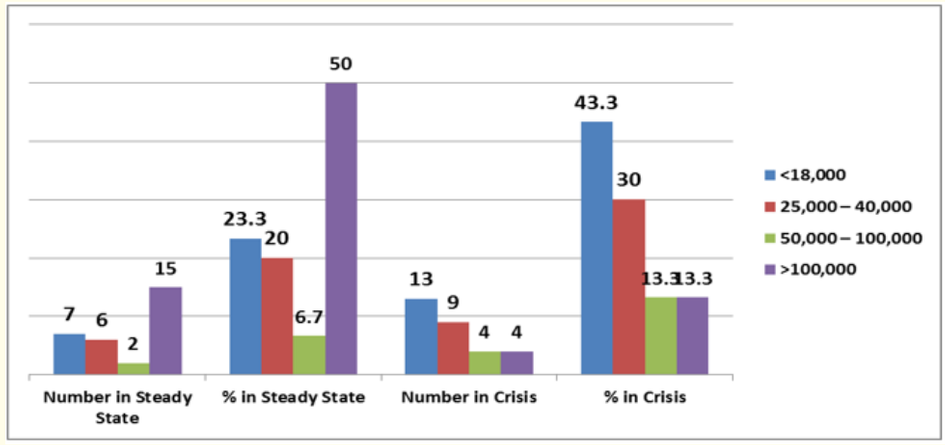

Figure 11: *Distribution of SCD cildren presentation to hospital in steady and VOC based on paternal annual Income (Naira).*

Distribution of the subjects based on the income of the mothers indicated that majority of the mothers of the subjects in the steady state (53.5%) and VOC (83.3%) earned < 18,000 naira. Figure 12 shows the distribution of SCD patients presenting to hospital in steady state and vaso-occlusive crisis based on the income of the mothers. Figure 12 shows the distribution of SCD patients presenting to hospital in steady state and VOC based on the income of the mothers.

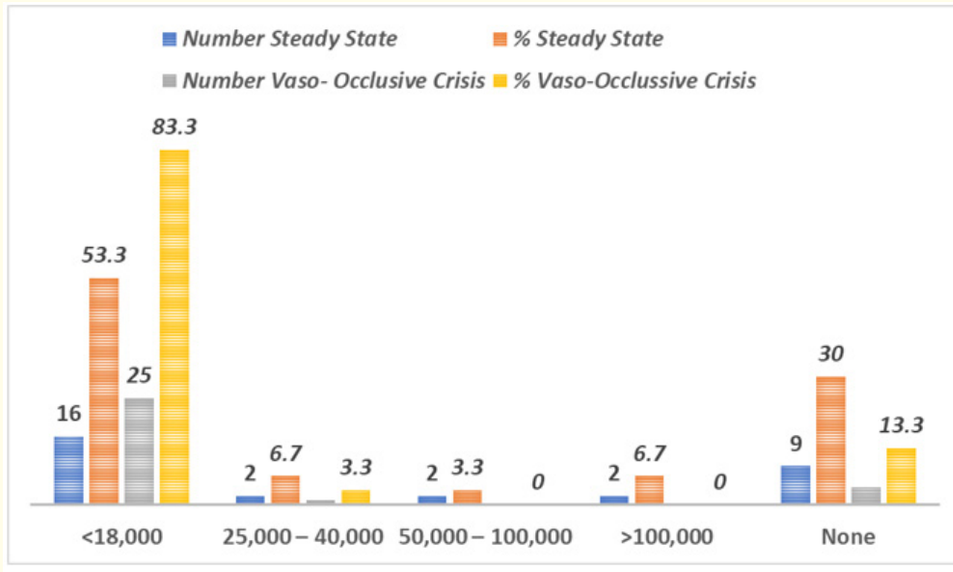

Figure 12: *Distribution of SCD cildren presentation to hospital in steady and VOC based on maternal annual Income (Naira).*

Distribution based on presence of plasmodium parasitaemia indicated that 23.3% of SCD subjects in the steady state had malaria infection compared to 76.7% among those with VOC. Figure 13 shows the role of Malaria infection in presentation to hospital among children with SCD in the steady state and in VOC.

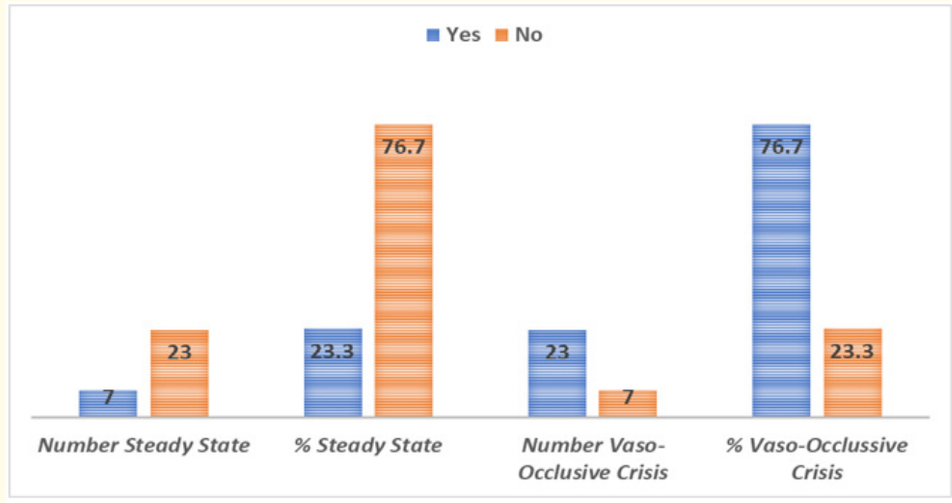

Figure 13: *Role of Malaria infection in presentation to hospital among children with SCD.*

Distribution based on presence of infection indicated that 36.7% of SCD subjects in the steady state had infection compared to 60% among those with VOC. Figure 14 shows the role of infection in presentation to hospital among children with SCD in the steady state and in VOC.

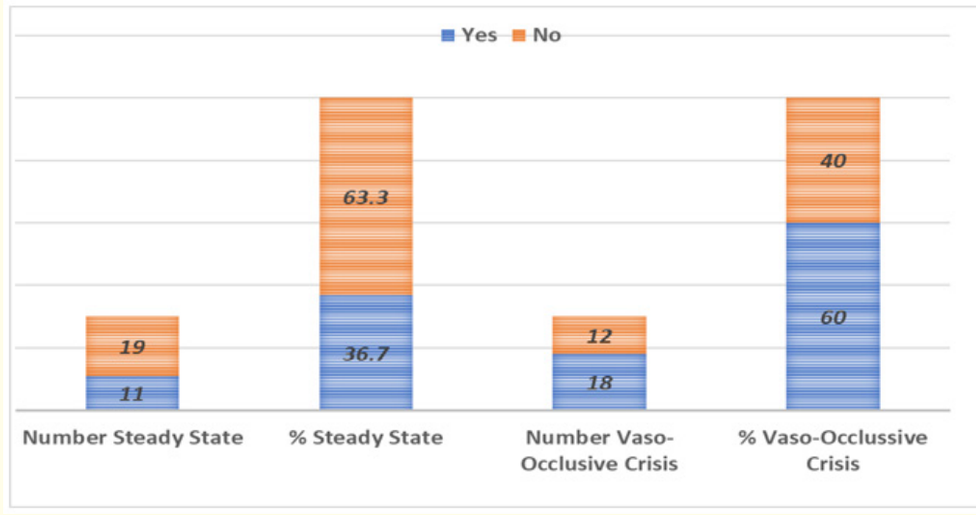

Figure 14: *Role of infection in presentation to hospital among children with SCD.*

Discussion

SCA is one of the most common genetic diseases in the world. Approximately 150,000 Nigerian children are born each year with SCD, making it the country with the largest burden of SCD in the world [11]. It accounts for up to 20% of neonatal mortality [14,21]. Our study has shown that sociodemographic characteristics can have a significant effect on the development of SCD complication and hospitalization. Our finding is consistent with a previous report in Ghana [22] but at variance with a previous report that indicated that sociodemographic characteristics appear to have little influence on the development of SCD complications [23].

Our study showed that majority of the participants were aged 5 years and above, with 80% in steady, 50% in VOC. The age group of our cohort of SCA subjects in this study are similar to subjects studied in previous reports [23-26]. Life expectancy of SCA patients are reduced considerably among younger children and older people. This may be because SCD- related complications reduce as the child grows into

his adult age and are higher in smaller children and older patients. This indicates that SCD-related mortality is likely to be higher among younger children and older people despite advances that emerged for the prevention and treatment of complications of the disease [27].

With respect to gender, we observed an equal distribution of males and females (50%) among subjects in steady state group but a slight increase in the number of females compared to males in VOC group (56.7% versus 43.3%). This finding is consistent with previous reports [22,26,28]. The reason for this female gender predisposition to hospitalization with VOC is not known. A previous report suggested that females generally report or complain more than males when they are suffering from different types of illnesses [29]. Similarly, a previous report in Ghana attribute this finding to cultural beliefs that boys and males are stronger, show bravery, strength and endurance during times of crisis and are expected to be the bread winners, leaders in their family and to endure pain [30].

We observed that a significant number of the SCA subjects in the study state and VOC were of the Hausa/Fulani ethnic group (90%). This could be due to the fact that the ethnic background of the study population is predominantly Hausa/Fulani.

Distribution of the subjects based on the level of education of parents showed that most of the paternal parents of children in VOC were educated up to secondary school (36.7%) while a significant number had no formal education (26.7%). Similarly, most of the maternal parents were either secondary school leavers (40.0% for steady, 33.3% for crisis) or had no formal education (23.3% for steady and 33.3% for crisis). Our finding is consistent with previous reports [31-34]. The reason why lower levels of education are associated with higher numbers of SCA children in VOC may be because education provides the knowledge and information needed in the management, treatment and coping with the disease. Better educated parents are more likely to be better informed about SCD and its management and outcomes [35,36]. Higher levels of education and income would mitigate the deleterious effects of the psychosocial consequences (anxiety and depression) associated with SCA. Parents of SCA children with higher education or income are more likely to make better informed decision about nutritional requirements and use of insecticide -treated mosquito nets to protect their children from malaria. They are also more able to afford the medication and the various treatment options required for the effective management of their SCA children [37,38].

In terms of position of the child in the family, most of SCD subjects in the steady state were in position 1-5 while majority of the subject in VOC were ≥ 6th position. In terms of the number of wives in the family, most of SCD subjects in the steady state and VOC were from monogamous family while other were from polygamous families (2 and 3 wives). Sokoto State is a Muslim dominated state in North Western Nigeria. The tenets of the religion allow men to potentially marry up to four wives. Polygamy is deeply rooted in culture and religion Our finding is consistent with a previous report [39] which indicated that children who live in polygamous families are more likely to have low educational attainment and achievement, drink alcohol, be absent from school and have obstacles in social adjustment. Children in a monogamous family are more likely to get better nutrition, care and love compared to polygamous families that are often associated with multiple wives and numerous children. This often put a strain on the finances, care and support offered to the children [1].

Distribution of the subjects based on the income of the fathers indicated that majority of the fathers of the subjects in the steady state (50%) earned > 100,000 naira while majority of the fathers of subjects with VOC (43.3%) earned < 18,000 naira. Distribution of the subjects based on the income of the mothers indicated that majority of the mothers of the subjects in the steady state (53.5%) and VOC (83.3%) earned < 18,000 naira. Low levels of family income have also been found to have a negative association with depressive symptomatology in patient with SCD [38]. Furthermore, patients with low family income are more likely to be depressed than those endowed financially [40,41]. Higher levels of education and income can potentially mitigate the deleterious effects of the psychosocial consequences of SCD-anxiety and depression. Patients with higher income are in a better position to have access evidenced based information on the best ways to manage SCD and to afford various treatment options.

In this study, we observed that 53.3% of children presenting in VOC were not attending school. This may be because 50% of crises children are less than 5 years of age or it may be due to low level of education and/or income of parents. We observed that children who were not registered and attend school were more prone to admission in hospital in steady state and in crisis. The reason why lower levels of education are associated with higher numbers of hospital admission in patients with SCD may be because education provides the knowledge and information needed for the effective management, treatment and coping with SCD. SCD children are more likely to be absent from school and to underachieve in school [35,36]. Underachievement and high level of absenteeism can potentially result in school dropout producing a negative impact on the future socio-economic status of these children. This can further negatively impact their access to information and ability to manage and cope with SCD. Educated individuals are more likely to be better informed about SCD, its management and outcomes.

Distribution of the subjects based on the occupation of the fathers indicated that majority of the fathers of the subjects in the steady (53.3%) and VOC (53.3%) were business men. Distribution of the subjects based on the occupation of the mothers indicated that majority of the mothers of the subjects in the steady (66.7%) and VOC (76.7%) were local farmers. Knowledge of mothers of sufferers of SCD specifically regarding aetiology of the disorder and acceptable medical care is vital in the effective management of the children. Previous report [42] indicates that there is considerable gaps in appropriate knowledge on SCD among mothers particularly those of low social economic status in Nigeria and that a comprehensive care plan that include a strategy to provide adequate and appropriate information on SCD should be properly-presented to parents or guardians of patients.

In terms of medical assessment of study group, malaria and general infection were observed (23.3% and 36.7% for children in the steady state) and (76.7% and 60.0% of SCD children in VOC) respectively. Our finding is consistent with a previous report [43] which indicated that malaria and sepsis are the principal precipitants of VOC in Nigeria and other sub-Saharan African countries. Our findings indicated that malaria and infection are the clinical hallmark of SCD and the main reason why SCD patients visit the hospital particularly those with VOC. SCD in sub-Saharan Africa are at increased risk of morbidity and mortality from malaria [44]. Our study is consistent with a previous report which indicates that malaria is a major cause of severe morbidity and death among patients with SCD [45]. Antimalarial chemoprophylaxis has been recommended in patients with SCD to reverse this trend [46]. Survival among children with SCD improved after implementation of intensive malaria control measures [47-49]. Previous report indicated that individuals with SCD can develop severe and fatal malaria [50]. Similarly, a previous report indicated that Malaria was recorded as a primary or secondary diagnosis at hospital discharge for 59 (10.6%) of the 555 patients with SCD at hospital admission in Kenya [51]. Previous report indicated that half of the children with SCD who contract malaria have acute painful episodes and severe haemolytic anaemia requiring transfusion [52]. Other evidence suggests that malaria is an important cause of death in SCD in patients outside the hospital [53]. There may be need for the implementation of malaria prophylaxis and the re-inforcement of the use of insecticide impregnated bednets [54].

We observed that infection was a common hallmark of the clinical symptoms seen among SCD patients presenting to hospital in study state and in VOC. Infection seems to be a significant contributor to morbidity and mortality in SCD particularly in developing countries. A secondary complication commonly seen n SCD is infection, which can be bacterial, fungal or viral [55]. SCD patients have a suboptimal immunity, which partly accounts for their increased susceptibility to infections [56-58]. Individuals with SCD typically suffer from functional hypo- or asplenism. The spleen plays a significant role as a phagocytic filter, removing old and damaged cells and blood-borne microorganisms. It is also the site of protective antibodies production. Hypo- or asplenism result in the increased susceptibility to certain bacterial infections seen in SCD [59]. Immunologic dysfunction in SCD is attributable to autosplenectomy with the resultant defective cellular and humoral immunity [60]. Prevention of infection in SCD should be implemented where possible. About 30% loss of splenic function occurs by first year of life and 90% by sixth year of life [61]. Prevention of infection through targeted antibiotic prophylaxis and vaccination is key in the effective management of infection in SCD.

Evidence has shown that without preventive actions, invasive pneumococcal infection is 30 to 600 times more likely to occur in SCD children compared to normal persons [62]. *Haemophilus influenza* is the next most common organism and affects children older than 5 years. In sub Saharan Africa and the developing world, *Salmonella, Klebsiella, Escherichia coli*, and *Staphylococcus* tend to be more common than pneumococcus [63,64].

Pneumococcus is a major threat to SCD patients and an often result in mortality from overwhelming sepsis. A key strategy in the prevention of Pneumococcal infection is vaccination [65]. Other vaccines that are important in children with SCD are *Haemophilus influenzae*, *N. meningitidis*, hepatitis B and influenza. Influenza can precipitate crisis but may also predispose to bacterial pneumonia. Although routine prophylaxis against pneumococcus is not an established practice among children with SCD in most settings [66]. However, evidence has shown in other settings that pneumococcus contributes significantly to infections in SCD [67-69]. In the light of compelling evidence, there seems a justification for vaccination of children with SCD against pneumococcus and the provision of chemoprophylaxis against common infections [70]. Although current national immunization programme in Nigeria routinely includes vaccinations against polio, tuberculosis, Diphtheria, tetanus, pertussis, hepatitis B, Haemophilus influenza infections, measles, and Yellow fever [71], however, for Nigerian children affected with SCD compulsory vaccinations should be implemented to cover pneumococcus, Streptococcus pneumonia, Influenza virus, and Neisseria meningococcus, human papillomavirus (HPV). Penicillin prophylaxis is another strategy recommended particularly for asplenic SCD patients [72]. Long-term penicillin prophylaxis can potentially result in development of resistance [73].

Previous report has also shown that micronutrient deficiency especially zinc deficiency is associated with lymphopenia and decreased immunity among children with SCD [74,75]. About 60-70% of SCD patients are zinc deficient. Other studies have also shown that significant deficiencies of other micronutrients such as magnesium and selenium also predispose SCD children to infections [76,77].

Conclusion

This study confirms that sociodemographic variables play a role in admission of SCD children to hospital. Socio-demographic characteristics should be considered seriously in the management of SCD patients to facilitate healing and restoration of quality of life. The Nigerian government should provide programs that will create awareness of SCD and its implication in this locality and provide financial assistance and better health care to the patients. Parents should be educated on the nutritional requirement of SCD patients and triggering factors for VOC to maintain steady state of the patients. Antioxidant supplementation may be a cheap accessible intervention for sickle cell disease individuals (in the steady or crisis states) to prevent further oxidative damage to the erythrocytes.

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