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■ Original Research Article

Sickle Cell Disease: Its Prevalence, Knowledge and Attitude Towards its Control Measures among Pregnant Women in a Northern Nigerian Tertiary Hospital

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ABSTRACT

Introduction: Sickle cell disease (SCD) is the most prevalent haemoglobinopathy in sub-Saharan Africa (SSA) and has been declared to be a public health burden due to its associated morbidity and mortality. Nigeria is the most endemic SCD country thus prevention of the disease remains of utmost importance. **Objectives**: To determine the prevalence of SCD in pregnancy; ~~and~~ assess knowledge of the disease and awareness of its control measures; and attitude of pregnant women towards its control measures. **Methodology**: A descriptive cross-sectional study involving 210 attendees of the antenatal clinic of Ahmadu Bello University Teaching Hospital Zaria. An interviewer-administered structured questionnaire was used to obtain information about socio-demographic characteristics, knowledge of SCD and attitude towards its control measures. Pregnant women with no evidence of genotype result had venous blood sampling and their blood samples were subjected to haemoglobin electrophoresis. The data was analyzed using SPSS version 21. The chi-square test was used to test associations between variables. The level of significance was set at $p<0.05$**. Results**: The mean age of participants was 28 ± 6.3 years. Nearly half (48.6%) had tertiary education, the majority (70.5%) had a personal source of income and 23.3% were in consanguineous unions. The prevalence of SCD was 1.4% (3/210). Most (97.6%) were aware of SCD but only 53.8% had good knowledge of the disease. The majority of the participants (97.1%) were aware of premarital screening; 21% were aware of prenatal diagnosis and 68.9% of women at risk of having an affected child are willing to accept prenatal screening. **Conclusion:** One in every 100 pregnant women has SCD. A high level of awareness does not directly translate to good knowledge about the disease. Age and educational level were associated with knowledge of SCD. Premarital screening and prenatal diagnosis were the commonest and least known of the control measures respectively.

Keywords: Attitude, Control Measures Sickle Cell Disease, Knowledge, Northern Nigeria, Pregnancy, Prevalence

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INTRODUCTION

Sickle cell disease (SCD) is a haemoglobinopathy with an autosomal recessive inheritance. It affects millions of people worldwide with the majority of affected persons living in sub-Saharan Africa (SSA). It affects about 3% of births in some parts of SSA making it the most prevalent haemoglobinopathy in that part of the continent.[1] SCD has been declared to be a public health problem because of the associated morbidity and mortality.[2,3] In developed countries, morbidity and mortality associated with SCD are very much reduced through the adoption of interventions starting from before conception up to postnatal life compared to SSA bearing the highest burden of the disease.[4]

Screening for SCD at various stages of life, comprehensive case management, infection and anaemia prevention, health education, and support for affected individuals and their families constitute the preventive and control measures in SCD.[5] Nigeria, despite being identified as the most SCD endemic country with about 150,000 affected births yearly, with up to 30% of the population having sickle cell trait (SCT) and SCD prevalence of nearly 3%,[6] the preventive and control measures are still in the infantile stage. Despite the slow and abysmal improvement in the management of individuals affected by SCD in SSA, some females survive till reproductive age and when pregnancy occurs, this becomes another dangerous phase of life associated with significant maternal morbidities and a higher mortality rate compared to their non-SCD counterparts. [7-9]

Worldwide, SCD is one of the most common genetic disorders. Affecting nearly 100 million people and accounting for over 50% of deaths in those with the severe disease worldwide.[6] SCD remains a public health problem, especially in the SSA region which has been neglected by key agencies.[10] Nigeria, India, and the Democratic Republic of Congo account for nearly 90% of the global burden of SCA.[11] Developed countries account for less than 10% of the global disease burden and 90% of children survive to adulthood due to the availability of comprehensive care and preventive strategies which are morbidity and mortality-reducing interventions.[10,12,13] However, the low-income countries bearing the greatest burden of the disease are characterized by widespread unavailability and inaccessibility of these interventions

A dearth of studies exists in northern Nigeria where the socio-cultural background favours consanguineous marriage which can propagate genetic disorders like SCD.[14] Pregnant women are prospective mothers and are important stakeholders in the control of SCD because of the role they play in many control measures like prenatal and postnatal screening as well as comprehensive management of affected children. Though few studies assessed knowledge of SCD and perception of control measures among the pregnant population,[15],[16] fewer studies exist among pregnant women of northern Nigeria. Thus, this study aimed to determine the prevalence of SCD in pregnancy, knowledge about the disease, awareness of and attitude towards SCD control measures among pregnant women attending the antenatal clinic of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria.

METHODOLOGY

Study Setting

The study was conducted in the Antenatal Clinic (ANC) and Haematology Department of ABUTH, Zaria, Kaduna state. ABUTH Zaria is a tertiary hospital that has the main hospital complex located at Shika and is popularly called ABUTH Shika. It has other satellite centres namely ABUTH Tudun Wada and Institute of Child Health (ICH) Banzazzau, all of which render antenatal care services. All specialist departments are mainly based at ABUTH Shika among which are the Obstetrics and Gynaecology and Haematology departments, which offer maternal health services including ANC and delivery to clients and haematological tests and blood transfusion services respectively. The booking ANC clinic is held every Wednesday of the week and is conducted by nurses and doctors in ABUTH Shika and ABUTH Tudun Wada and by nurses at ICH Banzazzau. Participants' recruitment took place between March to August, 2021.

Study Design

A cross-sectional descriptive study of 210 pregnant women.

Study Area

Booking antenatal clinics of Ahmadu Bello University Teaching Hospital (ABUTH), Tudun Wada, Shika and Institute of Child Heath Banzazzau, Zaria

Sample Size Determination

Using Cochran's formula, for a cross-sectional study, a SCD prevalence of 0.14% was obtained among pregnant women from a study by Nwabuko (2016) and a markup rate of 10%. n = sample size; Z= standard normal variate which is 1.96 at $P<0.05$; p = expected prevalence of SCD from a study by Nwabuko 2016 in south-south Nigeria of

0.14; q = 1-p (0.86), d = absolute precision put at 0.05, a total of 210 women was obtained.

Sampling Technique

A convenient sampling technique was employed. The participants were proportionately sampled from the three antenatal clinics after considering the average number of women booked monthly. Eighty-seven, 78 and 45 women were sampled from ABUTH Shika, ABUTH Tudun Wada and ICH Banzazzau respectively. Recruitment continued till the sample size was attained.

Inclusion criteria: All consenting pregnant women attending the booking antenatal clinic.

Data Collection Process

The data were collected at the booking antenatal clinic. After obtaining informed consent, a structured interviewer-administered numbered questionnaire was filled out for each eligible participant by the principal investigator and five trained research assistants who are registered nurses (two research assistants from ABUTH Tudun Wada and Institute of Child Health (ICH) Banzazzau each and one research assistant from ABUTH Shika). The knowledge about SCD was assessed using questions on symptoms/signs of SCD, cause of SCD, test for SCD and consanguinity. Consanguinity in this study was considered to be present when the child's father is a first or second cousin to the mother.

Answering SCD is transmitted from both parents, one correct symptom/sign, SCD can be tested using a blood test and knowing consanguinity could propagate transmission of SCD (each point scoring 1) gave a minimum score of four. Poor and good knowledge were considered as scores of <4 and ≥4 respectively. For women with known Hb genotype evidenced by sighting the result, the genotype was documented and they were exempted from blood sampling. For women with unknown Hb genotype, 3mls of venous blood was obtained from a peripheral vein under an aseptic condition by an experienced phlebotomist and put into an EDTA bottle. Each venous blood sample in the EDTA bottles was assigned the same number on the participant's questionnaire. The blood samples were subjected to haemoglobin electrophoresis using Shandon®

Laboratory Procedure

Hb electrophoresis was done using Shandon® in the Haematology department of ABUTH Shika. The red blood cells were obtained by washing three times with saline. To 1ml of washed packed cells, 3mls of Red Cell lysing agent (2 volumes of distilled water and one volume of carbon tetrachloride) was added and centrifuged at 3000rpm for three minutes. The Hb SS, Hb AS and Hb AA controls were prepared similarly. The cellulose acetate strips were immersed in Tris-EDTA-Borate buffer (pH 8.5) for 5-10minutes.

The electrophoretic chambers were filled to equal levels with the buffer. A dilution of 1 in 4 of the test and control haemolysates was made and about 0.5mls of each was on a sample well. The Cellulose acetate strip was removed from the buffer and held up to drain (excess buffer will be blotted using filter paper) then laid flat on a filter paper. The samples were transferred to the strip using the applicator 2-3cm from the end. A control was added for every 4 or 5 test samples. The strip was placed across the shoulders in an electrophoretic tank and the power was switched at 200 volts until good separation was achieved. Thereafter the power was switched off and the strip was placed in Ponceau S stain for 3-5 minutes. The excess background stain was removed by washing the strip in three consecutive changes of 5% acetic acid. The results were reported as haemoglobin bands after comparing with the appropriate controls.

Data Analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 21. The level of significance was set at <0.05. The frequencies and percentages were used to describe categorical data. Chi-square was used to test for associations between variables.

Ethical Consideration

Ethical approval was obtained from the Health Research Ethic Committee of ABUTH, Zaria (ID ABUTHZ/HREC/H24/2021). Adequate information was given to the participants and broad informed written consent was obtained from all participants. The questionnaires and blood samples were de-identified and confidentiality was strictly maintained.

RESULTS

The mean age and standard deviation (SD) of the study participants were 28±6.3 years. Most of them were Hausa (79.5%) and of Islamic faith (86.7%). Nearly half (48.6%) had a tertiary level of education, 70.5% had personal sources of income and 86.7% were resident in semi-urban areas. Only 23.3% were in a consanguineous union. Seventy per cent were parous women and 62.4%

Table 1: Socio-demographic Characteristics and Reproductive Profile

Characteristic	Frequency n=210	Percentage %	Characteristic	Frequency n=210	Percentage %
Age (years)			Personal source of income		
15-19	12	5.7	Yes	148	70.5
20-24	57	27.1	No	62	29.5
25-29	52	24.8			
30-34	51	24.3	Place of residence		
35-39	26	12.4	Rural	13	6.2
40-44	13	5.7	Semi-urban	182	86.7
			Urban	15	7.1
Tribe					
Hausa	167	79.5	Spousal Consanguinity		
Igbo	5	2.4	Yes	49	23.3
Yoruba	6	2.9	No	161	76.7
Religion			Parity		
Islam	182	86.7	0	63	30.0
Christianity	28	13.3	≥1	147	70.0
Highest educational level			GA at booking (weeks)		
Quranic only	8	3.8	<1 3	42	20.0
Primary	12	5.7			
Secondary	88	41.9	13 - <28	131	62.4
Tertiary	102	48.6	≥ 28	37	17.6

Table 2: Association between socio-demographic variables and knowledge of SCD

Characteristic	Poor knowledge Frequency (%)	Good knowledge Frequency (%)	Chi-square value	*p*-value
Age				
< 30 years	64 (30.5)	57 (27.1)	5.16	0.023
> = 30 years	33 (15.7)	56 (26.7)		
Parity				
0	30 (14.3)	33 (15.7)	0.07	0.786
> = 1	67 (31.9)	80 (38.1)		
Tribe				
Hausa	75 (35.7)	92 (43.8)	3.901	0.272
Non-Hausa	22 (10.5)	21 (10.0)		
Religion				
Islam	82 (39.0)	100 (47.6)	0.708	0.400
Christianity	15 (7.1)	13 (6.2)		
Occupation				
Gainfully employed	72 (34.3)	76 (36.2)	1.219	0.270
Not gainfully employed	25 (11.9)	37 (17.6)		
Educational level				
Less than Tertiary	55 (26.2)	45 (21.4)	6.400	0.011
Tertiary	38 (18.1)	64 (30.5)		
Place of residence				
Non-urban	7 (3.3)	6 (2.9)	0.327	0.568
Urban	90 (42.9)	107 (51.0)		

and 0.5% of the participants respectively. Less than half (48.1%) of the respondents knew that spousal consanguinity increased the likelihood of having offspring with SCD. Bone pain was the commonest symptom of SCD
known to the respondents and only 4.3% were unaware of any symptoms and signs of SCD.

The majority (74.7%) knew SCD to be an inherited disorder, 15.7% knew it to be a blood disorder, 8.5% had no knowledge of what causes SCD and 1.5% incorrectly attributed SCD to other causes. The majority (87.6%) of the participants knew SCD could be diagnosed using a blood test. Using a knowledge score of at least four, 53.8% had good knowledge of SCD.

Most pregnant women (97.6%) were aware of SCD and the commonest source of information was from family members and friends. Other sources of information were radio (28.6%), television (15.2%), school (14.8%), health-related meetings (4.3%), internet (3.8%) and others (1%). Although the awareness of SCD was very high, only 53.8% had good knowledge of SCD. Only age and educational level were found to be associated with a knowledge base of SCD as shown in Table 2. Women aged less than 30 years and those with less than tertiary education were about twice more likely to have poor knowledge about SCD (OR 1.91; C1 1.01-3.33 and OR 2.06; CI 1.17-3.61 respectively)

The majority of the pregnant women (97.1%) were aware of premarital screening for SCD; 41% knew their genotype before marriage and 41.9% were aware of their partner's genotype before marriage. However, 99.5% are willing to allow their children to have premarital screening for SCD. Only 21% were aware of prenatal diagnosis and majority (68.9%, n=138) of pregnant women with known Hb AS/HbSS/unknown genotypes were willing to accept prenatal diagnosis.

DISCUSSION

In this study, 1 in every 100 pregnant women is estimated to have SCD. This is higher than the finding by Nwabuko et al who studied pregnant women between 2004 to 2013 and found that 1 in 714 pregnant women in Port Harcourt is likely to have SCD,[17] 0.2% reported in newly delivered parturients in Benin City by Odunvbun et al[18] and 0.1% from a Cameroonian study.[19]This is however lower than the national prevalence of 3% in the general population[6] and among Saudi pregnant women.[20] This may be explained by the fact that SCD in Nigeria like in many other sub-Saharan African countries is faced with high mortality thus few girls survive to become pregnant. It is however higher than that reported in the USA by Boulet et al and Barfield et al of 0.5% and 0.6% respectively.[21,22] The wide variation in prevalence is due to the geographic distribution of SCD, with SCD being the predominant haemoglobinopathy in Africa, unlike thalassemia which is predominantly found in Asia, the Mediterranean, and the Middle East. With sickle cell gene heterozygosity as high as 30% and the associated survival advantage in malaria-endemic regions like Nigeria, this further accentuates the prevalence of SCD.[23] However, the prevalence of SCT found in this study is slightly below the national prevalence of 30%[6] but higher than that reported by Hamdi et al in Oman of 9.1%.[24]

Awareness of SCD among mothers is important because they can influence the decision about their children's selection of spouse in the future, thus can have an impact on the control measures of SCD. Very high awareness of SCD was found in this study but this awareness did not translate to an overall good knowledge as nearly half of the women lacked good knowledge of SCD which is consistent with findings among Nigerian youths reported by Alao et al;[25] Adewoyin et al;[26] Ugwu[27] and Boadu et al.[28] This depicts the gap in knowledge of SCD among the Nigerian populace that needs to be addressed as part of control strategies for SCD.

The level of knowledge obtained in this study is higher than findings in studies by Uche [29] who found 37.5% among undergraduates in Lagos and Adewoyin et al who found 17.8%.[26] Oluwole et al reported less than half of the respondents have good knowledge of SCD.[30] Educational level was found to be associated with knowledge about SCD in this study and is consistent with findings by Boadu et al;[28] Oluwole et al;[30] Babalola et al;[31] and Al-Qattan et al.[32] Age was also found to be associated with knowledge of SCD and this compares favourably with the study by Adigwe et al[33] but differs from the findings of Uche [29] and Adegbite.[34] In other words, higher education and advancing age which usually comes with a wealth of experience were found to be associated with a good knowledge base of SCD. Thus, allowing women to achieve higher education could improve their knowledge of SCD and its control measures.

Social media represents an efficient and fast way of disseminating information in this era. However, only 3.8% of the women became aware of SCD through the Internet. This represents an underutilization of this valuable medium in health education, especially in SCD. Thus, there is a need for agencies saddled with the responsibilities of SCD preventive and control measures to increase the dissemination of accurate information on SCD using this medium. Health-related contacts/meetings did not also feature as a common source of information about SCD thus highlighting the need to include SCD in the contents of health talk in antenatal clinics since pregnancy may be the only point some women are in contact with the hospital.

Although the majority of the women in this study were aware of premarital screening which is consistent with the findings of Ugwu [27] and Al-Qattan et al. [32] Less than half of the women in this study knew their Hb genotype and that of their partners before marriage. This is similar to findings by Odunvbin et al where 69.9% of mothers did not know their genotype and 92.6% did not know their partner's phenotype[18] and Oluwole et al where only 43% of unmarried adult respondents in an urban setting in Lagos knew their Hb phenotype.[30] Babalola et al found more than two-thirds of mothers of young infants knew their Hb phenotype and fewer women were aware of their spouses' phenotype.[31] This highlights the need to focus on unmarried adults as the target population for premarital screening to control SCD because their knowledge and attitude towards SCD are likely to influence their choice of a mating partner. This can be introduced early in senior secondary school health education as well as adolescent reproductive health education. This also reflects a suboptimal practice of premarital screening in Nigeria.

Although most women in this study were not aware of their Hb phenotype before marriage, nearly all were willing to allow their children to have premarital screening for SCD. Oluwole et al also reported the willingness of the majority of adults to have premarital screening.[30]

This study found a lower level of awareness of SCD prenatal diagnosis which is consistent with the study of Olatunya et al [35] but contrasts with findings by Okechukwu et al among parents of SCA patients attending the Hematology clinic where over 50% of respondents were aware of this procedure.[36] This may be because the latter are a select group of already affected children and are more likely to be better informed about SCD generally. Similar to the work of Okechukwu et al,[36] more than two-thirds of parents at risk of having offspring with SCD were willing to accept the procedure. Olatunya et al found only 17% of mothers of children with SCD in a southwestern Nigerian state were willing to accept prenatal SCD diagnosis [35] while Adewoyin et al found that 38.1% of corps members in Benin City were willing to accept the procedure.[26] This highlights the need to scale up awareness of this control measure. Awareness of premarital screening was higher than prenatal diagnosis as a control measure and is consistent with the findings of Ademosun et al in a similar study population in southwestern Nigeria.[16]

CONCLUSION

SCD is common among pregnant women. A high level of awareness does not directly translate to having good knowledge about the disease. Age and educational level were associated with knowledge of SCD. Premarital screening and prenatal diagnosis were the commonest and least known control measures respectively. The majority of the women had a positive attitude towards both premarital and prenatal screening for SCD.

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