Awareness, Knowledge and Attitude toward Sickle cell Disease among Undergraduate Students in a University in Bayelsa State, Nigeria.

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ABSTRACT

Background: *Sickle cell disease remains a major public health concern in Nigeria. Studies show that despite widespread awareness, there is paucity of knowledge amongst young adults. The implications of this dearth of knowledge are grievous seeing as this population should make informed reproductive choices following genetic counselling, thus strengthening prevention of sickle cell anaemia and its associated morbidity and mortality.*

Methodology: *A descriptive cross-sectional study was conducted among 300 undergraduates of Niger Delta University, Bayelsa state selected through multistage and systematic sampling. Data on sociodemographics, awareness, knowledge, and attitude toward sickle cell disease were collected using a semi-structured questionnaire. Data analysis was done using SPSS version 27. Student t test was used for comparison of means between two categories and analysis of variance (ANOVA) between 3 or more categories. A p-value of less than 0.05 was considered statistically significant.*

Results: *Out of 300 students, 53.3% were females. 94.7% were aware of the existence of sickle cell disease and half (52.3%) had good knowledge. Knowledge was significantly higher amongst students in the basic medical sciences ($p < 0.001$) and those who knew someone with sickle cell disease ($p=0.003$). Most (89%) supported premarital genetic counselling and 80.7% opposed relationships with probability of having a child with sickle cell disease. Primary aawareness sources were lectures/seminars, peers and social media.*

Conclusion: *Despite the students' high level of awareness about sickle cell disease, their knowledge was poor. However, their positive attitude can be leveraged on to improve availability of genetic counselling and testing services. Health education activities to improve their knowledge, drive positive strategies and improve informed reproductive choices which will reduce the morbidity associated with ssickle cell disease.*

Keywords: Sickle cell disease, awareness, knowledge, attitude, undergraduate students

INTRODUCTION:

Sickle cell disease (SCD) is a group of inherited haemoglobin disorders characterized by the presence of sickle red cells in the blood which leads to clinical illness.[1] Sickle cell anemia (SCA), the most prevalent SCD, results from a single base pair substitution in the gene encoding the β-globin chain of hemoglobin (Hb). In SCA, there is inheritance of two abnormal HbS genes (HbSS).[2] It is a noncommunicable disease of immense public health significance as Nigeria bears the highest burden of the disease worldwide, with 25% of the population possessing the sickle cell gene, while 2–3% live with SCA.[3,4] Other SCD include HbSC, HbSβ-thalassaemia among others. Sickle cell disease accounts for 8% of infant mortality in the country.[1]

Sickle cell anemia, the commonest SCD in Nigeria, is characterized by chronic red blood cell haemolysis and vaso-occlusion, which is further complicated by nitric oxide deficiency, causing oxidative damage to the body organs. When exposed to low oxygen tension, the red cells sickle due to intracellular polymerization of haemoglobin. The disease manifests as early as the sixth month of life. The resulting vaso-occlusion leads to episodes of pain and tissue infarction involving all organ systems of the body.[1,5] They present with recurrent ill-health and progressive organ damage. Chronic anaemia is a common feature resulting from the shortened life span of the sickled red cells, which are subsequently removed from the circulation.[5]

Despite its importance, studies have shown that there is inadequate knowledge of SCD amongst the populace. Awareness of SCD, implying being aware of the existence of SCD, and knowledge of SCD implying possession of specific concrete facts and understanding, is important especially among undergraduates, as this population includes both adolescents and adults who will need to make informed decisions sometime in the future concerning life partners and child rearing. This young population can then also lend a voice to help propagate the correct message about SCD to others. In 2015, Adewoyin *et al*[6] in Benin city found a low level of knowledge of SCD among new tertiary graduates. Only 17.8% had good knowledge despite a high level of awareness of 98.6%. Similarly, Uche et al[7] in 2017 found that there was a fair knowledge of SCD among undergraduate students of Lagos State University; 37.5% had good knowledge of SCD with a high level of awareness of 92.5%. Also, 77% of students agreed that Hb phenotype will play a significant role in their choice of marriage partners and would consent to premarital genetic counseling.[7]

Information on SCD is widespread and various sources are readily available ranging from the health workers, lectures/seminars, print and electronic media, peers as well as other popular social media avenues. Yalman *et al*[8] and Adigwe[9] found that school, health workers and social media were the main sources of information on SCD among students and unmarried adults respectively in Abuja, Nigeria. Cegbeyi *et al*[10] studied medical students in Abuja and almost all got their information from courses in school.

This study assessed the awareness, knowledge and attitude towards SCD among undergraduate students of the Niger Delta University (NDU) Bayelsa state and their awareness of their sickle cell phenotype. The source of their knowledge was also assessed. The result of this study among undergraduate students of the Niger Delta University (NDU), Bayelsa state will inform attempts at further educating this population in particular about SCD and primary prevention of SCD. This study will also add to the wealth of knowledge available on this important disease.

Materials and Methods

This was a descriptive cross-sectional study carried out among university undergraduates of the NDU at the main Campus, Wilberforce Island, Bayelsa state, Nigeria. The NDU is a state government-owned university and is the largest tertiary institution in the state. It has three campuses and 14 faculties with a student population of nearly 30,000. The NDU has a health center which caters for the health of its students by providing both inpatient and outpatient services. The study participants were selected using a multistage sampling technique where four faculties (Agriculture, Art, Basic medical sciences and Engineering) out of 14 were selected using a balloting system. Next, the same method (simple random balloting method) was used to select two departments from each of the four faculties. The selected departments were Crop production and Fisheries (Faculty of Agriculture), Theatre arts and Philosophy (Faculty of Arts), Anatomy and Physiology (Faculty of Basic Medical Sciences) and Civil engineering and Mechanical engineering (Faculty of Engineering).

Sample size was calculated using the formula for prevalence studies involving one group:[11]

$$n = \frac{z^2(pq)}{e^2}$$

where n = minimum sample size, z = 1.96 at 95% confidence limits, so that $z^2 = 3.8416$,
p = proportion of undergraduates with good knowledge of SCD[5]
17.8% was the proportion of undergraduates with good knowledge of SCD in Benin city.[5]
p = 37.5% = 0.178
q = 1 – p
= 1 – 0.178
= 0.822
e = error margin tolerated at 5%
= 0.05
$e^2 = 0.0025$

$$n = \frac{3.8416(0.178 \times 0.822)}{0.0025} = 225$$

Allowance for non-response (10%) = 23
Minimum sample size = 225 + 23 = 248
300 students were recruited for the study.

Systematic sampling was done by dividing the sampling frame by the calculated sample size to get the sampling interval. A random starting point was selected and every 8th student was chosen thereafter. Seventy-five respondents were allotted to each faculty (37 in one department and 38 in the other), and systematic sampling was used to select respondents. The sampling frame was obtained from the total number of students in each selected department, and respondents who are not available at the time of questionnaire distribution were replaced by the next student in the sampling frame. Informed consent was sought from the students who were identified by their departmental representatives at their lecture hall. Thus a total of three hundred (300) students were recruited over a period of one month; 1st to 30th November 2024. Questionnaire distribution was carried out by the authors and 3 research assistants (who were students of NDU and were not part of the respondents) who helped with navigating the various departments.

Study instrument/Procedure

A self-administered semi-structured questionnaire adapted from similar studies by Adewoyin *et al*[6] and Uche *et al*[7] was used to obtain information on sociodemographic parameters, awareness, knowledge, and attitude toward SCD. Respondents were asked if they were aware of SCD, how they heard about it, if they knew someone with SCD and if they were aware of their own haemoglobin phenotypes. The section on knowledge included questions on etiology, clinical manifestations, and treatment of SCD. Each of the 20 questions in the knowledge section was scored as 1 for "Yes" response or 0 for "No/I don't know" response to give a total knowledge score of 20. Scores between 0 and 6 were considered poor knowledge, 7 and 13 fair knowledge, and 14 and 20 good knowledge. Concerning their attitude, they were asked if they were willing to do genetic counselling and testing for sickle cell disease before marriage, if they were willing to carry on with a relationship despite the risk of raising children with sickle cell disease, what they would do if they found out they and their spouse have the sickle cell trait after marriage and what they would do if a prenatal diagnosis of SCD was made on their unborn child.

Data collection and analysis

Data from the study were analyzed using Statistical Package for Social Sciences (SPSS) version 27 software. Data is presented as tables and figures, as appropriate. The mean knowledge scores were compared between various groups (age of respondents, sex, religion, knowing someone with SCD, and Haemoglobin phenotype). The student t test was used for comparison of means between two categories and analysis of variance (ANOVA) between 3 or more categories, and p-value of less than 0.05 was considered statistically significant. The proportion of students that chose each of the options on awareness and attitude were analyzed and presented in frequency tables as shown below.

Ethical consideration and clearance

Ethical approval was obtained from the Research and Ethics Committee of NDUTH with number NDUTH/REC/0036/2019 and informed consent was obtained from the students.

Results

Table 1 shows the socio-demographic characteristics of the students. A total of 300 students participated in this study. There were 140 (46.7%) males and 160 (53.3%) females with a male to female ratio of 0.9:1. Most respondents were aged 20–24 years (188, 62.7%), followed by those aged 15–19 years (55, 18.3%), while those aged 30 years and above were the least comprising 3.7%. The four faculties had equal representation of 75 (25%) participants. The vast majority of students (98%) identified as Christians (Table 1).

Table 1; Socio-demographic Characteristics of Students

Characteristics	Frequency N = 300	Percentage (%)
Sex		
Male	140	46.7
Female	160	53.3
Age (years)		
15 - 19	55	18.3
20 - 24	188	62.7
25 - 29	46	15.3
30 - 34	9	3.0
=35	2	0.7
Faculty		
Agriculture	75	25.0
Art	75	25.0
Basic Medical Science	75	25.0
Engineering	75	25.0
Religion		
Christianity	294	98
Traditional	2	0.7
Islam	1	0.3
Others	3	1

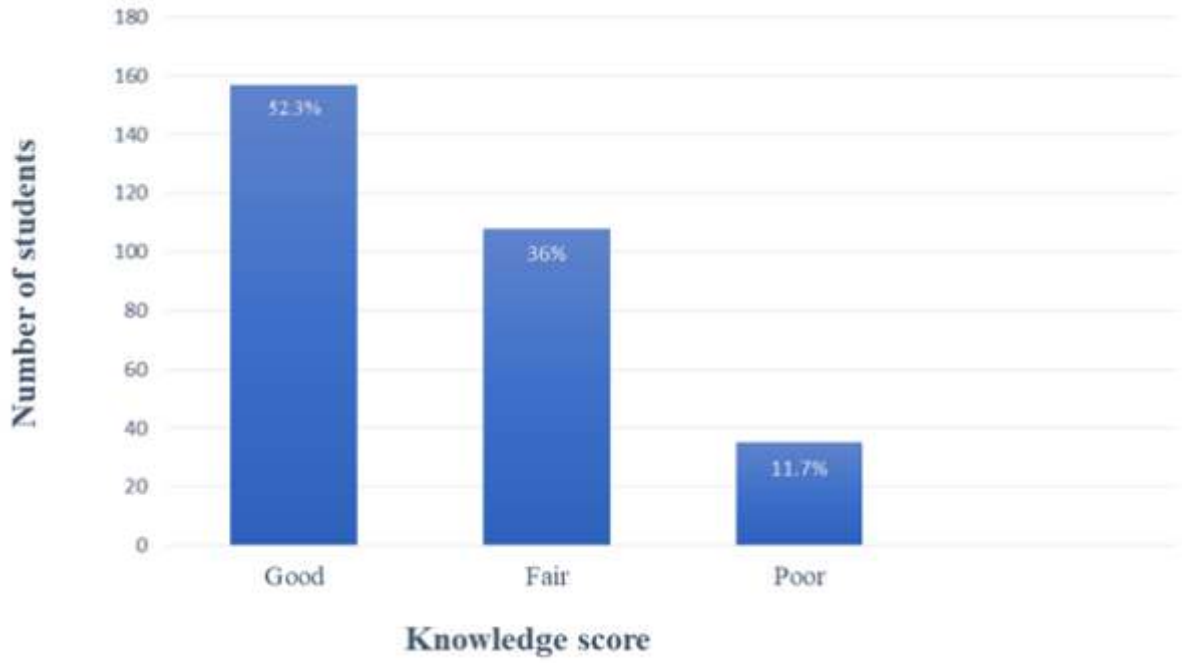

Figure 1: Knowledge of Sickle cell disease amongst students

One hundred and fifty-seven (52.3%) students demonstrated a good knowledge of SCD, while 108(36%) exhibited fair knowledge and 35(11.7%) had poor knowledge.The mean knowledge score was 63.4 ±24.01%. (Fig 1)

Table 2 shows a comparison of the mean percentage knowledge score of SCD by sociodemographic characteristics and haemoglobin phenotype. The females and males had similar mean percentage knowledge scores of 62.9 ± 24.65% and 63.9 ± 23.50% respectively (*P*= 0.403), which was not statistically significant. Students aged 30-34years had a higher score of 80 ± 13.45 while those aged >35years had the least score of 55 ± 7.05 (*P*= 0.305), which was not statistically significant. Muslims had the highest mean score of 70 ± 0.00 while Christians had the lowest score of 63.4 ± 24.2 (*P*= 0.976.), which was not statistically significant. Students with HbSS phenotype had the highest mean knowledge score of 98.35 ± 2.90% compared to those who were HbAA, HbAS and HbSC, however this was not statistically significant (*P*= 0.123). The differences in scores between the sexes, amongst the age groups, religions and the different Hb phenotypes were not statistically significant (p= 0.403, 0.305, 0.976 and 0.123 respectively).

Students in the faculty of Basic Medical Sciences had the highest mean percentage score of 74.93 ± 16.40% while Engineering had the least score with 60.2 ± 25.55%, which was statistically significant, p= <0.001. Students who knew someone with SCD had a higher mean percentage knowledge score of 68.65 ± 20.8 compared to those who did not, and this was statistically significant, p=0.003.

Table 2: Comparison of Mean Percentage Score of Knowledge of Sickle Cell Disease by Socio-demographic Characteristics and Haemoglobin Phenotype of Students.

	% Knowledge Score (score)		
Variables	**Mean ± S.D**	**Statistical Test**	**P-value**
Sex			
Male	62.9 ± 24.65 (12.58 ±4.93)	-0.364[t]	0.403
Female	63.9 ± 23.50 (12.78 ± 4.70)		
Age (years)			
15 - 19	61.9 ± 23.35 (12.38 ± 4.67)		
20 - 24	63.45 ± 24.4 (12.69 ± 4.88)		
25 - 29	62.4 ± 24.70 (12.48 ± 4.94)	1.213[f]	0.305
30 - 34	80 ± 13.45 (16.00 ± 2.69)		
35>	55.0 ± 7.05 (11.00 ± 1.41)		
Faculty			
Agric	54.35 ± 26.20 (10.87±5.24)		
Art	64.25 ± 22.20 (12.85±4.44)		
Basic Medical Science	74.93 ± 16.40 (15.00±3.28)	10.77[f]	<0.001*
Engineering	60.2 ± 25.55 (12.04±5.11)		
Religion			
Christianity	63.35 ± 24.2 (12.67 ± 4.84)		
Others	68.33 ± 2.90 (13.67 ± 0.58)	0.070[f]	0.976
Traditional	65 ± 28.30 (13.00 ± 5.66)		
Islam	70 ± 0.00 (14.00 ± 0.00)		
Knowing someone with SCD			
Yes	68.65 ± 20.8 (13.73 ± 4.16)	4.45[t]	0.003*
No	56.55 ± 26.25 (11.31 ± 5.25)		
Hb phenotype			
AA	66.35 ± 23.45 (13.27 ± 4.69)		
AS	66.90 ± 20.25 (13.38 ± 4.05)	1.945[f]	0.123
SC	65.00 ± 0.00 (13.00 ± 0.00)		
SS	98.35 ± 2.90 (19.67 ± 0.58)		

*S.D, Standard Deviation; [t], t-test; [f], F-test (ANOVA); * statistically significant*

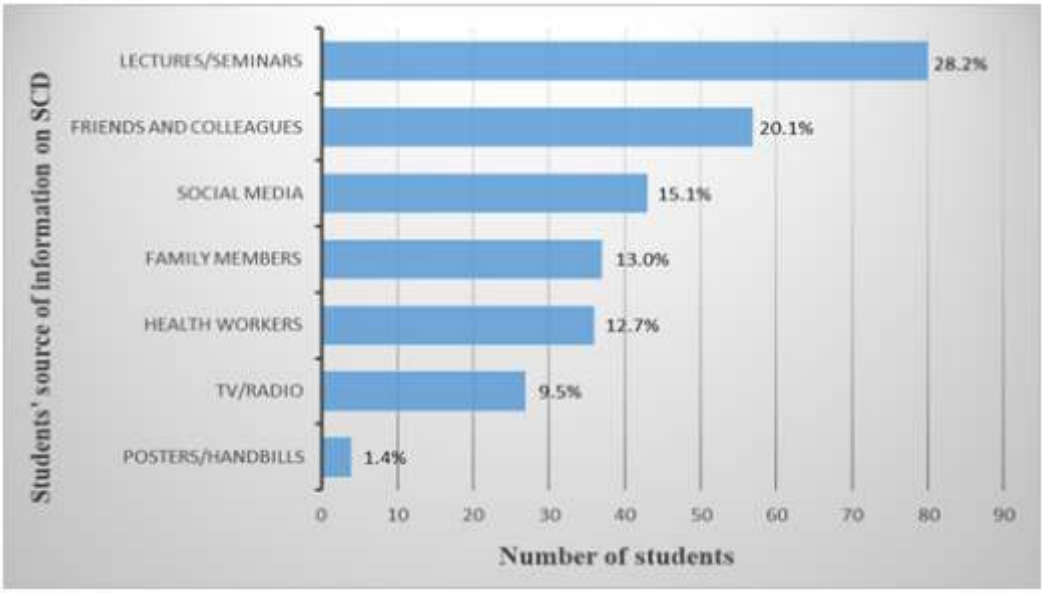

Figure 2: Students' Source of Information on Sickle Cell Disease

Of the 284 (94.7%) students who indicated they are aware of SCD, 80(28.2%) got their information from lectures/seminars, 57(20.1%) from friends and colleagues, 43(15.1%) from social media, 37(13.0%) from family members, 36(12.7%) from health workers, 27(9.5%) from TV/Radio and 4(1.4%) from posters/handbills.

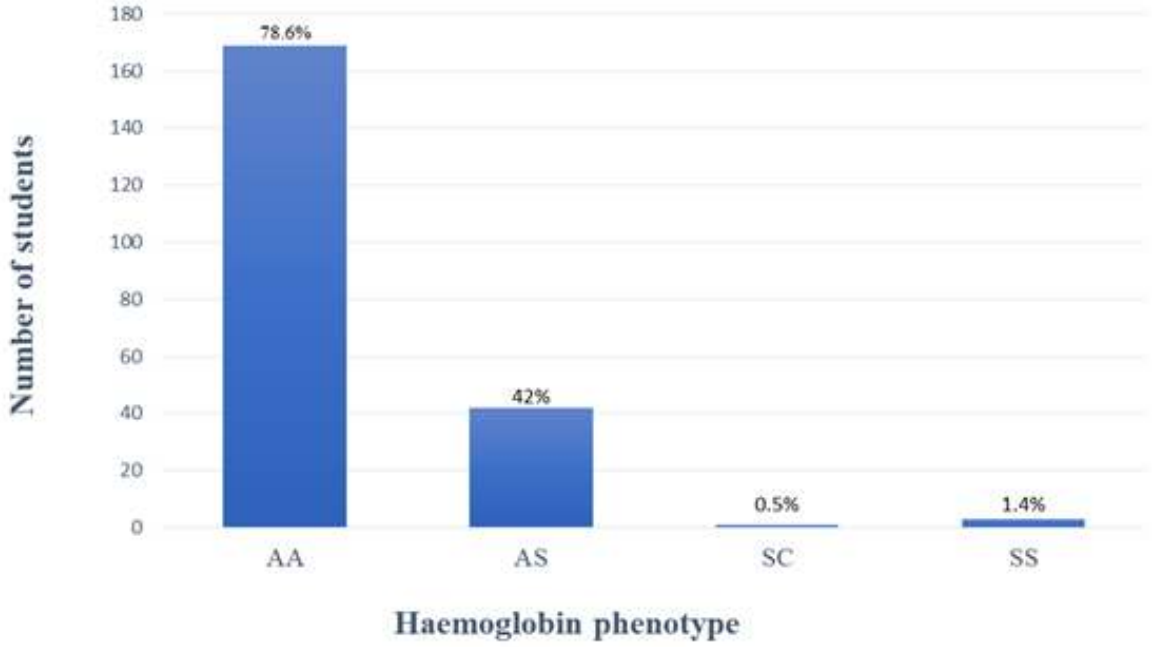

Figure 3: Haemoglobin phenotype of students

Figure 3 shows the Haemoglobin phenotype of students. Two hundred and fifteen (71.7%) students were aware of their Hb phenotype. Of these 215 students, 169(78.6%) were AA, 42(19.5%) were AS, 3(1.4%) were SS, and 1(0.5%) was SC.

Table 3 shows the students' attitude towards SCD. Two hundred and sixty-seven (89%) students were willing to carry out pre-marital genetic counseling and testing for SCD. Twenty five (8.3%) students were willing to continue a relationship where both they and their partner carry the sickle cell trait despite risk of raising children with SCD, while the majority, 242(80.7%), were unwilling to do so.

Concerning actions if students discover they and their partner carry the sickle cell trait after marriage, 130 (43.3%) said they would screen each pregnancy for SCD, 79 (26.3%) were unsure of what they would do, while 2(0.7%) were okay with having children with SCD.

Majority of the students, 134(44.6%), were unsure of what action to take if their unborn child is diagnosed with SCD, 78(6%) would allow the pregnancy to continue while 71(23.7%) would opt for a termination of the pregnancy.

Table 3: Attitude of the Students towards Sickle Cell Disease

	Frequency	Percentage (%)
Willingness to carry out pre -marital genetic counseling and testing for SCD		
Yes	267	89.0
No	24	8.0
Unsure	9	3.0
Willingness to continue a relationship despite risk of raising children with SCD		
Yes	25	8.3
No	242	80.7
Unsure	33	11.0
Action if student discovers they and their partner carry the sickle cell trait after marriage		
Opt to screen each pregnancy for SCD	130	43.3
Accept to have biological children	17	5.7
Accept to have children with SCD	2	0.7
Others*	72	24.0
Unsure	79	26.3
Action if unborn child is diagnosed with SCD		
Abortion	71	23.7
Allow the pregnancy to continue	78	26.0
Others	17	5.7
Unsure	134	44.6

*Others; adoption, opt not to have children, believe in God

DISCUSSION

There was a very high level of awareness about SCD in the index study, similar to other national and regional studies.[6,7,12-14] Despite this high level of awareness, this study revealed a low level of knowledge of SCD as only half of the students had a good knowledge, slightly higher than a similar study in a neighbouring higher institution.[12] However, much lower levels of knowledge were seen in previous studies in Benin and Ibadan in Nigeria, and in Ghana. [6,13,14]

Not surprisingly, respondents in the faculty of basic medical sciences had significantly higher knowledge than those in the other faculties as also reported by Adewoyin et al[6]in Benin and Cegbeyi[15] in Abuja. This may be attributed to their being in the field of health sciences and further information acquired in their ongoing undergraduate training. In contrast however, majority of the nursing students in Pakistan had poor knowledge about SCD despite being in advanced years of study.[16]Also, respondents who knew someone with SCD had significantly higher knowledge scores compared to those who did not. However, among students in Lagos, Nigeria in a study by Uche *et al*[7], it was not statistically significant.This buttresses the importance of continued education on SCD and strengthening measures already on ground. Regarding their source of information on SCD, about a third of the students got their information from Lectures/seminars and from friends and colleagues. Surprisingly fewer students got their information from social media and health workers (15.1% and 9.5% respectively), as seen by local and regional studies.[12,17] The availability and high social media usage by youths and young adults and their influence on their lifestyle is an important platform to utilize in spreading the correct information about SCD.[18,19]

Three-quarter of the students in this study knew their haemoglobin phenotypes as was seen in previous studies.[6,7,12-15,20] However, this was in contrast to studies in The Gambia and Cameroon where only few students and youths were aware of their haemoglobin phenotypes despite a similar national SCD prevalence to Nigeria.[21-24] In this study, the majority of the respondents were AA (78.6%), followed by a fifth who were AS (19.5%), 1.4% were SS and 0.5% were SC, similar to other local and regional studies.[3,4,6,12,14,15,20]Our findings are in keeping with the national prevalence rates of SCD in Nigeria which have remained unchanged for decades.[1]

The attitude of the respondents towards SCD showed that a majority (89%) were willing to carry out pre-marital genetic counseling and testing for SCD, similar to other local studies.[13,17,25] It is important to leverage this finding to encourage premarital screening while working towards universal screening at birth in Nigeria. Only a tenth of the students were willing to continue a relationship where both they and their partner carry the sickle cell trait. This was similar to a study in Ibadan, Nigeria, a decade earlier, and in Cameroon and Ghana in 2021.[6,7,17,21] This points to an unchanged attitude towards SCD among Nigerian undergraduate students over time. This was in contrast to findings in The Gambia where only 33.9% said they would end their relationship if they discovered their genotype predispose them to having children with SCD.[22] With more enlightenment about SCD diagnosis,

more centers for genetic counselling including reproduction options made available, this narrative may change.

About half of the respondents opted to screen each pregnancy if they discover that they and their partner carry the sickle cell trait after marriage, while a quarter of them were unsure of what action they would take. This brings to fore the importance of genetic counselling including prenatal diagnosis and making it widely available in Nigeria. Concerning their actions following prenatal diagnosis of SCD, about half of the respondents were unsure of what action to take, bringing to fore the ethical issues/dilemma in making a decision when the need arises. A quarter reported that they would abort the pregnancy, lower than reported in Benin, Nigeria.[6] Also, much fewer respondents reported that they would terminate the pregnancy in a study in Cameroon and none in a study in Lagos, Nigeria.[7,21] This response to prenatal screening in the index study and other national studies is not surprising due to the mostly Christian respondents and the widely held stance against abortion except when the life of the mother is at risk.

Conclusion

Despite the very high level of awareness concerning SCD, there is a low level of knowledge among the students. This low level of knowledge and the prevalence of SCD amongst this population has not changed much over the years. The somewhat positive attitude towards SCD should be leveraged with improvement in the provision of genetic counselling and testing services. There is a need to intensify efforts on the creation of awareness of SCD among university students as they make up a large part of the reproductive population in the nation, utilizing more social media avenues in keeping with the current trends of information dissemination.

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