



International Journal of Public Health Practice and Promotion (IJPHP)

VOLUME 1 ISSUE 1 (2026)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Knowledge, Attitude, and Perception of Sick Cell Disease Screening Among Adolescents in Bauchi North-Eastern Nigeria

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Article Information

Received: May 28, 2026

Accepted: August 04, 2026

Published: August 28, 2026

Keywords

Adolescent, Attitude, Knowledge, Perception, Screening, Sick Cell Disease

ABSTRACT

Sickle cell disease (SCD) is the most prevalent inherited haemoglobin disorder in Nigeria, with an estimated 4 to 6 million affected individuals and approximately 25% of the population carrying the sickle cell trait. Prevention depends on informed reproductive decision-making, which requires adolescents to have adequate knowledge of genotype status and a positive disposition toward screening. This study assessed the knowledge, attitude, and perception of SCD screening among adolescents in Bauchi Local Government Area, Bauchi State. A descriptive cross-sectional design was employed among 230 adolescents drawn from ten wards using multistage sampling. Data were collected electronically via KoBoToolbox and analysed using SPSS version 26 with frequency tables, chi-square tests, and odds ratios. The mean knowledge score was 5.91 out of 10, with 61.3% demonstrating adequate knowledge. Most respondents (93.0%) had a good attitude toward genotype screening. However, 73.9% feared a carrier result would prevent them from marrying their chosen partner, 67.0% perceived screening costs as prohibitively high, and 61.3% reported significant community stigma. Age, religion, and educational level were significantly associated with knowledge level ($p < 0.001$, $p = 0.030$, $p < 0.001$ respectively). Marital status, religion, and educational level were significantly associated with attitude ($p = 0.007$, $p < 0.001$, $p = 0.002$ respectively). Inadequate knowledge was associated with nearly three times higher odds of poor attitude toward screening (OR = 2.85, $p = 0.043$). Multi-level interventions addressing knowledge gaps, subsidised screening access, and community norm change are urgently needed.

INTRODUCTION

Background of Study

Sickle cell disease (SCD) is a hereditary blood disorder that is characterized by the production of abnormal hemoglobin molecules that cause the red blood cells to take a crescent or sickle shape. This is caused by a mutation in the gene responsible for the production of hemoglobin where glutamic acid is substituted with valine at position 6 on the beta chain of the globin molecule, leading to the formation of the abnormal HbS gene. This causes red blood cells to form a stiff, sticky and sickle shape that finds it difficult to pass through small blood vessels leading to several symptoms associated with SCD. Clinical manifestations may appear as early as six months of age and persist throughout adulthood, imposing significant economic, psychological, and social costs on affected individuals, their families, and the healthcare system (Elendu *et al.*, 2023).

Globally, SCD is prevalent in Sub-Saharan Africa, the Mediterranean, the Middle East, and South Asia. Nigeria has the highest national burden, with an estimated 4 to 6

million people living with the disease and approximately 25% of the population carrying the sickle cell trait (Nwabuko *et al.*, 2022). Since SCD is entirely inherited, prevention by early genotype screening and making informed reproductive decisions is the most effective strategy in reducing its prevalence.

Research Gap

Despite extensive research on the prevalence, clinical manifestations, and management of sickle cell disease (SCD) in Nigeria, there is limited evidence on the level of awareness, knowledge, and uptake of genotype screening among young adults, particularly students in tertiary institutions. Many individuals still discover their genotype only when preparing for marriage or after the birth of an affected child, suggesting inadequate utilization of preventive screening services. In addition, factors influencing genotype screening, such as cultural beliefs, misconceptions, access to healthcare, and attitudes toward genetic counseling, remain underexplored. Addressing these gaps will provide evidence to support targeted

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health education and interventions aimed at promoting informed reproductive decisions and reducing the burden of SCD.

LITERATURE REVIEW

Sickle cell disease (SCD) is the most common inherited hemoglobin disorder worldwide and is caused by a mutation in the β -globin gene, resulting in the production of abnormal hemoglobin S (HbS), which causes red blood cells to become sickle-shaped under low oxygen conditions. These abnormal cells obstruct blood flow, leading to chronic anemia, painful vaso-occlusive crises, organ damage, and reduced quality of life (Elendu *et al.*, 2023). Nigeria has the highest global burden of SCD, with millions of affected individuals and a high prevalence of sickle cell trait carriers, making genotype screening and genetic counseling essential preventive strategies (Nwabuko *et al.*, 2022). Studies have shown that although awareness of SCD has improved, the uptake of genotype screening remains inadequate due to poor knowledge, misconceptions, financial barriers, and socio-cultural factors. Consequently, strengthening health education, premarital genotype screening, and genetic counseling is crucial for promoting informed reproductive choices and reducing the incidence of SCD in Nigeria.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional research design was adopted for this study to assess the knowledge, attitude, and perception of sickle cell disease screening among adolescents in Bauchi Local Government Area, and to examine associations between sociodemographic characteristics and these outcome variables at a single point in time.

Ethical Considerations

Ethical approval for this study was obtained from the Bauchi State Ministry of health and social welfare research and ethics committee under the Directorate of planning, research and statistics prior to the commencement of data collection. The study adhered strictly to standard ethical guidelines for research involving human participants. All participants and, where applicable, their parents or guardians were informed of the purpose, methods, and voluntary nature of the study before participation. Written informed consent was obtained from adult respondents, while written assent was obtained from adolescent participants aged below 18 years alongside parental or guardian consent. Participants were informed of their right to withdraw from the study at any stage without penalty or negative consequences. All data collected were used solely for academic and research purposes, and confidentiality was maintained throughout.

Study Area/Setting

The study was carried out in Bauchi Local Government Area, which serves as the state capital of Bauchi State

in the North-Eastern geopolitical zone of Nigeria. The LGA is one of twenty local government areas in Bauchi State and houses the seat of the State Executive Governor. Geographically, Bauchi sits at approximately 617 metres above sea level on the northern fringe of the Jos Plateau, within the tropical savannah climatic zone, with an average temperature of 32°C and an annual rainfall of approximately 950mm. The LGA comprises twenty wards: Birshi, Dan'Amar A, Dan'Amar B, Daniya, Dankade, Dawaki, Dandango, Galambi, Gwaskwaram, Hardo, Kangere, Kundum Durum, Liman Katgum, Makama A, Makama B, Miri, Munmusal, Tirwun, Yamrat, and Zungur. The projected population of the LGA for 2026 is 960,000, with the majority of residents being of Hausa and Fulani ethnicity and of Islamic faith. The LGA hosts both conventional formal schools and Tsangaya Islamic schools, making it a particularly relevant setting for studying adolescent health knowledge across different educational pathways.

Study Population/Recruitment of Participants

The study population comprised adolescents aged 14 to 20 years residing in the selected wards of Bauchi LGA during the study period. This age bracket was specifically chosen because it represents the stage at which courtship and marriage decisions begin in this region, making genotype awareness particularly important.

Inclusion/Exclusion Criteria

All adolescents aged 14 to 20 years residing in the selected wards of Bauchi LGA who gave consent (or assent with parental consent for those below 18 years) were eligible for inclusion. Adolescents who were seriously ill at the time of data collection were excluded from the study.

Sample Size Determination

The sample size was calculated using the Krejcie and Morgan formula for determining sample size in descriptive studies: $n = \frac{X^2 N p(1 - p)}{[e^2(N - 1) + X^2 p(1 - p)]}$

Where: n = minimum sample size; N = projected population size of Bauchi LGA (960,000); p = estimated proportion of the population, assumed to be 0.5 in the absence of a prior local estimate; X^2 = chi-square value for 1 degree of freedom at 95% confidence level (3.841); e = acceptable margin of error (0.05). Applying the formula yielded a minimum sample size of 384 adolescents.

Sampling Technique

A multistage sampling technique was used to select study participants, ensuring adequate representation across the LGA. The stages were as follows:

1. In the first stage, all twenty wards of Bauchi LGA were listed.
2. In the second stage, ten wards were selected from the twenty using simple random sampling.
3. In the third stage, three settlements were selected from each of the ten chosen wards using simple random

sampling by balloting, yielding a total of thirty settlements. The number of respondents allocated to each settlement was proportional to its population size. Within each settlement, all formal schools and Tsangaya schools were identified, and respondents were recruited from these institutions to meet the required number per settlement.

Research Tools/Data Collection Instruments

A semi-structured, self-administered questionnaire was used to elicit information from respondents. The instrument was adapted from validated tools used in similar studies on SCD knowledge, attitude, and perception in Nigerian and African settings. The questionnaire consisted of the following sections: Section A: Sociodemographic characteristics (age, sex, marital status, tribe, religion, level of education, prior SCD screening history, and known genotype status); Section B: Knowledge of sickle cell disease and screening; Section C: Attitude toward sickle cell disease genotype screening; Section D: Perception of sickle cell disease and screening. For content validity, the instrument was reviewed by public health experts and professionals with expertise in haematology and community health, and items were aligned with established SCD knowledge, attitude, and perception frameworks to strengthen construct validity. Feedback from these reviewers was incorporated into the final version of the instrument. Reliability was assessed through a pilot study conducted among 38 respondents (10% of the sample size) in a similar community. Internal consistency was evaluated using Cronbach's alpha, with a minimum acceptable value of 0.7. Items found to be unclear or inconsistent were revised before the main data collection commenced.

Procedure for Data Collection

Data collection was carried out over a five-week period by trained research assistants who were fluent in both

English and Hausa, the primary language spoken in the study communities. Prior to data collection, a standardised briefing session was held to ensure uniform administration of the questionnaire across all sites. Community and school leaders were engaged beforehand to facilitate access to respondents and ensure a smooth data collection process.

The questionnaire was deployed electronically using KoBoToolbox (a validated open-source mobile data collection platform), to ensure real-time data entry, minimize transcription errors and facilitate efficient data management. Respondents who did not have access to a smartphone or who preferred a paper-based format were administered a printed questionnaire; afterward their responses were entered into KoBoToolbox at the end of the day.

Statistical Analysis

The collected data were checked for completeness, coded, and analysed using the Statistical Package for Social Sciences (SPSS) version 26. Categorical variables were summarised using frequencies and percentages, while continuous variables were presented using means and standard deviations. Chi-square tests were used to examine associations between sociodemographic characteristics and knowledge level, attitude category, and perception scores. The relationship between knowledge level and attitude was assessed using the odds ratio. A p-value of less than 0.05 was considered statistically significant. All results were reported with 95% confidence intervals where applicable.

RESULTS AND DISCUSSIONS

Sociodemographic Characteristics

Most respondents (47.4%) were aged 20 years and above; females were 53.0%; 71.7% were single; 66.5% were Hausa; 84.3% were Muslim; and 60.9% were at tertiary educational level. The ward of Dankade contributed the

Table 1: Socio-demographic Characteristics of Respondents, n=230

Demographic Characteristics	Frequency, n=230	Percentage (%)
Age Group (years)		
10-13	24	10.4
14-16	40	17.4
17-19	57	24.8
≥20	109	47.4
Sex		
Male	108	47.0
Female	122	53.0
Marital Status		
Single	165	71.7
Married	61	26.5
Divorced	2	0.9
Prefer not to say	2	0.9
Location (Ward)		

Birshi	41	17.8
Dan Dango	14	6.1
Dan'Amar A	10	4.4
Dan'Amar B	5	2.2
Dan'Iya	41	17.8
Dankade	64	27.8
Makama	20	8.7
Miri	21	9.1
Munmusal	11	4.8
Yamrat	3	1.3
Tribe		
Hausa	153	66.5
Fulani	45	19.6
Other	32	13.9
Religion		
Islam	194	84.3
Christianity	33	14.4
Others	3	1.3
Level of Education		
JSS1-3	24	10.4
SS1	11	4.8
SS2	20	8.7
SS3	20	8.7
Tertiary	140	60.9
Tsangaya (Islamic School)	15	6.5

highest share of respondents (27.8%), followed by Birshi and Dan'Iya (17.8% each). Full distribution is shown in Table 1.

Knowledge of SCD Among Adolescents Respondents
Knowledge was assessed using ten True/False/Don't Know items, with a maximum possible score of 10.

Table 2: Knowledge Level Across Respondents, n=230

Knowledge Category	Frequency, n=230	Percentage (%)
Inadequate (0-5)	89	38.7
Adequate (6-10)	141	61.3

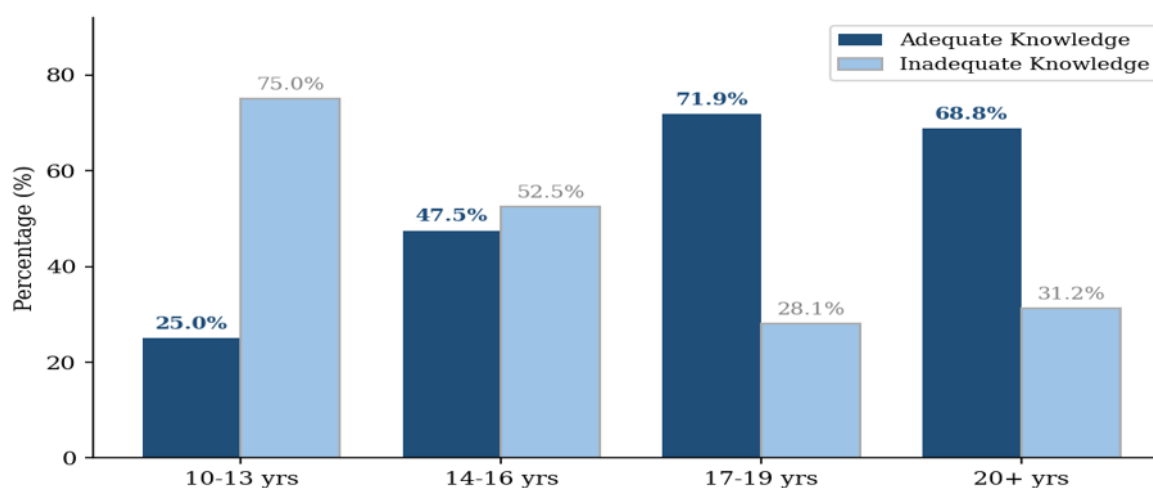


Figure 1: Distribution of Knowledge Score Among Adolescents in Bauchi, n=230

Scores of 0 to 5 were classified as inadequate knowledge and scores of 6 to 10 as adequate knowledge. The mean knowledge score was 5.91. As shown in Table 2, 61.3% of respondents (n = 141) demonstrated adequate knowledge, while 38.7% (n = 89) had inadequate knowledge.

Factors Influencing the Knowledge Level of Respondents

The table 3 presents chi-square analysis of sociodemographic factors associated with knowledge level. Age ($X^2 = 21.85$, $p < 0.001$), religion ($X^2 = 7.034$,

Table 3: Factors Influencing the Knowledge Level of Respondents, n=230.

Demographic Characteristic	Adequate n (%)	Inadequate n (%)	X2	p (<0.05)
Age Group (years)				
10-13	6 (25.0)	18 (75.0)	21.85	<0.001
14-16	19 (47.5)	21 (52.5)		
17-19	41 (71.9)	16 (28.1)		
≥20	75 (68.8)	34 (31.2)		
Sex				
Male	59 (54.6)	49 (45.4)	3.824	0.051
Female	82 (67.2)	40 (32.8)		
Marital Status				
Single	99 (60.0)	66 (40.0)	0.803	0.849
Married	40 (65.6)	21 (34.4)		
Divorced	1 (50.0)	1 (50.0)		
Prefer not to say	1 (50.0)	1 (50.0)		
Tribe				
Hausa	98 (64.1)	55 (35.9)	3.312	0.191
Fulani	28 (62.2)	17 (37.8)		
Others	15 (46.9)	17 (53.1)		
Religion				
Islam	126 (64.9)	68 (35.1)	7.034	0.030
Christianity	14 (42.4)	19 (57.6)		
Others	1 (33.3)	2 (66.7)		
Level of Education				
JSS1-3	7 (29.2)	17 (70.8)	30.669	<0.001
SSS1	6 (54.5)	5 (45.5)		
SSS2	8 (40.0)	12 (60.0)		
SSS3	9 (45.0)	11 (55.0)		
Tertiary	105 (75.0)	35 (25.0)		
Tsangaya (Islamic School)	6 (40.0)	9 (60.0)		

Decision on H_{01} : Significant associations were found between sociodemographic characteristics and knowledge level for age ($p < 0.001$), religion ($p = 0.030$), and educational level ($p < 0.001$), therefore H_{01} is rejected.

$p = 0.030$), and level of education ($X^2 = 30.669$, $p < 0.001$) were significantly associated with knowledge level. Tertiary-level respondents had the highest proportion of adequate knowledge (75.0%), while JSS 1 to 3 students had the lowest (29.2%). Sex ($p = 0.051$), marital status

($p = 0.849$), and tribe ($p = 0.191$) were not statistically significant.

Attitude Towards Sick Cell Disease Genotype Screening

Table 4: Quality of the Attitude Towards Sick Cell Disease Among Respondents

Attitude Category	Frequency, n=230	Percentage (%)
Poor (5-20)	16	7.0
Good (21-30)	214	93.0

Attitude was assessed using six Likert-scale items, with composite scores of 5 to 20 classified as poor attitude and 21 to 30 as good attitude. As shown in Table 4, the vast

majority of respondents (93.0%, n = 214) demonstrated a good overall attitude toward SCD genotype screening.

Factors Influencing the Attitude Towards Genotype Testing Among Respondents

The table 5 presents chi-square analysis of factors

influencing attitude. Marital status ($X^2 = 12.170$, $p = 0.007$), religion ($X^2 = 18.858$, $p < 0.001$), and level of education ($X^2 = 19.350$, $p = 0.002$) were significantly

Table 5: Factors Influencing the Attitude Towards Genotype Testing Among Respondents

Demographic Characteristic	Good	Poor	X2	p (<0.05)
Age Group (years)				
10-13	22 (91.7)	2 (8.3)	0.137	0.987
14-16	37 (92.5)	3 (7.5)		
17-19	53 (93.0)	4 (7.0)		
≥20	102 (93.6)	7 (6.4)		
Sex				
Male	100 (92.6)	8 (7.4)	0.064	0.800
Female	114 (93.4)	8 (6.6)		
Marital Status				
Single	156 (94.5)	9 (5.5)	12.170	0.007
Married	56 (91.8)	5 (8.2)		
Divorced	1 (50.0)	1 (50.0)		
Prefer not to say	1 (50.0)	1 (50.0)		
Tribe				
Hausa	144 (94.1)	9 (5.9)	1.798	0.407
Fulani	42 (93.3)	3 (6.7)		
Others	28 (87.5)	4 (12.5)		
Religion				
Islam	184 (94.8)	10 (5.2)	18.858	<0.001
Christianity	29 (87.9)	4 (12.1)		
Others	1 (33.3)	2 (66.7)		
Level of Education				
JSS1-3	23 (95.8)	1 (4.2)	19.350	0.002
SSS1	11 (100.0)	0 (0.0)		
SSS2	18 (90.0)	2 (10.0)		
SSS3	20 (100.0)	0 (0.0)		
Tertiary	132 (94.3)	8 (5.7)		
Tsangaya (Islamic School)	10 (66.7)	5 (33.3)		

associated with attitude toward screening. All SS1 and SS3 respondents showed good attitude (100.0%), while Tsangaya school attendees recorded the highest proportion of poor attitude (33.3%). Age ($p = 0.987$), sex ($p = 0.800$), and tribe ($p = 0.407$) were not significant.

Relationship Between Knowledge Level of Sickle Cell Disease and Attitude Towards Genotype Testing

The table 6 presents the relationship between knowledge level and attitude toward genotype testing. Adolescents with adequate knowledge were significantly less likely to

Table 6: Relationship Between Knowledge Level of Sickle Cell Disease and Attitude Towards Genotype Testing.

Attitude Category				
Knowledge Category	Poor	Good	OR (Odds Ratio)	p (<0.05)
Inadequate (%)	135 (95.7)	6 (4.3)	2.85	0.043
Adequate (%)	79 (88.8)	10 (11.2)		
Total	214	16		

Decision on H₀₂: Significant associations were found between sociodemographic characteristics and attitude toward SCD screening for marital status ($p = 0.007$), religion ($p < 0.001$), and educational level ($p = 0.002$) therefore, H₀₂ is rejected.

demonstrate poor attitude toward SCD screening, with those having inadequate knowledge approximately three times more likely to hold a poor attitude (OR = 2.85, $p = 0.043$).

Perception of Adolescents Towards Sickle Cell Disease Screening

Perception was assessed across five Likert-scale

items covering personal carrier susceptibility, spiritual attribution of SCD, community stigma, cost of screening, and fear of marital consequences of a positive result. Findings are presented in Figures 2 to 6.

Perceived Personal Carrier Susceptibility

A combined 53.1% of respondents agreed or strongly agreed that they could personally be a sickle cell gene

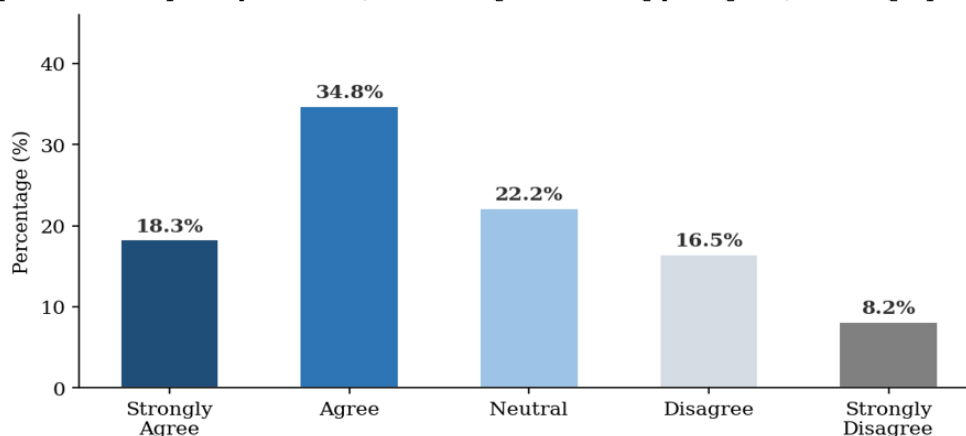


Figure 2: Bar Graph Showing Response to “I could be a carrier of the Sickle Cell Gene” (n=230)

carrier, indicating moderate perceived susceptibility. However, 24.7% disagreed or strongly disagreed, reflecting a perceived risk gap that may limit motivation to seek genotype testing.

Spiritual Attribution of Sickle Cell Disease

34.3% of respondents agreed or strongly agreed that SCD is a divine punishment, while 46.6% disagreed or strongly disagreed, and 19.1% remained neutral. This supernatural

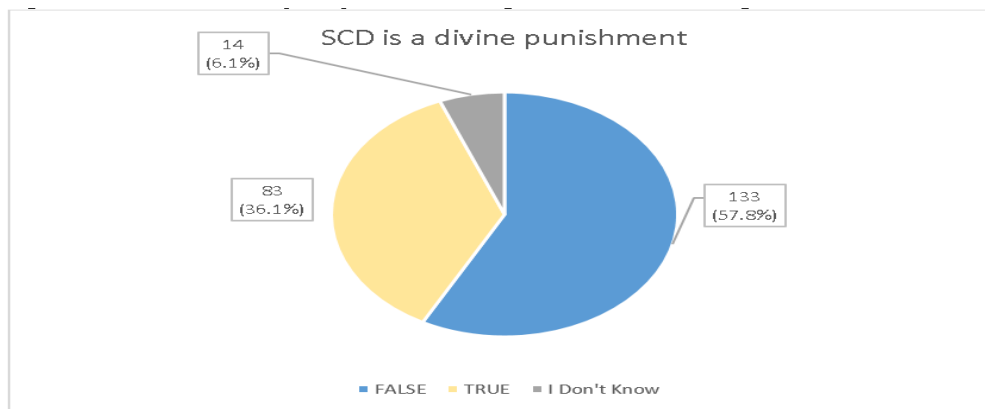


Figure 3: Pie Chart Showing Responses to “Sickle Cell Disease is a punishment from God” (n=230)

attribution among a substantial minority may reinforce stigma and reduce receptiveness to biomedical screening.

Perceived Community Stigma

A combined 61.3% of respondents agreed or strongly

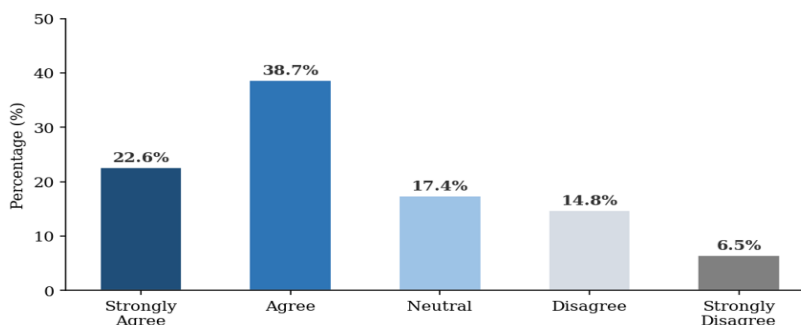


Figure 4: Bar Graph Showing Response to “There is a high level of Shame/Stigma to Having Sickle Cell Disease in my Community” (n=230)

agreed that SCD carries significant community stigma in Bauchi LGA. This perception of stigma is a major barrier to proactive disclosure of genotype status and engagement with voluntary testing services.

Perceived Cost of Screening

67.0% of respondents agreed or strongly agreed that the cost of genotype screening is prohibitively high in their community. This structural barrier underscores the

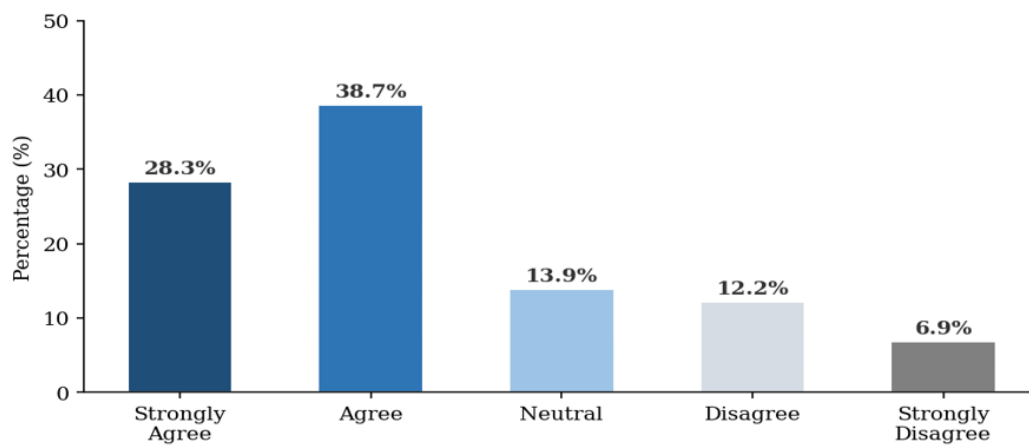


Figure 5: Bar Graph Showing Response to “The Cost of Screening for Sickle Cell Gene is too high in my Community in Bauchi” (n=230)

need for free or subsidised genotype testing services at accessible ward-level facilities.

Fear of Marital Consequences

73.9% of respondents agreed or strongly agreed that a

carrier result from SCD screening would prevent them from marrying the person love. This was the single most prevalent perceptual barrier identified in the study, reflecting the deep cultural and relational weight placed on genotype compatibility in this population.

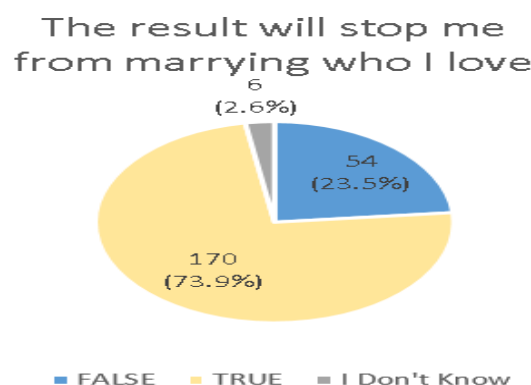


Figure 6: Respondents' Perception of the Impact of SCD Screening on Marriage Decisions

Decision on H₀₃

Inadequate knowledge was significantly associated with poor attitude toward SCD screening (OR = 2.85, $p = 0.043$), and the pattern of perception findings confirms a significant knowledge-perception linkage, therefore H₀₃ is rejected.

Discussion

Knowledge of Sickle Cell Disease and Screening Among Adolescents

The mean knowledge score in this study was 5.91 out of 10, with 61.3% of respondents demonstrating adequate knowledge and 38.7% scoring inadequately. While this finding suggests that the majority of adolescents in Bauchi LGA possess a foundational understanding of SCD, it also indicates that more than one in three adolescents

lack the depth of knowledge necessary to make informed decisions about genotype screening and reproductive choices. This pattern is broadly consistent with findings from comparable Northern Nigerian settings. Maigoro *et al.* (2024), in a study conducted in Misau LGA of Bauchi State, found that 26.4% of respondents had poor knowledge of SCD, with gaps most pronounced among those with limited formal education. Similarly, Balarabe *et al.* (2019) reported adequate knowledge among 62.5% of respondents in Sokoto State, a figure closely aligned with the present study, suggesting that knowledge levels across Northern Nigeria, while gradually improving, have not yet reached thresholds sufficient to sustain high screening uptake.

The significant association between educational level and knowledge ($X^2 = 30.669$, $p < 0.001$) is a critical finding.

Tertiary-educated respondents demonstrated the highest proportion of adequate knowledge (75.0%), while those in Tsangaya Islamic schools (40.0%) and JSS 1 to 3 (29.2%) had the most pronounced knowledge deficits. This is consistent with Agaba *et al.* (2025), who identified educational level as the primary determinant of SCD knowledge in Northern Uganda, and with Ezenwosu *et al.* (2020), who found that formal schooling strongly predicted accurate understanding of SCD inheritance patterns among adolescents in South-Eastern Nigeria. The consistently lower knowledge scores among Tsangaya school attendees are particularly notable given their significant presence in the Bauchi LGA population, and point to the need for SCD education that reaches beyond the formal school curriculum.

Age was also significantly associated with knowledge level ($X^2 = 21.85$, $p < 0.001$). Adolescents aged 17 to 19 years demonstrated the highest proportion of adequate knowledge (71.9%), with older adolescents (20 years and above) closely following at 68.8%, while the youngest group (10 to 13 years) showed the greatest deficits (75.0% inadequate). This pattern aligns with the developmental expectation that older adolescents have had more exposure to health education and information sources. Religion was also significantly associated, with Muslim respondents showing higher proportions of adequate knowledge than Christians (64.9% versus 42.4%; $p = 0.030$), a finding that may reflect the influence of mosque-based health messaging in predominantly Muslim communities, though this warrants further investigation.

Attitude of Adolescents Towards Sickle Cell Disease Genotype Screening

The overwhelming majority of respondents (93.0%) demonstrated a good overall attitude toward SCD screening, reflecting a broadly supportive environment for public health screening initiatives in Bauchi LGA. This is consistent with findings across multiple African settings. (Kyakuha *et al.*, 2024) reported positive attitudes toward premarital screening among adults in Northern Uganda, and Adamu and Biswal (2025) found good knowledge and positive attitudes toward premarital genotype testing among academic staff in Kaduna State. Among adolescent populations, comparable levels of attitudinal support have been reported in studies from Lagos (Uche *et al.*, 2017) and among undergraduates in the University of Abuja (Cegbeyi *et al.*, 2024).

However, the significant finding from Table 4.6 warrants particular attention: adolescents with inadequate knowledge were approximately three times more likely to have a poor attitude toward screening ($OR = 2.85$, $p = 0.043$). This knowledge-attitude relationship reinforces the position of Adesina *et al.* (2022), who cautioned that attitudinal improvements cannot be sustained in the absence of accurate foundational knowledge. In other words, the broadly positive attitudes observed in this study may be fragile if not grounded in comprehensive understanding of SCD inheritance, genotype implications,

and the specific benefit of early screening.

Educational level and religion were the most significant sociodemographic predictors of attitude. Notably, all respondents at SS1 and SS3 demonstrated good attitude, while Tsangaya school attendees recorded the highest proportion of poor attitude (33.3%; $X^2 = 19.350$, $p = 0.002$). The significant association between religion and attitude ($X^2 = 18.858$, $p < 0.001$), with Muslim respondents showing the highest proportion of good attitude (94.8%), may reflect the influence of religious teachings that frame premarital health screening as a responsible and morally endorsed practice, consistent with the position of several Islamic scholars on the permissibility of premarital testing. The finding that marital status was also significantly associated ($p = 0.007$), with divorced respondents showing markedly lower good attitude (50.0%), may reflect the complexity of lived experience in shaping health-related attitudes and merits deeper qualitative exploration.

Perception of Adolescents Towards Sickle Cell Disease Screening

The perception findings of this study reveal a tension between supportive attitudes on one hand and deeply embedded emotional and structural barriers on the other. The most striking finding is that 73.9% of respondents agreed or strongly agreed that a carrier result from SCD screening would prevent them from marrying the person they love. This fear of marital consequence as a barrier to proactive screening has been consistently identified across the literature. Erusiafe and Awunor (2023) identified anxiety about test results and the anticipation of rejection as primary drivers of screening avoidance among Nigerian youth. Adamu and Biswal (2025) similarly reported that fear of marital incompatibility was a dominant reason for delayed or falsified genotype testing among young adults in Kaduna. Hezekiah *et al.* (2025) further noted that even in states where premarital screening is legally mandated, result falsification remains a concern, pointing to the inadequacy of legislative enforcement alone without concurrent efforts to shift community norms.

Approximately 67% of respondents perceived the cost of genotype screening to be prohibitively high in their community, representing a structural barrier that compounds the emotional one. This is consistent with findings from comparable Northern Nigerian settings, where the out-of-pocket cost of laboratory testing places screening beyond the reach of many adolescents and their families, particularly those in rural wards with limited access to subsidised health services. The persistence of community stigma around SCD carrier status further discourages open discussion and voluntary testing, as adolescents fear that disclosure of their genotype status may lead to social exclusion or reduced marital prospects. Taken together, the perception findings suggest that the pathway from positive attitude to actual screening behaviour is significantly obstructed by fear, cost, and stigma. Baba (2023) observed a similar disconnect

in Tamale Metropolis, Ghana, where students who expressed favourable views toward SCD screening still did not pursue testing, citing social and financial barriers. These findings underscore the need for interventions that address not only knowledge and attitudes but also the structural and normative conditions that shape whether positive attitudes are ever acted upon.

CONCLUSION

This study assessed the knowledge, attitude, and perception of sickle cell disease screening among adolescents in Bauchi Local Government Area, Bauchi State. Findings reveal that while the majority of respondents demonstrated adequate knowledge and overwhelmingly positive attitudes toward SCD screening, significant subgroups remain vulnerable, particularly Tsangaya school attendees, younger adolescents, and those with lower levels of formal education. Perceptions rooted in the fear of marital consequences and the perceived high cost of screening represent critical barriers that undermine the translation of positive attitudes into actual screening behaviour. Educational level, age, and religion were the key sociodemographic determinants of both knowledge and attitude. Improving SCD prevention outcomes in this setting will require a multi-level approach that addresses knowledge gaps, structural barriers to screening access, and the social norms that sustain stigma and fear around carrier status disclosure. Based on the findings of this study, the following recommendations are offered. The Bauchi State Ministry of Health should advocate for the integration of compulsory premarital genotype screening into secondary school enrolment requirements, enabling adolescents to know their genotype status before courtship begins rather than at the point of marriage planning. Health educators and school authorities should design age-appropriate, curriculum-based SCD education programmes for both formal secondary schools and Tsangaya Islamic schools, with content specifically addressing inheritance patterns, genotype implications, and the personal and community benefits of early screening.

Community and religious leaders, particularly Islamic scholars with significant influence in Bauchi LGA, should be engaged as champions for normalising premarital genotype screening, framing it as a responsible, faith-consistent health practice rather than a social threat. The cost barrier to screening must be addressed through the provision of free or highly subsidised genotype testing at ward-level health facilities and community outreach points, ensuring that cost does not determine who has access to potentially life-altering information. Public health campaigns targeting adolescents should directly address the fear of marital consequence by promoting narratives of informed decision-making, highlighting that early knowledge of genotype status enables more options, not fewer, and that carrier status is not a source of shame.

Acknowledgements

The successful completion of this study would not have been possible without the support and contributions of several individuals and institutions. The researchers express sincere gratitude to all healthcare personnel who participated in this study for their time and valuable insights. Appreciation is also extended to the management and staff of the selected Primary Healthcare Facilities in Bauchi State for granting access and providing necessary support during data collection. Special thanks go to academic supervisors, mentors, and colleagues for their guidance, encouragement, and constructive feedback throughout the research process. Finally, heartfelt appreciation is extended to family and friends for their unwavering support and understanding during the course of this study.

REFERENCES

- Adesina, O. A., Ogamba, C. F., & Osibogun, A. (2022). Premarital genotype screening for sickle cell disease: knowledge gaps, perception and determinants of uptake among final year undergraduates of a tertiary institution in South-west Nigeria. *Nigerian Medical Journal*, 63(1), 50–58. <https://doi.org/10.60787/nmj.v63i1.94>
- Adigwe, O. P. (2022). Knowledge and awareness of sickle cell disease: a cross sectional study amongst unmarried adults in Nigeria's capital city. *Journal of Community Genetics*, 13(6), 579-585. <https://doi.org/10.1007/s12687-022-00607-x>
- Agaba, P., Nankinga, O., Andabati Candia, D., Musiimenta, E., & Nagawa, T. (2025). Correction: determinants of knowledge, attitudes, and practice towards sickle cell disease in Alebtong district, Lango region, Northern Uganda. *BMC Public Health*, 25(1), 1851. <https://doi.org/10.1186/s12889-025-23116-1>
- Baba, P., Iddi, Y., & Adadow, Y. (2023). Knowledge and beliefs, towards sickle cell disease among senior high school students in Tamale Metropolis. *Asian Journal of Pregnancy and Childbirth*, 6(1), 120-130.
- Balarabe, A., Abdulaziz, M., Bello, M., Njidda, G., Ibrahim, K., & Stephen, D. (2019). Knowledge of sickle cell disease; attitude and practice regarding premarital genotype counselling and testing among the lecturers of Usmanu Danfodiyo University, Sokoto, Nigeria. *International Archives of Medicine and Medical Sciences*, 1, 10-19.
- Cegbeyi, E., Baamlong, N., & Abah, S. (2024). Knowledge, attitude, and practice of genotype screening among undergraduate medical students in the University of Abuja. *Journal of Biomedical Engineering and Medical Imaging*, 11(3).
- Dalhatu, A., Abdurrahman, S. K., Zainab, D., Sani-Dalhat, K., Ashiru, M., Ahmad, R. A., & Muttaqa, M. (2025). Awareness and attitude towards premarital sickle cell genotype screening among residents of Kwarbai

- Zaria City. *FUOYE Journal of Biomedical Research*, 2(1), 80–86.
- Elendu, C., Amaechi, D. C., Alakwe-Ojimba, C. E., Elendu, T. C., Elendu, R. C., Ayabazu, C. P., Aina, T. O., Aborisade, O., & Adenikinju, J. S. (2023). Understanding Sick cell disease: causes, symptoms, and treatment options. *Medicine*, 102(38), e35237. <https://doi.org/10.1097/MD.00000000000035237>
- Erusiafe, J., & Awunor, N. (2023). Knowledge, attitude and control practices of sickle cell disease in Nigeria (Pt 58-67). *Annals of Clinical Sciences*, 8(2). <https://acsjournal.lasucom.edu.ng/index.php/acs/article/view/153>
- Ezenwosu, O., Chukwu, B., Okike, C., & Emodi, I. (2020). Knowledge and awareness of individual sickle cell genotype among adolescents in Southeast Nigeria. *Nigerian Journal of Paediatrics*, 47(3), 201-207.
- Hezekiah, A., Oladele, D., Nwegbu, M., & Nnodu, O. (2025). Awareness and acceptance of newborn screening for sickle cell disease in Nigeria. *Frontiers in Public Health*, 13.
- Issa, A., Ibrahim, O. R., Ibraheem, R. M., Lawal, A. F., Abdulbaki, M., AbdulKadir, M. B., Alabi, B. S., & Ernest, K. S. (2025). Prevalence of sickle cell disease and sickle cell traits among children and adolescents in Nigeria: a systematic review and meta-analysis. *Systematic Reviews*, 15(1), 32. <https://doi.org/10.1186/s13643-025-03029-1>
- Kyakuha, S., Scovia, M. G., Mugenyi, N., & Twineamatsiko, A. (2024). *Factors associated with utilization of preconception Sickle cell screening among women receiving antenatal care at Hoima regional referral hospital, Uganda*. Public and Global Health. <https://doi.org/10.1101/2024.05.07.24306985>
- Maigoro, A., Ibrahim, A., Usman, U., & Abdullahi, I. (2024). Knowledge and utilisation of premarital screening for sickle cell disease among residents of a semi-urban community, Bauchi State, Nigeria. *International Journal of Community Medicine and Public Health*, 11(1), 57-67.
- Nwabuko, O. C., Onwuchekwa, U., & Iheji, O. (2022). An overview of sickle cell disease from the socio-demographic triangle - a Nigerian single-institution retrospective study. *Pan African Medical Journal*, 41. <https://doi.org/10.11604/pamj.2022.41.161.27117>
- Olatona, F., Olanrewaju, F., Adeniyi, O., & Akanbi, O. (2021). Knowledge, attitude, and control practices of sickle cell disease among secondary school students in Osun State, Nigeria. *Journal of Community Medicine and Primary Health Care*, 33(1), 401-412.
- Uche, E., Obi, I., Eze, N., & Onuoha, C. (2017). Assessment of knowledge, awareness, and attitude of undergraduates toward sickle cell disease in Lagos, Nigeria. *Nigerian Journal of Clinical Practice*, 20(8), 1003-1009.
- WHO. (2025). *Sickle Cell Disease*. <https://www.who.int/news-room/fact-sheets/detail/sickle-cell-disease>