Original Research ***https://doi.org/10.5281/zenodo.18990215***

Volume 7, Issue 2, pp 119-129, December 2025

ACHIEVERS JOURNAL OF SCIENTIFIC RESEARCH

Open Access Publications of Achievers University, Owo

Available Online at *www.achieversjournalofscience.org*

Knowledge, Attitude, and Perception Towards Sickle Cell Disease Among Residents of Oke-Ose Community, Ilorin, Kwara State

Eluyera Z. N.[1], Olubiyi B. F.[2], Victor O. A. [2,3], Olubiyi S. K.[1*], Lawal A. S.[4], and Olubiyi J. I.[5]

[1]Department of Nursing Sciences, University of Ilorin, Nigeria.
[2]School of Public Health, University of Rwanda, Kigali, Rwanda.
[3]Department of Public Health, Nexus International University, Kampala, Uganda.
[4]Faculty of Nursing, Al-Hikmah University, Ilorin, Kwara State, Nigeria.
[5]Faculty of Nursing, Thomas Adewumi University, Irese-Oko, Omu-Aran, Kwara State, Nigeria.

***Corresponding Author's Email Address:** simeonolubiyi@gmail.com

Submitted: June 21, 2025; **Revised:** Nov 15, 2025; **Accepted:** Dec 5, 2025; **Published:** Dec 31, 2025

Abstract

Sickle Cell Disease (SCD) remains one of the most prevalent genetic blood disorders among African populations, with carrier rates ranging from 10% to 40% in some regions. This study assessed the knowledge, attitude, and perception of residents of the Oke Ose community toward sickle cell disease. A descriptive cross-sectional, non-experimental design was employed, and data were collected using a structured questionnaire administered to 421 conveniently selected respondents. The data were analyzed using SPSS version 25 and presented in tables and figures. Most respondents (79.6%) correctly identified SCD as a blood disorder and recognized major symptoms; however, substantial misconceptions persist. Half believed SCD is infectious (50.4%), 48.1% considered it contagious, 44.4% thought affected individuals cannot have children, and over half believed SCD can be cured or cannot be prevented. Despite these misconceptions, attitudes toward individuals living with SCD were largely positive, with over 80% supporting equal treatment and expressing comfort interacting with affected persons. A significant relationship was found between knowledge and attitude ($p = 0.001$), while educational status showed no association with perception ($p = 0.349$). These findings highlight persistent knowledge gaps and cultural misconceptions despite generally positive attitudes. Strengthened community education, premarital genetic counseling, and targeted awareness programs are crucial to improving understanding and reducing stigma surrounding SCD in the community.

Keywords: Attitude, Community Awareness, Knowledge, Perception, Sickle Cell Disease

1.0 Introduction

Sickle Cell Disease (SCD) is a group of hereditary blood disorders characterized by the production of abnormal haemoglobin known as haemoglobin S (HbS), which causes red blood cells to assume a sickle or crescent shape under low oxygen tension (Brown *et al.,* 2022). The condition occurs when an individual inherits the sickle gene from both parents (homozygous HbSS), leading to sickle cell anemia, or from one parent combined with other abnormal haemoglobin variants such as HbSC, HbSD, or HbSβ-thalassemia (Arishi *et al.,* 2021). This mutation, which involves the substitution of glutamic acid by valine in the sixth position of the beta-globin chain, results in fragile and rigid red blood cells that can obstruct blood flow and cause painful vaso-occlusive crises (Maboulou *et al.,* 2022).

This sickling process progressively damages red blood cells, shortens their lifespan, and leads to chronic anemia. The most severe form of the condition, sickle cell anemia**,** is characterized by fatigue, recurrent infections, jaundice, and episodes of intense bone and joint pain (Ashorobi & Bhatt, 2020). Individuals who inherit only one copy of the sickle cell gene (carriers) typically remain asymptomatic but can transmit the gene to their offspring (Innocent *et al.,* 2022).

Globally, SCD represents a significant public health challenge. Between 2000 and 2021, global births of babies with the disease increased by 13.7%, reaching approximately 515,000 cases annually, primarily due to population growth in sub-Saharan Africa and the Caribbean. During the same period, the number of people living with SCD rose by over 40%, reaching nearly 7.74 million, with an estimated 376,000 deaths recorded in 2021, 81,100 of which occurred among children under five years of age (Thomson *et al.,* 2023). In Nigeria, the burden is particularly high, with a carrier prevalence of about 25% and an estimated 150,000 affected births annually (Adigwe, 2022).

Sickle cell disease remains one of the most common genetic blood disorders in Africa, with carrier rates ranging from 10% to 40% in some populations (Anie, 2024). Despite advances in treatment and care, individuals with SCD still face a life expectancy approximately three decades shorter than the general population (Alaajmi & Abdeldafie, 2022). Beyond the physical complications, the disease also presents psychosocial challenges, including stigma, discrimination, and limited social opportunities, particularly in regions where knowledge about the condition remains low.

A better understanding and awareness of SCD among the population can contribute significantly to its prevention. Knowledge empowers individuals to make informed reproductive and health decisions, including premarital counseling and genetic screening, which are critical in reducing new cases (Adigwe, 2022). However, in many African communities, misconceptions about SCD persist, often fueled by cultural beliefs and limited access to accurate health information (Anie, 2024).

This study seeks to assess the knowledge, attitude, and perception of residents in the Oke Ose community toward sickle cell disease. By identifying knowledge gaps and prevalent misconceptions, the research aims to support the design of community-based interventions and policies that promote awareness, strengthen prevention, encourage positive behavioural changes, and strengthen community support for individuals living with SCD, ultimately contributing to improved health outcomes for individuals and families affected by SCD.

2.0 Materials and Methods

2.1 Study Setting

The research was conducted in the Oke Ose community, a semi-urban community in Kwara State, Nigeria, with an estimated population of 159,000 people. It is situated along the old Jebba road in the Ilorin East Local Government Area (LGA) of Kwara State, Nigeria. The majority of the

community's inhabitants speak the indigenous Yoruba Ilorin Language. In addition to the indigenous population, Oke Ose is home to individuals from various ethnic groups, including Hausas and Fulani, as well as students from the Kwara State Polytechnic and the University of Ilorin. The primary occupations of the community's residents are farming, trading, and artisanal work.

2.2 Research Design

A descriptive cross-sectional design was employed to assess the knowledge, attitude, and perception of people living in the Oke Ose community towards sickle cell disease (SCD).

2.3 Study Population, Eligibility Criteria, Sample Size, and Sampling Method

2.3.1 Study Population

The study population comprised people above 16 years old, who have lived in the Oke Ose community for at least one year.

2.3.2 Inclusion Criteria

Participants were eligible if they:

i. Were living in the Oke Ose community for at least one year;
ii. Were aged (≥15 years); and
iii. Willing and consent to participate in the study.

2.3.3 Exclusion Criteria

Women were excluded if they:

i. Not based in the Oke Ose community
ii. declined consent or withdrew participation; or
iii. Less than 15 years old

2.3.4 Sample Size Determination

The sample formula used for this research to calculate the sample size is Fisher's formula. The total population size used is 159,000. The sample size used for this study was calculated using Fisher's formula.

Where:

n = minimum required sample size in population greater than 10,000
Z = test statistic (Z = 1.96), 95 % confidence level
d = acceptable difference; using 5 % (d = 0.05)
p = expected frequency value, using 0.5
q = 1 – p
N= Target population (159,000)

$$n = \frac{Z^2 pq}{d^2}$$

To account for potential non-response, a 10% allowance was added, resulting in a target sample size of 421.

2.3.5 Sampling Technique

The sample was selected using a non-probability convenience sampling technique. This technique was selected based on the population type and the accessibility.

2.3.6 Data collection and analysis

Data were collected using a researcher-developed structured questionnaire, which underwent face and content validation by experts in the Department of Nursing Science. This validation ensured the clarity, relevance, and adequacy of the questionnaire items. A test-retest reliability test was conducted among 42 individuals in the Agbede community of Ilorin East, a community similar to the study respondents' community. This test-retest reliability test was conducted to ensure that the instrument functions as intended and is understood by the individuals who are likely to respond to it.

The instrument's reliability was measured using Cronbach's Alpha, resulting in a coefficient of 0.84, indicating acceptable reliability. The data collected were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.

3.0 Results

Most respondents (36.3%) were aged 21–25 years, while only 6.9% were aged 41 years and above, indicating a predominantly young sample (see Table 1). The gender distribution was nearly equal, with males comprising 50.8% and females 49.2%. In terms of religion, the majority were Muslims (56.3%), followed by Christians (40.4%) and a small proportion practicing traditional religion (3.3%). Over half of the participants (54.9%) were single, while 42.0% were married, and only a few were divorced (1.9%) or widowed (1.2%). Ethnically, the Yoruba group was dominant (79.3%), with smaller representation from Igbo (10.0%), Hausa (4.5%), and other ethnic groups (6.2%). Regarding educational attainment, most participants had a tertiary education (41.6%), followed by secondary (27.3%), primary (17.6%), and no formal education (13.5%), reflecting a relatively well-educated population.

Table 2 presents respondents' knowledge about sickle cell disease. A substantial majority (80%) of the study population correctly identified sickle cell disease (SCD) as a blood disorder. However, misconceptions were reported, as 50.4% believed it was infectious. Most respondents (76.5%) recognized key symptoms, including severe pain and frequent infections (74.5%). A strong understanding of its hereditary nature was evident, with 73.2% knowing it was inherited from carrier parents, although 34.9% incorrectly thought it could be inherited through contaminated food. Management options were generally well understood, with high recognition of blood transfusions (69.4%) and medications (73.2%), but less awareness of surgery (49.4%). Most respondents (76.9%) correctly identified blood tests as the diagnostic method for SCD. Awareness of genetic compatibility in marriage was strong, with 74.9% endorsing AS + AA pairings.

Table 1. Socio-demographic Characteristics of Participants (N = 421)

Variables	Frequencies (n)	Percentages (%)
Age Groups		
16-20 years	60	14.3
21-25 years	153	36.3
26-30 years	88	20.9
31-35 years	59	14.0
36-40 years	32	7.6
41 and above	29	6.9
Gender		
Males	214	50.8
Females	207	49.2
Religion		
Christianity	170	40.4
Islam	237	56.3
Traditional	14	3.3
Marital Status		
Singles	231	54.9
Married	177	42.0
Divorced	8	1.9
Widowed	5	1.2
Ethnicity		
Yoruba	334	79.3
Igbo	42	10.0
Hausa	19	4.5
Other	26	6.2
Level of Education		
No formal education	57	13.5
Primary	74	17.6
Secondary	115	27.3
Tertiary	175	41.6

Table 2: Knowledge of Sickle Cell Disease
SA- Strongly agree, A- Agree, D- Disagree, SD- Strongly Disagree

Variables	**Yes (n, %)**	**No (n, %)**
Sickle cell disease is a blood disorder.	335 (80.0)	84 (20.0)
Sickle cell disease is an infectious disease.	212 (50.4)	209 (49.6)
Severe pain episodes are a symptom of sickle cell disease.	322 (76.5)	99 (23.5)
Frequent infection is a symptom of sickle cell disease.	312 (74.5)	107 (25.5)
Yellowing of skin is a symptom of sickle cell disease.	282 (67.1)	138 (32.9)
Swelling of hands and feet is a symptom of sickle cell disease.	266 (63.2)	155 (36.8)
Sickle cell disease is gotten through contaminated food.	147 (34.9)	274 (65.1)
Sickle cell disease is inherited from parents who are carriers.	308 (73.2)	113 (26.8)
Sickle cell disease is not hereditary.	185 (44.2)	234 (55.8)
Blood transfusion is a management for sickle cell disease.	292 (69.4)	129 (30.6)
Medications are used for the management of sickle cell disease.	306 (73.2)	112 (26.8)
Surgery is a treatment for sickle cell disease.	202 (49.4)	207 (50.6)
Pain management therapy is a management for sickle cell disease.	336 (81.0)	79 (19.0)
Sickle cell disease is diagnosed through a blood test.	322 (76.9)	97 (23.1)
Sickle cell disease is diagnosed through a urine test.	217 (51.9)	201 (48.1)
AS + AA is ideal for marriage.	310 (74.9)	104 (25.1)
SS + SS is ideal for marriage.	106 (25.3)	313 (74.7)
AS + AS is ideal for marriage.	142 (34.1)	275 (65.9)

Some totals may not sum to 421 due to missing responses.

Overall, respondents demonstrated overwhelmingly positive attitudes toward individuals living with sickle cell disease (see Table 3). Most participants reported feeling positive about people with sickle cell disease (68.0%), comfortable interacting with them (87.9%), and supportive of equal treatment in society (83.8%). A substantial proportion (65.9%) also recognized that individuals with sickle cell disease are often unfairly judged. Support for initiatives aimed at helping affected individuals was very high (90.7%), and most respondents (88.1%) indicated that learning more about the health risks associated with sickle cell disease could further influence their attitudes.

Table 3: Respondents' Attitudes Towards Individuals with Sickle Cell Disease

Variables	SA (n, %)	A (n, %)	D (n, %)	SD (n, %)
Positive about individuals living with sickle cell disease.	138 (32.8)	148 (35.2)	49 (11.6)	86 (20.4)
Comfortable interacting with someone who has sickle cell disease.	208 (49.4)	162 (38.5)	30 (7.1)	21 (5.0)
Individuals with sickle cell disease should be treated equally in society.	201 (47.7)	152 (36.1)	31 (7.4)	36 (8.6)
Individuals with sickle cell disease are often unfairly judged.	129 (30.7)	148 (35.2)	55 (13.1)	88 (21.0)
Likely to support initiatives aimed at helping individuals with sickle cell disease	219 (52.0)	163 (38.7)	15 (3.6)	24 (5.7)
Learning more about the health risks associated with sickle cell disease would change my attitudes towards individuals living with it.	221 (52.5)	150 (35.6)	15 (3.6)	35 (8.3)

SA- Strongly agree, A- Agree, D- Disagree, SD- Strongly Disagree
Some totals may not sum to 421 due to missing responses.

Table 4: Respondents' perception of sickle cell disease

Variables	SA (n, %)	A (n, %)	D (n, %)	SD (n, %)
Genetic mutation is the main cause of sickle cell disease.	186 (44.2)	144 (34.2)	42 (10.0)	49 (11.6)
Sickle cell disease is a serious health issue in the Oke-Ose community.	99 (23.5)	100 (23.8)	128 (30.4)	94 (22.3)
The current management therapies for sickle cell disease are effective.	127 (30.2)	209 (49.6)	26 (6.2)	59 (14.0)
Sickle cell disease can significantly impact a person's quality of life.	188 (44.7)	177 (42.0)	17 (4.0)	39 (9.3)
Individuals with sickle cell disease can lead a normal life.	150 (35.6)	137 (32.5)	54 (12.8)	80 (19.1)
Feel sympathy towards people with sickle cell diseases.	179 (42.7)	178 (42.5)	24 (5.7)	38 (9.1)

SA- Strongly agree, A- Agree, D- Disagree, SD- Strongly Disagree
Some totals may not sum to 421 due to missing responses.

Table 4 highlights respondents' key perceptions of sickle cell disease. A large proportion (78.4%) correctly identified genetic mutation as the primary cause of SCD. Perceptions of the disease's seriousness within the Oke-Ose community were, however, divided, with 47.3% recognizing it as a serious health issue, while 52.7% did not perceive it as such. Most respondents (79.8%) agreed that

current management therapies are effective, and a substantial majority (86.7%) acknowledged that SCD can significantly affect an individual's quality of life. Nevertheless, opinions were less uniform regarding the ability of affected individuals to lead a normal life, as 68.1% believed this to be possible, while only 31.8% expressed doubt. A strong sense of empathy was observed, with 85.2% of respondents indicating that they felt sympathy toward individuals living with SCD.

The findings presented in Table 5 highlight several misconceptions about sickle cell disease (SCD) among respondents. Nearly half (48.1%) believed that SCD is contagious, while 44.4% thought that individuals with the condition cannot have children. More than half (58.7%) agreed that SCD can be cured, reflecting limited awareness of its chronic nature. Misunderstandings regarding inheritance were also evident, as 61.4% believed that if two carriers of the sickle cell trait marry, only one of their children could inherit the disease. Furthermore, 61.8% of respondents believed that SCD cannot be prevented.

Table 5: Respondents' misconceptions about sickle cell disease

SA- Strongly agree, A- Agree, D- Disagree, SD- Strongly Disagree

Variables	**SA (n,%)**	**A (n, %)**	**D (n,%)**	**SD (n,%)**
Sickle cell disease is contagious.	102 (24.4)	99 (23.7)	96 (23.0)	121 (28.9)
Individuals with sickle cell disease can't have children.	102 (24.2)	85 (20.2)	88 (20.9)	146 (34.7)
Sickle cell disease can be cured.	115 (27.4)	131 (31.3)	61 (14.6)	112 (26.7)
Sickle cell disease affects certain ethnic groups.	82 (19.6)	71 (17.0)	99 (23.7)	166 (39.7)
If two carriers of the sickle cell trait marry, only one of the children can have the disease.	115 (27.4)	143 (34.0)	55 (13.1)	107 (25.5)
Sickle cell disease cannot be prevented.	125 (29.7)	135 (32.1)	67 (15.9)	94 (22.3)

Some totals may not sum to 421 due to missing responses.

3.1 Association between Knowledge, Education, and Perception

The study found a significant association between community members' knowledge of sickle cell disease and their attitudes toward individuals living with the condition. Specifically, individuals with higher knowledge were more likely to have positive attitudes, as indicated by a chi-square value of 21.743 ($p = 0.001$). In contrast, there was no statistically significant relationship between educational status and perception of sickle cell disease (chi-square = 3.290, $p = 0.349$), suggesting that educational attainment did not significantly influence perceptions of the condition.

4.0 Discussion

This study highlights that the Oke Ose community has a basic understanding of sickle cell disease (SCD), identifying it as a genetic blood condition characterized by excruciating crises and recurrent infections. These results align with those of Adeyemo *et al.* (2021) and Kambale-Kombi *et al.* (2020), indicating successful penetration of medical knowledge, perhaps due to earlier public health

initiatives. Nevertheless, medical awareness alone is insufficient to eradicate longstanding cultural misunderstandings that perpetuate stigma or to fully translate into comprehensive knowledge and, consequently, beliefs.

Additionally, most respondents believed individuals with SCD can live normal lives, which contrasts with Essien *et al.* (2023), who reported beliefs associating SCD with depression, anxiety, and stigmatization. Notably, nearly half the respondents endorsed misconceptions that SCD is contagious or that affected individuals are infertile. These erroneous beliefs likely reflect deep-seated cultural frameworks that interpret chronic illnesses through metaphors of contagion or supernatural causation, as documented by Adigwe (2022) and Obeagu *et al.* (2024). In many societies, diseases that cause repeated suffering, evoke fear, or lead to social isolation often attract attributions to mystical forces or contagion, despite scientific evidence to the contrary. The infertility belief may have roots in anecdotal observations of some individuals with SCD experiencing reproductive complications, which are misgeneralized, obscuring the variability of fertility outcomes depending on disease severity (Adigwe, 2022). This highlights the persistent influence of cultural narratives and mysticism in shaping disease perceptions irrespective of biomedical knowledge.

Most respondents reported being comfortable interacting with individuals with SCD and endorsed equal treatment in society, contrary to findings by Namugerwa *et al.* (2023), who observed generally poor attitudes toward affected individuals. Higher SCD knowledge correlates strongly with empathy, social acceptance, and willingness to interact with affected persons, affirming the instrumental role of targeted health education in stigma reduction (Smith, 2021; Halawani *et al.,* 2024). Contrarily, formal educational attainment did not predict positive perceptions, implying that school-based education may insufficiently address community-specific health beliefs and cultural taboos. Therefore, health education must transcend didactic knowledge transfer and incorporate culturally resonant communication methods that acknowledge and respectfully challenge prevailing myths.

Furthermore, most respondents recognized the genetic mutation underlying SCD. They also acknowledged clinical management approaches such as pain control, unlike the low figures reported by Das *et al.* (2023), and most respondents considered current management therapies effective (Kenney & Smith, 2022) for acute SCD pain. However, fewer appreciated the full seriousness, variability of the disease's impact, and preventability of the disease, similar to the observations in analogous populations from Ghana (Brown *et al.,* 2022). This partial understanding could undermine engagement with preventive behaviours, including genetic counselling and early diagnosis, undermining public health objectives of prevention and eradication of the disease.

To bridge these gaps, culturally tailored interventions employing community dialogues, storytelling, and peer-led education can be particularly effective. Such participatory approaches facilitate open discussion of misconceptions about contagion and infertility, promote accurate understanding of inheritance patterns, and empower individuals to make informed reproductive and health decisions (Kambale-Kombi *et al.,* 2020; Maboulou *et al.,* 2022). Integrating medical facts with culturally sensitive narratives fosters trust and mitigates fear-based stigma, thereby improving social inclusion. Overall, these findings underscore a complex interaction between medical knowledge, cultural beliefs, and social attitudes in shaping community responses to SCD. Successful public health strategies must therefore combine evidence-based education with culturally informed dialogue to transform misconceptions into acceptance, reduce stigma, and enhance support for individuals living with SCD. Such integrative approaches will be crucial for improving the quality of life and health outcomes in affected communities, as well as for preventing future cases of SCD.

5.0 Implications of the Study

This study has important implications for public health practice, policy development, and community engagement within Oke-Ose and similar semi-urban communities in Nigeria, targeting community forums, religious gatherings, schools, and youth organizations. The persistence of misconceptions about contagion, curability, infertility, and the prevention of sickle cell disease (SCD) underscores the urgent need for targeted community-based health education programs. Educational interventions should move beyond basic biomedical explanations and incorporate culturally sensitive communication strategies that directly address prevailing myths and belief systems. Strengthening premarital screening policies and improving access to genetic testing could enhance preventive strategies to reduce the incidence of SCD births.

6.0 Limitations of the Study

The use of convenience sampling limits the generalizability of the findings beyond the Oke-Ose community and may have introduced selection bias. The cross-sectional design prevents causal inference about the relationships among knowledge, attitude, and perception. Additionally, reliance on self-reported data may have introduced social desirability bias, particularly in responses regarding attitudes toward individuals living with sickle cell disease. Finally, the relatively young and educated composition of the sample may not fully represent the broader community population.

7.0 Conclusion

This study reveals that residents of the Oke-Ose community possess moderate knowledge of sickle cell disease, particularly regarding its genetic basis, symptoms, and management. However, substantial misconceptions persist, especially concerning contagion, curability, prevention, and reproductive outcomes. Notably, these misconceptions coexist with generally positive attitudes toward individuals living with SCD. The significant association between knowledge and attitude underscores the role of accurate information in fostering supportive social behaviors, while the lack of association between educational attainment and perception suggests that misconceptions transcend formal education levels.

Addressing these gaps requires sustained, culturally responsive community education, strengthened genetic counseling initiatives, and promotion of premarital screening. Such efforts are essential to reduce misinformation, support preventive practices, and enhance the social and health outcomes of individuals and families affected by sickle cell disease in the community.

References

1. Adeyemo, D. O., Temidayo, I. A., Moshood, A. A., & Seun, D. O. (2021). Knowledge, attitude, and control practices of sickle cell diseases among senior secondary students in Osun State, Nigeria. *Pan African Medical Journal, 38*, Article 1. https://www.ajol.info/index.php/pamj/article/view/239131
2. 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), 647–654. https://doi.org/10.1007/s12687-022-00607-x
3. Alaajmi, S., & Abdeldafie, S. (2022). Knowledge and attitudes of nurses toward sickle cell disease patients in Jazan. *Journal of Family Medicine and Primary Care, 11*(11), 6935–6941. https://doi.org/10.4103/jfmpc.jfmpc_1089_22
4. Anie, K. A. (2024). The intersection of sickle cell disease, stigma, and pain in Africa. *Hematology, 2024*(1), 240–245. https://doi.org/10.1182/hematology.2024000549
5. Arishi, W. A., Alhadrami, H. A., & Zourob, M. (2021). Techniques for the detection of sickle cell disease: A review. *Micromachines, 12*(5), Article 519. https://doi.org/10.3390/mi12050519

6. Ashorobi, D., & Bhatt, R. (2020). Sickle cell trait. In *StatPearls*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK537130/
7. Brown, J. N., Atulley, E., Tamag, T., Ababio, E. R., & Prah, J. K. (2022). Assessing the knowledge, attitude, and perception towards sickle cell disease among university students in Ghana. *European Journal of Health Sciences, 7*(1), 1–12.
8. Das, A., Dixit, S., Barik, M., Ghosal, J., Babu, B. V., Bal, M., & Ranjit, M. (2023). Knowledge and perception related to sickle cell disease among tribal community, India: A mixed-method study. *Journal of the National Medical Association, 115*(4), 441–453. https://doi.org/10.1016/j.jnma.2023.06.007
9. Essien, E. A., Winter-Eteng, B. F., Onukogu, C. U., Nkangha, D. D., & Daniel, F. M. (2023). Psychosocial challenges of persons with sickle cell anemia: A narrative review. *Medicine, 102*(47), e36147. https://doi.org/10.1097/MD.0000000000036147
10. Halawani, S. H., Khan, S. A., Al Zughaibi, T. A., & Khan, S. A. (2024). Attitude and behavior of parents of children with sickle cell disease toward the disease: An observational study in Saudi Arabia. *Cureus, 16*(3), e55552. https://doi.org/10.7759/cureus.55552
11. Innocent, D. C., Ezejindu, C. N., Vasavada, A., & Duruji, C. O. (2022). Awareness, knowledge, and attitude of undergraduates towards sickle cell disease in southeastern Nigeria. *International Journal of Research and Scientific Innovation, 9*(8), 1–8.
12. Kambale-Kombi, P., Djang'eing'a, R. M., Opara, J.-P. A., Tonen-Wolyec, S., Tshilumba, C. K., & Batina-Agasa, S. (2020). Students' knowledge on sickle cell disease in Kisangani, Democratic Republic of the Congo. *Hematology, 25*(1), 91–94. https://doi.org/10.1080/16078454.2020.1727174
13. Kenney, M. O., & Smith, W. R. (2022). Moving toward a multimodal analgesic regimen for acute sickle cell pain with non-opioid analgesic adjuncts: A narrative review. *Journal of Pain Research, 15*, 879–894. https://doi.org/10.2147/JPR.S343069
14. Maboulou, V., Ngoutane, A., Molu, J., Mansour, M., Kountchou, C., Djoulde, I., & Essome, M. C. N. (2022). Sickle cell trait, knowledge, attitudes, practices and perceptions regarding sickle cell disease among people living in Yaoundé. *International Research Journal of Medicine and Medical Sciences, 10*(3), 1–9. https://doi.org/10.30918/IRJMMS.103.22.019
15. Namugerwa, C. H., Gavamukulya, Y., & Barugahare, B. J. (2023). Knowledge and attitude towards sickle cell anemia among caregivers of pediatric sickle cell patients at a tertiary hospital in Eastern Uganda: A cross-sectional study. *BMC Research Notes, 16*, Article 132. https://doi.org/10.1186/s13104-023-06633-3
16. Obeagu, E. I., & Obeagu, G. U. (2024). Addressing myths and stigmas: Breaking barriers in adolescent sickle cell disease education. *Elite Journal of Health Science, 2*(2), 7–15.
17. Smith, Y. (2021, March 27). Sickle-cell disease pathophysiology. *News-Medical*. https://www.news-medical.net/health/Sickle-Cell-Disease-Pathophysiology.aspx
18. Thomson, A. M., McHugh, T. A., Oron, A. P., Teply, C., Lonberg, N., Vilchis-Tella, V., Wilner, L. B., Fuller, K., Hagins, H., Aboagye, R. G., Aboye, M. B., Abu-Gharbieh, E., Abu-Zaid, A., Addo, I. Y., Ahinkorah, B. O., Ahmad, A., Amu, H., Aravkin, A. Y., & Arulappan, J. (2023). Global, regional, and national prevalence and mortality burden of sickle cell disease, 2000–2021: A systematic analysis from the Global Burden of Disease Study 2021. *The Lancet Haematology, 10*(8), e585–e599. https://doi.org/10.1016/S2352-3026(23)00118-7