KTREND JOURNALS
International Journal of Medical and Health Sciences (IJMHS)

DOI: 10.5281/zenodo.20923622 **Volume:** 1 **Issue:** 1 **ISSN:** 3141-643X

Behavioural Determinants of Health Belief Model Constructs Among Individuals with Sickle Cell Disease in Edo State, Nigeria

Obataze Josephine Akpoyovwere

Department of Nursing Science, Faculty of Applied Health Sciences, Edo State University, Iyamho, Edo State, Nigeria

Corresponding Author: akpoyovwere.obataze@edouniversity.edu.ng

Abstract

Sickle cell disease (SCD) remains one of the most important inherited blood disorders and continues to constitute a major public health challenge in Nigeria, which bears the highest global burden of affected births. Despite improvements in diagnosis and clinical management, preventable complications continue to contribute substantially to morbidity, repeated healthcare utilisation and reduced quality of life because long-term outcomes are strongly shaped by patients' health beliefs, behavioural practices and healthcare-seeking decisions. This study investigated the behavioural determinants of Health Belief Model (HBM) constructs among individuals living with sickle cell disease attending selected healthcare facilities in Edo State, Nigeria. A hospital-based descriptive cross-sectional analytical study was conducted among 312 individuals receiving routine sickle cell care. A structured questionnaire assessed socio-demographic characteristics, disease knowledge, genotype awareness, premarital counselling knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy. Data were analysed using descriptive statistics and multivariable logistic regression to identify independent predictors of favourable health beliefs. The findings showed that adequate knowledge of sickle cell disease, awareness of personal haemoglobin genotype, knowledge of premarital genotype counselling, regular clinic attendance and stronger perceptions of the benefits of preventive healthcare were independently associated with favourable HBM constructs, whereas perceived barriers significantly reduced the likelihood of positive health beliefs. The study demonstrates that behavioural determinants are fundamental drivers of

preventive healthcare utilisation among individuals living with sickle cell disease in Edo State. Integrating behavioural counselling into routine clinical management, strengthening genotype awareness programmes, expanding patient-centred health education and reducing structural barriers to care may substantially improve treatment adherence, disease self-management and health outcomes among people living with sickle cell disease in Nigeria.
Keywords: Sickle cell disease; Health Belief Model; behavioural determinants; preventive healthcare; self-management; genotype awareness; Edo State; Nigeria.

1 Introduction

Sickle cell disease is a group of inherited haemoglobin disorders characterized by the production of abnormal haemoglobin S, chronic haemolysis, recurrent vaso-occlusion and progressive multi-organ injury. The disease affects several body systems and is associated with recurrent painful crises, anaemia, infections, acute chest syndrome, stroke, renal impairment, psychosocial distress and premature mortality [9, 10, 11]. Although survival has improved in many settings through vaccination, antibiotics, hydroxyurea therapy, blood transfusion, newborn screening and comprehensive specialist care, SCD remains a major public health burden in low- and middle-income countries, particularly in sub-Saharan Africa [12, 32, 14].

Nigeria bears a substantial proportion of the global SCD burden. The persistence of the disease in the country is driven by high carrier frequency, limited newborn screening coverage, delayed diagnosis, incomplete access to specialist services, inadequate public awareness and social barriers surrounding genotype testing and reproductive counselling [6, 14]. For individuals already living with SCD, disease management requires lifelong engagement with healthcare services. Regular clinic attendance, medication adherence, adequate hydration, avoidance of crisis triggers, prompt recognition of complications, psychosocial support and timely healthcare seeking are necessary for preventing avoidable morbidity and improving quality of life [8, 15, 18].

In Edo State, Nigeria, SCD remains an important inherited and chronic health condition requiring continuous clinical attention. Specialist and general healthcare facilities in the state manage patients who present with painful crises, anaemia, infections and other complications. However, the effectiveness of care depends not only on the availability of clinical services but also on the willingness and ability of patients to adopt recommended preventive behaviours. Many avoidable complications are influenced by behavioural, psychosocial and structural factors, including knowledge gaps, misconceptions, stigma, cost of care, transportation difficulties, fear of relationship disruption after genotype disclosure and inconsistent clinic attendance.

The management of SCD therefore extends beyond pharmacological treatment. Patients' beliefs, perceptions and confidence in self-management strongly influence whether recommended behaviours are adopted. Individuals who understand their risk, recognize the seriousness of SCD, perceive the benefits of preventive care and believe they can take effective action are more likely to maintain positive health behaviours. Conversely, perceived barriers may reduce

healthcare utilisation even among individuals who possess basic disease knowledge [16, 17]. Understanding these behavioural determinants is essential for designing patient-centred interventions that can improve adherence, reduce preventable complications and strengthen long-term disease management.

The Health Belief Model provides a useful theory-based framework for examining these behavioural determinants. The model proposes that health behaviour is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy [1, 2, 3, 27]. Applied to SCD, the HBM helps explain why knowledge alone may not translate into clinic attendance, genotype screening, counselling uptake, treatment adherence or early healthcare seeking. It also provides a practical framework for nursing assessment, health education and behavioural counselling.

Previous studies have examined awareness, knowledge, premarital screening and healthcare utilisation in relation to SCD and other inherited conditions [22, 23, 24, 25]. However, fewer studies have focused on behavioural determinants of HBM constructs among individuals living with SCD within Edo State. This gap is important because behavioural determinants are modifiable and can be addressed through nursing education, community outreach, genetic counselling and health system strengthening.

This study therefore investigated the behavioural determinants of Health Belief Model constructs among individuals living with sickle cell disease attending selected healthcare facilities in Edo State, Nigeria. Specifically, it examined the influence of SCD knowledge, premarital counselling knowledge, genotype awareness, perceived benefits, perceived barriers, educational attainment, sex and clinic attendance on favourable HBM constructs. The findings are expected to support the development of nurse-led behavioural interventions that improve counselling uptake, self-management and health outcomes.

Significance of the Study

Sickle cell disease places considerable demands on affected individuals, families, healthcare providers and the Nigerian health system. Although advances in medical management have improved survival, behavioural factors influencing treatment adherence and preventive healthcare remain insufficiently addressed. This study provides empirical evidence on the behavioural determinants of HBM constructs among individuals living with SCD in Edo State. The findings may guide clinicians, nurses, public health practitioners and policymakers in designing evidence-based behavioural interventions that improve disease self-management, strengthen treatment adherence, reduce preventable complications and enhance quality of life.

Research Hypotheses

The following hypotheses were tested at the 5% level of significance:

$H_0 1$: There is no significant association between knowledge of sickle cell disease and

favourable Health Belief Model constructs among individuals living with sickle cell disease.

$H_0 2$: Awareness of haemoglobin genotype is not significantly associated with favourable Health Belief Model constructs.

$H_0 3$: Knowledge of premarital genotype counselling is not significantly associated with favourable Health Belief Model constructs.

$H_0 4$: Perceived benefits, perceived barriers and regular clinic attendance do not significantly predict favourable Health Belief Model constructs.

2 Conceptual Framework

The conceptual framework for this study is anchored on the Health Belief Model. It proposes that socio-demographic factors, disease knowledge, genotype awareness, premarital counselling knowledge and healthcare experiences influence perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy. These constructs shape preventive health behaviour and ultimately contribute to improved disease management among individuals living with SCD.

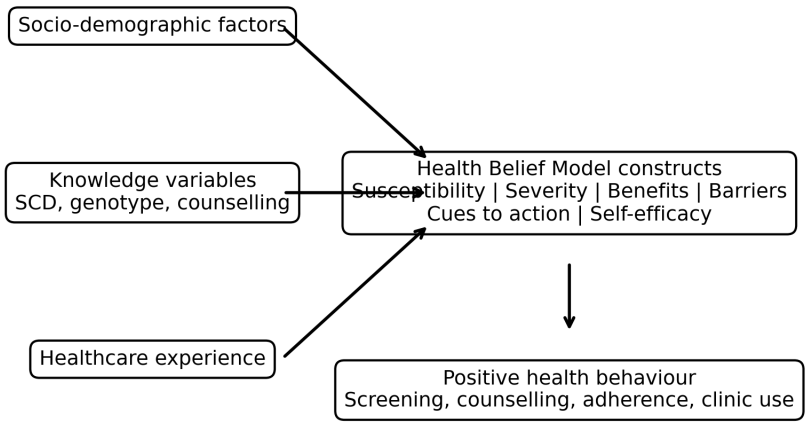

Figure 1: Conceptual framework linking socio-demographic factors, disease knowledge, healthcare experience, Health Belief Model constructs and positive health behaviour.

3 Materials and Methods

3.1 Study Design

This study employed a hospital-based descriptive cross-sectional analytical design to investigate behavioural determinants of HBM constructs among individuals living with SCD in Edo State, Nigeria. The design was appropriate because it permitted simultaneous assessment of socio-demographic characteristics, behavioural variables, health beliefs and associated predictors at a single point in time.

3.2 Study Setting

The study was conducted in selected healthcare facilities providing SCD management services in Edo State, Nigeria. Edo State is located in the South-South geopolitical zone of Nigeria and is served by tertiary, secondary and primary healthcare institutions. The selected facilities provide routine consultations, laboratory investigations, counselling, health education, hydroxyurea therapy, blood transfusion services, vaccination, nutritional counselling and follow-up care for individuals living with SCD. These facilities receive patients from both urban and rural communities and therefore offer an appropriate setting for investigating behavioural determinants of health beliefs.

3.3 Study Population

The study population comprised adolescents and adults diagnosed with SCD who attended routine outpatient sickle cell clinics during the study period. Eligible participants were individuals with confirmed SCD who were able to provide informed consent and respond to the study questionnaire. Participants who were critically ill during data collection, unable to provide consent or unable to complete the questionnaire were excluded.

3.4 Sample Size and Sampling Technique

The final analysis included 312 respondents. Participants were recruited from clinic attendance records using a systematic approach during routine follow-up visits until the required sample was achieved. Where an eligible participant declined participation or could not complete the questionnaire, the next eligible participant was approached.

3.5 Data Collection Instrument

Data were collected using a structured interviewer-administered questionnaire developed from relevant literature on SCD, behavioural science and the Health Belief Model. The instrument contained sections on socio-demographic characteristics, clinical and healthcare experiences, SCD knowledge, genotype awareness, premarital counselling knowledge and HBM constructs.

The HBM section assessed perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy using Likert-type items. Higher scores indicated more favourable beliefs for positive constructs, while higher perceived barrier scores indicated stronger obstacles to recommended behaviour.

3.6 Validity and Reliability

Content validity was established through review by experts in nursing science, public health, haematology, behavioural science and biostatistics. Their observations were used to improve clarity, relevance and coverage of the questionnaire. The instrument was pretested among individuals with SCD outside the selected study sites. Feedback from the pretest was used to refine wording and flow before final data collection.

3.7 Data Collection Procedure

Trained research assistants administered the questionnaire after explaining the study objectives to eligible participants. Participation was voluntary, and written informed consent was obtained before data collection. Questionnaires were checked for completeness and consistency before coding and entry into the study database.

3.8 Study Workflow

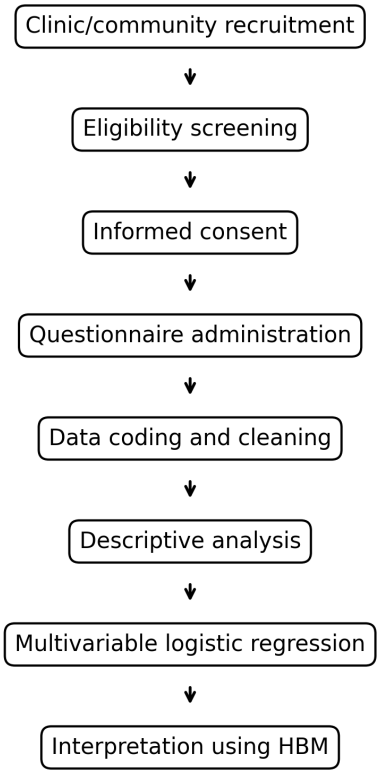

Figure 2: Study workflow from recruitment to Health Belief Model interpretation.

3.9 Statistical Analysis

Descriptive statistics were used to summarize participant characteristics, knowledge variables and HBM construct scores. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations. Multivariable logistic regression was used to identify predictors of favourable HBM constructs. Adjusted odds ratios, 95% confidence intervals, Wald statistics and p-values were reported. Statistical significance was set at $p<0.05$.

The logistic regression model was specified as:

$$\log\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k,$$

where P is the probability of favourable HBM constructs and $X_1, \ldots, X_k$ represent explanatory variables.

4 Results

4.1 Socio-Demographic Characteristics of Respondents

A total of 312 individuals living with SCD were included in the final analysis. The majority were young adults, with respondents aged 25–34 years constituting 42.3% of the sample and those aged 18–24 years constituting 40.4%. Respondents aged 35 years and above accounted for 17.3%. Females represented 57.7% of the study population, while males accounted for 42.3%. More than half of respondents had tertiary education, and most resided in urban communities.

Table 1: Socio-demographic characteristics of respondents

Characteristic	Frequency	Percentage
Age 18–24 years	126	40.4
Age 25–34 years	132	42.3
Age 35 years and above	54	17.3
Male	132	42.3
Female	180	57.7
Secondary education or below	139	44.6
Tertiary education	173	55.4
Urban residence	188	60.3
Rural/semi-urban residence	124	39.7

4.2 Knowledge and Behavioural Characteristics

Good SCD knowledge was observed among 58.0% of respondents, while 50.0% demonstrated good knowledge of premarital counselling. Approximately 65.7% knew their personal genotype. High perceived benefits were reported by 53.8% of respondents, while 37.8% reported high perceived barriers. Regular clinic attendance was reported by 55.8%, and 53.2% demonstrated favourable HBM constructs.

Table 2: Knowledge and behavioural characteristics of respondents

Variable	Frequency	Percentage
Good SCD knowledge	181	58.0
Good premarital counselling knowledge	156	50.0
Knows personal genotype	205	65.7
High perceived benefits	168	53.8
High perceived barriers	118	37.8
Regular clinic attendance	174	55.8
Favourable HBM constructs	166	53.2

4.3 Health Belief Model Construct Scores

Perceived benefits recorded the highest mean score, followed by perceived severity and self-efficacy. Cues to action and perceived susceptibility also recorded relatively high mean scores. Perceived barriers recorded the lowest mean score, suggesting that barriers were present but were less dominant than positive beliefs among respondents.

Table 3: Mean Health Belief Model construct scores

Construct	Mean	Standard deviation
Perceived susceptibility	3.74	0.66
Perceived severity	4.02	0.59
Perceived benefits	4.18	0.55
Perceived barriers	2.62	0.81
Cues to action	3.81	0.63
Self-efficacy	3.93	0.61

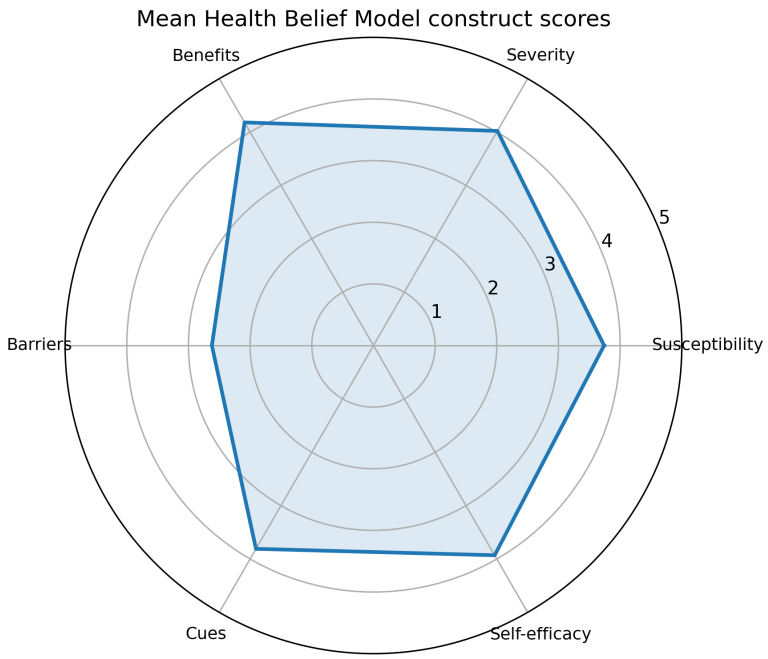

Figure 3: Radar chart showing mean scores across Health Belief Model constructs.

4.4 Behavioural Determinants of Favourable Health Belief Model Constructs

The multivariable logistic regression model identified good SCD knowledge, good premarital counselling knowledge, awareness of personal genotype, high perceived benefits, high perceived

barriers and regular clinic attendance as independent predictors of favourable HBM constructs. Tertiary education and female sex were not statistically significant after adjustment.

Respondents with good SCD knowledge were more likely to demonstrate favourable HBM constructs than those with poor knowledge (aOR=1.82; 95% CI: 1.04–3.19; p=0.036). Respondents with good premarital counselling knowledge were almost three times more likely to demonstrate favourable beliefs (aOR=2.96; 95% CI: 1.63–5.39; p<0.001). Awareness of personal genotype also significantly increased the likelihood of favourable HBM constructs (aOR=2.41; 95% CI: 1.34–4.34; p=0.003). High perceived benefits showed the strongest positive association (aOR=3.28; 95% CI: 1.78–6.05; p<0.001), whereas high perceived barriers reduced the likelihood of favourable HBM constructs (aOR=0.43; 95% CI: 0.24–0.78; p=0.005). Regular clinic attendance was also significant (aOR=1.69; 95% CI: 1.02–2.82; p=0.043).

Table 4: Multivariable logistic regression analysis of predictors of favourable HBM constructs

Predictor	β	SE	Wald χ^2	aOR	95% CI	p-value
Good SCD knowledge	0.599	0.285	4.42	1.82	1.04–3.19	0.036
Good premarital counselling knowledge	1.085	0.305	12.66	2.96	1.63–5.39	<0.001
Knows personal genotype	0.880	0.299	8.65	2.41	1.34–4.34	0.003
High perceived benefits	1.188	0.312	14.49	3.28	1.78–6.05	<0.001
High perceived barriers	-0.844	0.301	7.86	0.43	0.24–0.78	0.005
Tertiary education	0.451	0.285	2.51	1.57	0.90–2.74	0.112
Female sex	0.165	0.269	0.38	1.18	0.70–1.98	0.533
Regular clinic attendance	0.525	0.261	4.05	1.69	1.02–2.82	0.043

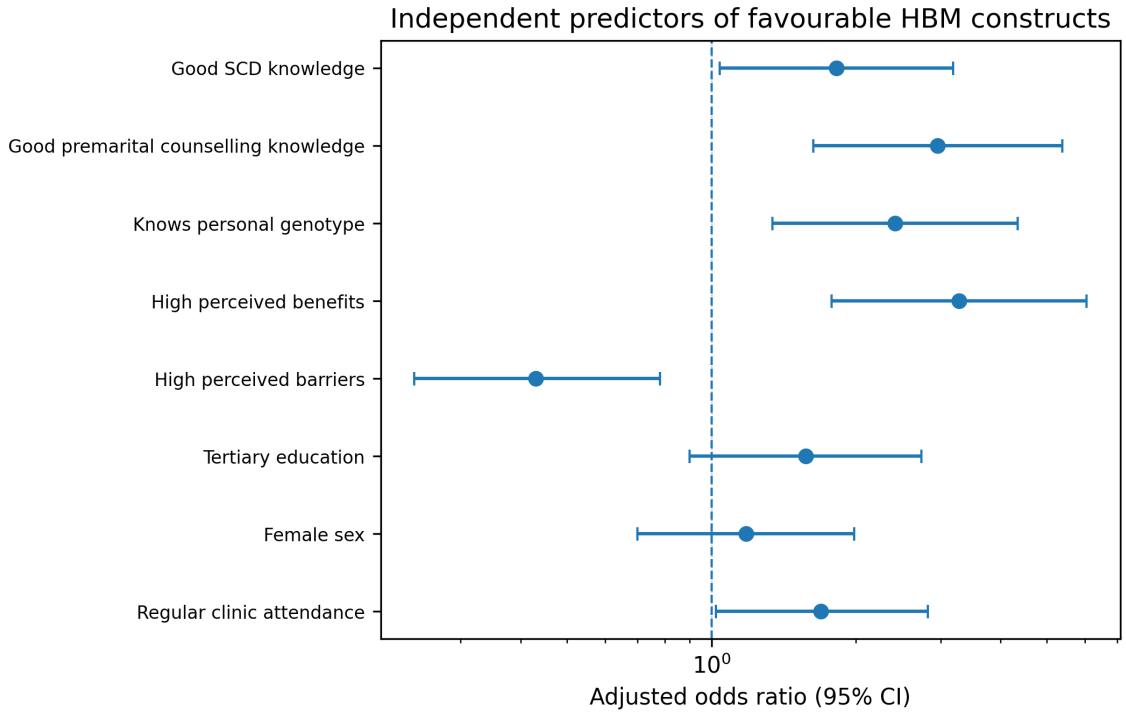

Figure 4: Forest plot showing adjusted odds ratios and 95% confidence intervals for predictors of favourable HBM constructs.

5 Discussion

This study investigated the behavioural determinants of HBM constructs among individuals living with SCD attending selected healthcare facilities in Edo State, Nigeria. The findings demonstrate that behavioural and cognitive factors play a central role in shaping health beliefs and healthcare-seeking behaviour. Specifically, SCD knowledge, genotype awareness, premarital counselling knowledge, perceived benefits, perceived barriers and regular clinic attendance independently predicted favourable HBM constructs. These findings reinforce the value of behavioural theory in understanding how individuals with chronic hereditary disorders make decisions about prevention, self-management and healthcare utilisation.

Adequate knowledge of SCD was significantly associated with favourable HBM constructs. Participants with better knowledge were more likely to understand disease susceptibility, recognise the seriousness of complications and appreciate the importance of preventive care. This finding supports the view that patient education is a critical component of chronic disease management. In SCD, knowledge enables individuals to recognize early warning signs, adhere to medication, maintain hydration, avoid triggers and seek care promptly during crises. However, knowledge alone may not be sufficient unless accompanied by supportive counselling and removal of barriers to care.

Knowledge of premarital genotype counselling was one of the strongest predictors of favourable health beliefs. Although premarital counselling is often discussed mainly as a

reproductive prevention strategy, this finding suggests that counselling also contributes to broader health awareness and self-management. Individuals who understand genotype compatibility, inheritance patterns and reproductive risk may be more likely to value preventive care and communicate effectively with partners, families and healthcare providers. This supports the need to strengthen genotype counselling in schools, religious organisations, youth programmes and clinical services.

Awareness of personal haemoglobin genotype was also independently associated with favourable HBM constructs. Genotype awareness may increase perceived susceptibility and motivate individuals to seek appropriate healthcare guidance. In the Nigerian context, genotype awareness remains central to SCD prevention and control because it informs reproductive decision-making, partner counselling and early enrolment into appropriate care. The finding emphasizes the need for accessible, confidential and affordable genotype testing services in Edo State and other parts of Nigeria.

Perceived benefit emerged as the strongest positive predictor of favourable HBM constructs. This is consistent with the Health Belief Model, which proposes that individuals are more likely to adopt health-promoting behaviour when they believe the recommended action will produce meaningful benefits [1, 3]. In SCD management, perceived benefits may include reduced painful crises, fewer hospital admissions, improved physical functioning, better quality of life and increased confidence in reproductive decision-making. Healthcare workers should therefore communicate the practical benefits of routine follow-up, medication adherence, vaccination, hydration, early treatment and genetic counselling in clear and culturally appropriate language.

Conversely, perceived barriers significantly reduced the likelihood of favourable HBM constructs. Barriers may include cost of care, transportation challenges, long waiting times, stigma, fear of relationship disruption following genotype disclosure, limited access to specialist clinics and inadequate social support. These barriers can prevent positive action even when patients understand the disease and recognize the benefits of care. This finding underscores the importance of addressing structural and psychosocial barriers alongside patient education. Reducing out-of-pocket expenditure, expanding health insurance, decentralising SCD services and providing confidential counselling may improve healthcare utilisation.

Regular clinic attendance was independently associated with favourable HBM constructs. Routine follow-up provides repeated opportunities for health education, behavioural counselling, reinforcement of self-management practices, monitoring of complications and psychosocial support. Patients who maintain regular contact with healthcare providers are more likely to receive accurate information, build trust and develop confidence in managing their condition. Nurse-led SCD clinics, peer-support groups and multidisciplinary care teams can therefore strengthen positive health beliefs and improve adherence to preventive practices.

Educational attainment and sex were not statistically significant after adjustment for behavioural variables. This suggests that specific modifiable behavioural determinants may be more useful intervention targets than broad demographic characteristics. Regardless of educational level or sex, individuals who know their genotype, understand premarital counselling, perceive

benefits of care and experience fewer barriers are more likely to demonstrate favourable health beliefs. Interventions should therefore target all individuals living with SCD while tailoring messages to their knowledge gaps, beliefs and social circumstances.

Overall, the findings show that HBM constructs provide a practical framework for understanding SCD-related behaviour in Edo State. Integrating behavioural assessment into routine clinical and nursing practice may help identify patients who require additional education, counselling and support. The findings also support the inclusion of behavioural counselling in public health strategies aimed at reducing the burden of SCD in Nigeria.

6 Implications for Nursing Practice

Nurses are central to SCD education, counselling and long-term follow-up. The findings support routine assessment of HBM constructs during clinic visits. Nurse-led counselling should emphasize the benefits of screening and care, identify perceived barriers, build self-efficacy and provide confidential support for sensitive reproductive decisions. Health education sessions should cover disease inheritance, genotype awareness, medication adherence, hydration, nutrition, infection prevention, pain management and early warning signs that require urgent medical attention. Community-based nursing outreach can also improve genotype awareness and premarital counselling uptake.

7 Public Health and Policy Implications

The findings have important implications for SCD prevention and control in Edo State and Nigeria. Behavioural interventions should complement biomedical management by promoting sustained treatment adherence, strengthening disease self-management, improving healthcare utilisation and encouraging informed reproductive decision-making. Public health programmes should expand genotype awareness campaigns through schools, tertiary institutions, religious organisations, community groups and youth-focused platforms. Policymakers should also reduce financial and access barriers to screening, counselling and specialist care.

8 Strengths and Limitations

A major strength of this study is its theory-driven approach, which applies the Health Belief Model to identify modifiable behavioural predictors among individuals living with SCD. The use of multivariable logistic regression provides clinically interpretable estimates that can guide intervention design. The study also provides locally relevant evidence from Edo State, a setting where behavioural data on SCD remain limited.

Several limitations should be acknowledged. The cross-sectional design limits causal inference, meaning that associations observed in this study should not be interpreted as proof of

causality. Self-reported data may be affected by recall and social desirability bias. In addition, participants were recruited from healthcare facilities, which may exclude individuals with SCD who rarely access formal care. Future multicentre and longitudinal studies are needed to validate these findings and assess whether improvements in HBM constructs translate into sustained behavioural change and better clinical outcomes.

9 Conclusion

Behavioural determinants significantly influence HBM constructs among individuals living with SCD in Edo State, Nigeria. Good SCD knowledge, knowledge of premarital genotype counselling, awareness of personal genotype, high perceived benefits and regular clinic attendance increased the likelihood of favourable health beliefs, whereas perceived barriers reduced it. These findings demonstrate that improving behavioural determinants should be considered an essential component of comprehensive SCD management. Integrating behavioural counselling, genotype education, patient-centred health education and barrier-reduction strategies into routine care may strengthen disease self-management, improve adherence and reduce preventable complications.

10 Recommendations

Healthcare facilities should integrate HBM-based behavioural counselling into routine SCD clinics. Nurses and other healthcare providers should strengthen continuous patient education on disease inheritance, medication adherence, hydration, nutrition, infection prevention and recognition of early complications. The Edo State Ministry of Health should expand genotype awareness campaigns through schools, tertiary institutions, faith-based organisations and community outreach programmes. Premarital genotype counselling should be strengthened to improve informed reproductive decision-making while reinforcing broader disease prevention and self-management education. Government and healthcare institutions should improve financial access to comprehensive SCD care through expanded health insurance coverage, subsidised essential medications and decentralised specialist services. Future research should use longitudinal designs to examine causal relationships between behavioural determinants, treatment adherence, clinical outcomes and quality of life.

Ethical Approval

Ethical approval was obtained from the appropriate institutional ethics committee before commencement of the study. Administrative approval was also obtained from participating healthcare facilities.

Informed Consent

Written informed consent was obtained from all participants before data collection. Participation was voluntary, and confidentiality was maintained throughout the study.

Funding Statement

This research received no external funding.

Conflict of Interest

The author declares no conflict of interest.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and ethical requirements.

Author Contribution

Obataze Josephine Akpoyovwere conceived the study, designed the methodology, supervised data collection, conducted the analysis, interpreted the findings, drafted the manuscript and approved the final version for publication.

Acknowledgements

The author acknowledges the study participants, healthcare workers and research assistants who supported the conduct of this research.

References

[1] Rosenstock, I. M. (1974). Historical origins of the Health Belief Model. *Health Education Monographs*, 2(4), 328–335.

[2] Becker, M. H. (1974). *The Health Belief Model and Personal Health Behavior*. Thorofare, NJ: Charles B. Slack.

[3] Janz, N. K., & Becker, M. H. (1984). The Health Belief Model: A decade later. *Health Education Quarterly*, 11(1), 1–47.

[4] Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York: W.H. Freeman.

[5] Glanz, K., Rimer, B. K., & Viswanath, K. (2015). *Health Behavior: Theory, Research, and Practice*. 5th ed. San Francisco: Jossey-Bass.

[6] World Health Organization. (2023). *Sickle-cell disease and other haemoglobin disorders*. Geneva: WHO.

[7] Centers for Disease Control and Prevention. (2024). *Sickle Cell Disease*. Atlanta, GA: CDC.

[8] National Heart, Lung, and Blood Institute. (2014). *Evidence-Based Management of Sickle Cell Disease*. Bethesda, MD: NHLBI.

[9] Rees, D. C., Williams, T. N., & Gladwin, M. T. (2010). Sickle-cell disease. *The Lancet*, 376, 2018–2031.

[10] Ware, R. E., de Montalembert, M., Tshilolo, L., & Abboud, M. R. (2017). Sickle cell disease. *The Lancet*, 390, 311–323.

[11] Piel, F. B., Steinberg, M. H., & Rees, D. C. (2017). Sickle cell disease. *New England Journal of Medicine*, 376, 1561–1573.

[12] Piel, F. B., Hay, S. I., Gupta, S., Weatherall, D. J., & Williams, T. N. (2013). Global burden of sickle cell anaemia. *The Lancet*, 381, 142–151.

[13] Sundd, P., Gladwin, M. T., & Novelli, E. M. (2019). Pathophysiology of sickle cell disease. *Annual Review of Pathology*, 14, 263–292.

[14] Nnodu, O. E., Oron, A. P., Sopekan, A., Akaba, G. O., Piel, F. B., & Chao, D. L. (2021). Child mortality from sickle cell disease in Nigeria. *The Lancet Haematology*, 8(10), e723–e731.

[15] Yawn, B. P., et al. (2014). Management of sickle cell disease: Summary of the 2014 evidence-based report. *JAMA*, 312(10), 1033–1048.

[16] Haywood, C. Jr., et al. (2014). Barriers to healthcare among adults with sickle cell disease. *American Journal of Hematology*, 89(3), 282–286.

[17] Tanabe, P., et al. (2019). Emergency care for adults with sickle cell disease. *Academic Emergency Medicine*, 26(1), 1–12.

[18] Treadwell, M. J., et al. (2016). Self-management in sickle cell disease. *Patient Education and Counseling*, 99(7), 1137–1144.

[19] Al-Shafai, M., et al. (2022). Knowledge, perception and attitude toward premarital screening. *International Journal of Environmental Research and Public Health*, 19(7), 4418.

[20] Al-Shroby, W. A., et al. (2021). Awareness of premarital screening and genetic counselling. *Journal of Multidisciplinary Healthcare*, 14, 389–399.

[21] Alkalbani, A., et al. (2022). Factors affecting willingness to undertake premarital screening tests. *SAGE Open Nursing*, 8, 23779608221078156.

[22] Oluwole, E. O., et al. (2022). Knowledge, attitude and premarital screening practices for sickle cell disease among young adults in Lagos. *Pan African Medical Journal*, 42, 8.

[23] Ezenwosu, O. U., et al. (2021). Awareness and knowledge of sickle cell disease in Nigeria. *BMC Public Health*, 21, 1234.

[24] Adeboye, M. A., et al. (2020). Health education and genetic counselling for sickle cell disease prevention. *African Journal of Reproductive Health*, 24(4), 89–98.

[25] Olatunya, O. S., et al. (2021). Predictors of healthcare utilisation among individuals with sickle cell disease. *African Health Sciences*, 21(2), 650–659.

[26] Alidu, L., & Grunfeld, E. A. (2025). Application of the Health Belief Model to pre-conception care among women with sickle cell disease. *BMC Pregnancy and Childbirth*, 25, 101.

[27] Champion, V. L., & Skinner, C. S. (2015). The Health Belief Model. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health Behavior: Theory, Research, and Practice*. Jossey-Bass.

[28] Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in health research. *Health Education & Behavior*, 42(1), 81–90.

[29] DeBaun, M. R., & Kirkham, F. J. (2016). Central nervous system complications and management of sickle cell disease. *Blood*, 127(7), 829–838.

[30] Serjeant, G. R. (2013). The natural history of sickle cell disease. *Cold Spring Harbor Perspectives in Medicine*, 3(10), a011783.

[31] Anie, K. A. (2005). Psychological complications in sickle cell disease. *British Journal of Haematology*, 129(6), 723–729.

[32] Ohene-Frempong, K., et al. (2016). Sickle cell disease in Africa: A public health priority. *American Journal of Preventive Medicine*, 51(1S1), S12–S16.