Patient Preference and Adherence

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ORIGINAL RESEARCH

Beyond the Prescription: Hydroxycarbamide Utilization and Adherence Among Persons Living with Sickle Cell Disease in Rural Ghana

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Purpose: To assess the utilization and adherence to hydroxycarbamide therapy among sickle cell disease (SCD) patients in a rural Ghanaian setting, and predictors of adherence.

Patients and Methods: We conducted a cross-sectional study among 100 SCD patients receiving care at a rural health facility in Ghana. Data were collected using a structured questionnaire administered to adult patients and caregivers of paediatric patients. Descriptive statistics and multivariable logistic regression were used to assess hydroxyurea utilisation, adherence, and associated factors.

Results: The study population was predominantly paediatric, with caregivers completing questionnaires for most participants. More than half of the respondents (56%) had use hydroxyurea for over 2 years. While 80% reported always taking the drug, the majority admitted to missing at least one dose in the preceding month. The most reported barriers were forgetfulness (50%) and financial constraints (44.6%). Although gender and educational level were associated with adherence in unadjusted analyses, these factors were not independent predictors in the multivariable logistic regression model.

Conclusion: Hydroxyurea utilization in this rural setting is encouraging and reflects the positive impact of national policies such as the "Ahodwo Program". However, adherence challenges persist. This is primarily driven by behavioral and financial barriers than demographic factors. Optimising hydroxyurea use will require targeted interventions, including patient and caregiver education and financial risk protection mechanisms that build on the existing national programs. From a policy perspective, these findings support strengthening caregiver-centred adherence interventions. Future studies should prioritise age-stratified, longitudinal designs to better characterise adherence patterns in adults and children.

Keywords: sickle cell disease, hydroxyurea, Agogo, Ghana

Introduction

Sickle-cell disease (SCD) is a genetic blood disorder characterised by chronic hemolytic anaemia, vaso-occlusion, and recurrent painful episodes, including sickling crises and other complications such as sickle cell organ syndrome, which can lead to a poor quality of life and early mortality.[1] Internationally, SCD further exerts a substantial burden that is not amply addressed.[2] Approximately twenty-five million people are affected worldwide, with most of them in sub–Saharan Africa (SSA).[1] Also, 312,000 children are born with SCD annually globally.[3] Disproportionately concentrated in Sub-Saharan Africa, the highest burden accounts for 75% of the global sickle cell disease burden.[2,4] It is estimated that >90% of babies with sickle cell disease die by early adulthood, mainly in sub-Saharan Africa.[5] It affects 1–3% of the population in many African countries and accounts for 7–16% of under-five deaths.[5–7] Along with all other countries around the world, Nigeria, Ghana, and Tanzania are among the top ten in the number of children born with SCD, with more than 11,000 babies born annually in each country.[8]

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Worldwide, hydroxyurea (HU) has been recognised as a significant advancement in SCD therapy, being one of the few currently approved medications capable of modifying the disease course.[1,9] In 2014, the National Institute of Health (NIH) and in 2018, the British Society of Haematology recommended that all affected individuals receive HU therapy, and all sickle cell children should be started on the drug from age nine months upwards, irrespective of their clinical severity, to reduce SCD-related morbidity and mortality in end-stage organ failure.[10,11]

While treatment is present to enhance the outcome of this disease, different socioeconomic circumstances can affect utilization and adherence to the medication, resulting in a higher disease burden within different geographical areas.[12,13] The available data on the use of hydroxyurea by the sickle cell health-care providers in Nigeria indicate underutilization.[1] Other nationally representative administrative databases have demonstrated increased under-utilisation, resulting in more hospital admissions and Emergency Room (ER) visits, in both pediatric and adult patients with SCD.[14,15] A cross-sectional study conducted in the Eastern province of Saudi Arabia, where the prevalence of SCD is higher than in other regions, also cited under-utilisation.[16]

The Sickle Cell Foundation of Ghana, in partnership with the Ghana Ministry of Health (MOH), Ghana Health Services and Novartis, launched a public-private partnership in 2019 to address major SCD management gaps.[17] The initiative was holistic and included access to hydroxyurea (HU) scale-up, newborn screen implementation services, as well as broader health system strengthening activities.[18] Biomedical data were derived from health records, combined with reported modifications in clinical outcomes and quality of life (QoL) ascertained via patient and/or caregiver interviews in the only published evaluation of this programme to date.[17] These results have significantly enhanced our understanding of the clinical and patient-reported impact of this benefit.

Although Ghana has expanded access to HU, most evidence comes from urban or tertiary settings. Rural populations face unique barriers such as limited drug supply, inadequate laboratory monitoring, costs, and sociocultural beliefs that may hinder utilization and adherence. These factors may contribute to a rural–urban gap in utilization and adherence that remains unexamined. This study aimed to assess hydroxyurea utilisation and adherence, and to identify factors associated with adherence, among patients with sickle cell disease in a rural Ghanaian setting.

Methods

Study Area

The study was carried out at the Presbyterian Hospital in Agogo, Ashanti Akim North, Ghana. The hospital is a 350-bed referral facility offering diverse services, including specialized clinics. The hospital's sickle cell clinic, operating weekly, manages about 130 patients, with roughly 110 on hydroxyurea therapy.

Study Design

This study was a hospital-based descriptive cross-sectional design, conducted to assess the utilization and adherence of HU among patients with sickle cell disease. Patients were recruited using a convenience sampling technique. The data were collected using a structured questionnaire administered as an online survey via Google Forms (sent and followed up via WhatsApp) or in hard copy for patients without internet access. Participation was voluntary, and anonymity was maintained. The cross-sectional design was selected to provide a snapshot of HU utilization and adherence, enabling the evaluation of associations between demographic, socioeconomic, and HU utilization.

Study Population

The study population comprised patients with sickle cell disease receiving hydroxyurea therapy at the Presbyterian Hospital, Agogo. Eligible participants were adults aged 18 years and above who could independently provide informed consent and complete the questionnaire. Also, patients below 18 years whose parents or caregivers provided consent were allowed to complete the questionnaire on their behalf. For paediatric participants, information on education level and monthly household income was provided by caregivers and reflects caregiver or household socioeconomic characteristics.

Exclusion criteria included individuals with sickle cell disease who are not on hydroxyurea, caregivers who refused to participate, and subjects with cognitive or other severe medical impairment that precluded them from providing valid responses. Questionnaires were completed by caregivers for paediatric participants. Adherence reflects caregiver-supervised medication use. Due to the small number of adult participants, analyses were conducted on the combined sample, with age group included as a covariate.

Data Collection Tool

The study questionnaire was developed based on a previously validated tool used in a similar study and adapted to the Ghanaian context.[19] The original questionnaire demonstrated acceptable internal consistency reliability in the previous study, with a reported Cronbach's alpha of $\alpha \geq 0.70$. The questionnaire used included sections on demographic information, hydroxyurea utilization patterns, adherence, perceived barriers, and clinical outcomes. The questionnaire was pretested in 10 participants to ensure consistency in responses. These participants were excluded from the final study. In the present study, the questionnaire demonstrated acceptable internal consistency, with a Cronbach's alpha of $\alpha \geq 0.71$. Data collection was conducted from 4th September to 4th December 2024.

Ethical Concerns

Ethical clearance (REF.CHRPE/AP/953/24) was sought from the Kwame Nkrumah University of Science and Technology (KNUST) Committee on Human Research Publication and Ethics (CHRPE) and from the research committee of the Presbyterian hospital, Agogo (APH/ADM/RES-135/24) which was the only site for the data collection. Prior to data collection, the study purpose was explained to participants using a Patient Information Leaflet. Informed consent was obtained from each participant before they were granted access to the questionnaire. Participation in the study was entirely voluntary, and respondents were assured of anonymity and confidentiality. They were informed that they could withdraw from the study at any stage without providing any reason and without any consequences to their clinical care.

Data Analysis

Data were entered into Google Forms and exported to SPSS (Statistical Package for the Social Sciences, Version 27) for analysis. Caregivers completed the questionnaires for paediatric participants. Measures of hydroxyurea utilisation, adherence, and missed doses reflect caregiver-supervised medication use. Due to the small number of adult participants, analyses were conducted on the combined sample, with age group included as a covariate. The results were presented as percentages and frequencies. Descriptive statistics were used to present the demographic characteristics, hydroxyurea utilization, and adherence patterns, and results were presented as frequencies and percentages. Chi-square tests and independent *t*-tests were used to examine associations between adherence and selected demographic variables, as appropriate.

Furthermore, a multivariable binary logistic regression model was used to determine the predictors of hydroxyurea adherence. Adherence (adherent vs. non-adherent) was treated as the dependent variable. The independent variables were age, gender, educational status, and years since diagnosis. The adjusted odds ratios (AORs) with 95% confidence intervals were estimated. A p-value < 0.05 was considered statistically significant.

Variables that showed associations in bivariate analyses were further evaluated using multivariable binary logistic regression. This identifies independent predictors of hydroxyurea adherence, with adjusted odds ratios and 95% confidence intervals reported.

Results

Respondents' Characteristics

From Table 1, a total of 100 respondents with sickle cell disease (SCD) who were receiving care at Presbyterian Hospital, Agogo, participated in the study. The age distribution revealed that 46% of participants were aged 11–20 years. At the same time, 42% were 2–10 years. Females constituted 51% of the sample (n=51), and 87% were students. The majority have primary-level education (66%) and come from households with monthly incomes below GH₵ 500 (49%).

Table 1 Demographic Characteristics of SCD Patients at Presbyterian Hospital, Agogo (n=100)

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	2–10	42	42.0
	11–20	46	46.0
	21–30	9	9.0
	31–40	1	1.0
	>40	2	2.0
Gender	Male	49	49.0
	Female	51	51.0
Educational Level	No formal education	1	1.0
	Primary education	66	66.0
	Secondary education	26	26.0
	Tertiary education	7	7.0
Employment Status	Employed	9	9.0
	Student	87	87.0
	Unemployed	4	4.0
Monthly Income (GH₵)	<500	49	49.0
	500–1000	32	32.0
	1001–2000	9	9.0
	>2000	10	10.0

Hydroxyurea Utilization Patterns

Among the patients, 56% reported using hydroxyurea for more than two years. Regarding adherence, 80% reported "always" taking the medication as prescribed, while 10% used it "often", 8% "sometimes, 2%" never. Despite these high reported adherence levels, 56% had missed not less than one dose in the previous month. Although 80% of respondents reported always taking hydroxyurea as prescribed, more than half reported missing at least one dose in the preceding month, indicating that adherence challenges in this setting are largely driven by behavioural and financial barriers rather than by a lack of prescription or utilisation. Details are presented in Table 2.

Table 2 Hydroxyurea Utilization Patterns Among SCD Patients (N = 100)

Variable	Category	Frequency (n)	Percentage (%)
Prescribed Hydroxyurea	Yes	98	98.0
	No	2	2.0
Duration of Hydroxyurea Use	<6 months	9	9.0
	6 months–1 year	15	15.0
	1–2 years	18	18.0
	>2 years	56	56.0

(*Continued*)

Table 2 (Continued).

Variable	Category	Frequency (n)	Percentage (%)
Self-Reported Frequency of Use	Always	80	80.0
	Often	10	10.0
	Sometimes	8	8.0
	Never	2	2.0
Missed Dose in the Past Month	Yes	56	56.0
	No	44	44.0

Missed Doses and Frequency

Among those who missed doses (n=56), 49.1% missed 1–2 doses, 21.1% missed 3–5 doses, and 29.8% missed more than 5 doses within the last month. The primary reasons cited were forgetfulness (50%) and cost (44.6%). Followed by difficulty obtaining the drug (2%) and fear of long-term side effects (1.8%). This indicates a significant adherence gap in a considerable proportion of the study population. Details are presented in Table 3.

Factors Associated with Hydroxyurea Adherence

Gender role and educational level significantly impacted adherence from the Chi-square analysis. Male patients were more likely to adhere than females (p=0.045). Similarly, participants with primary education had significantly higher adherence than those with secondary or tertiary education (p=0.021). No significant association was found between adherence and age group (p=0.444) or household income (p=0.571). However, these associations reflect unadjusted bivariate relationships and were not retained after adjustment in the multivariable regression analysis.Details are presented in Table 4.

Logistic Regression Analysis of Predictors of Hydroxyurea Adherence

To further explore predictors of hydroxyurea adherence, binary logistic regression analysis was conducted using age, gender, education level, and years since diagnosis as predictor variables. Although gender and education level were significantly associated with adherence in bivariate (chi-square) analyses, these associations were not retained in the multivariable logistic regression model after adjustment for age group and years since diagnosis. Predictors of adherence showed that none of the variables were statistically significant.

Table 3 Frequency and Reasons for Missed Hydroxyurea Doses in the Past Month

Category	Subcategory	Frequency (n)	Percentage (%)
Frequency of Missed Doses	1–2 times	28	49.1%
	3–5 times	12	21.1%
	More than 5 times	17	29.8%
Reasons for Missing Doses	Forgetfulness	28	50.0%
	Cost of medication	25	44.6%
	Difficulty obtaining the drug	2	2.0%
	Fear of long-term side effects	1	1.8%
	Reporting late for review	1	0.9%

Note: Multiple reasons could be selected; thus, percentages under “Reasons” may exceed 100%.

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Table 4 Adherence to Hydroxyurea by Demographic Characteristics

Variable	Adherent (%)	Non-Adherent (%)	p-value
Gender	Male: 77.6%	Female: 58.8%	0.045*
Education	Primary: 75.8%	Secondary/Tertiary: 52.9%	0.021*
Age group	2–20 yrs: 69.3%	>20 yrs: 58.3%	0.444
Income	<GHS 500: 65.3%	≥GHS 500: 70.6%	0.571

Note: (*Statistically significant at p < 0.05).

Table 5 Multivariable Binary Logistic Regression Analysis of Predictors of Hydroxyurea Adherence (N = 100)

Predictor Variable	B (Coefficient)	S.E.	Wald	df	p-value	Adjusted Odds Ratio (Exp(B))	95% CI for Exp(B)
Gender (Male vs. Female)	−0.068	0.459	0.022	1	0.882	0.934	0.380–2.298
Age (2–20 vs. >20 years)	−0.978	0.878	1.241	1	0.265	0.376	0.067–2.101
Education Level	−0.401	0.571	0.493	1	0.483	0.670	0.219–2.050
Years Since Diagnosis	0.172	0.546	0.100	1	0.752	1.188	0.408–3.463
Adherence (Outcome Variable)	0.376	0.505	0.555	1	0.456	1.457	0.542–3.918
Constant	1.593	0.823	3.751	1	0.053	4.918	—

Gender (B = −0.068, p = 0.882) and age category (B = −0.978, p = 0.265) were not associated with adherence. Level of education (B = −0.401, p = 0.483) and years since diagnosis (B = 0.172, p = 0.752) did not show any significant impact. Adjusted odds ratios (AOR) for all the variables fell within the range of 0.376 to 1.457 with wide confidence intervals crossing unity, indicating no significant relationships. The overall logistic regression model was not statistically significant ($p > 0.05$), suggesting that demographic and clinical factors considered in this study were not significant predictors of adherence. That would suggest hydroxyurea adherence in this rural Ghanaian setting is more likely to be influenced by unmeasured behavioural, psychosocial, or system-level factors such as patient beliefs, medication availability, reminder systems, or caregiver support. All the details are presented in Table 5.

Discussion

The demographic characteristics of the study population at the Presbyterian Hospital, Agogo, indicate that most of the patients were adolescents (11–20 years) and children aged 2–10 years. This indicates the considerable burden of SCD within pediatric and adolescent groups. Findings of this study are consistent with global trends, where most SCD cases are detected early in life due to the genetic basis of the condition.[19,20] Although evidence demonstrates that early diagnosis substantially reduces morbidity and mortality, neonatal sickle cell screening programs in Ghana are limited.[21] As a result, many patients are only diagnosed following their first severe clinical crisis, which delays the timely initiation of disease-modifying interventions such as hydroxycarbamide therapy.[22]

In this study, almost all patients were prescribed hydroxyurea, with more than half reporting continuous use for over two years, and the majority self-reporting that they "always" take the medication. Given that the study population was predominantly paediatric, and adherence for children is largely caregiver-supervised, these utilisation and adherence patterns should be interpreted as reflecting caregiver- and household-level behaviours rather than autonomous patient behaviour. Accordingly, associations with education and socioeconomic status represent caregiver or household influences on adherence rather than child-level determinants.

These findings can be further contextualised using the World Health Organization's multidimensional adherence framework. This conceptualises medication adherence as being influenced by five interacting domains: patient-related, therapy-related, condition-related, health system–related, and socioeconomic factors. With this study, financial barriers align with socioeconomic constraints, forgetfulness and caregiver supervision reflect patient- and caregiver-related factors. Difficulties in accessing hydroxyurea indicate health system–related factors. Concerns about long-term side effects relate to therapy-related influences. Placing these findings within the WHO framework highlights that multiple interacting determinants shape hydroxyurea adherence in this predominantly paediatric population. This reinforces the need for integrated, caregiver-focused, and system-level interventions.

The study's rural setting further shapes these adherence dynamics. Caregivers and patients in rural areas often encounter challenges. Some of these include the distances that may need to be traveled to access medical facilities, as well as the shortage of specialized medicines and medical personnel. All of these can affect consistent access to hydroxyurea and routine follow-up. Inter-period medicine stock-outs, the time lag between lab testing and prescription refills, out-of-pocket costs, and loss of income for households with scarce financial resources are also factors that worsen adherence. Within this context, adherence behaviour reflects not only individual or caregiver motivation but also structural health-system barriers characteristic of rural, resource-limited settings.

The sustained utilization reported in this study is encouraging. Given that long-term adherence is essential for realising the full clinical benefits of hydroxyurea, including reductions in vaso-occlusive crises, hospitalisations, transfusion requirements, and mortality.[23,24] Our study findings are in contrast to earlier reports from several sub-Saharan African countries, where uptake has historically been limited by high cost, irregular supply, and inadequate monitoring systems.[25,26] The adherence observed in our cohort reflects recent policy advances on sickle disease in Ghana, such as national approval in 2018 and implementation of the "Ahodwo Program".[27] The program expanded access and improved affordability. The study findings suggest national investments in hydroxyurea are being translated into long-term patient use at the facility level. It also highlights the potential for reductions in sickle cell disease burden in Ghana.

Despite the encouraging levels of long-term use, many patients in our study acknowledged "missing doses" in the month before the study mainly due to forgetfulness and financial constraints. A smaller proportion attributed non-adherence to difficulty obtaining the drug and concerns about long-term side effects. Forgetfulness as a key factor has also been reported in Nigerian and Ugandan cohorts.[28,29] Where patients often struggle to integrate hydroxyurea into their daily routines. Similarly, financial barriers have been widely documented. Studies done in Tanzania and the Democratic Republic of Congo reported that the out-of-pocket cost of hydroxyurea remains prohibitive for many families despite demonstrated clinical benefits.[30,31]

In contrast, studies conducted in high-income countries have reported much higher adherence rates, mainly attributable to subsidized drug costs, reliable supply chains, and structured follow-up systems.[16] Although our study emphasizes that national initiatives such as the "Ahodwo Program" have widened access to hydroxyurea in Ghana, ancillary interventions are still required. They may be in the form of patient education, debunking of myths surrounding side effects, reminders to limit forgetfulness, and financial support mechanisms to avoid cost-related discontinuations. Such multipronged approaches are required to sustain adherence and ensure that the clinical effectiveness of hydroxyurea observed globally can be ideally realized in the Ghanaian context.

Adherence to hydroxyurea has clinical and public health implications. Reductions in vaso-occlusive crises, hospital admissions, transfusion requirements, and mortality among patients with sickle cell disease are associated with improved adherence. Improved adherence can also translate into reduced healthcare utilisation, lower treatment costs, and improved quality of life, particularly in high-burden, resource-limited settings. In this context, the adherence patterns observed in our predominantly paediatric cohort have implications not only for individual clinical outcomes but also for strengthening sickle cell disease control strategies within the health system.

Socio-demographic characteristics also appeared to influence adherence in our study. Given that the majority of participants were children and adolescents, educational level and income in this study reflect caregiver or household characteristics, and the observed associations should therefore be interpreted as caregiver-level influences on hydroxyurea adherence rather than child-level determinants.

Male patients and participants with primary education showed higher adherence in bivariate analyses; however, these factors were not independent predictors after multivariable adjustment. It is possible that the higher adherence reported among males reflects social desirability bias, as males have been shown in other self-reported health and quality-of-life

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studies to report more favourable outcomes, a pattern consistent with the lack of an independent gender effect in the multivariable regression analysis.

The observed gender difference is consistent with findings from other sub-Saharan African studies.[25,29,32] Similar studies in the region reported that women often have additional caregiving responsibilities, limited autonomy in health decisions, and financial constraints that may reduce treatment consistency.[28,33] By contrast, studies from high-income countries have found no significant gender-related differences in adherence.[34,35] This pattern was likely attributable to more substantial health system support and fewer gender-based barriers. The association between lower educational level and higher adherence in our cohort may be explained by the fact that the majority of our patients were children and adolescents.

In this age group, caregivers, often parents or guardians, mostly supervise daily medication use, thereby promoting better adherence despite the patient's limited formal education. However, patients with higher education, mainly older adolescents or young adults, may have competing school or work demands. This may interfere with consistent hydroxyurea use, leading to low adherence. It is also possible that, given the predominantly paediatric nature of the study population, parental or caregiver involvement in medication supervision may have contributed to the observed adherence patterns. However, caregiver involvement was not directly assessed in this study. Hence, the need for tailored adherence support strategies that will address the realities of different patient subgroups.

The logistic regression analysis did not identify any of the examined demographic, age, gender, educational level, or years since diagnosis as significant predictors of hydroxyurea adherence. In our rural Ghanaian setting, the absence of significant demographic predictors suggests that adherence may be influenced by factors beyond baseline characteristics. However, behavioural, psychosocial, and system-level influences, such as patient or caregiver beliefs, reminder practices, and family support, were not directly assessed in this study and should be explored in future research.

Similar findings have been reported in studies from Uganda and Nigeria, where demographic factors were poor predictors of adherence.[28,32,36] Instead, health system barriers and patient-level factors, including perceptions of side effects, forgetfulness, and financial constraints, played a more prominent role.[28,37] Conversely, studies from high-income countries have sometimes found associations between adherence and variables such as parental education, but these effects were often attenuated once psychosocial support and structured follow-up were taken into account.[38,39] Our findings therefore reinforce the need to broaden adherence research beyond demographic predictors, to include qualitative and system-level assessments that can inform context-specific interventions aimed at sustaining hydroxyurea use.

Limitations

This study has some limitations that should be considered when interpreting the findings. First, adherence was assessed through self-report, which is open to recall and social desirability bias and may not fully reflect actual medication use. Secondly, the study was conducted in a single rural hospital, which may limit generalizability to other settings in Ghana with different health system resources or patient populations. The findings are most applicable to similar rural Ghanaian or West African contexts and may not be directly generalisable to urban settings or nationwide populations.

Thirdly, the cross-sectional design rules out causal inferences, as predictors of adherence could not be assessed longitudinally. In addition, the use of convenience sampling and electronic data collection via WhatsApp and Google Forms may have introduced selection bias by favouring respondents with greater access to digital technologies or higher technological literacy, potentially limiting the representativeness of the study population.

Fourthly, the predominance of children and adolescents limited the feasibility of age-stratified analyses; future studies with larger adult samples should examine age-specific determinants of adherence. Fifthly, the sample was predominantly paediatric; education and socioeconomic variables reflect caregiver or household characteristics, which limit direct comparison with adult-only adherence studies. Also, some potentially important factors such as psychosocial influences, caregiver dynamics, and health system barriers, were not measured, and these factors could have provided a more comprehensive understanding of adherence patterns. Age-stratified analyses were not feasible because adherence behaviour differs fundamentally between caregiver-mediated paediatric treatment and self-managed adult treatment. Also, the sample size for the adult group was small. Hence, the findings should be interpreted primarily within a predominantly paediatric, caregiver-supervised context. The regression approach was appropriate for the study objectives, the sample size may have limited the multivariable model's statistical power to detect small effect sizes, and non-significant associations should therefore be interpreted with caution. In addition, the regression model included mainly demographic variables and did not capture other potentially important clinical and health system–related factors, such as disease severity, frequency of clinic visits, or intermittent drug availability, which may have confounded the observed associations.

Finally, the study did not assess supply chain challenges, promotional activities by the Ministry of Health or non-governmental organisations, or specific implementation strategies such as decentralised medicine pick-up points, which may influence hydroxyurea access and adherence following national approval. The extent to which supply chain reliability and promotional activities influence adherence requires further investigation.

Conclusion

This study demonstrates encouraging hydroxyurea utilisation and adherence among predominantly paediatric sickle cell disease patients receiving caregiver-supervised treatment in a rural Ghanaian setting. Notably, the multivariable regression analysis identified no demographic characteristics as independent predictors of adherence, suggesting that structural and contextual factors, rather than individual-level attributes, may play a more critical role in shaping hydroxyurea adherence in this setting.

This also reflects the positive impact of national policy initiatives such as the Ahodwo Program in Ghana. However, adherence challenges persist, with many patients reporting missed doses in the preceding month. This was primarily due to forgetfulness and financial barriers. Sociodemographic variables such as gender, age, and education did not significantly predict adherence in regression analysis. And this emphasizes the role of unmeasured behavioural, psychosocial, and system-level factors. These findings align with Ghana's National Sickle Cell Disease Control Program and the WHO 2023–2030 Sickle Cell Disease Implementation Strategy, both of which prioritise equitable access to hydroxyurea and system-level support for adherence, particularly in resource-limited settings.

Again, these findings highlight that while policy-driven improvements in access are critical, sustained adherence will require targeted interventions to maximize the clinical benefits of hydroxyurea.

Recommendations

Improving understanding of hydroxyurea, correcting misconceptions, and educating patients and caregivers are important future intervention strategies. The introduction of adherence-support tools (example reminder systems) and regular follow-ups should be incorporated into routine practice. Strategies to reduce out-of-pocket expenses, which hinder continuous therapy, include financial protection mechanisms and subsidy programs. More mixed-methods and longitudinal studies are needed to focus on the behavioural, psychosocial, and health system factors that influence adherence, thereby developing context-relevant strategies. To ensure equitable and sustained access, expanding the Ahodwo Program and incorporating hydroxyurea monitoring into national sickle cell services are crucial for maintaining access across Ghana.

Abbreviations

SCD, sickle-cell disease; SSA, sub–Saharan Africa; HU, hydroxyurea; ER, emergency room; NIH, national institute of health; QoL, quality of life; MOH, ministry of health; KNUST, kwame nkrumah university of science and technology; CHEPE, committee on human research publication and ethics; AOR, adjusted odds ratios.

Data Sharing Statement

The data underlying this article will be shared on reasonable request to the corresponding author.

Ethics Statement

The study was approved by was sought from the Kwame Nkrumah University of Science and Technology (KNUST) Committee on Human Research Publication and Ethics (REF.CHRPE/AP/953/24) and the research committee of the Presbyterian hospital, Agogo (APH/ADM/RES-135/24).

Informed Consent

The procedures used in this study adhered to the principles of the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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