BMC Primary Care

RESEARCH Open Access

Barriers to medication adherence for secondary stroke prevention in rural communities in Cameroon: a qualitative study

Mundih Noelar Njohjam[1,2*], Niakam Tiffany Falonne[2] and Mark Olivier Ngoule[2]

Abstract

Background Stroke survivors in rural communities may face unique challenges in accessing and adhering to medications for secondary prevention. This qualitative study aimed to explore the factors associated with medication adherence among stroke survivors in rural settings.

Methods We conducted semi-structured interviews with 15 stroke survivors, 5 caregivers, and 5 healthcare providers in rural communities. We conducted thematic analysis of the data using a grounded theory approach.

Results Six key themes emerged: access (subthemes: inefficient/non-existent healthcare services, limited access to health facilities, shortages of medications), medication-related (subthemes: side effects and polytherapy), patient-level (subthemes: beliefs and knowledge about stroke and medications, attitudes and motivation towards treatment), health system and provider-related (subthemes: quality of patient-provider communication and counselling, shortages of healthcare workers, healthcare workers' knowledge of stroke and medication), economic and environmental barriers (subthemes: poverty, lack of transportation and political conflict), and socio-cultural barriers (subthemes: stigma and social isolation and cultural practices).

Conclusion The barriers to adherence to medications for secondary stroke prevention in the studied rural communities were multifactorial and mostly resulted from preventable health and socioeconomic factors. A multistrategic approach including enhancement of patient education, streamlining medication changes, rural healthcare worker training on secondary stroke prevention, patient counselling and addressing concerns and side effects, community outreach and education to raise awareness about stroke prevention, and the use of single-pill combination therapy can address these barriers and ensure long-term adherence.

Keywords Stroke, Medications, Adherence, Secondary prevention, Rural communities, Barriers, Medications

*Correspondence:
Mundih Noelar Njohjam
njohjammundih@yahoo.com
[1]Mankon District Hospital, Bamenda, Cameroon
[2]Department of Neurology, Cheikh Anta Diop University, P.O Box 5035, Dakar, Senegal

Background

Stroke is a leading cause of acquired disability in low- and middle-income countries [1, 2]. In Sub-Saharan Africa (SSA), stroke-associated mortality and morbidity are alarmingly high, exacerbated by low awareness, suboptimal treatment, and poor control of risk factors like hypertension [3]. Secondary stroke prevention, including adherence to medications, is crucial to reduce the risk of recurrent stroke and associated disabilities [4–6]. However, medication adherence remains a significant challenge, particularly in rural communities that face additional barriers to healthcare access and continuity. Secondary prevention of stroke is a major component of stroke care both in the acute and chronic phases [7–9]. Medical management of vascular risk factors like hypertension, dyslipidaemias, diabetes, and atrial fibrillation is extremely important in secondary stroke prevention. Assessing and addressing barriers to adherence to medications for secondary stroke prevention is crucial to ensuring long-term compliance. Strategies to improve medication adherence for secondary stroke prevention must consider the unique challenges in specific settings, such as rural communities. Strategies that worked for urban settings may not be readily transferable or effective in rural settings due to significant disparities in healthcare that exist between rural and urban communities [10]. A variety of access barriers often impede rural communities' access to healthcare services.

Healthcare delivery in Cameroon is hindered by several challenges including poor infrastructure and inadequate manpower especially in rural areas. The lack of essential diagnostics and therapeutics as well as a critical shortage of healthcare workers (HCWs) often results in low access to essential healthcare services, suboptimal patient care, longer waiting times for patients, limited capacity to handle emergencies, and high mortality [11].

In most rural communities, healthcare services are provided by nurses, and community healthcare workers with little expertise. Stroke care in rural communities in Cameroon is challenged by a critical shortage of stroke-trained physicians and primary care providers compared to urban areas, leading to suboptimal stroke care [12]. Barriers to accessing healthcare services in rural communities result in challenges in the treatment of chronic diseases like stroke. Data on medication adherence among rural stroke survivors in African settings is scare. Most studies assessing medication adherence among stroke survivors have been focused on urban stroke survivors. The evidence from these studies may not truly reflect the realities in rural communities. The data from this study will contribute to the reduction of this data gap.

Examining the factors that influence medication adherence for secondary stroke prevention is essential to inform interventions that can strengthen secondary stroke prevention and reduce the burden of stroke. In this study, we aimed to explore the barriers to medication adherence for secondary stroke prevention among stroke survivors in some rural communities in Cameroon and to showcase context-informed solutions to address these barriers.

Methodology

Design and participants

We conducted semi-structured interviews with stroke survivors recruited from patients' registers of five rural primary health centres of the Cameroon Baptist Convention Health Services and through community outreach activities in rural communities. We recruited healthcare providers from both public and private health facilities in these sites. The study included only patients aged 18 years and older who had a confirmed diagnosis of either ischemic or haemorrhagic stroke. We excluded participants who met the eligibility criteria but were critically ill or had severe cognitive impairment. We used purposive sampling to ensure that we included a representative and diverse sample in terms of socioeconomic status, sex, disability, and duration of stroke.

Considering the iterative nature of the interviews and the risk of dropout or low response, we initially contacted and invited 20 stroke survivors and their caregivers and 10 primary healthcare providers. Participants who were willing to give informed consent and participate in the study were invited for semi-structured interviews. We ensured that only participants with relevant experience and differing opinions and perspectives were included.

Study settings

We recruited participants from five rural primary health centres and communities in the North West region of Cameroon. The health system of this region has been grappling with limited resources and poor access to care and has been further strained by the ongoing conflict [13–15]. Stroke care in the region is primarily available at a regional hospital, which has a dedicated stroke unit and outpatient rehabilitation services [16, 17]. Rural communities in the region often face barriers to accessing specialised stroke care. Prior to the conflict, the region was considered underserved in terms of healthcare infrastructure and human resources, and the situation has only worsened in recent years with the ongoing socio-political crisis. Local healthcare systems have been destroyed and healthcare delivery is regularly interrupted by unpredictable ghost towns and lockdowns. The conflict has resulted in the displacement of healthcare providers and consequently a reduction in the patient-doctor ratio in this region with negative impact on healthcare delivery. Furthermore, unpredictable ghost towns, travel restrictions, and multiple security checkpoints have

disrupted the normal operations in this region [15]. Patients may miss appointments for medication refill and local health facilities may run out of medications or may not be able to get medications on time due to lockdowns [15].

Data collection

We conducted semi-structured interviews using open-ended questions to explore participants' experiences with stroke, access to healthcare, and adherence to medications for secondary prevention. We conducted pilot semi-structured interviews to develop topics that would guide the interviews. These topics informed the direction of questioning. We pre-tested and validated the semi-structured interview guide. The pretesting allowed us to rephrase some of the questions to ensure they were clear and concise. We also revised questions to avoid leading or biased language. Also, we included follow up questions after the pre-test to probe for more detailed or specific responses. Additionally, we removed redundant questions to eliminate duplicates. Interviews continued until data saturation was reached, and no new themes emerged. All interviews with patients and their caregivers were conducted in either the patient's home or in a health facility. Each interview session lasted between 45 minutes and 1 h. Local translators were used to facilitate communication with participants who could not understand English or pidgin. We also worked with community members to translate and back-translate data to ensure accuracy. Data collection was stopped when data saturation was reached based on the following criteria:

- No new information emerges from additional data collection from two consecutive participants.
- The relationships between themes were well-understood and no new connections are being made.
- Themes or concepts were repeating.
- Data collection yielded redundant information even after refining analysis.

The interviews were conducted in October 2024 and were audiotaped and transcribed. A copy of the interview guide has been included as a supplementary file.

Data analysis

We thematically analysed the data to understand the multilevel barriers influencing medication adherence. The codebook was created iteratively, as codes and themes emerged from the data. We used a grounded theory approach during the coding, iteration, saturation and memo-writing. During the coding process, data was coded using an open coding to identify initial concepts and themes. We then refined the codes to identify patterns and relationships between the codes. Next, we organize codes into categories. As for the iterative process, we compared new data to existing codes, categories and themes. This was followed by revision and refining of codes, categories and themes as new data emerged. We stopped the data collection when no new insights or themes emerged and the data was repetitive. Memos were written to gain insights on relationships between codes and categories. The first author read the transcripts and then listened to the recordings to correct any mistakes. A second member of the research team double-coded 50% of all interviews. We rectified discrepancies through discussions with a third author until we agreed upon the final themes and sub themes.

Results

We conducted a total of 25 semi-structured interviews with 15 stroke survivors, 5 caregivers, and 5 healthcare providers. Table 1 shows the characteristics of the stroke survivors.

Key themes

Six key themes emerged: access, medication, patient-level, health system and provider-related, economic and environmental barriers, and socio-cultural barriers. Table 2 summarizes the key themes and subthemes.

Access-related barriers

Inefficient/non-existent healthcare services

Participants described how the inefficiencies and inadequacies of the local healthcare system often discourage them from adhering to their medications.

> *"the nurse at health centre is not always around. You can go there and she has gone to the farm or to town and you have to wait for a long time or go home without your drugs" (P15, Female).*
>
> *" the machine to measure blood pressure at the health centre is not working at times. At least when you see that your blood pressure is good, it shows that the drugs are working and you are motivated to take them every day." (P02, Male).*
>
> *"In the big hospital in town, they told me to always measure my sugar and that I should not take my diabetes medicine when my sugar is too low. At the village health centre, the sugar machine is sometimes bad and you cannot know how your sugar is, so I don't take my diabetes medication if I feel that my sugar is low even though it might not be low" (P05, Male).*
>
> *"the village health centre does not have the needles for insulin injection and so I cannot inject my insulin when I don't have needles" (P05, Male).*

Table 1 Characteristics of stroke survivors

Participant ID	Sex	Occupation	Stroke type	Time since stroke (months)	Co-morbid conditions	Current medications
P01	Female	Trader	Ischemic	24		Aspirin, statin
P02	Male	Farmer	Ischemic	7	Hypertension	Aspirin, statin
P03	Male	Farmer	Hemorrhagic	48	Hypertension	Amlodipine and hydrochlorothiazide
P04	Male	Teacher	Hemorrhagic	32	Hypertension	Captopril
P05	Male	Farmer	Ischemic	120	Diabetes	Insulin, aspirin and statin
P06	Male	Farmer	Hemorrhagic	13	Diabetes and hypertension	Amlodipine and Lisinopril
P07	Female	Farmer	Ischemic	20	Hypertension and diabetes	Insulin, aspirin and statin
P08	Female	Unemployed	Ischemic	17		Aspirin, statin
P09	Female	Farmer	Ischemic	60		Aspirin
P10	Male	Fisherman	Ischemic	72		Aspirin, statin
P11	Male	Farmer	Ischemic	3	Atrial fibrillation, Hypertension	Wafarin, Lisinopril, Amlodipine
P12	Male	Carpenter	Ischemic	8	Diabetes	Metformin, aspirin and statin
P13	Male	Farmer	Hemorrhagic	10	Hypertension	Captopril
P14	Female	Cook	Ischemic	2	Atrial fibrillation	Wafarin, statin
P15	Female	Trader	Ischemic	23		Aspirin, statin

Table 2 Key themes and subthemes

	Main theme	Sub-themes
1.	Access-related barriers	• Inefficient/non-existent healthcare services • Limited access to health facilities • Shortages of medications
2.	Medication-related barriers	• Side effects • Polytherapy
3.	Patient-level barriers	• Beliefs and knowledge about stroke and medications • Attitudes and motivation towards treatment
4.	Health system and provider-related barriers	• Quality of patient-provider communication and counselling • Shortages of healthcare workers • Healthcare workers' knowledge of stroke and medication
5.	Economic and environmental barriers	• Poverty • Lack of transportation • Conflict
6.	Socio-cultural barriers	• Stigma and social isolation • Cultural practices

Limited access to health facilities

Some of the stroke survivors reported facing significant logistical and financial barriers to accessing healthcare facilities, particularly those located in urban centres.

> *"The nearest hospital is very far from this village. You have to take two different cars or hire a bike to get there, and the transport is too much for me. Even when I have money to go, I worry about the effect of the bad roads on my health so I don't always go." (P10, Male).*

> *"there is no hospital in this village where you can buy stroke medicines. I sometimes buy my medicines from medicine stores in the village." (P01, Female).*

Shortages of medications

Participants also reported frequent stock outs of essential stroke prevention medications, like aspirin,anti-hypertensive and anti-diabetic medications at local health centres and hospitals, further hindering their ability to adhere to their treatment regimens.

> *"Sometimes when I go to the hospital, they tell me they don't have my own kind of drugs. I have to send someone to help me and buy in town or stay without medication." (P11, Male).*
>
> *"I usually get my high blood and diabetes drugs from the health centre, but sometimes the health centre does not have them. When it finishes at the health centre, I have to wait until they buy it again. (P07, Female)*
>
> *"we don't have all the different kinds of medications for diabetes and hypertension; we have to switch patient from one medication to another based on what is available. Some patients may not like this and will prefer to wait until their usual medication is available. This is really a big problem here." (HCW3, Male).*
>
> *"Amlodipine works for my high blood pressure, but when it is finished at the hospital, they sometimes give me a different drug that I'm not used to. I even*

took one, and it made me very weak, and my eyes were turning. Since that day, I am afraid of changing my medication. I prefer to wait." (PO4, Male).

Medication-related

Side effects

Experiencing unpleasant side effects from medications caused some participants to either stop taking the medications or take them irregularly.

" At times when I take my medicines for high blood pressure, I feel very weak and dizzy. When I feel like that, I will not take the medicines for the next two days or even more so that the symptoms will not worsen." (P10, Male).
"I was taking aspirin and I vomited blood. Someone told me that it was because of aspirin. Since that day I don't take aspirin." (P15, Female).
"I have swallowed drugs until my neck is paining. I think too much medicines have caused a wound in my neck and so some days, I don't take medicines." (P05, Male).

Polytherapy

Some of the participants cited taking multiple drugs and/or multiple dosing schedules as barriers.

"the medicines are too many, the number of medicines you have to take at once already discourages you." (P06, Male).
"you have to take medicines every morning, afternoon and evening every day. Sometimes you can be sleeping during the day and the time for medication can pass without you knowing" (P02, Male)".
"My father takes medicines three times a day. It's very difficult for me to give him his medicines every day because sometimes I will be at the farm when it's time to give him the medications in the afternoon" (P12, Caregiver).

Patient-level barriers

Beliefs and knowledge about stroke and medications

Most participants lacked adequate knowledge about stroke, the importance of secondary prevention, and the role of medications, while many held misconceptions about the causes and treatment of stroke, which influenced their adherence to medications.

As one participant explained, "I don't even know why I have to take these medications every day. I thought the medications are to treat my stroke but I have not seen any changes since I have been taking them." (P09, Female).
"I think that my stroke was caused by witchcraft, not because of any high blood pressure. These medications will not really help me." (P03, Male).
"People have told me that some of these medications can cause problems if I take for a long time. I try to take them only when I don't feel myself." (P06, Male).
"I think that traditional medicines will cure my stroke faster than the Western medicines. They put a lot of chemicals in western medicine" (P12, Male).

Attitudes and motivation towards treatment

Participants frequently cited low motivation as a barrier to long-term adherence, often due to the psychological impact of stroke.

"There are days where I am down and I feel that it's useless to continue taking drugs." (P14, Female).
"Some days I just forget to take my medicines, or I don't feel like taking them. It's hard to take drugs every day of your life." (P09, Female).

Health system and provider-related barriers

Quality of patient-provider communication and counselling

Most participants felt that healthcare providers do not adequately explain the importance of their medications or provide clear instructions on proper use.

"The doctor just told me to give these medicines to my mother every day, but he didn't explain what they were for, the side effects and situations where I shouldn't give her. I use my common sense to decide when or when not to give." (P07, female, caregiver).
"When I ask the nurse at the village health centre questions about my medicines for diabetes, he doesn't give me a good answer. I ended up leaving the health centre feeling discouraged." (P06, Male).
"The doctor doesn't spend much time with us each time we go to the hospital. She just writes the prescription and tell us to come back in one or two months, you can't even ask questions." (P15, female, caregiver).

Continuity of care and provider trust

Frequent turnover of healthcare providers and lack of continuity in care negatively impacted participants' trust in the healthcare system and willingness to adhere to medications.

"I went to the health centre one day and there was a new nurse. I was told the nurse who had been following me up had been transferred. I had to explain my entire story again, and the new nurse didn't seem to have experience and it made me less motivated to go there for treatment." (P11, Male).

Shortages of healthcare workers

Understaffing at healthcare facilities was cited as a barrier to effective medication counselling and follow-up.

"There is only one nurse at the clinic who is responsible for giving all the medications and providing instructions. She is always in a hurry and can't spend much time explaining things to us." (P01, Female).
"There is no doctor at our village hospital, only nurses who are trying their best to help sick people like me. To see a stroke doctor, you have to go to Bamenda and this is expensive." (P02, Male).

Healthcare workers' knowledge of stroke and medication

Gaps in healthcare providers' knowledge about stroke, its risk factors, and appropriate secondary prevention medications were also highlighted as contributors to poor patient adherence.

"The nurses at the health centre don't know about stroke. I avoid going there to buy my father's drugs." (P03, Male, caregiver).
"Sometimes the nurse gives me a different medication than what the doctor prescribed without proper explanation. Since I don't know if they know what they're doing, I don't go there, I prefer to stay without taking their drugs." (P11, Male).
"I am just a nurse and I am aware of the gaps in my own knowledge about stroke treatment. I can't provide optimal care to stroke patients given my limited knowledge." (HCW1, Female).
" I didn't receive any specific training on stroke during my training as a nurse. I'm doing my best to learn while working. I only refill medications exactly as I see in the book without much explanation." (HCW5, Female).

Economic and environmental/contextual barriers

Poverty

Financial constraint was a common barrier to adherence; participants often had to make difficult trade-offs between purchasing medications and meeting other essential needs for their families.

"I struggle every month to buy medicines for my father's illness. Sometimes he has to skip some days or I will buy only for one or two weeks because my money is small." (P06, Male, Caregiver).
"The small money I get from selling my farm produce cannot pay for my husband's medicines and food in this house all the time. Sometimes I will buy food for the house instead of his medicines." (PO4, female, Caregiver).
" if the hospital does not have my mother's drugs, I have to travel far to other health centres or to town to try to find them, which is very costly and takes a lot of my time." (P01, male, Caregiver).
"some patients come to the health centre and cannot pay for their drugs. We have to give them the medications and keep their books or ID documents as a guarantee. This is risky, as some of them may not return to pay for their drugs and collect their cards. We end up having too many uncollected cards and negative accounts." (HCW4, Male).

Lack of transportation

Transportation costs and difficulties Accessing healthcare facilities emerged as major barriers to medication adherence.

"It takes me at least two hours to reach the hospital. Due to my health condition, I require a comfortable seat in the car, and I must pay extra money each time to ensure my comfort. I don't always have money to pay, so I don't always go." (P10, Male).
"When the rainy season comes, the rains spoil the roads and make it difficult for patients to come to the health centre to buy drugs." (HCW2, Male).
"Our neighbour has a bike, he helps us to buy my father's medication from the district hospital, but I have to give him money for petrol. When he is not around or when I don't have the money for the petrol, my father will not have medications." (P12, Male, Caregiver).

Socio-political crisis

Ongoing socio-political conflict and insecurity in some of the communities disrupted access to healthcare services and the supply chain for essential medications.

" Due to the ongoing crisis, the village hospital is sometimes closed for several weeks. During such times, I can't buy my blood pressure medications." (P09, Female).

"Sometimes I go to the health centre and they will tell me that the roads have been blocked and so medications cannot reach the village."(P11, Male).
"The supply chain is unreliable, especially with the unpredictable ghost towns and unrest in the village." (HCW3, Male).

Socio-cultural barriers

Stigma and social isolation

Some participants reported experiencing social stigma and isolation due to stroke, which negatively impacted their mental health and perceived self-worth, ultimately affecting their motivation to adhere to treatment.

"After my stroke, many of the villagers started looking at me with bad eyes. They see me as a person with bad luck. This really makes me to feel discourage to treat myself." (P08, Female).
"People treat me differently and avoid me on the road, thinking I might contaminate them. I feel so ashamed when I go out, so I avoid going to buy medications. I prefer sending someone to go and get the medications for me. If I don't have anyone to send, I will stay like that. "(P13, Male).

Cultural beliefs and practices

Deeply rooted cultural beliefs and traditional healing practices in many communities also influenced attitudes towards conventional stroke medications and treatment.

"In my culture, people believe that illnesses like stroke are caused by evil spirits or the anger of the gods. I was advised to use traditional medicines and to visit native doctors instead of using hospital medicines." (P09, Female).
"My family took me to native doctors for cleansing. They believe in native doctors and they prefer to pay for these cleansing than to buy modern medications." (P14, Female).
"The culture here makes it difficult for many patients to take their medications regularly. The patient will come for refill this month, the next month he is visiting a native doctor who will tell him to stop taking his medications." (HCW3, Male).

Discussion

Our results show that barriers to adherence to medications for secondary stroke prevention in rural communities is multifactorial and mostly results from socioeconomic disparities, limited access to healthcare, and cultural norms.

Patient-level factors, such as knowledge, beliefs, and self-efficacy, play a significant role in medication-taking behaviours. Stroke survivors who did not fully understand the importance of their medications or perceived that the medications were ineffective were less likely to adhere to their treatment regimens. Similar studies in different settings have reported these findings [7–9, 18–20].

Self-efficacy is an important determinant of level of motivation and health behaviour [21]. In his self-efficacy theory of motivation, psychologist Albert Bandura defined self-efficacy as people's belief in their ability to control their functioning and events that affect their lives [21]. According to this theory, people's beliefs in their efficacy are influenced by mastery experiences (previous performance), vicarious experiences (social role models), social persuasion, and emotional states. Mastery experiences or previous performances are the most influential source of efficacy information. Stroke survivors in rural communities who have struggled to consistently take their medications may lose confidence in their ability to adhere to the regimen, negatively impacting their motivation and adherence behaviours. Conversely, those who have successfully managed their medications may feel more empowered, leading to better adherence. In addition, seeing or hearing from stroke survivors who have consistently adhered to their medications (social role models) can cause other stroke survivors who are struggling with adherence to believe that they too possess the capabilities to consistently adhere to their medications. Health providers should therefore aim to enhance patient's self-efficacy through verbal and social persuasion, social role modelling, and providing feedback and encouragement [22, 23]. Stroke survivors should regularly receive positive verbal feedback encouraging them to believe that they have the skills and capabilities to succeed. Small successes achieved in taking medications as prescribed should be celebrated and even rewarded to build patients' confidence. Adapting medication schedules and reminders to align with daily routines in rural settings and preferences can make adherence more manageable and achievable.

Social role models for medication adherence could also improve medication adherence in rural settings. Pairing stroke survivors with role models who have experienced and successfully overcome similar challenges with medication adherence could help in building self-motivation for those struggling with medication adherence. This can create a great sense of community and reduce feelings of discouragement which can be a significant barrier to adherence. Also, sharing personal experiences with someone who has had similar experiences can help stroke survivors to understand their condition better and provide a sense of hope. Furthermore, social role models can be good sources of information about medication,

potential side effects and other stroke-related issues. This can help to dispel myths and misinformation in rural settings where healthcare professionals may not have the time to address such issues in depth.

Enhancing patients' knowledge on the risk or consequences of non-adherence to medications for secondary stroke prevention is also imperative. Six main cognitive constructs affect health behaviour, according to the health belief model of behaviour change. These are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action [24]. Stroke survivors who do not understand the severity of stroke (such as those who had minor strokes), and the risk of stroke recurrence associated with poor medication adherence may be less meticulous with adherence to medications for secondary prevention [25]. In addition, those who do not perceive the effectiveness of medications in reducing the risk of stroke may not adhere to medications. Also, patients who perceive obstacles to medication adherence may be more likely to experience difficulties with adherence. For example, patients may feel less motivated to take medications as prescribed or intentionally skip doses due to concerns about side effects or cost. Furthermore, specific cues, either internal or external, can facilitate or hinder patients' ability to consistently adhere to medications.

Strategies to enhance stroke survivors' understanding of secondary prevention and bolster their confidence in managing their condition could help improve medication adherence in these communities. Such strategies should include targeted patient education, support groups, and the engagement of community health workers. Prior to discharge from acute care, stroke survivors and their caregivers (especially those who will be moving to rural areas) should receive comprehensive education on the importance of secondary prevention medications, potential side effects and barriers to adherence that might ensue, and strategies to overcome such barriers and integrate medication-taking into daily routines [22].

Socio-cultural factors, such as stigma, social isolation, and traditional beliefs, also emerged as significant barriers to medication adherence. Social isolation and feelings of shame resulting from stroke-related stigma negatively impacted stroke survivors' motivation and self-worth, making it difficult for them to consistently engage in the management of stroke. The fear of being seen as "cursed" by the community led some participants to avoid seeking regular care. The prioritization of traditional healing practices over biomedical treatment in many communities also undermined adherence, as survivors were pressured by their families to forgo medications in favour of cultural remedies. Myths and misconceptions about stroke are very common in rural areas due to low health literacy levels and need to be addressed through context-informed health education campaigns [3]. To be effective, these campaigns should be community-driven and address stigma while simultaneously promoting social integration of stroke survivors. Bridging the gap between traditional and biomedical care could help mitigate these barriers [26]. Cultural sensitivity and community engagement should be prioritized when conducting stroke awareness campaigns in rural contexts. Incorporation of healthy local beliefs and practices into secondary prevention efforts should also be considered.

Health system-level barriers, such as unreliable supply chains and the shortage of stroke care personnel in rural areas, further complicated medication adherence. Participants described frequent stock outs of medications at local health facilities and the need to travel long distances to obtain their prescriptions, which resulted in missed doses and treatment interruptions. Strengthening the capacity of primary healthcare systems to provide continuous access to essential stroke medications and other stroke services in rural communities is critical [7, 27]. Strategies to ensure continuous supply of medications could include task-shifting to community health workers and integrating stroke care into existing chronic disease management programs. Local community health workers and/or nurse should be trained and deployed to homes to provide basic stroke prevention services. For example, community healthcare workers can be trained on how to perform home blood pressure and glucose monitoring and refer stroke patients with poorly controlled blood pressure or glucose to healthcare facilities. This should be done following clearly established evidence-based guidelines and protocols with close supervision and support from stroke specialists or stroke-trained general practitioners. Supply chains in rural communities should be strengthened and buffer stocks maintained to ensure consistent availability of essential medicines [8]. To overcome the shortage of specialists, community-based stroke programs delivered by trained, supervised non-specialist providers may be a feasible option [27, 28]. Context-informed stroke education program guided by patients' experience should be developed and implemented for healthcare providers to improve their ability to support stroke survivors' medication adherence. Such programs should emphasize the importance of patient-centered care, effective communication for health behaviour change, goal-setting, and care coordination. Healthcare workers in rural communities should be trained on effective techniques for engaging patients in shared decision-making such as the 5 A's (assess, advise, agree, assist, and arrange) and FRAMES (feedback, responsibility of patient, advice to change, menu of options, empathy, self-efficacy enhancement) approaches, motivational interviewing, problem-solving, and collaborative care planning [29, 30].

Access-related barriers underscored the need for innovative, community-based models of stroke care that leverage local resources and community participation. Community health workers, and stroke survivor support groups could play a vital role in facilitating medication adherence by providing home visits, home-based education, medication management support, and linkages to facility-based care [31]. Existing community-based initiatives such as community-directed treatment for Ivermectin (CDTI), which have been successfully implemented for other chronic conditions in low-resource settings, could be adapted for stroke. Key community members with non-healthcare background can be identified and trained on door-to-door distribution of medications, as seen in successful onchocerciasis programs. This could ensure consistent access to secondary prevention medications even in the most remote areas. Mobile clinics to rural areas could enhance the availability and accessibility of healthcare professionals and medications for stroke survivors, addressing the stroke specialist gaps in these communities. Mobile clinics equipped with necessary medical equipment, essential stroke medications and staff can facilitate blood pressure and glucose checks, and provide onsite consultations and follow-up for stroke patients. This will prevent patients from traveling to urban areas which as some of the patients mentioned is usually very costly. Community outreach activities and the empowerment of local leaders and lay health workers may be necessary to increase stroke awareness, destigmatize stroke, and facilitate the integration of stroke survivors into the community. Also, subsidization of medications and stroke care services could also alleviate the financial burden on stroke survivors and their families, improving adherence and long-term outcomes.

Medication-related barriers, such as side effects and polypharmacy, were other key challenges. Stroke survivors who experienced medication side effects and/or were taking two or more medications were more likely to be non-adherent. Polypharmacy is common in secondary stroke prevention and often contributes to non-adherence [32]. For example, patients with ischemic stroke who have other comorbid cardiovascular conditions like diabetes and hypertension may be required to take antidiabetic or antihypertensive medications in addition to an antiplatelet and a statin. Simplifying treatment regimens, using fixed-dose combinations where possible, and providing clear, tailored medication education could help address these barriers. Rural healthcare providers should be trained to effectively counsel patients on medication management, side effect monitoring, and the rationale for each prescribed drug. Polypill strategies involving the combination of multiple secondary prevention medications into a single pill have been shown to improve adherence in other cardiovascular diseases and may be a feasible approach in rural stroke settings [33–35].

The use of incentives and enablers such as free or subsidized medications, transportation support, and food supplements may also help address financial and structural barriers to adherence. Such approaches have been successfully used in other chronic disease programs in low-resource settings and could be adapted for stroke care [36].

Conclusion

We found multilevel barriers to adherence to medications for secondary stroke prevention in the rural communities. Most of these barriers are preventable. Long-distance travel to reach a stroke physician or purchase medications may be costly and burdensome for patients living in rural areas, with subspecialty care often even farther away. These patients may substitute local primary care providers for subspecialists, or they may decide to postpone or forego care. In such contexts, it is absolutely critical to develop and implement community-based models of stroke care that leverage local resources, community participation, and innovative service delivery approaches to ensure continuous access to essential secondary prevention medications in rural areas. Randomized controlled trials to test the efficacy of the different proposed strategies in improving adherence to medications for secondary prevention in rural communities are warranted.

Abbreviations

CDTI	Community-directed treatment for Ivermectin
FRAMES	feedback, responsibility of patient, advice to change, menu of options, empathy, self-efficacy enhancement
HCW	Healthcare worker
IRB	Institutional review board
SSA	Sub-Saharan Africa

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-02842-w.

Supplementary Material 1

Acknowledgements

We are grateful to all the participants and their caregivers for accepting to participate in this study. We would also like to thank the healthcare workers for their voluntary participation and help in recruiting stroke patients in the rural communities.

Author contributions

MNN, NFT and MON were involved in the study design and conceptualization. MNN did all the interviews and data collection. MNN and NFT analysed the data. MNN wrote the first draft of the manuscript. All authors (MNN, NFT, MON) contributed to the review and the editing of the manuscripts. All the authors read and approved the final manuscript.

Funding

Not applicable.

Data availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the institutional ethical review board of the Cameroon Baptist Convention Health Services (reference number IRB2023-06). Prior to each interview, each participant was briefed on the objectives, activities, and any potential risk associated with participating in the study. All participants were also informed of their rights to withdraw from the study at any point. Each participant received a participant information sheet, and we obtained written informed consent from each participant before each audio-recorded interview. Where there were language barriers, local translators were used to ensure that all participants fully understood the objectives and activities of the study before giving informed consent. An encrypted voice recorder was used to record the interviews, and all audio recordings were subsequently deleted after transcription of each interview. Data from the study was only accessible to the authors. The study was conducted in accordance with Helsinki's declaration.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 19 January 2025 / Accepted: 15 April 2025
Published online: 24 April 2025

References

1. Avan A, Digaleh H, Di Napoli M, Stranges S, Behrouz R, Shojaeianbabaei G, et al. Socioeconomic status and stroke incidence, prevalence, mortality, and worldwide burden: an ecological analysis from the global burden of disease study 2017. BMC Med. 2019;17(1):191.
2. Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, et al. Global and regional burden of stroke during 1990–2010: findings from the global burden of disease study 2010. Lancet. 2014;383(9913):245–55.
3. Akinyemi RO, Ovbiagele B, Adeniji OA, Sarfo FS, Abd-Allah F, Adoukonou T, et al. Stroke in Africa: profile, progress, prospects and priorities. Nat Rev Neurol. 2021;17(10):634–56.
4. Weir E. Stroke prevention. CMAJ. 2005;173(4):363.
5. Strong K, Mathers C, Bonita R. Preventing stroke: saving lives around the world. Lancet Neurol. 2007;6(2):182–7.
6. Hacke W. Stroke is preventable. Int J Stroke. 2017;12(8):795.
7. Esenwa C, Gutierrez J. Secondary stroke prevention: challenges and solutions. Vasc Health Risk Manag. 2015;11:437–50.
8. Hankey GJ. Secondary stroke prevention. Lancet Neurol. 2014;13(2):178–94.
9. Bangad A, Abbasi M, de Havenon A. Secondary Ischemic Stroke Prev Neurother. 2023;20(3):721–31.
10. Tandi TE, Cho Y, Akam AJC, Afoh CO, Ryu SH, Choi MS, et al. Cameroon public health sector: shortage and inequalities in geographic distribution of health personnel. Int J Equity Health. 2015;14:43.
11. Intelligence GL. An Overview of the Healthcare System in Cameroon. Generis Global Legal Services. 2024 [cited 2025 Feb 12]. Available from: https://generisonline.com/an-overview-of-the-healthcare-system-in-cameroon/
12. Massi DG, Mbouleup FTN, Dissongo JI, Mapoure YN. Epidemiology, clinical features and outcome of stroke in rural versus urban hospitals in Cameroon. Journal of Stroke and Cerebrovascular Diseases. 2024 Apr 1 [cited 2024 Jul 31];33(4). Available from: https://www.strokejournal.org/article/S1052-3057(24)00026-0/abstract
13. Cameroon. Crisis causes health-care challenges| OCHA. [cited 2024 Jun 16]. Available from: https://www.unocha.org/news/cameroon-crisis-causes-health-care-challenges
14. Médecins Sans Frontières (MSF.) International. [cited 2024 Mar 2]. A hospital at the heart of the North-West crisis in Cameroon| MSF. Available from: https://www.msf.org/hospital-heart-north-west-crisis-cameroon
15. Bang HN, Balgah RA. The ramification of Cameroon's Anglophone crisis: conceptual analysis of a looming complex disaster emergency. Int J Humanitarian Action. 2022;7(1):6.
16. Cockburn L, Fanfon TN, Bramall A, Ngole EM, Kuwoh P, Anjonga E, et al. Best practice guidelines for stroke in Cameroon: an innovative and participatory knowledge translation project. Afr J Disabil. 2014;3(1):92.
17. Angwafor S, Steve N, Cyrille N, Njamnshi WY, Ngarka L, Njamnshi A. Characteristics of stroke in two regional hospitals in Cameroon. Journal of the Neurological Sciences. 2021 Oct 1 [cited 2025 Jan 6];429. Available from: https://www.jns-journal.com/article/S0022-510X(21)02314-5/fulltext
18. (PDF) Utilizing Social Determinants of Health Model to Understand Barriers to Medication Adherence in Patients with Ischemic Stroke: A Systematic Review. ResearchGate. 2024 Dec 9 [cited 2025 Jan 5]; Available from: https://www.researchgate.net/publication/373511496_Utilizing_Social_Determinants_of_Health_Model_to_Understand_Barriers_to_Medication_Adherence_in_Patients_with_Ischemic_Stroke_A_Systematic_Review
19. Chauke GD, Nakwafila O, Chibi B, Sartorius B, Mashamba-Thompson T. Factors influencing poor medication adherence amongst patients with chronic disease in low-and-middle-income countries: A systematic scoping review. Heliyon. 2022;8(6):e09716.
20. (PDF) Barriers to medication adherence in a rural-urban dual economy: a multi-stakeholder qualitative study. ResearchGate. 2024 Nov 4 [cited 2025 Jan 5]; Available from: https://www.researchgate.net/publication/353847372_Barriers_to_medication_adherence_in_a_rural-urban_dual_economy_a_multi-stakeholder_qualitative_study
21. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev. 1977;84(2):191–215.
22. Bussell JK, Cha E, Grant YE, Schwartz DD, Young LA. Ways health care providers can promote better medication adherence. Clin Diabetes. 2017;35(3):171–7.
23. Brown MT, Bussell JK, Medication Adherence. WHO Cares? Mayo Clinic Proceedings. 2011;86(4):304–14.
24. Alyafei A, Easton-Carr R. The Health Belief Model of Behavior Change. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Jan 12]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK606120/
25. Intamas U, Rawiworrakul T, Amnatsatsue K, Nanthamongkolchai S, Palmer MH. Care of stroke survivors in community: a case study of rural Thai community. J Health Res. 2020;35(1):77–87.
26. Joubert J, Prentice LF, Moulin T, Liaw ST, Joubert LB, Preux PM, et al. Stroke in rural areas and small communities. Stroke. 2008;39(6):1920–8.
27. Pandian JD, William AG, Kate MP, Norrving B, Mensah GA, Davis S, et al. Strategies to improve stroke care services in Low- and Middle-Income countries: A systematic review. Neuroepidemiology. 2017;49(1–2):45–61.
28. Madu EC, Richardson KD, Ozigbo OH, Baugh DS. Improving cardiovascular disease prevention and management in Africa: issues to consider for the 21st century. Ethn Dis. 2003;13(2 Suppl 2):S71–76.
29. Searight HR. Counseling patients in primary care: Evidence-Based strategies. Afp. 2018;98(12):719–28.
30. US Preventive Services Task Force. Behavioral counseling interventions to promote a healthy diet and physical activity for cardiovascular disease prevention in adults with cardiovascular risk factors: US preventive services task force recommendation statement. JAMA. 2020;324(20):2069–75.
31. Scheffler E, Mash R. Figuring it out by yourself: perceptions of home-based care of stroke survivors, family caregivers and community health workers in a low-resourced setting, South Africa. Afr J Prim Health Care Fam Med. 2020;12(1):e1–12.
32. Fitzpatrick D, Gallagher PF, Polypharmacy. Definition, Epidemiology, Consequences and Solutions. In: Cherubini A, Mangoni AA, O'Mahony D, Petrovic M, editors. Optimizing Pharmacotherapy in Older Patients: An Interdisciplinary Approach. Cham: Springer International Publishing; 2023 [cited 2025 Jan 12]. pp. 15–31. Available from: https://doi.org/10.1007/978-3-031-28061-0_2
33. Roshandel G, Khoshnia M, Poustchi H, Hemming K, Kamangar F, Gharavi A, et al. Effectiveness of polypill for primary and secondary prevention of cardiovascular diseases (Polylran): a pragmatic, cluster-randomised trial. Lancet. 2019;394(10199):672–83.
34. Sarfo FS, Nichols M, Opare-Addo PA, Ovbiagele B. Polypill programs to prevent stroke and cut costs in low income countries: moving from clinical efficacy to pragmatic implementation. Stroke. 2023;54(2):407–14.
35. Castellano JM, Pocock SJ, Bhatt DL, Quesada AJ, Owen R, Fernandez-Ortiz A, et al. Polypill strategy in secondary cardiovascular prevention. N Engl J Med. 2022;387(11):967–77.

36. Lutge EE, Wiysonge CS, Knight SE, Sinclair D, Volmink J. Incentives and enablers to improve adherence in tuberculosis. Cochrane Database Syst Rev. 2015;2015(9):CD007952.

Publisher's note