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RESEARCH

Utilizing an mHealth Platform and Community Health Workers to Enhance Epilepsy Screening and Treatment in a Rural Setting in Mali: A Closed Cohort Study

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Abstract

Background In Mali, the screening, diagnosis, and treatment of epilepsy face significant challenges due to a shortage of qualified health workers in rural areas, limited access to health services, and cultural barriers. This study assessed how mHealth platforms can support task shifting to community health workers (*Relais*) to screen and treat epilepsy at the community level.

Methods We conducted a cohort study involving persons with epilepsy (PWE) and *Relais* in 17 villages in the Nonkon health area of the Kolokani Health District, approximately 105 km northwest of Bamako, the capital city of Mali. *Relais* collected data using mobile phones equipped with an "Epi-Collect" application specifically designed for epilepsy management, enabling *Relais* to record patient information digitally. All collected data was securely stored in "telesante.ml," a telemedicine platform utilized by healthcare professionals.

Results Out of 64 patients suspected of having epilepsy by the *Relais* and indexed on the platform, 61 patients were confirmed by the neurologist through remote evaluation, resulting in a confirmation rate of 95%. After an 18-month follow-up, the patient retention rate was 86.89% (53 out of 61). At baseline, 98.36% (60 out of the 61) experienced at least one seizure per month. However, after six months of treatment, 89.28% (50 out of 56 at month six) PWE had no seizures in the last month ($p < 0.0001$).

Conclusion This study demonstrates the insightful effectiveness of leveraging an mHealth platform to empower community *Relais* to manage epilepsy in rural Mali. The *Relais* demonstrated a high capacity for screening, with neurologists confirming most suspected cases they identified. This innovative approach resulted in excellent patient outcomes, including a high retention rate over the follow-up period and statistically significant reduction in seizures. While challenges such as mobile network coverage and varying literacy levels among *Relais* were encountered, the findings strongly support this mHealth strategy as a viable solution to bridge the healthcare gap, significantly improving access to and management of epilepsy for remote and hard-to-reach populations.

Keywords *Relais* · Epilepsy · Rural · mHealth · Mali

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1 Introduction

Epilepsy is one of the most common neurological disorders globally, ranking second only to headaches as a prevalent condition [1]. It is characterized by irregular neuronal discharges or hyperexcitability of neurons, which can occur in a synchronized manner. This disorder is recognized as a major global public health concern [2].

Studies have reported that the incidence of epilepsy is higher in low- and middle-income countries (LMIC) compared to high-income countries (HIC), with reported rates of 139.0 per 100,000 persons (95% CI 69.4–278.2) in LMICs versus 48.9 per 100,000 persons (95% CI 39.0–61.1) in HICs. According to the 2016 Global Burden of Disease Collaborators, approximately 46 million people are affected by epilepsy, with nearly 80% of those living in LMICs [3].

Epilepsy is a significant health issue in Mali, though prevalence rates vary by region and study methodology. A large community-based study across six health districts published in 2022 reported a mean prevalence of 2 cases per 1,000 persons (2‰). This study found the highest rate in the Kenieba district (3‰), and the lowest in the Kadiolo district (1.5‰). In this study, the key epilepsy risk factors identified in Mali include a history of cerebral malaria and meningitis, as well as obstetrical complications like delayed delivery [4].

According to the World Health Organisation (WHO), treating epilepsy is simple and affordable [5]. However, there are several gaps in screening and treatment, including the availability and accessibility of diagnostic tools, antiepileptic drugs, neurologists, and specialized physical, occupational, and speech therapies [6, 7]. Cultural beliefs and practices, socioeconomic factors such as poverty and lack of access to healthcare, and the stigma associated with epilepsy also pose significant challenges [8, 9]. Additionally, there is a shortage of neurologists, especially in remote or rural areas of many LMICs, where more than half of individuals with epilepsy lack access to treatment [10, 11].

Given these challenges, mobile technologies and mHealth are rapidly advancing and are key components of modern medicine [12] that could improve the screening and treatment of epilepsy. The mHealth process involves virtual interaction between patients and healthcare professionals [13]. Specifically, the mHealth approach uses mobile technology to connect rural patients with specialist supervision, enabling ongoing monitoring and management of health condition from a distance.

Task shifting, when integrated with mobile health (mHealth), involves empowering non-specialist CHWs with mobile technologies to perform duties habitually done by health professionals for epilepsy care. Using applications on smartphones or tablets, these frontline workers can administer standardized screening tools, digitally collect patient data, and record videos of seizure events for remote review by a specialist [14]. This mHealth-supported model also enables automated medication reminders for patients and provides health workers with decision-support algorithms to guide basic management protocols. By leveraging accessible mobile technology, this approach decentralizes expertise, overcoming geographic barriers and the scarcity of neurologists in low-income settings. Ultimately, this strategy aims to drastically improve the early identification of epilepsy, ensure timely connection to care, and support treatment adherence within remote communities [15–17].

In most African countries, including Mali, community actors known as community Health workers (CHWs) serve as vital links between the health system and local communities. These individuals are volunteers chosen by their community in collaboration with the health system to carry out information and awareness-raising activities for a health area. They have participated in various activities and programs related to onchocerciasis, schistosomiasis, malaria, guinea worm, and in disease screening [18, 19].

In Mali, in 2000, the primary community health consisted of unpaid volunteers known as *relais communautaires* (Relais) who provided a fragmented collection of services, mainly focused on health education and campaigns. However, facing poor health outcomes and limited progress toward the Millennium Development Goals (MDGs), particularly for child mortality (MDG 4), a shift in policy was initiated. The Ministry of Health (MoH) recognized the need to upskill the existing volunteer workforce. The MoH decided to harmonize community health efforts by developing a unified strategy for Essential Services in the Community (*Soins Essentiels dans la Communauté* or SEC). This SEC strategy, developed between 2009 and 2011, established a new, professionalized cadre of health workers called Agents de Santé Communautaire (*ASCs*). The goal was for these paid *ASCs* to connect communities to formal community health centres, or *centres de santé communautaire* (*CSCOMs*), and extend a standardized package of promotional, preventive, diagnostic, and treatment services to the household level, while also supervising the volunteer *Relais* [20].

Therefore, the two types community health workers (CHWs) that currently in operation include: 1] CHWs *"Agents de santé communautaire"* (*ASC*), who are trained via government curriculum and paid a salary. They provide basic health care at the village and household level and offer a range of services including primary care, family planning services and counseling on various aspects of health; 2] the "Community Relais" (*Relais*) who are persons in communities who act as liaisons between healthcare facilities (such as community health centres) and the communities they serve. They are unpaid and locally recruited. Their primary roles include health education, advocacy, and the promotion of healthy behaviours and practices among community members. This paper is focused on the second type of CHWs, the "*Relais*" [20].

This study builds on previous community experiences and the implementation of mHealth solutions, including telemedicine and dermatology, as well as in malaria prevention through mobile mass-messaging services in Mali to effectively replace door-to-door mobilization for an indoor residual spraying campaign [22], representing innovative practices in Mali. Our goal was to enhance access to screening and treatment for persons with epilepsy (PWE) in rural areas. Specifically, this research aimed to assess the performance of the *Relais* in the screening and treatment of epilepsy using an mHealth platform, thereby improving screening and access to care for PWE in rural Mali.

2 Methodology

2.1 Operational Definitions

There are two levels of community health workers (CHWs) in Mali:

1) CHWs "*Agents de santé communautaire*" (*ASC*) who are trained through a government curriculum and paid a salary. They provide basic health care at the village and household level and offer a range of services including primary care, family planning services and counselling on various aspects of health.
2) The "Community Relais" (*Relais*) who are volunteers selected in collaboration with the health system and act as liaisons between healthcare facilities (such as community health centres) and the communities they serve. Their primary roles include health education, advocacy, and the promotion of healthy behaviours and practices among community members.

In this paper, the first cadre of CHWs will be called "*ASCs*," and the second will be referred to as "*Relais*," with the latter representing the focus of the current mHealth approach.

Suspected Epilepsy Case: An individual who themselves, or whose close relatives, answered positively to one or more of the three epilepsy screening questions administered by CHWs.

Confirmed Epilepsy Case: A suspected case that was confirmed by a neurologist through a detailed clinical interview.

2.2 Study Settings, Design, and Period

This was a closed cohort study conducted from September 2019 to March 2021. The Nonkon health area was selected based on the results of prior pilot data (2017, unpublished), which indicated a high number of unreported epilepsy patients (n=>50) as noted by local *Relais*.

Each confirmed PWE received a monthly supply of phenobarbital, prescribed by a neurologist based on the clinical presentation assessed via the mHealth platform and consultation by telephone. A dedicated *Relais* was assigned to support each patient in their respective village of residence.

2.3 Study Population

This study was conducted in the Nonkon health area, a rural locality within the Kolokani Health District of Koulikoro Region, located 105 km from Bamako, the capital city of Mali. The study population included: (1) *Relais* residing in the Nonkon health area and who volunteered to participate; and (2) Individuals of any sex or age residing in one of the 17 study villages who were suspected of having epilepsy based on the screening by *Relais*.

The *ASC* were involved to play a supportive role in assisting *Relais*, particularly in cases where the CHW's education level facilitated better engagement with the mobile health platform and patient care. As such, they were not considered part of the study population.

2.3.1 Inclusion and Exclusion Criteria

For Relais: Eligible participants were *Relais* from the Nonkon health area who volunteered for the study regardless of age and gender and were endorsed by their local community.

For Persons with Epilepsy (PWE): Inclusion criteria were voluntary participation, residence in one of the 17 study villages, and suspicion of epilepsy as determined by *Relais* through a standardized questionnaire. There was no limitation on participation based on age or gender.

2.3.2 Sampling Strategy

A two-stage sampling approach was employed:

Relais Selections: One *Relais* was purposely selected from each of the 17 villages, based on prior community health experience and willingness to use mobile technology. *Relais* received training on epilepsy identification, treatment protocols, and use of the Epi-Collect mHealth platform.

PWE Identification: An exhaustive sampling approach was used to identify all suspected epilepsy cases in the 17 villages. *Relais* screened community members using a validated questionnaire adapted from Konipo et al. (2021). All suspected cases were referred to a neurologist for confirmation and were included in the study if diagnosed clinically with epilepsy.

2.4 Data Collection, Equipment, and Participants

We developed an mHealth platform and the "Epi-collect" software in collaboration with the National Agency for Telehealth and Medical Informatics (in French *ANTIM: Agence Nationale de Telemedecine et d'Informatique Medicale*). Mobile phones equipped with the Epi-collect software were integrated into a free mobile health communication network (i.e., interconnected lines to call each other without charge) for monitoring and data collection. Each cell phone was equipped with the Epi-collect application and connected to the telesante.ml server, which hosts the mHealth platform. The Epi-collect application included three modules: registration (census), monitoring, and drug stock management. The study was conducted in three main phases (supplemental Fig. 1).

2.4.1 Phase 1: Training

A training session was held at the Nonkon Community Health Centre (CHC) to train *Relais* and *ASCs* on how to identify suspected cases of epilepsy within their community, drug side-effect management, and mHealth platform usage. The study team member B.C (expert in mHealth), A.K. (expert in mHealth), M.D (neurologist), and F.N.K. (medical doctor and study coordinator) conducted the training.

The epilepsy screening tool included three questions: (i) Has the subject ever experienced loss of consciousness, involuntary urination, or drooling? (ii) Has the subject experienced uncontrollable shaking or abnormal limb movements with sudden onset and duration of a few minutes? (iii) Has the subject ever been told they have epilepsy?

A total of 26 participants were trained, including 19 *Relais*, five *ASCs*, the nurse technical director of the community health centre, and the local drug store manager.

2.4.2 Phase 2: Implementation

Relais used the Epi-collect application to register suspected epilepsy cases. A neurologist remotely confirmed cases via the platform and mobile phone consultation. Upon confirmation by the neurologist, treatment initiation instructions were sent via SMS to the representative *Relais*. A neurologist prescribed phenobarbital based on the patients' clinical presentations, and all cases responded well to the treatment. Over the study period, the neurologist was supervising the PWE monthly through remote consultation and when called upon by the *Relais*.

2.4.3 Phase 3: Follow-up

In the third phase, confirmed epilepsy cases were put on phenobarbital after individual treatment codification and were monitored monthly by the *Relais*, supported by *ASCs* in some cases. Each *Relais* visited the patients under their responsibility to check on their treatment. They documented how many tablets the patient had taken in the previous month, how many had been lost, how many seizures had occurred, and whether the treatment had been interrupted. The information collected was transmitted to the platform monthly. The study neurologist was called to provide remote consultation as required, adapt treatment, as well as to advise patients and healthcare workers (supplemental Fig. 2). Monthly field visit by the study team provided technical support and incentives to *Relais* and *ASCs*.

2.5 Data Analysis

The data were analysed using Microsoft Excel (2013) and SPSS (Statistical Package for Social Sciences) version 25. Statistical significance was set at $p<0.05$. We presented the descriptive data of the study populations using numbers and percentages. We calculated the confirmation rate as the number of cases confirmed by the neurologist out of the total number of cases reported by the *Relais* on the platform. The following performance indicators were assessed:

1) The percentage reduction in the frequency of epileptic seizures since inclusion in the study.
2) Patient retention rate in treatment, evaluated by calculating the percentage of PWEs who completed follow-up, the percentage of deaths, and drop-out /lost to follow-up.
3) The platform's utilization, assessed by calculating the number of SMS transmission errors, including patient code authentication errors and *Relais* ID authentication errors.
4) Patient satisfaction evaluated using a Likert scale survey.

3 Results

3.1 Sociodemographic Characteristics of *Study Participants*

Among the *Relais*, males comprised 100% of the participants. Nearly all Relais had over ten years of experience (Table 1)

For suspected cases of epilepsy, most patients were male, accounting for 64% (41/64). The median age of the

Table 1 Sociodemographic characteristics of the *Relais* involved in Nonkon health areas from 2019 to 2021

Characteristics	*Relais* ($N=17$)	
	Numbers	%
Sexe		
Male	17	100
Female	0	0
Age range		
[25–45]	1	6
>46 years	16	94
Education		
Literate in Bambara	7	41
Primary school	7	41
Secondary school	3	18
High school	0	0
University	0	0
Marital status		
Single	0	0
Married	17	100
Year of experience		
Under 5 years	1	6
[5–10]	0	0
[11–15]	4	23
[16–20]	9	53
More than 20 years	3	18

Table 2 Sociodemographic characteristics of suspected epilepsy cases detected in Nonkon health areas from 2019 to 2021

Characteristics	Numbers	Percentage
Sex		
Female	23	36
Male	41	64
Age group in years		
<10	8	12
[10–19]	19	30
[20–29]	19	30
[30–39]	9	14
[40–49]	3	5
[50–59]	2	3
[60 and above]	4	6
Median age with range	20 years [3; 78]	
Level of education		
No education	46	72
Primary school	14	22
Secondary school	4	6
Marital status		
Married	17	26
Single	24	38
Lives with parent(s)	23	36

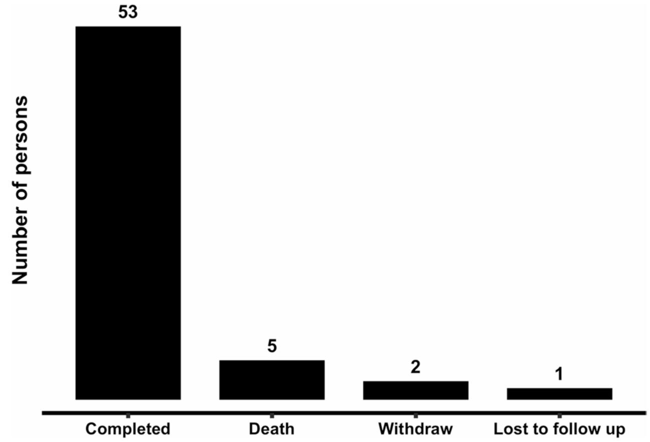

Fig. 1 Level of retention of persons with epilepsy in treatment using mhealth platform in Nonkon health area from 2019 to 2021

patients was 20 years, ranging from 3 to 78 years. Among our patients, 72% (46/64) had not received formal education (Table 2).

3.2 Diagnostic Capacity of *Relais* Supported by the mHealth Approach

Of a total of 64 persons screened as suspected cases of epilepsy by the *Relais*, 61 (95%) were confirmed by the neurologist.

3.3 *Relais* Performance Indicators

After 18 months of follow-up, 86.89% (53/61) of patients had completed their follow-up. We recorded five (8.19%) deaths, two (3.28%) drop-outs, and one loss to follow-up (1.64%) (Fig. 1).

Almost all patients (60/61) had at least one seizure per month at inclusion. This number dropped in the third month of follow-up (M3), with only seven patients with seizures out of the 59 who had followed up during this period. From M3 to M18, the number of patients with seizures significantly decreased ($Chi^2=266.1$, ddl $=6$, $p<0.0001$) (Fig. 2).

Out of a total of 2,632 SMS sent by the *Relais* to the platform's server, 2,217 (84%) were filed correctly, and 415 (16%) contained errors and were thus rejected. There were two types of sending error: authentication errors were the most frequent, with 291/415 (70%), compared to 124/415 (30%) errors relating to patient codes that had not been entered correctly (Table 3).

3.4 Level of Patient Satisfaction of Management with the mHealth Platform

Out of 53 patients surveyed at the end of the study, 48 (91%) said they were satisfied with this care approach through

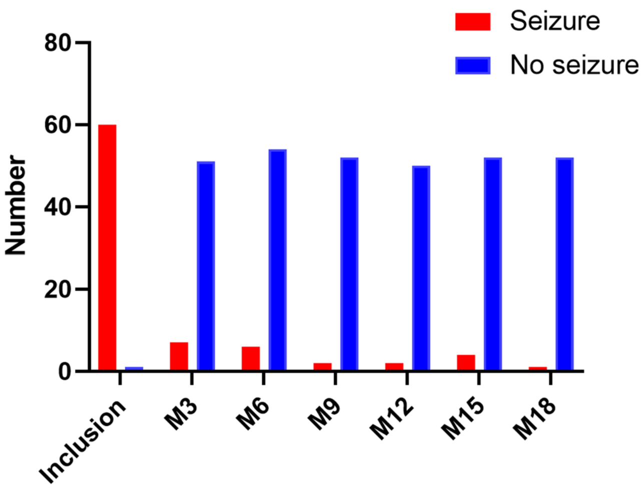

Fig. 2 Reduction of seizure frequency in persons with epilepsy during the follow-up period in Nonkon health areas from 2019 to 2021

Table 3 Relais performance in sending data to the mHealth platform from 2019 to 2021

Messages	Numbers	Percentage
SMS sent	***N*=2632**	
Favourable responses	2217	84
Errors	415	16
Types of errors	***N*=415**	
Patient code	124	30
Authentication errors (*Relais* ID)	291	70

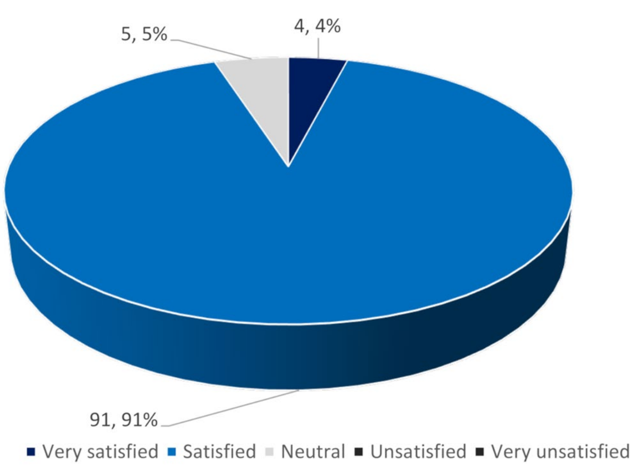

Fig. 3 Patient satisfaction according to post-intervention Likert scale survey

Relais and the mHealth platform, and 4% (2/53) said they were very satisfied. Meanwhile, 5% (3/53) of our patients were neutral (Fig. 3).

4 Discussion

A closed cohort study was conducted from September 2019 to March 2021 in the Nonkon health area of Kolokani Health District. The study aimed to assess the capacity of *Relais* to manage epilepsy using mHealth. This study found that all 17 Relais involved for mHealth implementation were male (100% of participants). We acknowledge that specific cultural reasons for this were not formally investigated. However, we can postulate that established gender roles in these rural communities may influence who volunteers for public facing roles such as health-related messengers and leaders.

We included 17 *Relais* supported by *ASCs*. In recent years, Mali's health system has expanded to deploy *ASC* in many larger villages in addition to the existing *Relais* in every village [20]. We initially planned to work only with *Relais*, but during the implementation phase, we came to understand that *Relais* sometimes have low-literacy rates and limited smartphone skills. This mHealth design was based on the concept that telemedicine is a method of healthcare delivery well suited for epilepsy care, where there is an insufficient supply of trained specialists, however, we found that some *Relais* still needed *ASC* support [25]. This support helped ensure optimal implementation of the study procedures and data collection, mitigating potential negative impacts on data quality and patient follow-up and highlight the need to consider this literacy and skills to used technologies in health.

In 95% of cases, the suspected epilepsy cases identified by the Relais were confirmed by the neurologist. This high concordance may reflect the *Relais*' strong familiarity with the screening questionnaire. This high capacity for screening by *Relais* could strengthen access to treatment for PWE in countries with limited resources, such as Mali. A study conducted in Rwanda reported a similarly high performance of *Relais* [21].

We believe *Relais* should form the basis for setting up a community-based epilepsy management program using mHealth tools, to bridge the gap between patients and neurologists and improve the traditional initiative of community-based epilepsy treatment [22]. For example, China has implemented community-based epilepsy care with mHealth components through The Going West Project, which has brought case studies, ward rounds, lectures, and consultations to over 40 remote areas in Western China [5]. Other initiatives, such as conferences, courses, and an annual epilepsy summer school, have trained thousands of physicians from various levels of the healthcare system [5].

A critical area for improvement in upcoming mHealth epilepsy initiatives is the addition of specific questions within screening tools to identify less severe and non-motor seizure types. The current screening tool focuses on overt symptoms like loss of consciousness and convulsions. However, other forms of epilepsy, such as absence seizures or focal aware seizures, can be more delicate and certainly missed by Relais and family members. Missing these cases leads to an underestimation of the true prevalence of epilepsy and, more importantly, leaves individuals with these seizure types without a diagnosis and necessary treatment, as the occurrences are often not documented as being epileptic in nature [23]. To implement this, the Epi-collect application could be modified to include validated screening questions for a broader range of seizure types, reflecting an updated understanding of seizure classification [24]. These questions would be carefully formulated in local languages, like Bambara, with pictorial aids to help *Relais* effectively question community members about less dramatic but equally significant epileptic events.

Furthermore, to improve diagnostic accuracy, future iterations of this mHealth program should aim to incorporate a portable electroencephalography (EEG) component. While the clinical confirmation rate by neurologists in this study was high at 95%, an EEG provides objective physiological evidence of epileptic brain activity, which is the gold standard for diagnosis. It is particularly crucial for confirming epilepsy in ambiguous cases or when trying to classify the specific epilepsy syndrome to optimize treatment. The primary barrier to EEG uses in rural settings is the lack of equipment and trained technicians. However, recent advancements have led to the development of low-cost, portable, and user-friendly EEG devices that have proven feasible for use in such resource-limited settings [25, 26]. In terms of implementation, trained *ASCs*, who generally have higher education levels than *Relais*, could be taught to apply the portable EEG headset. The recorded data could then be uploaded via the mHealth platform to the "telesante.ml" server for remote interpretation by a neurologist in Bamako. This task shifting approach, which has been successfully piloted with nurses and non-physician personnel in other parts of Africa, would not only enhance the diagnostic capabilities of the program but also provide a more complete model for decentralized epilepsy care [27].

During the follow-up period, we observed a gradual reduction in the number of patients with epileptic seizures. This reduction could be explained by the fact that patients complied well with their treatment because they could benefit from regular monthly follow-ups by the *Relais* and the neurologist (remotely). However, the incidences of seizures rose slightly in the 15th month. This increase was due to the reappearance of seizures in two of our patients following a drug shortage. To overcome this, any mHealth program for epilepsy management must operate within a robust anti-epileptic drug supply chain at the peripheral health system level. Drug shortages are a very practical challenge for the management of epilepsy across Africa. In Mali, during a community-based epidemiologic study, we observed that Phenobarbital, the primary anti-epileptic drug, was available in only 26 (14.9%) of the 174 surveyed health centres [28]. In this study we included the drug management component, the community health center drug store manager did send the drug stock information to M Helath plafform. However, to prevent drug stockouts, a key strategy is to enhance the "Epi-collect" mHealth platform with an integrated inventory management module. This will empower *Relais* to digitally report medication stock levels in real-time directly from the villages. The mHealth system can then be configured to automatically trigger SMS alerts to health canter staff and program managers when supplies fall below a critical threshold. This proactive notification system allows for timely replenishment before a stockout can occur, moving from passive data collection to active supply management.

Submission of monthly monitoring data on the platform varied between 93% and 100%. The lowest rates were recorded in November 2019 and July 2020. The lapses in November 2019 can be explained by the fact that we were at the very beginning of the study, and the *Relais* had not fully mastered sending data to the platform. Meanwhile, the July 2020 period corresponds to a time of fieldwork in rural Mali, which meant the *Relais* spent more time on their farming activities than on study activities during this period. In Mali, the health system distinguishes between salaried *ASCs* and unpaid *Relais*, it is essential to understand that for many individuals in both roles, community health work is not their unique job. Most rely on other activities, such as farming or local trade, for their primary livelihood. This highlights the need to think about the sustainability and adoption strategies by the communities to motivate *Relais*, which is very important for any community-based intervention [29, 30]. To better ensure study procedures are prioritized in the future, practical strategies need be implemented, including providing performance-based financial stipends, offering non-financial incentives like mobile phone credits for data transmission, and establishing community support for Relais' farming activities. Integrating these tangible motivation strategies from the outset is vital for the long-term sustainability and success of community-based health interventions like epilepsy and mHealth approach.

The majority (90%) of the PWE were satisfied with adhering to this decentralized treatment through coaching via the mHealth platform. After the project period, many of them tried to reach out to the study team through their *Relais* to get information on the treatment and continuous support. Our findings align with those of Mirpuri et al. (2021), who also found that a mobile intervention led to statistically significant improvements in both medication adherence and self-efficacy scores among PWE [17].

When integrated with the mHealth platform, the telephone serves as an effective tool for remote patient monitoring, providing patients with access to specialists as well as on-site screening and treatment under the supervision of *Relais*. However, in some cases, the effectiveness of this strategy may be limited by the education level of *Relais*, making support from CHWs essential for optimal implementation.

4.1 Limitations of the Study

One of the main challenges we faced was the coverage of the cellular networks in the study area. As a result, we could not consider certain features during the design stage. For instance, the *Relais* could not notify us about cases of death, drop-out, and loss to follow-up on the platform in a timely manner. Additionally, *Relais* struggled to report adverse events and monitor missing doses during follow-up. To mitigate these difficulties, we resorted to making direct telephone calls, as opposed to relying on data to submit information. Another difficulty we faced was the varying education levels of the *Relais*, which affected their ability to interpret the feedback messages accurately.

This study generalizability is constrained by its unique context in rural Mali, requiring significant local adaptation for future replication. We recognize that the regular monthly follow-ups may have introduced a Hawthorne or social desirability effect, potentially influencing the high rates of compliance and satisfaction reported by participants who knew they were being observed. However, we challenge that the clinically significant and objective reduction in seizure frequency provides strong evidence of genuine treatment efficacy beyond what can be attributed to self-reported data alone.

5 Conclusions

This study demonstrates the insightful effectiveness of leveraging an mHealth platform to empower community *Relais* to manage epilepsy in rural Mali. The *Relais* demonstrated a high capacity for screening, with neurologists confirming most suspected cases they identified. This innovative approach resulted in excellent patient outcomes, including a high retention rate over the follow-up period and statistically significant reduction in seizures. Most patients expressed satisfaction with this decentralized care model. While challenges such as mobile network coverage and varying literacy levels among *Relais* were encountered, the findings strongly support this mHealth strategy as a practical solution to bridge the healthcare gap, significantly improving access to and management of epilepsy for remote and hard-to-reach populations.

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Author contributions Conceptualisation, H.D., F.N.K.; O.S. ; Methodology, H. D ; F.N.K., M.K.; M.D.; Software, B.C.; Training, B.C., AK ; M.D., F.N.K. ; Validation, S.D., H.S., Y.I.C. ; Formal analysis, H.D ; M.K; S.D. O.S.; Investigation, H.D ; F.N.K., M.K., M.D., Resources, H.D ; B.C.; Data analysis, H.D ; F.N.K., M.K.; Copywriting - Preparing the original draft, H.D., F.N.K., M.K.; Writing, editing and publishing, H.D., D.M.T., Y.M.M.; MS; P.W. HF; Supervision, Y.I.C ; H.S ; Y.M.M.; S.D.; O.S.; Project administration, H.D.; Acquisition of financing, H.D.

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Data Availability The study team confirms that the essential data related to the findings are available within the paper. However, the datasets used for analysis can be obtained by sending email to the corresponding authors in line with our institution regulation of research data sharing.

Declarations

Ethics Approval and Consent to Participate The protocol was review and approved by the Ethical Committee of the University of Sciences, Techniques and Technologies of Bamako (Approval No. 2018/04/CE/FMPOS).
Community authorization was requested and obtained from the participating villages. All participants provided signed informed consent form prior to their inclusion in the study.
Administrative authorization was obtained from the Kolokani Health District Medical Officer.

Consent for Publication Not applicable to this study.

Competing Interests The authors declare no competing interests.

Disclaimer All authors were involved in the study implementation.

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