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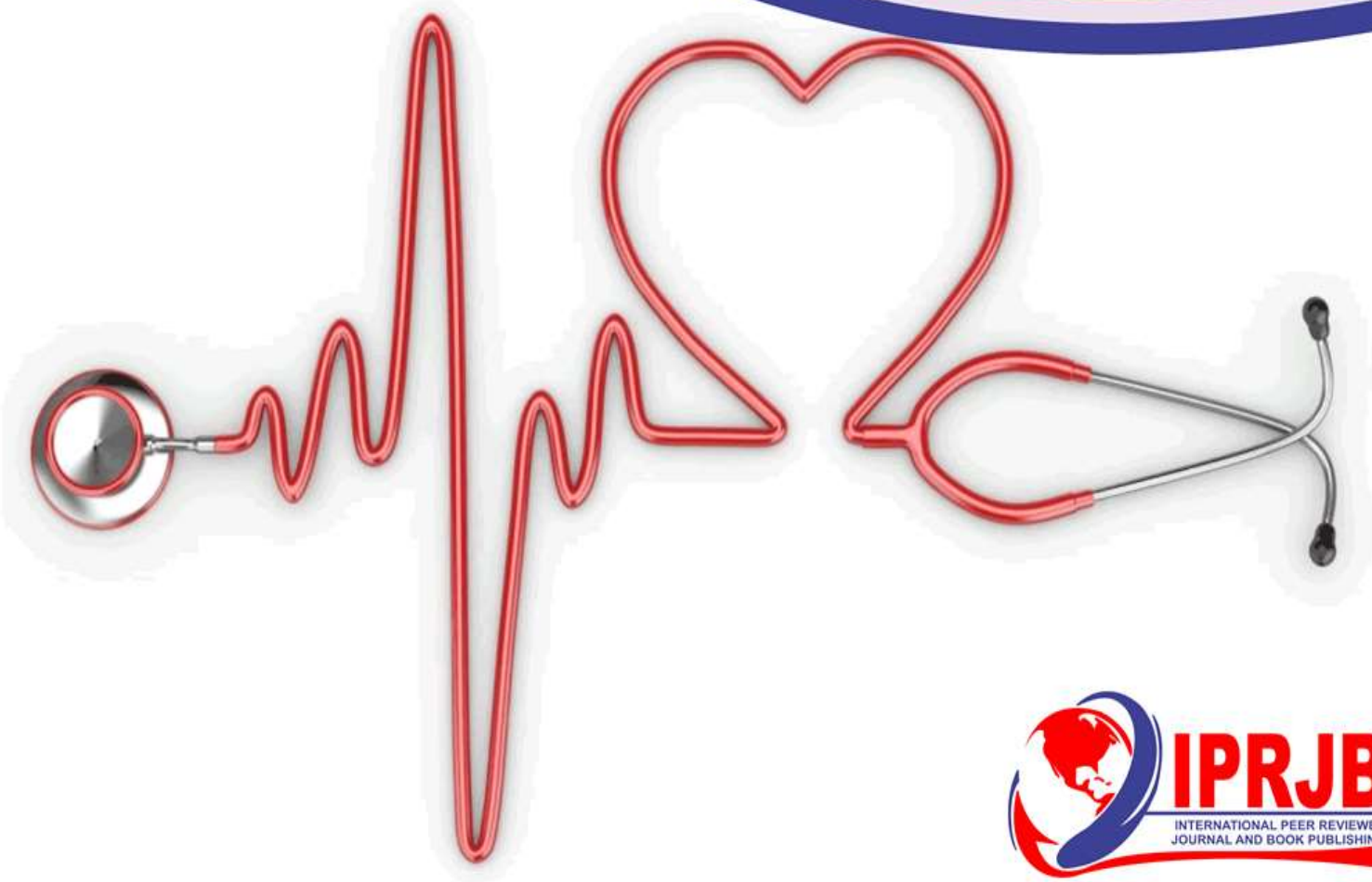

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CHPs Experiences with SMS Supported Diarrhoea Disease Case Management in Kakuma Ward, Kenya: A Qualitative Approach

Leticia Cindy Buluma[1*]
Department of Family Medicine, Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya

Prof. Isaac Mwanzo
Department of Family Medicine, Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya

Dr. Harun Kimani
Department of Family Medicine, Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya

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Abstract

Purpose: In low-resourced settings such as Turkana County, diarrhoeal disease is a leading cause of morbidity and mortality among children under five years of age (WHO.,2024). The burden of diarrhoeal disease is particularly high in settings with poor Water, Sanitation and Hygiene (WASH) conditions in arid and semi-arid (ASAL) areas, such as Turkana County (WHO, 2024). In Kenya, despite the critical role Community Health Promoters (CHPs) play as the first point of contact for caregivers at the community level in community case management of diarrhoeal disease under Kenya's Community Health Policy (2020–2030), knowledge gaps persist in maintaining consistent adherence to integrated community case management of diarrhoeal disease. While Short Message Service (SMS) mobile Health (mHealth) interventions have shown promise in bridging the knowledge gap by reinforcing knowledge in community case management of common childhood diseases. The effectiveness of SMS-supported interventions in low-literacy settings remains limited (Greve et al., 2022). Kakuma Ward in Turkana West Sub-County was purposively selected for its population dynamics and the burden of diarrhoeal disease. This study addressed CHPs gaps in community case management by documenting the experiences and perceived impact of an SMS intervention on community case management of diarrhoeal disease. The findings are expected to benefit CHPs, caregivers of children under five, Sub-County Health Management Teams (SCHMT), and mHealth program designers working in similar low-resource settings.

Methodology: This study was underpinned by the Social Cognitive Theory and the Capability, Opportunity, Motivation - Behaviour (COM-B) model. The Social Cognitive Theory is described in Bandura's book, The Social Foundations of Thought and Action (Bandura, 1986), and the COM-B model is a behavioural framework by Michie et al (Michie et al., 2011). Data was collected through focus group discussions with caregivers (n = 16) and CHPs (n = 32) and Key Informant Interviews (n = 6) with Community Health Officers and Assistants within four community units in Kakuma Ward. The FGD and KII transcripts were analysed using the six phases of thematic analysis outlined by Braun and Clarke (2006). Thematic saturation was reached across all participant groups.

Findings: Participants in the study viewed the SMS messages as a way to reinforce existing knowledge on community case management of diarrhoeal disease, build confidence as they perform their roles in the community, and support decision-making when they visit households with children under 5 years of age who have diarrhoeal disease. The SMS supported intervention was associated with improved recognition of danger signs and improved community case management practices, through increased use of Oral Rehydration Salt (ORS) and zinc as standard commodities for managing diarrhoea among children under 5 years of age at the community level.

Unique Contribution to Theory, Practice and Policy: SMS supported interventions should integrate literacy inclusive features, such as interactive voice response and pictorial aids, with in-person training. Supportive supervision by Community Health Assistants (CHAs) and a reliable supply of ORS and Zinc should also be emphasised in mHealth community health programs. Future longitudinal qualitative research is recommended to assess the behavioural sustainability and knowledge retention across different literacy levels among CHPs in mHealth programs in low-resource settings.

Keywords: *SMS, Diarrhea, Community Case Management, Community Health Promoters, Social Cognitive Theory, COM-B*

JEL Classification Codes: *I12, I15, I18*

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INTRODUCTION

According to the United Nations Inter-Agency Group for Child Mortality Estimation (2026), diarrhoeal disease is the third leading cause of mortality and morbidity after pneumonia and preterm birth complications for children under five worldwide. ASAL regions such as Turkana County have far higher disease burdens. In addition to waterborne diseases spreading more easily in ASAL settings, the burden of diarrhoeal disease is increased by limited access to basic healthcare and safe water, as well as inadequate use of latrines (KDHS, 2022). The prevalence of diarrhoea disease among children under five in Turkana County is 17.6%, compared to the national average of 14.3%. The WASH situation is equally worrisome. Fewer than half of the population in Turkana County (42%) have reliable access to safe water, and just 9% have access to adequate sanitation (KDHS, 2022). Community-driven approaches, such as having Community Health Promoters (CHPs) manage childhood diseases at the community level, make a real difference in the early management and referral of diarrhoea cases among children under five. The Kenya Community Health Policy 2020 - 2030 highlights the roles of CHPs in providing households with health education on managing diarrhoea with ORS and zinc, and advising caregivers on when to refer children under 5 to the nearest health facility for common community diseases such as diarrhoea. The gap in adherence to iCCM guidelines on case management of diarrhoeal disease is not always easy to address. A lot of times, it comes down to CHPs not getting enough training or support.

According to Bassi et al. (2018), mobile health interventions are increasingly being considered as approaches in improving the effectiveness of community health systems, though the evidence base is limited in scope SMS supported mHealth interventions have been used to deliver health information to CHPs, given the high mobile phone penetration (Sowon et al., 2022). Despite existings quantitative evidence from Sub-Saharan Africa showing improved knowledge and practice among CHPs using mHealth interventions (Kayode-Alabi et al., 2024), there is limited qualitative evidence on the mHealth experiences of CHPs in low resourced settings. In Low and Middle Income Countries, mHealth interventions, such as SMS, have demonstrated effectiveness in increasing uptake of child health services (Kachimanga et al., 2024b). Previous studies focused on urban, peri-urban, and health facility settings, where literacy levels, mobile network connectivity, and mobile network connectivity are comparatively higher than in ASAL resource constrained settings. Evidence from mHealth interventions suggests a predominance of quantitative designs in measuring outcomes without adequately explaining how SMS influences CHPs' knowledge and practice (Sowon et al., 2022). There is limited knowledge from studies on SMS supported implementation among CHPs managing diarrhoeal disease in nomadic ASAL communities in Kenya. Studies by Kachimanga et al. (2024b), who examined mHealth adoption among CHPs in rural Malawi, and Chi et al. (2023), who assessed CHP knowledge and practices in Cameroon, did not assess SMS acceptability or effectiveness within the Integrated Community Case Management (iCCM) framework for the management of diarrhoeal disease. The current study addresses these gaps by providing contextual evidence on SMS supported diarrhoea case management in Turkana County.

Statement of the Problem

Although mHealth interventions, such as SMSs, have shown positive health outcomes in urban and peri-urban settings, there is limited evidence of their effectiveness among populations with low literacy levels. In terms of literacy, Turkana County lags much behind the rest of Kenya. According to the results of the 2022 Kenya Demographic and Health Survey, 41% of men and

59% of women aged 15 to 49 in Turkana County lack formal education. That stands in sharp contrast to the national statistics, which show that only 3% of men and 6% of women in Kenya lack formal schooling. It is difficult to overlook the gap. There are many barriers, including, but not limited to, low literacy rates, nomadic populations, language barriers, and inadequate mobile phone networks. These barriers affect how SMSs are used and how they are responded to. This evidence gap raises questions about the suitability and effectiveness of mHealth interventions in other contexts, a major barrier to implementing them in these settings.

Theoretical and Conceptual Framework

This study was based on the Capability, Opportunity, Motivation Behaviour (COM-B) model (Michie et al., 2011). The model is a simple way to understand why people do what they do, and how larger systems influence their decisions. In low resourced settings such as Turkana, COM-B explains how external factors influence behaviour, especially through Opportunities. The idea is that individuals behave according to what they can do, what their environment permits them to do, and what motivates them. Capability, opportunity and motivation in the COM-B model shape people's behaviour. The Opportunity component in the model highlights contextual barriers, such as ORS and zinc stockouts, unreliable network, insufficient supervision, and poor infrastructure. These issues all affect how well SMS-supported community case management is implemented and whether people actually use it.

The Social Cognitive Theory (SCT) (Bandura, 1986) was used in this study to assess the internal and interpersonal mechanisms that influence behaviour within the COM-B model, particularly within the Capability and Motivation components. SCT assumes that behaviour, the social environment, and cognitive processes shape human behaviour (Bandura, 1986). This study drew specifically the four SCT constructs: self-efficacy, behaviour, observation and reinforcement. Self-efficacy explained how CHPs managed diarrhoea disease in children under 5 years of age within the constraints of their environment. Behavioural competence is the knowledge and skills needed to engage in a behaviour and concerns the extent to which SMS messages improved CHPs' knowledge of case management for diarrhoeal disease. And reinforcement addressed the intersection between SMS as a tool for delivering knowledge. Finally, in the context of low literacy, CHPs relied on peer interactions to learn through SMSs and applied it accordingly, a process that formed the basis of observational learning.

COM-B provided the structural foundation for understanding behaviour change in this context. At the same time, SCT offered a microlevel explanation of how Capability and Motivation are developed and sustained among CHPs. The COM-B model and SCT framework provided an integrated approach to gathering evidence on CHPs' experiences with SMS-supported community case management of diarrhoeal illness. While SCT described the internal and social processes of CHPs, COM-B captured the broader and systemic limitations on those processes.

METHODOLOGY

Study Design

The researcher used a qualitative approach to examine participants' experiences with SMS supported community case management for diarrhoeal disease. The qualitative approach was part of a wider quasi-experimental mixed-method study.

Description of the Intervention

Based on Kenya's national Integrated Community Case Management (iCCM) guidelines and the Kenya Community Health Policy 2020–2030, the researcher designed the SMS intervention

in collaboration with Community Health Assistants and the Turkana County Department of Community Health. The SMSs focused on the key messages that CHPs need to effectively manage diarrhoeal disease in children under five at the community level. These SMSs included messages on identifying signs and symptoms of diarrhoea; determining the severity of dehydration; correctly preparing and administering Oral Rehydration Salts (ORS) and zinc supplementation; practising hygiene and water safety; and early referral of diarrhoea cases to the nearest health facilities for further management by a health care provider. To ensure the accessibility of the SMSs and accommodate the literacy levels of the CHPs, the SMSs were translated and delivered in English, Kiswahili and Nga' Turkana. The Ministry of Health community health unit registry provided the personal mobile phone numbers of CHPs to whom SMS messages were sent during the study's six month intervention period. Over the six months, CHPs received SMS messages in a three week cycle: four SMSs in week one, six SMSs in week two, and five SMSs in week three. The three week cycle continued throughout the intervention period. Each CHP received approximately 145 SMS messages.

Study Setting

The study was conducted in four community health units, Nadapal, Natiir, Komudei, and Nakoyo, in Kakuma Ward, Turkana West sub-county, Turkana County, Kenya. Kakuma ward is characterised by a high incidence of diarrhoeal disease, inadequate health infrastructure, and a heavy reliance on community based health service delivery.

Study Population and Sampling

Participants in the study included Community Health Officers and Assistants, CHPs, and caregivers of children under five. CHPs who had served their communities for more than two years in operational community health units, received diarrhoeal case management SMS messages during the six month intervention period, and owned mobile phones were included in the study. Using Ministry of Health monitoring tools (MOH 513, 516, 515, and 100) to identify homes with children under five who had documented cases of diarrhoea in the month before the data collection, caregivers were chosen from households linked to the sampled CHPs. The functional community health units to which the sampled CHPs were linked served as key informants.

Data Collection

FGDs and KIIs were conducted in person using semi-structured guides. After the six-month SMS intervention, the FGD and KII guides were used to assess participants' knowledge, behaviours, and experiences regarding community case management of diarrhoeal disease. KIIs assessed the experiences of key informants responsible for CHP supervision, which included Community Health Assistants. Depending on the participants' preferred language, all conversations and interviews took place in either NgaTurkana or Kiswahili. The discussions and interviews with participants were audio-recorded, transcribed, and thematically categorised for analysis.

Data Analysis

Braun and Clarke's (2006) six phase thematic analysis approach was used to analyse the qualitative data. The steps included familiarising with the data, generating initial codes, searching for themes, reviewing the themes, defining and labelling themes, and preparing the final report. After developing codes from participants' responses, the codes were categorised

and themed in accordance with the study's goals. The principal researcher used a codebook that was applied uniformly to all transcripts for analysis.

Researcher Positionality and Reflexivity

In this study, the researcher had two roles: first, to design and implement the six-month SMS intervention; and second, to collect qualitative data on participants' experiences with the intervention. This dual role as a researcher and intervention architect is recognised as a potential source of bias, particularly on the social desirability of participant responses and the researcher's personal stake in the intervention's results. To reduce the researchers' bias, data collection was deliberately conducted around participants' honest experiences, including obstacles and limitations. Both favourable and non favourable experiences were. To promote transparency in the analysis process, the researcher kept a reflecting notebook during data collection and analysis, documenting interpretative choices and instances of interpretive ambiguity. Also, a subgroup of CHAs who served as Research Assistants participated in participant verification, reviewing emergent themes and offering input on how well interpretations represented their experiences.

Reliability

The study's reliability was evaluated using Lincoln and Guba's (1985) framework. Lincoln and Guba's framework outlines credibility, transferability, dependability, and confirmability as the main areas to consider when assessing reliability. By documenting experiences from the three participant groups that included caregivers, CHPs, and key informants, triangulation increased the study's trustworthiness. This made it possible to identify and contrast the various viewpoints and experiences held by the groups. The researcher assistant's experience in Kakuma reduced the likelihood of miscommunication. To ensure that interpretations represented their experiences, a subset of CHPs and CHAs were given access to emergent themes as part of the member vetting process. This study provided a detailed description of the study setting, participant characteristics, intervention design, and data collection procedures. The results were contextualised within the ASAL conditions of Turkana County. The researcher documented methodological decisions, changes, and explanations for theme development and coding. The researcher utilised reflective journaling to record assumptions, new interpretations, and areas of analytical doubt to determine the extent to which the findings were influenced by the facts rather than the researcher's bias. When no new codes or themes emerged from further FGDs and interviews with all participant groups, saturation was considered reached.

Ethical Considerations

The researcher obtained ethical approval from the Kenyatta University Ethical Review Committee, the National Commission for Science, Technology and Innovation, the Ministry of Education and the Ministry of Health in Turkana County. Confidentiality was maintained throughout the study period, and Informed consent was taken from all the study participants.

RESULTS

Following the six-month SMS intervention, this study examined the experiences of caregivers and Community Health Promoters regarding community case management of diarrhoeal illness. Six KIIs (n = 6), four FGDs with CHPs (n = 32), and two FGDs with caretakers (n = 16) were all done by the researcher and the research assistants. Thematic analysis revealed contextually rich themes across all three participant groups, indicating improvement in

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community case management practices for diarrhoeal illness, as well as in knowledge and confidence.

Five themes emerged from caregiver focus group discussions: increased knowledge and awareness; better case management of diarrhoeal illness at the home level; increased confidence and decision-making; implementation barriers; and perceptions and acceptability of the SMS intervention. CHP discussions generated ten themes highlighting improvements in case management alongside structural and knowledge-related challenges. KIIs reflected system-level themes related to CHP capacity, the burden of diarrhoea, and the perceived impact of the SMS intervention.

Table 1: Thematic Analysis across Caregivers, Community Health Promoters (CHPs), and Key Informants

Theme	Caregivers (n=16, FGDs)	CHPs (n=32, FGDs)	Key Informants (n=6)
Improved knowledge and awareness	Improved understanding of causes, symptoms, and prevention	Knowledge is largely reinforced rather than newly acquired	Improved awareness observed among CHPs and caregivers
Recognition of danger signs and dehydration severity	Identification of danger signs and severity	Improved identification of severe cases	Improved assessment and classification reported
Changes in diarrhoea management practices	Increased use of ORS and zinc; improved hygiene and referral	Existing practices reinforced	Improved case management practices observed
Enhanced confidence and decision-making	Increased self-efficacy in managing diarrhoea	Improved confidence in case management and caregiver engagement	Increased confidence observed among CHPs
Barriers to implementation	Illiteracy, resource constraints, and access challenges	Literacy, language, technology, and community-level barriers	Literacy and training gaps identified
SMS as a reinforcement tool	Supports and reinforces existing knowledge	Widely perceived as a reminder rather than training	Reinforces prior training, but is insufficient alone
Perceptions and acceptability of SMS	Generally positive and considered useful	Widely accepted among CHPs	Positive but influenced by literacy levels
Community-level impact	Improved hygiene and management of diarrhoea in under-fives	Improved caregiver adherence to diarrhoea management	Improved management practices reported
Persistence of home remedies	Continued use when ORS/zinc is unavailable	Acknowledged but less prominent at endline	Traditional practices persist
Knowledge gaps in iCCM/IMNCI	—	Limited application of protocols	Gaps in the application of practices reported
Health system and structural constraints	Limited resources affect implementation	Need for training, supervision, and support	Systemic constraints identified
Preference for blended interventions	Preference for visual support tools	Preference for physical training and local language use	Integration of SMS with training is recommended

Perspectives from Caregivers of Children under Five

Five themes emerged from the thematic analysis of caregiver FGD responses: (1) better understanding and awareness of diarrhoea management; (2) better household diarrhoea management practices; (3) improved confidence and decision making; (4) implementation barriers; and (5) perceptions and acceptability of the SMS intervention.

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Theme 1: Improved Knowledge and Awareness of Diarrhoea Management

After CHP's household visits reinforced with the SMS content, caregivers reported a better understanding of the causes, symptoms, and prevention methods of diarrhoea.

"CHPs… teach us that diarrhoea is caused by drinking contaminated water and eating contaminated food. (FGD1, R2)"

"After receiving SMS messages, CHPs address us on the signs and symptoms of diarrhoea and how to manage it by giving ORS and zinc. (FGD1, R5)"

"Signs of dehydration include dry mouth, sunken eyes, decreased urine output… and in severe cases, shock. (FGD1, R8)"

"People were not maintaining hygiene, but for now, people are told to keep the environment and things clean. (FGD2, R1)"

Theme 2: Improved Diarrhoea Management Practices at the Household Level

Caregivers reported changes in treatment and referral practices when caring for a child with diarrhoeal disease.

"When the child is infected with diarrhoea, you give the child ORS and zinc. (FGD1, R5)"

"I provided both ORS and zinc… the child's recovery was faster than I had expected. (FGD2, R4)"

"You refer a child to a health facility if the diarrhoea becomes more severe. (FGD1, R8)"

"If the child has sunken eyes… severe dehydration is being referred immediately. (FGD2, R3)"

"Since the CHP educated me, I always prioritise hygiene maintenance. (FGD1, R6)"

Theme 3: Enhanced Confidence and Decision-Making

Caregivers expressed increased confidence and improved decision making in managing diarrhoeal cases among their children.

"Yes, I am confident… I am able to assess diarrhoea and manage it by administering ORS and zinc. (FGD1, R1)"

"Since the intervention of SMS messages for CHPs, I have been able to have more confidence in managing my child when he has diarrhoea. (FGD2, R5)"

"It reminds me that when a child starts vomiting and diarrhoea, I should give ORS and zinc immediately. (FGD2, R1)"

Theme 4: Barriers to Implementation

Caregivers identified barriers that affected the implementation of recommended diarrhoea management practices.

"Due to illiteracy… I usually look for people who know how to read and interpret for me the writings on medicine, especially ORS. (FGD1, R3)"

"Lack of equipment for cleaning compounds and inadequate water in the community. (FGD1, R2)"

"Home remedies are always used in the absence of ORS and zinc. (FGD2, R4)"

Theme 5: Perceptions and Acceptability of the SMS Intervention

Caregivers expressed generally positive perceptions of the SMS messages, particularly as reinforcement tools for CHPs.

> *"They are really helpful since they make you remember what you have to do. I read some from the CHP who visited my house. (FGD1, R3)"*
>
> *"The ones that the CHP used when she visited my house were easy to understand. She read them to me and showed me how to mix ORS. (FGD1, R2)"*
>
> *"SMS messages are good for reminders, not for training. (FGD1, R5)"*
>
> *"I prefer that I could also receive the same SMS the CHPs received in the Kiswahili language. (FGD1, R8)"*

Perspectives from Community Health Promoters (CHPs)

Ten themes emerged from the thematic analysis of Community Health Promoters FGD responses: (1) Perceived stability in diarrhoea causes; (2) Increased confidence in diarrhoea management; (3) Limited change in community case management practices; (4) Limited knowledge and use of iCCM; (5) Improved recognition and referral of severe cases; (6) Availability of essential commodities; (7) Barriers to effective implementation; (8) SMS as a reminder rather than a training tool; (9) Better community practices and outcomes; and (10) Preference for integrated and localized intervention approaches.

Theme 1: Perceived Stability in Diarrhoeal Causes

CHPs showed a consistent understanding of the causes of diarrhoea, attributing the disease mostly to poor food handling, contaminated water, and poor hygiene. According to the Social Cognitive Theory concept of behavioural competence, this pre-existing body of information served as the basis for SMS reinforcement. We are aware that contaminated water and poor household hygiene are the main causes of diarrhoea.

> *"We know that diarrhoea comes from dirty water and poor hygiene around the home."*

Theme 2: Increased Confidence in Diarrhoea Management

After being exposed to SMS communications, CHPs reported feeling more confident when handling cases of childhood diarrhoea. Their increased self-efficacy, as proposed by Bandura (1986), was demonstrated by their capacity to interact with caregivers and manage cases involving children under five.

> *"Since receiving SMS messages, I have gained confidence when handling children under five."*

Theme 3: Limited Change in Core Treatment Practices

According to CHPs, the SMS intervention supported rather than introduced basic treatment practices, particularly the use of zinc and ORS. According to both SCT and the COM-B model, this pattern is consistent with SMS serving as a behavioural reinforcement mechanism.

> *"We advise caregivers to use ORS and zinc… this is what we were taught, and the SMS reminds us."*

Theme 4: Limited Knowledge and Use of iCCM/IMNCI

Several CHPs stated that they were unable to fully implement the iCCM protocols, particularly with respect to age-based zinc dosing and the grading of dehydration severity. This gap

highlights the need for supplementary in-person training, as it is an issue that SMS only reinforcement cannot resolve.

"I know how to give ORS, but the dosage for zinc for different ages is sometimes not clear to me."

Theme 5: Improved Recognition and Referral of Severe Cases

SMS-reinforced knowledge translated into improved clinical decision-making at the household level, as CHPs reported increased capacity to assess severity and make appropriate referral decisions.

"Now I can tell when a child needs referral."

"When a child has sunken eyes and is not drinking, I know it is time to refer."

Theme 6: Strong Availability of Essential Commodities

CHPs stated that ORS and zinc were generally available in their community units, which made it easier to put SMS reinforced information into practice. The 'Opportunity' component of the COM-B model, which states that sufficient physical resources facilitate behaviour change, is reflected in this research.

"ORS and zinc are available at the health facility, and I give them to families when I visit."

Theme 7: Persistent Barriers to Effective Implementation

The biggest barrier to CHPs' interaction with SMS content was literacy. Inequalities within the community health workforce resulted from CHPs with low literacy relying on peers or supervisors to interpret communications.

"I cannot read… I have to ask someone to interpret."

"Some of us have to ask the CHA to read the SMS for us and explain the meaning."

Theme 8: SMS as a Reminder rather than a Training Tool

It was constantly stated that SMS's function was to reinforce pre-existing knowledge rather than to deliver new knowledge. CHPs made a clear distinction between formal training obtained through Ministry of Health channels and the SMS approach. This perception supports the intervention's design aim and is consistent with the SCT construct of reinforcement.

"SMS is good for reminders but not for training."

"Training should also be done physically."

Theme 9: Improved Community Practices and Outcomes

Thanks to their interactions with caregivers and SMS reinforced information, CHPs noticed improvements in community hygiene habits and a decrease in the incidence of diarrhoea.

"Now people maintain hygiene, and cases have reduced."

"Caregivers are more willing to listen when I visit because they know I have current information."

Theme 10: Preference for Integrated and Contextualised Intervention Approaches

The integration of SMS with practical exercise, supervision, and materials in local languages was strongly preferred by CHPs. One recommended substitute for CHPs with low literacy was voice-based messaging.

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"They were easy to understand and usually arrived during work days."

"If the messages were read aloud in NgaTurkana, even those who cannot read would benefit."

Perspectives from Key Informants

Four themes emerged from the thematic analysis of KII responses, which reflected system level perspectives on CHP capacity, the impact of the SMS intervention on service delivery, and structural factors influencing implementation: (1) better community case management and CHP knowledge; (2) better adherence to diarrhoea management guidelines; (3) persistent structural and capacity gaps; and (4) suggestions for integration with training and supervision.

Theme 1: Improved CHP Knowledge and Community Case Management Practices

After the SMS intervention, key informants reported improved case management and increased CHP awareness at the home and community levels.

"Over the last few months… CHPs have been able to identify and refer cases of diarrhoea in children under five. (CHO)"

"They have improved in assessing and classifying dehydration levels and identifying signs of diarrhoea. (CHA)"

Theme 2: Improved Adherence to Diarrhoea Management Guidelines

Key informants observed a steady improvement in CHPs' compliance with iCCM guidelines, particularly regarding ORS, zinc administration, and proper referral procedures.

"CHPs are starting to use iCCM guidelines… just using the knowledge from the SMS trainings. (CHO)"

"They can administer ORS and Zinc and even refer severe cases to the health facility. (CHA)"

Theme 3: Persistent Structural and Capacity Gaps

Key interviewees frequently emphasised that literacy limitations prevent CHPs from independently engaging with SMS information and that SMS alone is insufficient to address fundamental knowledge gaps.

"Many CHPs are illiterate and need physical training. (CHO)"

"They usually accept, and even if it is helpful to them, some CHPs who are not good at reading visit me for a better understanding of the content in the SMS. (CHO)"

Theme 4: Recommendations for Integration with Training and Supervision

To maximise impact, key informants all suggested combining SMS with in-person instruction, encouraging monitoring, and community-level feedback systems.

"The use of SMS has contributed to better hygiene and management of diarrhoea cases based on the referrals we get for children under five… (CHO)"

"But for the full benefit, the messages should come alongside proper training. (CHO)"

Discussion

The findings, drawn from the experiences of CHPs, caregivers and key informants, offer insights into the role of SMS within the wider architecture of community health. The SMS messages were largely reminders rather than providing new information, reinforcing existing

knowledge, building CHP confidence, and supporting decision-making. The results therefore suggest that SMS-supported learning is not a stand-alone training tool but a support tool that improves CHPs' understanding of case management of diarrhoeal disease. This finding is consistent with Social Cognitive Theory, which maintains that previously learned behaviours are reinforced and sustained by contextual cues, such as regular SMS reminders (Bandura, 1986). It is also in line with research showing that, rather than being used separately, mHealth tools have the greatest impact when they are integrated into current health professionals' workflows to strengthen capacity (Kachimanga et al., 2024; Odendaal et al., 2020). Caregivers reported higher rates of ORS and zinc use, better recognition of danger signs, and earlier care-seeking behaviour. These downstream effects were evident at the household level, indicating that SMS reinforcement was implemented through CHPs' involvement during household visits. These results, which are in line with the COM-B model, show how increased capacity and drive, combined with the opportunity provided by regular community interaction, produce quantifiable improvements in diarrhoea cases (Michie et al., 2011).

However, the study also revealed significant drawbacks to SMS-based reinforcement. SMS reminders alone are insufficient to overcome basic training deficiencies, as evidenced by persistent knowledge gaps, particularly regarding zinc dosage and the classification of dehydration severity. These results are consistent with research showing that community-level knowledge of diarrhoea management remains inadequate throughout East Africa (Abate et al., 2024) and that CHPs' knowledge gaps persist in areas with little to no structured, supervised training (Chi et al., 2023). A particularly important moderating element was literacy: whereas almost one-third of CHPs relied on peers or supervisors for interpretation, those with higher literacy levels interacted more directly and independently with SMS content. This emphasises an aspect of mHealth design that is frequently disregarded and demonstrates the "physical capability" constraint found in the COM-B model (Michie et al., 2011). Implicitly assuming a minimum literacy barrier puts interventions at risk of being inaccessible to a sizable section of the target user base, which could increase rather than lessen disparities in the health workforce (Greve et al., 2022; Kachimanga et al., 2024a). These results highlight the necessity of inclusive mHealth designs that, especially in low-literacy ASAL environments, accommodate different literacy levels through peer-supported content delivery and visual aids (Kachimanga et al., 2024a; Greve et al., 2022). Despite these drawbacks, all participant groups, including CHPs, caregivers, and key informants, reported that the SMS intervention was highly acceptable. This is in line with data from similar LMIC settings where mHealth tools have been well received when perceived as relevant and accessible (Karim et al., 2023; Odendaal et al., 2020).

Limitations

Although the qualitative approach was relevant for gathering participants' experiences, the approach did not allow for causal inference or quantitative assessment of the intervention's effect on diarrhoea outcomes. Because of the context-specific approach in Kakuma Ward, the results were limited in their relevance to areas with different literacy levels or health system design. Also, the six-month intervention timeframe limits the assessment of long-term sustainability of knowledge gains or behavioural changes. To facilitate an open interpretation of the results, these limitations are acknowledged and should guide the creation of subsequent assessments.

Conclusion

SMS-supported interventions can strengthen existing knowledge of diarrhoeal case management, support better decision-making by CHPs during household visits, and contribute to community case management of diarrhoeal disease. The findings from this study demonstrate that SMS functions primarily as a reinforcement tool. Its greatest impact can be realised when integrated with in-person refresher training, consistent supportive supervision, reliable commodity supply, and literacy-friendly delivery methods.

Recommendations

The following precise and useful suggestions are put forth in light of the study's findings:

For mHealth developers and program designers:

- Create SMS interventions with literacy inclusive forms, such as interactive voice response systems and voice-based messages, to guarantee fair access for all CHP employees in environments with varying reading levels. Group reading sessions at the community health unit level and pictorial job aids should be investigated as complementary distribution methods.

For Sub-County Health Departments and Health System Managers

- Combine SMS supported interventions with structured in-person refresher training and supportive supervision to fill in fundamental knowledge gaps that SMS cannot fill on its own, especially in zinc dose and dehydration severity categorisation. To facilitate the interpretation and use of SMS content, the CHP supervision model should be specifically utilised.
- As a prerequisite for SMS supported behavior change, make sure that commodities, especially zinc and ORS, are consistently available within community units.

For Future Studies

- Future qualitative research should adopt longitudinal designs to track behavioural changes over time, knowledge retention, and the sustainability of practice changes among CHPs following SMS interventions.
- Studies should specifically assess the differential impact of SMS interventions on CHPs with varying literacy levels in order to develop evidence-based, literacy-stratified delivery strategies for community health worker mHealth programs in low-literacy settings.

Appendix A: Interview and Focus Group Discussion Guides

The following semi-structured guidelines were used to collect data from each participant group. During administration, questions were translated into NgaTurkana and Kiswahili to reflect the language and setting.

A.1 Caregivers Focus Group Discussion Guide

- What do you know about the causes of diarrhoea disease in children under five?
- Since the SMS project started, have you noticed any changes in the way CHPs communicate about preventing and managing diarrhoea for your child?
- How do you handle diarrhoea in your child at home? What has changed?

- How confident are you in controlling diarrhoea at home? What makes you more or less confident?
- What are your obstacles in following CHP advice?
- What are your thoughts on the SMS messages that CHPs received? Were they helpful?

A.2 Focus Group Discussion Guide for Community Health Promoters

- Do you understand the causes, signs, and treatment of diarrhoea in children under five?
- How has the SMS intervention improved your understanding and confidence in managing diarrhoea?
- Have you observed any changes in your practice since getting SMS messages?
- What challenges do you experience while utilising SMS knowledge?
- Do you regard SMS messages as training, reminders, or something else?
- What improvements would you suggest for the SMS program?

A.3 Key Informant Interview Guide: Community Health Officers and Assistants

- How has the SMS intervention impacted CHPs' knowledge of diarrhoea disease?
- In the community health units you oversee, how have caregiver practices in the management of diarrhoea disease changed?
- What effects have system-level or structural factors had on the effectiveness of the SMS intervention?
- What are your thoughts on SMS message design and delivery?
- What recommendations would you make to improve SMS-supported CHP programs?

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