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Barriers and Challenges to Adherence to Seasonal Malaria Chemoprevention Treatment in the Selingué Health District in 2023: An Implementation Research Study

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Abstract **Original Research Article**

Introduction: Seasonal malaria chemoprevention [SMC] is a key malaria control strategy in Mali targeting children aged 3–59 months and has been extended to children aged 59–120 months in four health districts of the Sikasso region. However, implementation gaps have been reported, potentially affecting adherence to the treatment regimen. This implementation research aimed to identify barriers to SMC adherence in the Selingué Health District and to propose actionable recommendations. ***Methods:*** A qualitative study was conducted in September 2023 using semi-structured interviews with SMC implementers and focus group discussions involving community leaders, health workers, and community health volunteers. Data were audio-recorded, transcribed, and analyzed thematically. ***Outcome***: Barriers to adherence were identified across three domains: [i] organizational, including misalignment of the campaign period, lack of supervision of follow-up doses, and limited communication strategies; [ii] socio-cultural, including household decision-making dynamics, strong maternal involvement with limited paternal support, and competing agricultural activities; and [iii] trust-related, including mistrust of health workers and medicines driven by rumors. ***Conclusion***: Strengthening adherence to SMC requires improved, context-sensitive communication, trusted community-based actors, and enhanced supervision of follow-up doses. Meaningful community engagement is critical to address misconceptions and sustain adherence.

Keywords: Implementation research; Barriers; Seasonal malaria chemoprevention adherence; Selingué, Mali.

1. INTRODUCTION

Malaria cases have increased globally, reaching 249 million cases in 2022, with a 6% increase in mortality in 2022 compared with 2019; 78% of malaria-related deaths occurred among children under five years of age [1]. In Mali, the malaria incidence rate increased from 133‰ in 2018 to 172‰ in 2022, and from 224‰ to 250‰ among children under five years of age [2]. In response to this public health challenge, the World Health Organization [WHO] has recommended Seasonal Malaria Chemoprevention [SMC] since March 2012 as a complementary strategy to existing malaria prevention measures. Mali has been implementing this strategy nationwide since 2016 [3]. SMC consists of the monthly administration of a combination of sulfadoxine–pyrimethamine and amodiaquine [SP + AQ] to children aged 3 to 59 months during the high malaria transmission season, for up to four cycles per year [4].

During the four campaign rounds, this strategy targeted 3,736,648 children aged 3 to 59 months and 235,902 children aged 60 to 120 months, achieving a coverage rate of 98% in the pilot health districts of Selingué, Kadiolo, and Koutiala [5]. For SMC to have a sustained impact on malaria control, high coverage must be achieved and maintained over several transmission seasons [6,7]. In Mali, although community acceptance of SMC is generally high, adherence to the last two doses of the regimen [Days 2 and 3] remains a major challenge [8].

These challenges are multifactorial and include limited access to certain localities due to insecurity, insufficient interpersonal communication by healthcare workers regarding the importance of completing the full treatment cycle, underestimation of the SMC target population, and the absence of effective mechanisms to monitor the home administration of the second and third

doses of amodiaquine [2,8]. Additional factors such as forgetting to administer the medication, lack of time, or the absence of mothers or caregivers have also been reported by those responsible for administering the drugs at home, contributing to poor adherence to the SMC regimen [9].

In the Selingué Health District, SMC targets children aged 0 to 120 months, and coverage rates exceed the national average [5,10]. Nevertheless, the district continues to experience challenges related to treatment adherence, which justified the present study aimed at identifying the barriers and obstacles to adherence to the SMC treatment regimen in the district.

2.1. Conceptual Framework

Within the context of implementation research [11], analysis of the SMC implementation process indicates that, despite high coverage rates achieved during SMC campaigns, several factors may negatively affect adherence to the SMC treatment regimen. These include geographical inaccessibility, insufficient social mobilization and caregiver retention during drug distribution visits, inadequate management of drug-related adverse events, and poor community perception of SMC, among others [12,13].

In practice, although the first dose of SP/AQ is supervised by the distribution team, there is limited assurance that the prescribed SMC treatment schedule particularly the administration of doses on Days 2 and 3 is fully respected. To achieve optimal effectiveness of SMC, the attitudes of parents or caregivers, as well as sustained support from implementation actors, are essential.

2. METHODS

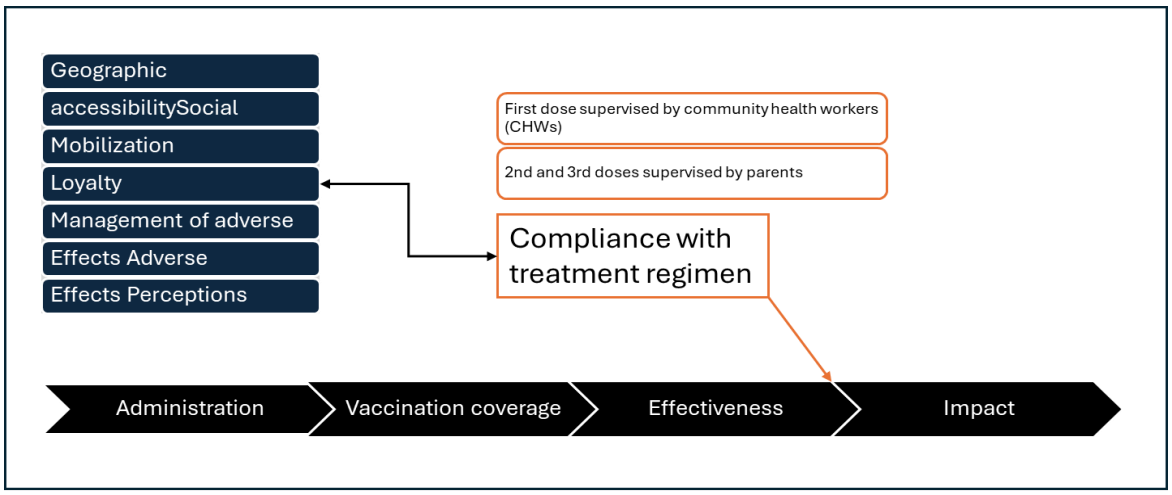

Figure 1. Analysis of adherence to the seasonal malaria chemoprevention treatment regimen within the implementation process in the Selingué Health District.

2.2. Study Setting

The study was conducted in the Selingué Health District, located in the Sikasso Health Region of Mali. This district was selected because, as a pilot district, SMC targeted children aged 0 to 10 years and achieved coverage rates higher than the national average [14].

2.3. Study Design and Period

This study was conducted as part of implementation research [IR]. A qualitative design was adopted, based on semi-structured individual interviews and focus group discussions. Data collection took place from September to December 2023. The study involved SMC implementation stakeholders at the district level as well as influential community leaders.

2.4. Data Collection

Investigators received refresher training on qualitative research approaches and were organized into pairs for individual interviews and into teams of three for focus group discussions. An exhaustive list of key stakeholders involved in SMC implementation was established, and appointments were scheduled at the convenience of consenting participants.

2.4.1. Individual Interviews

Paired investigators, equipped with an audio recorder and a semi-structured interview guide, conducted face-to-face interviews. One investigator recorded participants' responses, while the other took notes and prompted follow-up questions. A total of eight individual interviews were conducted with key SMC implementation actors in the district. These included the Sub-Prefect, the District Medical Officer [DMO], the Head of the Local Department of Social Development and Solidarity Economy, the Mayor, the President of the Women's Association, the District Malaria Focal Point, the Health Information System [HIS] Officer, the

President of the Local Federation of Community Health Associations [FELASCOM], the President of Technical Center Directors, and the President of the Youth Association.

2.4.2. Focus Group Discussions

Two focus group discussions, involving eight and ten participants respectively, were conducted in the Binko and Tièguoècourouni health areas of the Selingué Health District. Interviews were held in a setting prepared specifically for the activity. During each session, one investigator facilitated the discussion using the guide, a second recorded the discussions, and a third took notes. The discussions were interactive, with probing questions used to further explore participants' perspectives.

Participants included the President of the Community Health Association [ASACO], the village chief hosting the community health center, a community health worker [CHW], two community volunteers [male and female], a representative of religious leaders, a representative of women, a school principal, and two influential community members [male and female]. An initial rapid transcription of the discussions was conducted on-site and subsequently used to support in-depth transcription. Collected data were transmitted to the Data Manager progressively throughout the data collection process.

2.4.3. Community Diagnosis

A one-day community diagnosis was conducted in one of the pilot municipalities [Tagandougou], covering three health areas [Binko, Tièguoècourouni, and Sogondjan]. The activity coincided with the weekly market day. Participants included men and women of various age groups without distinction. The data collection team comprised four investigators from the research team, the Selingué referral health center, the Department of Social Development and Solidarity Economy, the Technical Center Director, and the ASACO President. A semi-structured guide was administered, and data were collected through video and audio recordings, complemented by note-taking.

2.5. Data Analysis

The multidisciplinary research team was responsible for data analysis. Verbatim transcription of all recorded interviews and discussions was performed, supported by field notes taken by investigators. During in-depth content analysis, relevant segments were defined as units of analysis in accordance with the study objectives. These units were organized into themes and sub-themes. Using a triangulation approach across participants' narratives [15], key themes were synthesized and interpreted, supported by illustrative verbatim quotations.

2.6. Ethical Considerations

The research protocol was submitted for approval to the Ethics Committee of the National Institute of Public Health of Mali. Participation in the study was voluntary. Written or verbal informed consent was obtained from all participants, who were free to withdraw from the study at any time without any consequences. Confidentiality of the information was ensured. Focus group participants received compensation in the form of a flat-rate allowance to cover transportation costs and refreshments.

3. RESULTS

3.1. Opportunities Facilitating SMC Implementation

According to stakeholders, the opportunities facilitating SMC implementation in the Selingué Health District arise from a combination of environmental, social, and institutional factors. Community acceptability strengthened by the involvement of local actors and awareness-raising through community-based channels such as local radio represents a major lever for campaign success. In addition, the commitment of local political and health authorities provides essential logistical and moral support. Finally, the tangible impact of the campaign, reflected in reductions in hospitalizations and mortality, contributes to a positive perception of SMC and may encourage sustained adherence.

3.1.1. Environmental Context Favorable to SMC

Several implementation stakeholders highlighted that environmental conditions in the district create a favorable setting for SMC campaigns, including:

- High malaria incidence: Malaria peaks during the rainy season, and SMC is therefore perceived as essential to reducing malaria-related child mortality.
- Climatic and infrastructural conditions: The rainy season, combined with inadequate infrastructure [insufficient drainage systems] and the presence of a dam, promotes mosquito proliferation and reinforces the need for preventive interventions.

"The malaria peak coincides with the rainy season, when mosquitoes proliferate […] so these drug distribution campaigns help prevent malaria cases." *Local administrative official*

3.1.2. Community Acceptability of SMC and Local Participation

Stakeholders emphasized the acceptability of SMC within communities, which is supported by:

- Trust in community-based health workers: Drug administration by health workers recruited from within the community is a key factor in SMC acceptability, as communities place greater trust in individuals they know and with whom they share social ties.

- Involvement of youth and community leaders: The participation of local actors, such as youth leaders and women's leaders, enhances family adherence to SMC.

"We trust people who are close to us more than outsiders. The acceptability of SMC really comes from the fact that it is our own relatives who administer the medicines." *Local government representative*

3.1.3. Institutional Support and Engagement of Local Authorities

According to participants, institutional support and authority engagement are based on:

- Political and administrative support: The campaign benefits from the involvement of local authorities [Sub-Prefect, religious leaders, RECOTRADE, FELASCOM], ensuring effective coordination and alignment of all stakeholders within the district.
- Engagement of health authorities: The availability and active involvement of the District Medical Officer and the district management team strengthen the credibility of the campaign and enable rapid response to emerging needs.

"There is strong engagement from political and administrative authorities […] and the entire district health management team is available." *SMC implementation stakeholder*

3.1.4. Existing Awareness-Raising and Communication Mechanisms

These mechanisms include:

- Use of local media: Community radio is widely used to disseminate information about SMC. The local radio host plays a key role in message dissemination, ensuring that information reaches even remote areas.
- Support from ASACO members and the steering committee: Although ASACO does not directly participate in drug distribution, it plays a major role in community sensitization, thereby strengthening community engagement.

"The efforts of locally recruited distributors are an opportunity, combined with the involvement of community radio, especially the presenter who supports us." *Technical Director of a Community Health Center*

3.1.5. Reduction in Healthcare Costs and Hospitalizations

Perceived benefits of SMC for local communities included:

- Positive financial impact: SMC campaigns have contributed to a reduction in malaria cases, lowering household healthcare expenditures and reducing hospital admissions. Health facilities have also reported fewer severe malaria cases, indicating a positive campaign effect.
- Prevention of child mortality: By reducing malaria incidence, SMC helps prevent child deaths within the community.

"Deaths and malaria-related hospitalizations have decreased in the community." *Healthcare worker at the Referral Health Center*

3.1.6. Availability of Human Resources and Key Actors

Efforts made during SMC implementation include:

- Participation of key health actors: The availability of local health professionals, such as Technical Center Directors [TCDs] and healthcare staff, is a major asset for implementation. Their presence ensures timely response to emergencies and continuity of care.
- Efforts of locally recruited distributors: Recruiting distributors from within communities fosters direct community involvement and strengthens continuity and trust.

"There are many opportunities supporting these SMC campaigns; key health actors are always available whenever needed." *Social Development and Solidarity Economy official*

3.2. Barriers and Challenges

Stakeholder discussions revealed several factors limiting adherence to the SMC treatment regimen. The main challenges are analyzed below, with illustrative excerpts from participants' narratives.

3.2.1. Organizational barriers and challenges

- Campaign timing: The late start of SMC campaigns in July instead of June increases the likelihood of encountering children already ill with malaria. When eligibility criteria are not respected, more pronounced adverse effects may occur, leading parents to refuse administration of subsequent doses. In addition, the limited distribution period, combined with the rainy season, reduces the presence of parents [particularly mothers] and children in households during distributor visits, thereby limiting adherence. Many children are absent during first-dose distribution, and health workers lack sufficient time to revisit households.

  "It is impossible to reach everyone during the five-day campaign period." *SMC implementation actor*

  "If we could reduce malaria cases starting in June and July, we would record fewer cases of non-adherence and fewer early deaths." *Case management officer at the Referral Health Center*
- Unsupervised second and third doses: Responsibility for administering follow-up doses rests entirely with parents, without direct

supervision by health workers. This often results in non-compliance, with unused or discarded medicines found in households. As a result, treatment effectiveness is compromised due to limited understanding of the importance of the last two doses.

"It is very important to take time to explain to mothers instead of just distributing medicines and leaving." *School official*

- Inadequate communication strategies: Awareness messages broadcast via television and radio are often poorly followed, as these media are not regularly accessed by many mothers. Messages are sometimes standardized and insufficiently adapted to local contexts. Drug distribution is occasionally conducted rapidly, without clear explanations of treatment importance and effects, leading to limited understanding of SMC benefits and regimen adherence.

  "Strengthening community-based communication could help […] information delivered by someone from within the community builds more trust." *SMC implementation actor*

  "Awareness-raising must be adapted to the context; otherwise, people will listen but not understand the message." *Local elected official*

3.2.2. Sociocultural Barriers and Challenges

- Occupation: A large proportion of the population is engaged in agriculture, fishing, or livestock farming, leading to frequent mobility particularly during harvest periods and prolonged parental absence from households. This mobility complicates access to children for timely dose administration.
- Social organization: Mothers are primarily responsible for child health, but their numerous domestic and social responsibilities hinder strict adherence to the SMC regimen. Without the involvement of fathers or household heads, follow-up doses may be neglected, reducing treatment effectiveness.

  "The involvement of mothers alone is not enough; household heads must also be involved to ensure doses are properly administered." *Women's leader*

3.2.3. Security-Related Barriers [Mistrust]

- Mistrust toward healthcare workers: Communities express mistrust toward health workers, partly fueled by rumors of collaboration with foreign organizations. While medicines may be accepted under pressure, this does not guarantee adherence to the full regimen.

  "Many people really do not trust health workers; they are not reassured by the care provided." *Youth leader*

- Mistrust toward medicines: The free provision of SMC medicines raises doubts about quality and safety. Mild side effects [e.g., vomiting, chills] are often misinterpreted as signs of danger, reinforcing reluctance to complete treatment. Rumors further exacerbate concerns.

  "They believe these medicines cause anemia in children and other illnesses." *Local government representative*

- Mistrust toward the SMC process: Some parents question the effectiveness of SMC, misunderstand the concept of prevention, or perceive SMC as a foreign intervention rather than a national policy. These perceptions contribute to poor adherence, evidenced by unused medicines found in households.

  "Previously, false information circulated in the community […] claiming that these campaigns aimed to make our children sick." *Local elected official*

3.3. Proposed Strategies to Improve the SMC Treatment Regimen

Several strategies to improve SMC treatment adherence emerged from stakeholder and community discourse:

- Introduction of community-based radio programs: Local radio broadcasts should be co-hosted by local health staff [DMO, Head of SLDSES, or TCD] to explain SMC objectives and benefits and address community concerns.
- Early campaign initiation in June and expansion from four to five rounds: Early initiation before malaria outbreaks may reduce adverse effects associated with administering drugs to undiagnosed malaria cases.
- Household follow-up visits on Days 2 and 3 by community volunteers: Volunteers familiar with families should verify or assist with administration of follow-up doses.
- Involvement of fathers in medication follow-up: As household heads responsible for healthcare expenditures, fathers' engagement supports household economic stability and adherence.
- Financial support for ASACO during SMC campaigns: Strengthening ASACO mobilization teams would enable sustained community engagement.
- Training and involvement of influential community members in sensitization: Trained ASACO members, community volunteers, drug distributors, traditional leaders, and trusted individuals should lead awareness activities.
- Improvement of drug palatability: Enhancing taste is essential to improve acceptance among children.

4. DISCUSSION

This study analyzed the barriers and facilitating factors influencing adherence to the Seasonal Malaria Chemoprevention [SMC] treatment regimen based on narratives from SMC implementation stakeholders and community actors. The findings highlight a complex interaction of organizational, sociocultural, and

communication-related factors shaping treatment adherence. These results are consistent with evidence from other countries implementing SMC in sub-Saharan Africa, particularly in the Sahelian region where this strategy is widely deployed [16].

Organizational Barriers

Organizational constraints particularly those related to the timing, duration, and structuring of SMC campaigns emerged as major determinants of non-adherence. The national strategy, which schedules four SMC rounds over five-day periods between July and October, does not fully align with local malaria transmission dynamics, where initial cases may occur at the onset of the rainy season. Administering SMC drugs to children already infected with malaria may increase the perceived occurrence of adverse events, thereby undermine parental trust and reduce the likelihood of completing the treatment regimen [7,16]. Similar challenges have been reported in Burkina Faso, Niger, and northern Nigeria, where delayed initiation of SMC campaigns has been associated with reduced coverage and adherence [7,17]. Evidence from Burkina Faso indicates that initiating SMC prior to the first transmission peak improves preventive effectiveness and family adherence [12]. The World Health Organization also emphasizes that appropriate timing of SMC is critical to maximizing impact and minimizing adverse events [16]. Furthermore, the short duration of each round limit's opportunities for complete coverage and follow-up, particularly in rural areas that are difficult to access during the rainy season. Studies conducted in Chad and Burkina Faso have shown that overly brief distribution windows reduce opportunities for catch-up visits and supervision of follow-up doses, thereby contributing to incomplete adherence [12].

Sociocultural Barriers

The sociocultural barriers identified in this study reflect dynamics widely observed across West Africa. Although mothers are primarily responsible for administering SMC doses, decision-making power within households largely remains with fathers or household heads. This gendered distribution of roles has been documented in Mali, Burkina Faso, and Nigeria, where limited male involvement constitutes a barrier to adherence to child health interventions, including SMC [9,12]. Population mobility linked to agropastoral activities [agriculture, fishing, livestock farming, artisanal mining] also represents a major obstacle. Similar findings have been reported in Niger and northern Ghana, where seasonal migration leads to children's absence during SMC campaigns and complicates household follow-up [18,19]. These results underscore the need to adapt SMC implementation strategies to local socioeconomic realities rather than relying solely on static distribution models. In contrast to studies highlighting the influence of religious beliefs on the acceptability of preventive interventions [20], religion did not emerge as a significant barrier in this study, emphasizing the importance of context-specific analyses.

Communication-Related Barriers

The communication challenges identified are consistent with those reported in the SMC literature. Although mass media campaigns are commonly used, this study found that standardized messages disseminated via national radio or television have limited reach and effectiveness among rural populations. Several studies conducted in Burkina Faso, Niger, and Senegal demonstrate that community radio and locally recognized communicators significantly improve understanding, credibility, and acceptability of SMC-related messages [12,21,22]. The findings of the present study confirm a preference for proximity-based communication delivered by trusted community actors. Insufficient interpersonal communication during drug distribution constitutes another key factor contributing to non-adherence. Multicenter evaluations have shown that distributors often prioritize logistical aspects over explaining treatment regimens and potential adverse events [21]. Koko *et al.,* reported that communication was largely focused on retaining SMC cards, while information on side effects was rarely addressed [9]. Similar gaps were identified by Diarra *et al.,*, who emphasized that inadequate explanations foster mistrust and premature discontinuation of treatment [23].

Policy Adaptation and Consideration of Local Context

Beyond operational and sociocultural barriers, this study highlights structural limitations related to insufficiently clear definition of SMC objectives and limited adaptation of strategies to local contexts. International experiences suggest that greater flexibility in campaign planning regarding timing, number of rounds, and communication modalities enhances community ownership and improves treatment adherence [8]. Comparative analyses across multiple countries indicate that SMC campaign models tailored to local specificities contribute substantially to program success [24,12].

Implications for SMC Implementation

Overall, the barriers to SMC adherence observed in the Selingué Health District are not isolated but reflect systemic challenges shared by many countries implementing this strategy. Addressing these challenges requires an integrated approach that goes beyond the biomedical framework and combines epidemiological data, sociocultural understanding, and participatory communication strategies, in line with World Health Organization recommendations [16].

CONCLUSION

This implementation research conducted in the Selingué Health District demonstrates that adherence to the Seasonal Malaria Chemoprevention [SMC] treatment regimen is hindered by a combination of organizational,

sociocultural, and communication-related barriers. Delayed initiation of campaigns, limited duration of distribution rounds, lack of systematic supervision of follow-up doses, and misalignment between the SMC calendar and local malaria transmission dynamics compromise full treatment adherence. Improving adherence therefore requires strengthened community-based communication, increased involvement of community actors and fathers, and greater flexibility in campaign planning.

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