

Original Research Article

Strategies to improve uptake of the RTS, S malaria vaccine in a malaria endemic area of Western Kenya

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ABSTRACT

Background: The World Health Organization (WHO) recommended the first malaria vaccine, RTS, S in October 2021 to prevent malaria in children in sub-Saharan Africa. However, sub-optimal vaccine uptake, especially the 3rd and 4th doses has been reported. This study engaged key stakeholders involved in vaccine delivery in Muhoroni sub-county of western Kenya to evaluate strategies that can improve vaccine uptake.

Methods: A purposive sampling method was used to select participants for focus group discussions (FGDs) and key informant interviews (KIIs). Four FGDs were conducted with caretakers whose children either completed or did not complete the recommended 4 doses of the vaccine or did not take any dose, and 1 FGD with 11 community health volunteers (CHVs). The KIIs involved 11 nurses in charge of maternal and child health (MCH) clinics. Interview guides were used for the FGDs and KIIs. Data was analyzed thematically using NVIVO software version 12.

Results: Majority of the participants suggested engaging CHVs, community outreaches, community dialogues, sending reminders through short message services (SMSs) and use of local radios and/or television as possible strategies to improve vaccine uptake.

Conclusions: Strategies such as enhanced CHV engagement, adoption of technology and improved communications were regarded as suitable ways of improving the uptake of RTS, S malaria vaccine.

Keywords: Malaria vaccine, Caretakers, CHVs, Strategies

INTRODUCTION

In 2022, there were an estimated 249 million malaria cases and 608,000 deaths worldwide with sub-Saharan Africa accounting for 94% of cases and 95% of deaths.¹⁻³ In 2020, Kenya reported an estimated 27 million cases and 12,600 deaths due to malaria.⁴ Malaria prevalence in children aged 6 months to 14 years in the Lake endemic zone in Kenya was 19% against a national prevalence of 6%.^{5,6} The prevalence is still high despite Kenya implementing several malaria control strategies.⁷

The World Health Organization (WHO) recommended two malaria vaccines, RTS, S and R21 Matrix-M for malaria prevention in children living in moderate to high malaria transmission areas.^{8,9} This recommendation was based on evidence obtained in a large phase 3 trial and a malaria vaccine pilot implementation programme (MVIP) conducted in Ghana, Kenya, and Malawi.^{10,11} The MVIP showed that RTS, S vaccine was safe, feasible to implement through routine immunization programs, and was associated with a 22% reduction in incidence of hospitalization with severe malaria, 17% reduction in

hospitalization with a positive malaria test and a 13% reduction in all-cause mortality.² At a time when reduction of the global malaria burden has stalled, addition of RTS,S malaria vaccine to the existing interventions is a major milestone and has the potential to save thousands of lives each year.^{12,13}

The dosing schedule of the malaria vaccine consist of 3 doses given at least four weeks apart starting at around 5 months of age and booster dose at around 12-18 months after the 3rd dose. The public health impact of the malaria vaccine will be dependent on attaining high coverage of all the four doses.¹⁴ However, the coverage of the third and fourth doses has been sub optimal.^{15,16} In the MVIP, the coverage of the first three RTS, S doses was between 73 and 79% in Ghana, Kenya and Malawi, while the coverage of the third and fourth dose was between 62 and 66% and 32%.¹⁰ Earlier studies reported similar low coverage of the third and fourth doses of RTS, S vaccine. In a study conducted in 2021 in Sunyani Municipality in Ghana, the uptake of RTS,S dose 1 was 94.1%, but this figure reduced to 90.6% and 78.1% for dose 2 and 3 respectively against a WHO target of 90%.¹² Although data on coverage of the 4th dose was not reported in this study, the decrease in 3rd dose coverage is concerning.¹² A recent cross-sectional study conducted in Muhoroni sub-county, western Kenya reported a coverage of 59%, and 31% for the 3rd and 4 doses respectively, which was significantly lower compared with coverage of routine childhood vaccines such as the third dose of diphtheria, tetanus and pertussis (DPT3) vaccine, which was 87% in 2022.¹⁰ Evaluation of strategies that could improve the uptake of the last two doses of the malaria vaccines will be crucial in achieving full benefit of this life saving intervention. The aim of the current study was to engage key stakeholders involved in delivery of vaccines to evaluate and suggest possible strategies that can improve the uptake of the malaria vaccine in a malaria-endemic area of western Kenya.

METHODS

Study design

This study used an exploratory study design. focus group discussions (FGDs) and key informant interviews (KIIs) were conducted with purposively selected respondents. The respondents for the FGDs consisted of community health volunteers (CHVs) and three categories of caretakers - those whose children completed the recommended four doses of the malaria vaccine, those whose children received less than the recommended doses and those whose children did not receive the malaria vaccine. The respondents for the KIIs consisted of nurses in charge of the maternal child health (MCH) clinics. The venue for the data collection was the respective health facilities where the caretakers were accessing routine health services, in a secluded room with minimal interferences, and at the offices of nurses. The data collection process was iterative, involving continuous recording, translation, transcription, and interpretation of data.

Study area

The study was conducted in Muhoroni sub-county in Kisumu County, western Kenya (Figure 1). The sub-county is located 50 kilometres east of Kisumu City and is one of the seven sub-counties in Kisumu. Muhoroni is a mostly rural area, with a total population of 154,116 individuals. Sugarcane and rice farming, small-scale trading and fishing are the main economic activities in the area. The region is swampy and prone to flooding during the rainy season. Malaria transmission in the area is perennial with an annual peak in May to July during the long rainy season.¹⁸ Malaria prevalence in Muhoroni sub-county is estimated to be around 18%.¹⁹

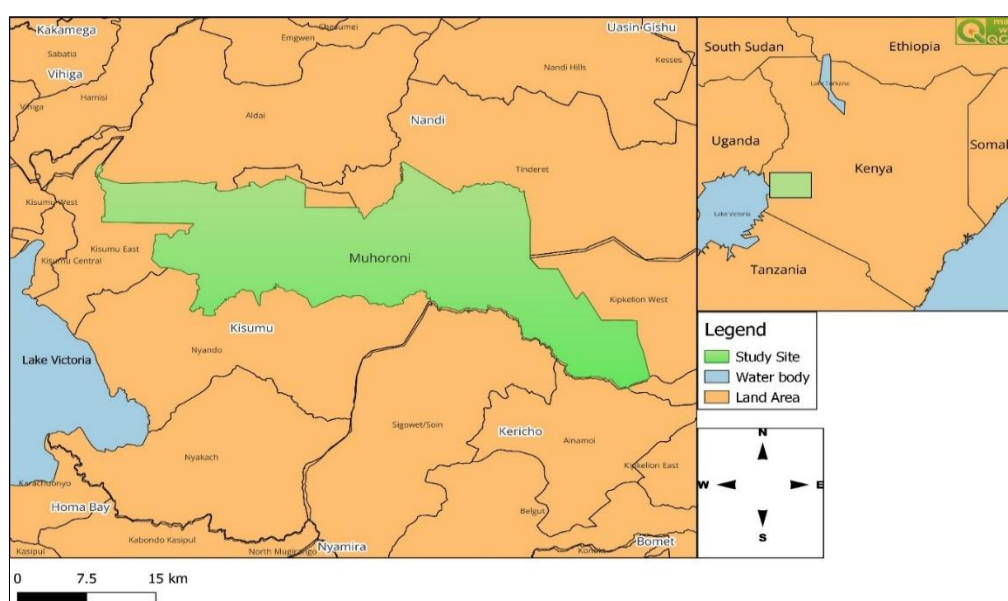


Figure 1: Map of Muhoroni sub-county.

Study population

The study population consisted of 25 caretakers, 10 caretakers whose children completed the recommended 4 doses, 6 caretakers whose children did not complete the recommended 4 doses, 9 caretakers whose children did not receive any RTS, S dose, 11 CHVs and 11 nurses in charge of MCH services where childhood vaccines are administered.

Data collection

Data was collected using structured FGD and KII guides in the month of September 2023. Interviewers consisting of social scientists (MO, IA), and research assistants (PO, EA, GO, PO) were trained on data collection. Interview tools were piloted in the adjacent Kisumu East sub-county. The tools were reviewed and adjusted appropriately before the start of data collection. Interview sessions were audio recorded and moderated by the interviewers.

Data analysis

Thematic analyses were used in data analysis. Analysis was primarily deductive and inductive and audio recordings were transcribed and translated from the local language into English. The qualitative transcripts were coded for themes that arose from the data and then grouped into different families of related themes. This was then followed by a line-by-line micro-analysis using open coding. The codes were then assembled into potential themes and a thematic chart was developed in MS Word. The themes were compared across the transcripts and the different groups, to establish the range and similarities of the participants' perceptions and views. We coded interviews and discussions and came up with a single codebook that was used in the analysis. We used NVivo software (QSR International) version 12 for analysis.

RESULTS

Socio-demographic characteristics of study participants

Out of the 36 caretakers invited for the group discussions, 11 of them did not turn up. All the caretakers who participated in FGDs were female except one (24/25), and the majority were between the ages of 20-39 years and most (18/25) had completed primary school education. Twelve CHVs were invited for a FGD, however, 1 did not turn up. There was a mixture of females and males CHVs who participated in the FGDs (7 females and 4 males). All the 11 healthcare providers who participated in the KIIs were female aged between 20 and 50 years and all of them had tertiary education. All the nurses had tertiary education.

Strategies to improve RTS, S uptake

The strategies discussed during the interviews included community barazas, community dialogue, community

outreaches, engagement of CHVs and any other strategies that that could improve the uptake of the 4th dose of malaria vaccines.

Community barazas

The sub-theme community barazas explored the respondent's views on partnering with the local administration to give health education and sensitize the community about malaria vaccines. The caregivers and the CHVs reported that they had heard about community barazas but very few had attended any.

The respondents mentioned that community barazas nowadays hardly happen unless it is from a special authority such as the County Commissioner. Community barazas were not deemed to be an option in the strategies to improve RTS, S uptake since very few people attend barazas.

"They are just a few unless there is something bad that has happened in the community, that is when the DC calls for a baraza to discuss but those barazas for educating villagers were stopped, those that were being held every Friday were stopped." Male 35 years, caretaker.

Another parent reported that not everyone was invited to the community barazas and the invitation depended on the content and the target group.

"They usually invite people based on age. They look for the age group they want to attend the baraza. Not everyone." Female 37 years, caretaker.

Very few healthcare providers acknowledged ever attended Barazas. Some thought the attendance was good while others reported that the attendance was poor. Some reported that most of the people attending the community barazas were men and women rarely attended.

"Attendance is not usually good, when I compare the numbers with when I started working those days a long time ago when the chief could call for a baraza almost everyone would come, nowadays very few people attend." Female 53 year, CHV.

Some of the respondents agreed that the community barazas could be good avenues to talk about the malaria vaccine, and healthcare providers should be allowed to use the platform.

Others felt that the information should be given by the community leaders for the message to have some form of authority and to be trusted by the people.

"Yes, it will help because you know the people surrounding them entrusted them with that position, so they have a very big influence on those people so when they are involved, the uptake will be a little bit higher." Female 26 years, nurse.

Table 1: Sociodemographic characteristics of the participants.

Category	Three FGD for caretakers whose children			One FGD for CHVs	KIIs for Nurses in charge of MCH clinics
	Completed the recommended 4 doses	Did not complete the recommended, 4 doses	Did not take any RTS,S vaccine	CHVs	None
Gender					
Female	9	6	9	7	11
Male	1	0	0	4	0
Age (in years)					
20-29	4	3	3	0	1
30-39	3	3	4	3	3
40-49	3	0	2	5	5
50 and above	0	0		3	2
Level of education					
Primary	5	4	9	Not asked (NA)	0
Secondary	4	2	0	NA	0
Tertiary	1	0	0	NA	11

Community dialogue

KII and FGDs on community dialogue explored awareness and participation in community-based dialogue activities and the possibility of using them as a strategy to improve uptake of the malaria vaccines. Caretakers and CHVs were aware of the community dialogue and had attended. Attendance of community dialogue was mentioned to be good especially when refreshments were provided. Community dialogue was used mostly during the COVID-19 pandemic but the current study, the forum focused on health challenges and were mostly addressed by the CHVs.

"I have only heard one by the CHVs. They usually just organize and call people. And then they teach people." Female 37 years, caretaker.

Equally, healthcare providers were aware of and had attended community dialogues which were held quarterly. The respondents described community dialogue days as a key entry point to the community and considered them better than the chiefs' barazas. There were contrasting views on attendance at community dialogue activities whereby some respondents thought they were good while others thought that the attendance was poor, unless there were incentives such as refreshments.

Furthermore, some respondents noted that mobilization was necessary when one needed a larger audience, but challenges such as availability of transportation means were barriers when the mobilizers needed to move around to mobilize members of the community.

"The turnout was good and things that were being discussed in this meeting were concerning the community and the facility." Female 44 years, caretaker.

Other respondents agreed that the avenue of community dialogue could be used to pass information about the malaria vaccine.

"Yeah, so it would be an idea that would help us just to bring to their attention that there is this thing, there is this malaria vaccine and we are not doing well about it and it's because of A, B, C, D and then you let them acknowledge that malaria is a problem and if we don't want more of our children to fall sick then they should come for immunization". Female 37 yrs, nurse.

In some instances, healthcare providers carried and administered the vaccines during community dialogue days.

"This one we usually have occasionally. During those dialogue days, we go with the vaccines. Those who have children, we can vaccinate them." Female 36 yrs, nurse

Community outreach

Most of the respondents agreed that community outreaches could be used to improve the uptake of the malaria vaccines. Most of the respondents were aware of community outreach, had participated in some and could be a good forum to inform the community about the importance and the availability of malaria vaccines.

"When there is an outreach, it helps us understand the benefits of the malaria vaccine. The people who didn't know, get to know. Some people don't know about it well." Female 41 years, CHV.

Healthcare providers mentioned that outreaches can be a good strategy to reach inaccessible areas and bringing health services including vaccines closer to the community thus improving vaccine uptake.

“When we do outreaches, we get more numbers than when we wait in the facility.” Female 41 years, nurse.

Funding and maintaining the cold chain during outreaches were cited as major challenges especially when the venue for the outreach was far from the health facility.

“You are going out there with the malaria vaccine, where is your immunization site? Mostly we are going you are not even supported in terms of even a structure, maybe it’s under a tree, how are the temperatures? Are you giving the child a potent vaccine or its water? You understand? So, issues of potency come in, so for me, these outreaches should be where the vaccine safety is taken care of, in the static stations that is taken care of because then you have a chain of packs, the cool packs, the cool cold chain packs.” Female 43 years’ nurse.

Engaging CHVs

Engagement of CHVs to improve uptake of malaria vaccines was familiar to most of the respondents. Most of the caretakers and CHVs agreed about the role of the CHVs in facilitating malaria vaccine uptake. The CHVs were familiar with the households in their catchment area and most of them were already involved in promoting the uptake of routine childhood vaccines. In addition, healthcare providers acknowledged that engagement of the CHVs in vaccine uptake was already ongoing. Part of the CHV work involved the identification of children due for immunization at the community level and referring them to the health facility and creating awareness about vaccines.

“We can use the CHVs to spread awareness on the vaccine because most people don’t go to the market. So, if they don’t go to the market, they cannot know about this. So, the CHV can easily move door to door spreading awareness about the vaccine.” Female 29 years, nurse.

“Maybe just with a referral because they cannot give vaccines themselves. So, the best thing is to refer a child who hasn’t gotten.” Female 30 years, nurse.

Another one is the creation of awareness of the existence of the vaccine, this one we can do through the CHVs or even the campaigns.” Female 26 years, nurse.

Other strategies

There were two additional strategies mentioned by responders that could improve uptake of malaria vaccines.

Use of short message services (SMSs) and/or phone calls

Respondents reported that there is a digital system that links MCH with CHVs and sends a SMs reminder to a CHVs when a child is due to immunization. However, this has challenges since some caretakers give wrong phone numbers.

“Everyone has a phone and receives messages. We can receive notifications on the phone so that it reaches everyone. So, if the CHV announces it, it is sent on the phone, radio, it can be good.” Female 46 years, caretaker.

“That digital platform can remind the CHV that today, this child is due for the clinic, it’s reminding the CHV; this child in your [interruption]. This child in your community is due for the clinic. So, it is the CHV to follow up that that client was in the clinic. So, when the client has gone to the clinic, then the CHV should be able to update, yeah. But one gap that we have there is that the platform is working so well, but it is not complete because the CHV has that alert, but the CHV can also just click that alert and say that the client has gone without physically going to see that the client has gone to the clinic.” Female 51 years, nurse.

The use of mainstream media such as radio and television

Most of the respondents thought that strategies such as using local radios and TVs to create awareness about malaria vaccines could improve the uptake. They suggested that this should be consistent and not only for some period.

“Another way to remind people about the vaccine is through local Radios and Television, we are reminded to take our children for a malaria vaccine, if a mother hears this, then she checks her next visit date for the child not to miss”. Female 29 years, caretaker.

DISCUSSION

This study identified possible strategies that can be used to improve the uptake of the RTS, S malaria vaccine. From the different strategies discussed with stakeholders, involvement of the CHVs, supported community outreaches and use of technology such as SMS, local TV and radios were suggested as good strategies that can improve the coverage of the RTS, S malaria vaccine. However, there were mixed opinions about the use of community dialogues, issuing of LLINs during dose 4 and chiefs’ barazas.

Most participants agreed that CHVs are very essential in health service promotion and can have a great impact in creating awareness about the vaccine and reminding caretakers to take their children for vaccination.³ Since CHVs have household data, engaging them to remind the caregivers about the malaria vaccine when their children are due very important and could potentially improve the uptake. Most of the healthcare providers mentioned that this is the work that CHVs are already doing, however, they need support in terms of proper and continuous training about the vaccine and need job aids, refresher trainings and stipends to enable them provide uniform and quality service to the community.⁸

The community outreach strategy was fully supported by all the caretakers, and they were all aware of the outreaches and participated in them. There was consensus by

parents/guardians that community outreaches are good for creating awareness about the malaria vaccine and the importance of taking children for vaccination. Healthcare providers also mentioned that outreaches are a good strategy to reach inaccessible areas. Community outreach and home visits have been established as effective strategies for improving childhood vaccine uptake.²⁰ Outreach facilitates interactions between caretaker and trusted healthcare providers.²¹

However, financial constraints, maintenance of cold chain, and language barriers are some of the challenges experienced during outreaches. Other studies have reported cost implications associated with community outreach.^{21,22} Mobile health teams and health camps, the commonly employed forms of outreach activities conducted in Pakistan and Afghanistan were reported to be costly.²² In addition to the cost of equipment such as cooling facilities, the additional human resources, supervision, and training increase the already high cost of this strategy. The high cost of this strategy makes it unsustainable especially in low and middle-income countries.²³

Calling and/or SMSs reminders to caretakers when a child is due for vaccination was mentioned by most respondents as a way of improving vaccine uptake. They mentioned that caretakers have many responsibilities, and some tend to forget to check MCH booklets for vaccination dates. Reminder and recall systems have been reported to improve childhood immunization and have been endorsed by the American Academy of Pediatrics for successful improvement of vaccine uptake in children.²¹ The use of SMS reminders for upcoming or missed schedules was found to improve uptake of RTS,S malaria vaccine in Ghana.^{24,25} In a study conducted in Northern Ghana, mobile-phone-based interventions were associated with taking vaccines on time.²⁶ Likewise, SMS reminders coupled with incentives were found to significantly improve both the uptake and timeliness of other childhood vaccines.^{27,28} Healthcare providers mentioned that SMS is a very effective reminder, wrong phone numbers or those that are no longer in service given by caretakers remain a challenge. This challenge can be overcome by taking at least 3 numbers from the caregiver, his/her number and two other people that are close relatives or neighbors that can be reached in case the caretaker is not reachable.

Creating awareness about RTS, S vaccine through local TV and radio stations was also mentioned as an effective strategy in improving the uptake. This finding is similar to the results of an online survey conducted in Nigeria which showed that mainstream media/advertisements (radio, television, posters, billboards, and pamphlets) was a major source of information about malaria vaccines. This strategy was deemed to be very effective since most people have radios broadcasting in local languages and the messages are easily understood.

Most of the respondents in our study were aware of the community dialogue sessions and had attended some. They mentioned that attendance at the community dialogue days is influenced by the availability of refreshments and mobilization. When good community mobilization and information about availability of refreshments is communicated, the attendance is usually good. This means that community dialogue can be an effective tool in boosting malaria vaccine uptake if given enough support. A study conducted to assess the programmatic feasibility of RTS,S malaria vaccine implementation in real-world settings reported that engagement of the community improved vaccine uptake.³⁰ Community dialogues conducted to educate people about the risk of COVID-19 in western Uganda reduced concerns about vaccine safety and side effects and increased the willingness to take up the vaccine.³¹ Utilization of existing community gatekeepers such as CHVs to spearhead community dialogues yields better outcomes.³²

However, a lot of financial support and coordination is needed to ensure that there is a wider community participation. The use of incentives such as refreshments to boost attendance at such sessions has been reported in sub-Saharan Africa, however, the sustainability of incentives has been questionable.^{33,34}

Using chiefs' barazas to sensitize the community about the malaria vaccine did not appear to be favored since most of the respondents said that barazas nowadays are hardly held and when the attendance is always poor on the few occasions when they are held. Infrequent and poor attendance at community Barazas was also reported by an exploratory study of community involvement in communication for sustainable solid waste management conducted in Migori County, western Kenya.³⁵ Most of the respondents mentioned that they don't attend the few scheduled barazas. Furthermore, the respondents reported that most of the people attending the community barazas were male, and females rarely attend. Other studies have reported male dominance in such gatherings.³⁶ Most caregivers in this study were females, who in most rural areas are responsible for taking children for vaccination. Therefore, the use of community barazas to improve vaccine uptake will not work due to poor attendance by women.

Limitations

This study was conducted in one sub-county within the peri-urban settings in Kisumu County, where 95% of the residents belong to one ethnic group. Therefore, the findings might not necessarily reflect the situation in other malaria endemic counties in western Kenya where there could be differences in care seeking behavior and perceptions about malaria. In addition, the small sample size of participants might not be representative of the views of the wider population in the area and in other areas with different socio-cultural backgrounds and healthcare infrastructure.

CONCLUSION

Based on the findings, there are several strategies that can be used improve the coverage of malaria vaccines. However, each strategy has its advantages, challenges and is context specific. This implies that stakeholders involved in the delivery of malaria vaccines need to explore the strategy that works best in their area.

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