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How Cultural Practices Shape Community Acceptance of the Spatial Emanator Mosquito-Repellent Device: A Qualitative Study in Ngenge Ward, Muleba District, Tanzania

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ABSTRACT **Original Research Article**

Spatial emanators have been proposed as an extra tool for preventing malaria, but whether people accept an unfamiliar device depends on more than how well it works. This study explored how cultural practices shape community acceptance of the Spatial Emanator mosquito-repellent device in Ngenge Ward, Muleba District, Tanzania. Cultural practices were the main factor of interest and community acceptance was the outcome. A qualitative phenomenological design was used, guided by the Health Belief Model and some ideas from Diffusion of Innovations. Twenty-six participants (18 household members, four community leaders and four health workers) were purposively selected from shoreline, farming and peri-urban communities. Data were collected through in-depth interviews, focus group discussions and key informant interviews, and analysed thematically using Braun and Clarke's six-phase approach. Participants did not describe cultural practices as a major obstacle. They judged the device against what they already knew about malaria, their past use of herbal remedies when health services were far away, and their experience with mosquito nets, which they valued but said do not protect people in the evening. They expected trust in health workers and local leaders, and a clear explanation of what the device is for, how it works and whether it is safe, to affect how it would be received. Interest was conditional, and willingness to accept a device is not the same as actually using it. The study concludes that cultural compatibility gives a reason to consider the device but does not guarantee acceptance. It recommends clear and respectful communication through trusted local people, and further research on actual use, affordability and performance.

Keywords: Community Acceptance, Cultural Practices, Spatial Emanator, Malaria Prevention, Muleba District.

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Introduction

Malaria is still a major public-health problem in sub-Saharan Africa. Insecticide-treated nets (ITNs) and indoor residual spraying (IRS) have helped to reduce it, but they do not protect people in every activity or place. Exposure can continue when people spend time outdoors or in spaces these measures do not cover (Achee et al., 2012). In Tanzania, malaria prevention has included distributing long-lasting insecticidal nets and spraying in selected areas, although risk and exposure differ from place to place (United Republic of Tanzania, National Malaria Control Programme, 2021).

This gap has raised interest in passive spatial repellents, commonly called Spatial Emanators. These devices release active ingredients into the air around them and may reduce mosquito entry, landing or biting in a defined space (Achee et al., 2012; Ogoma et al., 2012; Syafruddin et al., 2020). An experimental-hut study in south-eastern Tanzania found that a transfluthrin-based product reduced mosquito landing and blood feeding (Swai et al., 2023). The World Health Organization (2025) now conditionally recommends indoor use of spatial emanators as an additional intervention in areas

with ongoing malaria transmission, alongside established measures.

Good technical results, however, do not show that a community will accept a device, understand how to use it, feel safe with it or keep using it. These are social questions as well as technical ones (Pulford et al., 2011). In this article, community acceptance means how far people consider an intervention appropriate, based on what they think and feel about it, following Sekhon et al.'s (2017) idea of acceptability. It is studied here before routine use, so it is different from adoption and actual use. Culture is not treated as simple resistance to new things. It covers the shared explanations, routines and social expectations that households use to decide what counts as real protection.

Statement of the Problem

Passive spatial emanators are meant to protect people in places where ITNs and IRS usually do not reach. Their value outdoors or in the early evening depends on how well they work, but also on whether people understand the device, think it is appropriate and safe, and can use it as intended. Studies of existing malaria-control measures in Tanzania have pointed to the importance of community trust, cultural views and local explanations of illness (Liheluka et al., 2023; Mayala et al., 2015; Pulford et al., 2011). These findings are useful background, but they cannot simply be applied to the Spatial Emanator, which is an unfamiliar technology with its own questions about placement, operation, cost and safety. The literature reviewed does not explain well how local cultural practices and beliefs shape the way people in a particular ward think about such a device before they start using it. This study addresses that gap.

Study Objective

The objective of this study was to explore how cultural practices shape community acceptance of the Spatial Emanator mosquito-repellent device in Ngenge Ward, Muleba District, Tanzania.

Cultural practices are the main influencing factor under study and community acceptance is the outcome. Because the design is qualitative, the study describes how the two are linked and does not measure how strong the link is.

Literature Review

Theoretical Framework

The study is guided mainly by the Health Belief Model (HBM), which explains why people accept or reject health-protective actions through their beliefs about a health threat and the value of acting (Champion & Skinner, 2008; Rosenstock, 1966). Its main parts are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and, in later versions, self-efficacy (Rosenstock et al., 1988). Applied to the Spatial Emanator, the HBM helps to organise questions about how residents understand malaria risk, what benefits they expect from the device, what worries they have, and what information or experiences might prompt them to consider it. Because the HBM focuses on individual perceptions, it can underplay the influence of household authority, cultural meanings and community trust. It was therefore used as a guide for thinking, not as a model for prediction.

Diffusion of Innovations (Rogers, 2003) adds to the HBM by explaining how an innovation spreads through a social system and how people judge it by its relative advantage, compatibility, complexity, trialability and observability. Compatibility, meaning whether an innovation fits existing values, experiences and routines, is especially relevant to the objective of this study. Both theories are read from a sociological point of view, in which individual perceptions sit within household relations, livelihoods, community norms and relationships with local institutions.

Empirical Review

Makungu et al. (2017) carried out qualitative research at four sites in Dar es Salaam to understand how people see mosquitoes and mosquito-control methods. Participants described being exposed to mosquitoes outside sleeping spaces and said that nets did not cover every situation in which they met mosquitoes. The study recommended that new vector-control tools should take account of people's experience and existing practices. Its urban setting, however, differs from rural Ngenge Ward. Liheluka et al. (2023) studied community knowledge, attitudes, practices and beliefs about malaria in north-western and southern Tanzania. They reported that local beliefs, the use of local herbs and consulting traditional healers were among the issues affecting malaria prevention and control, which shows why local knowledge and preventive behaviour need to be understood. Evidence on general malaria knowledge, however, does not necessarily explain how residents will judge a relatively unfamiliar spatial emanator. Another Tanzanian study linked community views of malaria to livelihoods (Mayala et al., 2015).

Evidence from western Kenya is a closer comparison. Muya Ekodir et al. (2025) followed 30 households over time in a trial of Mosquito Shield, a spatial repellent. Participants first reported positive views, including a perceived drop in mosquito activity, but they also raised concerns about installation, coverage, how long the product lasts and how well it works over time. Related work in Kenya suggests that community opinion and encouragement from community health volunteers can affect how households respond to a spatial repellent, and that worries about chemical safety and side effects can also matter (Harvey et al., 2025). Still, acceptance after a device is installed is different from acceptance before routine use, and these findings cannot simply be carried over to Ngenge Ward. Taken together, the literature suggests that traditional practices and beliefs interact with perceived usefulness, trust, information and

comparison with familiar methods. It does not show how residents of a particular rural ward interpret a passive Spatial Emanator in relation to their own practices before they use it.

Research Methodology

The study used a qualitative phenomenological design to explore how participants experienced and understood malaria prevention and how they thought about using a passive Spatial Emanator. Qualitative inquiry suits research questions about meanings, context and the ways people explain their actions and decisions (Creswell & Poth, 2018; Merriam & Tisdell, 2016; Patton, 2015), and phenomenology focuses on the meanings people give to their everyday experience (van Manen, 2016). The study was done in Ngenge Ward, Muleba District, Kagera Region. In this setting malaria prevention takes place within varied household, social and livelihood conditions, including farming and communities near Lake Victoria.

Purposive sampling was used to select people whose experiences, roles or knowledge could shed light on the issue (Palinkas et al., 2015). Household participants had to be at least 18 years old, have lived in Ngenge Ward for at least one year, have some experience of or involvement in malaria prevention at household or community level, and be willing to give informed consent. Participants were sought from shoreline, farming and peri-urban settings. The final sample was 26 participants: 18 household members, four community leaders and four health workers. Of the household members, six took part in individual in-depth interviews (IDIs) and 12 in two focus group discussions (FGDs) of six people each. The four community leaders and four health workers took part in key informant interviews (KIIs). The sample was not meant to be statistically representative, and its adequacy is judged by the depth and range of the accounts collected.

Interview and discussion guides had open-ended questions and probes on malaria-prevention practices, cultural interpretations, mosquito exposure, household decision-making and first views of the device. Ideas from the HBM and Diffusion of Innovations were used as sensitising ideas, not as a fixed coding frame. Interviews and discussions were transcribed word for word. Kiswahili material was transcribed in the original language and then translated into English for analysis and reporting. Data were analysed thematically using the six-phase approach of Braun and Clarke (2006). The researcher read the transcripts repeatedly, coded relevant material in MAXQDA, grouped codes into candidate themes, checked them against the coded extracts and the whole dataset, and then defined and named the themes. MAXQDA helped with organising and retrieving data, but interpreting meaning remained the researcher's job. Trustworthiness was supported by comparing accounts across participant groups, keeping divergent and qualifying accounts, and reflecting on the researcher's own assumptions (Lincoln & Guba, 1985).

Ethical approval was obtained from St. Augustine University of Tanzania before data collection, and administrative permission was obtained from the Kagera Regional Administrative Secretary and the Muleba District Administrative Secretary. Participants gave informed consent, could skip questions or withdraw without penalty, and were identified by codes (for example IDI-1 and KII-1) and not by name. Because participants had not used the device, their views are reported as perceptions, expectations and willingness to consider use, not as evidence of actual use.

Findings and Discussion

This section presents findings on how cultural practices and beliefs shaped participants' views of the Spatial Emanator. Household members, community leaders and health workers talked about malaria in relation to everyday routines, experience with mosquito nets, trust and information. These accounts are presented as people's perspectives, not as numbers showing what the whole community thinks.

Understanding Malaria and Making Sense of a New Device

Participants understood malaria as a serious health problem and linked it to mosquito bites. They also connected rainy-season conditions and stagnant water with mosquito breeding. An elderly male participant explained:

> "Malaria is among the diseases that kill many people in our community, especially children. Mosquitoes breed in stagnant water, and unless people protect themselves, they easily become infected." (IDI-1)

This account links illness to a known source of exposure and to a duty to take protective action. The mention of children gives prevention a family meaning: it is a way of protecting those seen as most vulnerable. Participants, however, knew malaria and established measures much better than the Spatial Emanator. What they already knew could serve as a starting point for talking about the device, but it should not be taken as automatic acceptance. This fits the HBM in that perceived seriousness and exposure may shape how people think about a preventive measure, although the accounts do not show that perceived risk caused willingness to use the device.

Traditional Practices and Contemporary Prevention

Traditional ways of dealing with illness came up when participants recalled how malaria-like symptoms were handled in the past. One participant explained:

> "Previously, people depended on traditional herbs because hospitals were far away. We boiled medicinal leaves and drank them whenever someone developed malaria. Nowadays, health facilities are available, and people mostly use hospital medicines." (IDI-2)

This account links treatment choices to access and history. Using medicinal plants was not necessarily a rejection of

formal medicine; it could be a practical response to the services available at the time. It is one person's account of change and should not be applied to all households or taken to mean that traditional practices have disappeared. It is also important that the Spatial Emanator was discussed as a way to prevent malaria, not to treat it. Prevention and treatment have different places in people's experience of illness: a preventive device is judged on protection before illness, while treatment is considered after symptoms start. Participants could therefore place the device alongside familiar preventive practices without seeing it as a replacement for clinical treatment. They did not name any cultural rule against considering the device.

Mosquito Nets and the Expectation of Complementary Protection

Mosquito nets were the most familiar thing participants compared the device with. They valued nets but named limits, including exposure before bedtime, damaged nets, discomfort in hot weather and evening activities outside the sleeping area. A male farmer stated:

> "Mosquito nets help us, but mosquitoes bite us before we sleep. Many people remain outside during the evening, and by the time they enter the net they have already been bitten." (FGD participant)

Another participant reported: "Some nets become old and develop holes. Others have bedbugs, making people reluctant to sleep inside them" (IDI-3). These accounts do not reject nets. They point to a gap between exposure during evening routines and the moment a person gets under the net, and they show that protection depends on the condition of the net and on whether people are willing to use it. The Spatial Emanator was seen as a possible addition to nets, for the time before sleep or outside the sleeping space. This resembles Rogers' (2003) idea of compatibility: a new measure may seem more acceptable when people can imagine using it with, rather than instead of, a familiar one. The study did not test whether the device fills this gap, and seeing it as compatible does not mean people will actually use it. The accounts also match Makungu et al.'s (2017) finding that nets do not cover every situation in which people meet mosquitoes.

Trust, Credibility and Local Leadership

Trust came up as a key issue in how an unfamiliar technology might be introduced. A health worker stated:

> "People trust us because we are always working with them. If Spatial Repellent is introduced through health workers, the community will accept it much faster." (KII-1)

This is a health worker's own view of their relationship with the community. It points to the value of familiarity and regular contact, and it assumes that trust in a health worker will carry over to a new intervention. Community leaders were also seen as go-betweens:

> "If our leaders understand the programme first, everyone else will follow because people trust them." (FGD participant)

This statement expects people to follow their leaders, and that should not be accepted without question. Participants also raised questions about safety, operation, installation, maintenance and how well the device would work, so a trusted messenger alone was not seen as enough. In HBM terms, familiar health workers and local representatives can act as cues to action. Sociologically, such cues work through relationships and local institutions, not only through the message itself. This agrees with Kenyan evidence that community opinion and community health volunteers can shape responses to spatial repellents (Harvey et al., 2025), but the present data do not show that all residents would follow their leaders' views.

Conditional Interest and the Need for Explanation

Some participants showed interest because they believed the device might deal with exposure before bedtime:

> "If this product keeps mosquitoes away before bedtime, then it will greatly help our families because mosquito nets only protect us after sleeping." (FGD participant)

Another stated, "We are willing to use it provided we receive enough education on how it works" (IDI-4). These accounts show conditional interest, not unconditional acceptance: the first depends on the device working as expected, and the second on being given enough explanation. Participants also stressed the need to understand why a product is being introduced:

> "People first need to understand why they are being given this product. Without proper explanation, some may fear using it." (FGD participant)

The worry here is not only a lack of information but also uncertainty about why a new product is being introduced and what it will mean for the household. Relative advantage, in Rogers' (2003) sense, helps explain why protection before bedtime appealed to some participants. That advantage was perceived, not measured: the study did not compare the device with other methods or watch households use it.

Shared Views, Differences and Limits of the Evidence

Household members, community leaders and health workers shared several concerns. They recognised malaria as important, knew nets well, knew the device less well, and felt that explanation was needed. Their emphases differed. Household members talked about everyday exposure and the condition of nets, health workers about explanation and practical use, and community leaders about mobilisation and local communication. This shows that the same issues came up across groups, not that the whole community holds one attitude. Positive interest sat alongside questions about safety,

operation, maintenance and effectiveness, and no participant clearly rejected the device. The fairest reading is that acceptance was conditional and, in several practical respects, still unsettled.

Overall, participants judged the device through their earlier malaria knowledge, treatment histories, experience with nets, trust in local people, perceived compatibility and need for information. These are social and cultural contexts for judging the device, not statistically proven determinants. The findings agree with the view that technical performance and social acceptance are separate questions (Pulford et al., 2011; Swai et al., 2023), and they add to evidence from experienced users in Kenya (Muya Ekodir et al., 2025) by describing views held before routine use. The study has limits. The sample was small and purposive, participants had not used the device, recruitment involved local gatekeepers, and the study did not look closely at gendered household authority, kinship or religious influences.

Conclusion

The study explored how cultural practices shape community acceptance of the Spatial Emanator in Ngenge Ward. Among these participants, cultural practices and beliefs were not described as major barriers. Participants understood the proposed device through what they already knew about malaria, their past use of herbal remedies and later access to health services, and the strengths and gaps of mosquito nets, and some saw it as possibly compatible with and complementary to established prevention. Trust in health workers and local leaders, together with clear communication, mattered for how participants expected the device to be received, but trust did not remove their questions about safety, operation and maintenance. The conclusion the evidence supports is that cultural compatibility gives a basis for considering the device, while acceptance stayed conditional. It would be wrong to conclude that all cultural concerns were settled or that the wider community has accepted the device.

Recommendations

Based on the findings, the study makes the following recommendations. First, future communication should use accurate, approved and easy-to-understand information on the device's purpose, operation, limits, safety, installation and maintenance. It should separate what is established from what is still uncertain, and make clear that existing malaria-prevention advice, including the use of ITNs, should continue. Second, health workers and community leaders should be given accurate product information and should make room for questions, demonstrations and follow-up, without pressuring households or suggesting that effectiveness has been proven. Third, engagement should be respectful of culture and let residents voice uncertainty, disagreement or safety concerns. Fourth, further research should look at actual use, continued use, affordability and independent technical performance. Any pilot should keep awareness, perceived acceptance, willingness, uptake, correct use and continued use apart, and not treat them as one outcome.

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