Improving Malaria Case Management: A baseline and endline assessment of community pharmacists and medicine vendors in Nigeria

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ABSTRACT

Background: Nigeria accounts for about 26-27 % of the global malaria burden. Community pharmacists (CPs) and Patent & Proprietary Medicine Vendors (PPMVs) are critical players in malaria case management in the private sector. Phillips Pharmaceuticals Nigeria Limited, on behalf of the National Malaria Elimination Programme with funding from the Global Fund, delivered interventions to improve access to quality malaria care in this sector.

Objective: This study assessed the effectiveness of targeted interventions aimed at improving the practices of these private providers, focusing on facility registration, use of Malaria Rapid Diagnostic Test (mRDT) kits, and adherence to national malaria treatment guidelines.

Methods: A comparative study of baseline and endline data collected through structured surveys from CPs (518 - baseline; 210 - endline) and PPMVs (3,799 - baseline; 1,287 - endline) in five states in Nigeria: Gombe, Kano, Kwara, Delta and Ogun was conducted. Post-baseline, CPs and PPMVs received a two-day training and a year-long mentoring on proper malaria diagnosis using mRDTs and treatment with Artemisinin-based Combination Therapies (ACTs). Statistical analyses, including McNemar's and chi-square tests, assessed changes between baseline and endline.

Results: The study showed a significant increase in registered facilities post-intervention (59 new registrations; $p < 0.05$, effect size = 0.076). A significant improvement was observed in the awareness of national guidelines for malaria diagnosis and treatment (from 56% at baseline to 93% at endline; $p < 0.001$, effect size = 0.345, 95% CI: 0.320 - 0.371). The practice of testing before treatment significantly increased (from 59% at baseline to 96% at endline; $p < 0.001$, effect size = 0.469, 95% CI: 0.426 - 0.513). Additionally, there was a notable shift towards the use of mRDTs and ACTs for malaria treatment (from 89% at baseline to 95% at endline; $p < 0.001$).

Conclusion: The findings from this study point to the importance of continued engagements with the private sector to improve malaria diagnostics and treatment outcomes.

Keywords: Malaria, Private sector, Malaria Rapid Diagnostic Test (mRDT) Kits, Artemisinin-based Combination Therapies (ACTs).

Amélioration de la prise en charge des cas de paludisme : évaluation initiale et finale des pharmaciens communautaires et des vendeurs de médicaments au Nigéria

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RÉSUMÉ

Contexte: Le Nigéria représente environ 26 à 27 % de la charge mondiale du paludisme. Les pharmaciens communautaires (PC) et les vendeurs de médicaments brevetés (VMP) jouent un rôle essentiel dans la prise en charge des cas de paludisme dans le secteur privé. Phillips Pharmaceuticals Nigeria Limited, pour le compte du Programme national d'élimination du paludisme (PNEL), a mis en œuvre des interventions visant à améliorer l'accès à des soins de qualité contre le paludisme dans ce secteur.

Objectif: Cette étude a évalué l'efficacité des interventions ciblées visant à améliorer les pratiques de ces prestataires privés, en mettant l'accent sur l'enregistrement des établissements, l'utilisation de kits de test de diagnostic rapide du paludisme (TDRmT) et le respect des directives nationales en matière de traitement du paludisme.

Méthodes: Une étude comparative des données de référence et finales recueillies au moyen d'enquêtes structurées auprès des CP (518 - données de référence ; 210 -données finales) et des PPMV (3 799 - données de référence ; 1 287 - données finales) dans cinq États du Nigéria : Gombe, Kano, Kwara, Delta et Ogun a été menée. Après la phase initiale, les CP et les PPMV ont reçu une formation de deux jours et un accompagnement d'un an sur le diagnostic approprié du paludisme à l'aide des TDRm et du traitement par des combinaisons thérapeutiques à base d'artémisinine (ACT). Les analyses statistiques, y compris les tests de McNemar et du chi carré, ont évalué les changements entre la phase initiale et la phase finale.

Résultats: L'étude a montré une augmentation significative du nombre d'établissements enregistrés après l'intervention (59 nouveaux enregistrements ; $p < 0,05$, taille de l'effet = 0,076). Une amélioration significative a été observée dans la connaissance des directives nationales pour le diagnostic et le traitement du paludisme (de 56 % au départ à 93 % à la fin ; $p < 0,001$, taille de l'effet = 0,345, IC à 95 % : 0,320 - 0,371). La pratique du dépistage avant le traitement a considérablement augmenté (de 59 % au départ à 96 % à la fin ; $p < 0,001$, taille de l'effet = 0,469, IC à 95% : 0,426 - 0,513). De plus, on a observé une évolution notable vers l'utilisation des TDRm et des ACT pour le traitement du paludisme (de 89 % au départ à 95 % à la fin ; $p < 0,001$).

Conclusion: Les résultats de cette étude soulignent l'importance de poursuivre la collaboration avec le secteur privé afin d'améliorer le diagnostic et les résultats du traitement du paludisme.

Mots-clés: Paludisme, Secteur privé, Kits de tests de diagnostic rapide du paludisme (TDRm), Thérapies combinées à base d'artémisinine (ACT).

INTRODUCTION

Malaria is a disease of public health concern attributed to the transmission of Plasmodium parasites through the bites of infected female Anopheles mosquitoes.[1] The disease is endemic to the tropics, particularly sub-Saharan Africa, which accounts for 94% of global cases (263 million) and 95% of malaria-related deaths (597,000) reported in 2023.[2] Malaria is also a significant economic burden, reducing productivity, increasing healthcare costs, and perpetuating poverty in endemic regions.

Nigeria bears the heaviest burden globally, contributing 26% of malaria cases.[2] In 2021 alone, Nigeria recorded 194,000 malaria-related deaths, underscoring the urgent need for sustained and innovative control measures.[3] Despite substantial investments in malaria control programs, including the Roll Back Malaria (RBM) initiative and the President's Malaria Initiative (PMI), progress toward malaria eradication has been slow in Nigeria.[4] Several factors contribute to the persistence of malaria, including poor access to public health facilities, suboptimal diagnostic practices, and the widespread use of inappropriate antimalarial treatments.[5,6]

Proper case management of malaria is essential for achieving malaria elimination, as it ensures that only confirmed cases are treated with antimalarial medicines, thereby reducing the risk of drug resistance and minimizing wastage of resources. Effective case management also prevents missed diagnoses, thereby improving patient outcomes and reducing community transmission.[7] The National Malaria Elimination Program (NMEP) strategic plan emphasizes that accurate diagnosis using Malaria Rapid Diagnostic Test (mRDT) kits or microscopy, followed by treatment with recommended Artemisinin-based Combination Therapies (ACTs), is a cornerstone of malaria elimination strategies.[1] Misdiagnosis and the indiscriminate use of antimalarial drugs not only undermine control efforts but also contribute to the emergence of drug-resistant strains of Plasmodium falciparum, threatening the efficacy of existing medications.[8]

The private sector is a vital component of the healthcare system in Nigeria, as it is often the first point of contact for individuals seeking treatment for febrile illnesses, including malaria. Studies show that up to 60% of febrile cases are treated in private retail outlets, such as pharmacies and patent & proprietary medicine facilities, particularly in rural and peri-urban areas where access to public health facilities is limited.[9] Community pharmacists (CPs) and Patent and Proprietary Medicine Vendors (PPMVs) are uniquely positioned to play a pivotal role in malaria case management due to their accessibility, affordability, and widespread presence in both urban and rural settings. However, the capacity of these private providers to deliver accurate malaria diagnoses and appropriate treatment is often undermined by limited knowledge of national malaria treatment guidelines, inconsistent use of mRDT kits, and the frequent overuse of antimalarial drugs without proper testing.[10,11]

The Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund), as well as other Malaria initiatives, have been instrumental in addressing these challenges by providing funding for interventions such as the distribution of insecticide-treated nets (ITNs), the procurement of mRDT kits, and the supply of ACTs. Phillips Pharmaceuticals Nigeria Limited, on behalf of the National Malaria Elimination Programme with funding from the Global Fund, delivered interventions to improve access to quality malaria care in this sector. The role of the private sector, particularly CPs and PPMVs, remains critical in bridging the gaps in malaria case management in Nigeria.[12] Recognizing the importance of private providers in malaria control, this study assesses the impact of targeted interventions implemented by Phillips Pharmaceuticals Nigeria Limited (PPNL) on behalf of the NMEP. The project, conducted across five states in Nigeria as selected by the Global Fund & NMEP based on prior pilot study (Ogun, Kwara, Delta, Gombe, and Kano), included training and education aimed at improving the case management practices of CPs and PPMVs. The interventions focused on improving their knowledge of national treatment guidelines, promoting the use of mRDT kits, and enhancing regulatory compliance and reporting practices. By comparing baseline data collected in 2022 with endline data from 2024, this study evaluated changes in registration status, diagnostic practices, and adherence to recommended treatment protocols. The findings will provide more insight into the potential of engaging the private sector to enhance malaria control efforts and contribute to the broader goal of malaria eradication.

METHODS

Study design

This comparative study assessed baseline (pre-intervention) and endline (post-intervention) knowledge

and practices of CPs and PPMVs in malaria case management and reporting. The study was conducted in five states in Nigeria (Gombe, Kano, Kwara, Delta, and Ogun) between January 2022 and December 2023. These states were selected as they represent five of the six geopolitical regions of Nigeria (except the South East) and are part of the private sector malaria case management project implemented by PPNL on behalf of NMEP with funding support from the Global Fund.

After the collection of baseline data, participants received a two-day training in February 2022 followed by mentoring through December 2023 on malaria case management following the national treatment guidelines. The training focused on improving the use of mRDT kits, malaria case management, enhancing regulatory compliance, and promoting adherence to recommended ACTs for malaria treatment.

Training of data collectors

Before data collection, a three-day intensive training program for data collectors was conducted in December 2021. The training involved a total of 50 data collectors (10 per state) who were trained on the study objectives, ethical considerations, and the use of electronic data collection tools using REDCap (Research Data Capture) platform. The training was facilitated by experienced malaria program officers, researchers, and data analytics experts. Specific topics covered during the training included:

1. The importance of accurate data collection in malaria case management research.
2. Familiarization with the structured survey questionnaire and its components.
3. Techniques for building rapport with participants to ensure honest and accurate responses.
4. Standard operating procedures (SOPs) for conducting interviews and observations.
5. The use of digital data collection tools.

Role-playing sessions and mock interviews were conducted to assess the competence of data collectors and ensure consistency in data collection approaches. Data collectors were also sensitized on ethical requirements, including obtaining informed consent and ensuring participant confidentiality.

Participants

A purposive sampling strategy was used to select a representative mix of CPs and PPMVs from the project participants largely based on the available records of premises registered with Pharmacy Council of Nigeria across the five states. Participants were selected to capture the diverse range of malaria case management practices across different geographic and practice settings. The study aimed for appropriate rural-urban representation, recognizing the differential burden of malaria between these settings. As shown in Table 1, the actual distribution achieved was 55% rural and 45% urban at baseline, and 60% rural and 40% urban at endline.

The baseline survey, conducted in January 2022, included 4,317 participants (12% CPs and 88% PPMVs) who were part of the PPNL-implemented private sector project. Due to funding limitations, the intervention program focused on a subset of 1,497 participants (14% CPs and 86% PPMVs) who were actively involved in malaria diagnosis and treatment. These 1,497 participants received the training intervention and were mentored through the program period, ultimately completing the endline survey in December 2023. This explains the difference in sample sizes between baseline (N = 4,317) and endline (N = 1,497) assessments as shown in Table 1.

Training of community pharmacists and patent and proprietary medicine vendors

Following the baseline survey, a two-day training program for the 1,497 selected CPs and PPMVs was conducted in February 2022 across the five states. The training sessions were facilitated by PPNL, malaria control program officers, and local health authorities, while representatives from the Global Fund supervised the training.

Key components of the training included:

1. **National Malaria Treatment Guidelines:** Participants were trained on the latest national guidelines for malaria diagnosis and treatment, including the use of mRDT kits and ACTs.
2. **Importance of Diagnostic Testing:** Emphasis was placed on confirming malaria cases using mRDT kits before administering treatment.
3. **Proper Use of mRDT Kits:** Practical demonstrations and hands-on sessions on proper techniques for using mRDT kits.
4. **Pharmaceutical Management:** Training in appropriate storage, handling, and dispensing of ACTs
5. **Regulatory Compliance:** Importance of maintaining registration with relevant regulatory bodies and adhering to national health standards

6. **Reporting Practices:** Proper record-keeping and reporting malaria cases to local health authorities.

Post-training, participants received mentorship and support from the project implementation team (PPNL) from February 2022 through December 2023. This included monthly supervisory visits, on-the-job coaching, and refresher training sessions to address identified gaps in knowledge or practice.

Data Collection

Baseline survey

Baseline data were collected in January 2022. Data collectors visited community pharmacies and patent & proprietary medicine shops in the five states to administer structured surveys and conduct observations. The survey captured information on:

- Socio-demographic characteristics (e.g., age, gender, education level, and years of experience in malaria case management).
- Registration status of the facilities.
- Practices related to malaria diagnosis and treatment, including the use of mRDT kits and recommended ACTs.
- Availability of mRDTs and ACTs

Post-Intervention (Endline) Survey

The endline survey was conducted in December 2023, following the one-year intervention period. The selection of samples at endline was based on simple random sampling, which will remove bias and confounders relating to reliability of the findings. Data collection followed the same procedure as the baseline survey, allowing for a direct comparison of results.

Data collection tools

Data was collected using structured electronic questionnaires programmed into tablets. The electronic survey forms had built-in validation checks to minimize errors during data entry. Observational checklists were also used to assess the availability of mRDT kits, ACTs, and adherence to recommended malaria case management practices at the facilities.

Data analysis

The data obtained were analyzed using RStudio 2024.09.1+394. The analysis included:

1. **Descriptive Statistics:** To summarize socio-demographic characteristics and case management practices.
2. **McNemar's Test:** To assess changes in binary outcomes, such as registration status (registered vs. not registered), over time.
3. **Stuart-Maxwell/Marginal Homogeneity Tests:** For categorical variables with more than two levels to compare changes between baseline and endline in the same participants.

A p-value of less than 0.05 was considered statistically significant.

Ethical consideration

Ethical approval for the study was obtained from the National Health Research Ethics Committee of Nigeria (NHREC). Written informed consent was obtained from all participants before data collection. Participants were assured of confidentiality, and personal identifiers were excluded from the dataset to protect privacy.

RESULTS

Table 1: Socio-demographic characteristics of participants

Demographic Variable	Baseline n (%) N=4,317	Endline n (%) N=1,497
Nature of Practice		
CP	526 (12)	212 (14)
PPMV	3,791 (88)	1,285 (86)
Location of premises		
Rural	2,365 (55)	900 (60)
Urban	1,948 (45)	596 (40)
Gender		
Male	2,513 (58)	900 (60)
Female	1,804 (42)	597 (40)
Age Group		
18-25	432 (10)	120 (8)
26-35	1,684 (39)	599 (40)
36-45	1,468 (34)	464 (31)
46-55	518 (12)	210 (14)
56 and above	215 (5)	104 (7)
Education Level		
No formal education	22 (0.5)	13 (0.9)
Primary education	60 (1.4)	3 (0.2)
Secondary education	3,022 (70)	539 (36)
Tertiary education	1,213 (28.1)	942 (62.9)

A total of 4,317 participants took part in the baseline survey and 1,497 of them were captured for the endline survey. There were more males than females in both the baseline and endline phases with 58% and 60% males respectively. Participants were majorly in the age range of 26 - 35 years (39 and 40%). With respect to the educational level of participants, 70% had secondary education at the baseline phase while 62.9% had tertiary education at the endline phase (Table 1).

At baseline, 59 facilities were unregistered out of a total of 4,317. By the endline phase, all 59 facilities (100%) had achieved registered status ($p < 0.05$). Conversely, 10 facilities that were initially registered at baseline (10 out of 1497, ~0.006%) were unregistered at endline. These findings are statistically significant, as indicated by the McNemar's test ($p < 0.05$) and Stuart-Maxwell test ($p < 2.2e-16$) (Table 2).

Table 2: Changes in registration status from baseline to endline.

Transition	Numerator	Denominator	Percentage
Not Registered → Registered	59	59	100%
Registered → Not Registered	10	1,497	~0.006%

The table shows the percentage of facilities that transitioned from "Not Registered to Registered" and "Registered to Not Registered" between baseline and endline.

Table 3: Knowledge and Practices of Participants at Baseline and Endline

Variable	Baseline (%)	Endline (%)	p-value	Effect Size (Cramer's V)	95% CI
***Knowledge level of Recommended Guideline for Treatment of Malaria**					
Adequate	86	94			
Inadequate	14	6			
Practice of Carrying Out a Test Before Treatment			<0.001	0.469	0.426-0.513
Conducted test (Yes)	59	96			
Conducted test (No)	41	4			
****Medicines Given for Case Management of Malaria**					
ACTs	89	95			
Non-ACTs	11	5			
Awareness of National Guidelines for Malaria Diagnosis and Treatment			<0.001	0.345	0.320-0.371
Aware	56	93			
Not aware	44	7			
Willingness to Use Rapid Diagnostic Test Kits					
Willing	85	97			
Unwilling	15	3			

* By "Adequate" Knowledge level of Recommended Guidelines for the Treatment of Malaria, we mean those who responded that Artemisinin-based Combination Therapies (ACTs) is the recommended first line for the treatment of malaria; while "Inadequate" were those who responded otherwise.

** Examples of brands of ACTs; Amatem, Coartem, Lonart, etc. While examples of Non-ACTs brands are; Fansidar, Nivaquine, etc.

The study results demonstrated significant improvements in key areas following the intervention. Awareness of national guidelines for malaria diagnosis and treatment increased from 56% at baseline to 93% at endline ($p < 0.001$, effect size = 0.345, 95% CI: 0.320-0.371). Similarly, the practice of testing before treatment rose from 59% to 96% ($p < 0.001$, effect size = 0.469, 95% CI: 0.426-0.513). Table 3 summarizes these findings. Furthermore, adherence to recommended testing using mRDT and Artemisinin-based Combination Therapies (ACTs) increased from 89% at baseline to 95% at endline ($p < 0.001$). These results point to the effectiveness of targeted training and mentoring interventions in improving malaria case management practices among private healthcare providers.

DISCUSSION

This study assessed the impact of targeted interventions on malaria case management practices among CPs and PPMVs across five States (Gombe, Kano, Kwara, Delta and Ogun) in Nigeria. The findings revealed significant improvements in registration status, knowledge of national malaria treatment guidelines, diagnostic testing practices, and adherence to recommended antimalarial treatments. These results point to the critical role of the private sector in malaria case management and its potential to contribute meaningfully to malaria eradication efforts.

Importance of the private sector in malaria case management

The private sector, especially CPs and PPMVs, represents a vital component of the healthcare delivery system in Nigeria. Studies have consistently shown that more than 60% of febrile illnesses, including malaria, are treated in private retail outlets, such as pharmacies and patent & proprietary medicine shops, particularly in rural and peri-urban areas where access to public health facilities is limited.[9,11] These outlets are often the first point of contact for individuals seeking healthcare due to their proximity, affordability, and perceived convenience.

Self-medication is an important behaviour of individuals across ages, gender, level of education and status. It has been cited as a major factor contributing to the misuse and abuse of over-the-counter antimalarial agents and thereby contributing to the occurrence of antimalarial resistance.[13,14] Furthermore, a study revealed a significant association of self-medication with male gender, younger people of < 40 years of age and lower level of education. Financial constraint was reported as the main reason for this behaviour.[15]

For many people, due to financial constraints, patent and proprietary medicine stores and pharmacies are their first solution providers whenever they experience fever rather than conducting a test or visiting a hospital to see a medical practitioner. In many cases, malaria tests will be avoided due to the high cost of mRDT kits and ACTs. In such situations, there is a high chance of people erroneously using other cheaper options of antimalarial drugs instead of ACTs such as sulfadoxine-pyrimethamine (SP) which is intended for intermittent antimalarial treatment during pregnancy.[16]

However, the capacity of private providers to deliver quality malaria case management has been constrained by limited knowledge of national guidelines, inconsistent use of diagnostic tools, and inappropriate treatment practices. The results of this study demonstrated that targeted interventions, such as training and mentoring, can address these gaps and improve the performance of private providers. By equipping CPs and PPMVs with the necessary knowledge and tools, the private sector can play a pivotal role in reducing malaria-related morbidity and mortality.

Key Findings and Implications

1. **Improved registration status**

   The significant increase in the number of registered stores observed in this study suggests the effectiveness of targeted regulatory interventions. At baseline, many PPMV shops operated without proper registration, which limited their accountability and access to support from regulatory bodies. Following the intervention, 59 previously unregistered stores became registered, while only 10 stores lost their registration. This improvement in regulatory compliance ensured that these outlets were monitored and supported, thereby enhancing the quality of the malaria case management services they provide.[12,17]

   Strengthening regulatory frameworks and ensuring compliance is critical for malaria control. Registered facilities are more likely to adhere to national guidelines and receive resources, such as mRDT kits and ACTs, from government and international partners. This creates a more organized and effective healthcare system capable of tackling malaria and other public health challenges.

2. Knowledge of national guidelines and diagnostic testing

The observed improvement in participants' knowledge of national malaria treatment guidelines (from 86% at baseline to 94% at endline) highlights the importance of continuous education and training for private healthcare providers. The substantial increase in the use of mRDT kits for malaria diagnosis (from 59% at baseline to 96% at endline) is particularly noteworthy, as diagnostic testing is a cornerstone of proper malaria case management.

The World Health Organization (WHO) recommends that all suspected malaria cases undergo diagnostic confirmation before treatment to prevent the misuse of antimalarial drugs and minimize the risk of drug resistance.[1] By fostering the routine use of mRDT kits, this study has contributed to aligning private sector practices with global standards. This is particularly important in Nigeria, where the overuse of antimalarial drugs without proper diagnosis has been a major challenge.[5]

The increased willingness to use mRDT kits (from 85% at baseline to 97% at endline) observed in this study suggests that targeted training, coupled with the availability of diagnostic tools, can overcome barriers to diagnostic testing. Moreover, this could be a result of participants becoming more informed and more confident in the handling and use of the mRDT kits. However, ensuring the sustained availability and affordability of mRDT kits will be crucial for maintaining these gains.

3. Adherence to recommended antimalarial treatment

Adherence to recommended antimalarial treatment markedly improved during the study period. The proportion of participants using ACTs for malaria case management increased from 89% at baseline to 95% at endline. ACTs are the globally recommended first-line treatment for uncomplicated Plasmodium falciparum malaria due to their high efficacy and low resistance profile.[18]

The findings highlight the effectiveness of training and mentoring in promoting evidence-based treatment practices. However, challenges such as the affordability of ACTs and the presence of counterfeit drugs in the market remain potential barriers to sustained adherence. Addressing these challenges will require stronger regulatory enforcement, increased subsidies for ACTs, and ongoing education for both providers and patients.

4. Broader implications for malaria eradication

Proper malaria case management is critical for achieving the global goal of malaria eradication. Accurate diagnosis using mRDT kits or microscopy ensures that only confirmed cases receive antimalarial treatment, thereby reducing the misuse of drugs and the risk of drug resistance.[19] Furthermore, adherence to recommended treatment protocols improves patient outcomes and prevents the spread of malaria within communities.

The results of this study demonstrate that engaging the private sector can significantly enhance malaria control efforts. By improving the practices of CPs and PPMVs, the intervention has contributed to better diagnosis and treatment outcomes, which are essential for reducing the burden of malaria in Nigeria.

Global and local perspectives

The findings of this study align with global evidence on the importance of strengthening private sector engagement in malaria control. Similar interventions in other malaria-endemic countries, such as Ghana and Kenya, have shown that training private providers can lead to significant improvement in malaria case management practices.[10] However, Nigeria's unique healthcare landscape, characterized by a fragmented private sector and weak regulatory enforcement, presents additional challenges that must be addressed.

Locally, the study points to the need for sustained collaboration between government agencies, international partners (such as the Global Fund), and the private sector. These partnerships are critical for scaling up interventions, ensuring the availability of essential commodities, and building the capacity of private providers to deliver quality healthcare services.

Recommendations for future interventions

(i) Continuous education and mentorship programs are essential for sustaining the improvements observed in this study. Refresher training sessions should be conducted periodically to ensure that CPs and

PPMVs remain up to date with the latest guidelines and best practices.

(ii) The intervention should be scaled up to other states in Nigeria to replicate the positive results observed in this study. Government policies to encourage sponsors further support malaria control campaigns across the nation. Special attention should be given to rural areas, where access to public health facilities is limited, and the role of private providers is even more critical.

(iii) The availability of mRDT kits and ACTs must be prioritized. Subsidies and supply chain improvements can help ensure that these essential commodities are affordable and accessible to private providers. The observed improvements in test usage and prescribing of ACTs, suggests that maintaining supplies is necessary to sustain the overall goal.

(iv) Regulatory bodies should intensify efforts to monitor and support private providers, ensuring that all community pharmacies and patent & proprietary medicine shops are registered and compliant with national health standards.

(v) Future research should explore the impact of community awareness campaigns on malaria case management outcomes. While the study demonstrated statistically significant improvements in provider practices, the role of patient demand and community knowledge in driving proper diagnostic testing and treatment adherence remains unexplored. Studies investigating how community education influences care-seeking behaviours and creates demand for evidence-based malaria services would complement observed provider-focused findings and potentially identify intervention strategies that address both supply and demand aspects of quality malaria case management.

Limitations

While this study provides valuable insights, it is not without limitations. The use of self-reported data may introduce reporting bias, as participants may overstate improvements in knowledge and practices. A significant limitation was the substantial attrition rate, with the sample size decreasing from 4,317 participants at baseline to 1,497 at endline due to funding constraints. This reduction in sample size may have introduced selection bias if those who remained in the study differed systematically from those who were not followed up. Additionally, the purposive sampling approach limits the generalizability of the findings. Future studies should consider using probability sampling methods, implementing strategies to minimize participant attrition, and incorporating objective measures of provider performance to strengthen the validity of results.

CONCLUSION

The findings from this comparative study suggests the effectiveness of targeted interventions to positively influence malaria case management practices among CPs and PPMVs. The results point to the importance of engaging the private healthcare sector in malaria control efforts. The positive changes observed from baseline to endline highlight the potential for similar initiatives to enhance malaria control efforts in other settings. The results showed statistically significant improvement in store registration status, knowledge of recommended malaria treatments, the use of mRDT kits, and adherence to recommended malaria medications and guidelines which are indices for better diagnosis and case management of malaria ultimately leading to significant reduction in the burden of malaria in endemic regions.

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