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A STUDY OF COMMUNITY-LEVEL AWARENESS, ACCESS AND ADHERENCE TO ROLL BACK MALARIA INITIATIVE STRATEGIES IN IMO STATE, NIGERIA

[1*]Akanazu, C.O., [1]Mbanefo, D.N., [2]Ogwo, U.K., [2]Egbom, S.E., [2]Onyima, E. C., [2]Udensi, J.U., [1]Asuzu, E.N., [1]Osuoji, N.J., [2]Kenechukwudozie, O.Q., [3]Osuagwu, I.K., [4]Ezenwaka, C.O., [5]Ugwulor, L.O and [2]Njoku, J.O.

[1]Department of Public Health; [2]Department of Environmental Health Science, [3]Department of Health Services; Federal University of Technology, Owerri, Imo State; [4]Department of Biology, Federal University, Otuoke, Bayelsa State, Department of Public Health, Gregory University, Uturu, Abia State, Nigeria

[*]Author for Correspondence: akjamin2010@gmail.com

ABSTRACT

Malaria continues to be a significant public health issue in Nigeria, with the Roll Back Malaria (RBM) initiative being vital for national control efforts. This research assessed community awareness, accessibility, and compliance with RBM strategies throughout Imo State, Nigeria. A community-based cross-sectional survey was carried out among 1,272 residents from the three senatorial districts of Imo State. Information was gathered using a structured questionnaire administered by interviewers. Descriptive statistics, chi-square tests, and logistic regression analyses were utilized to evaluate awareness, accessibility, and adherence to essential RBM interventions, which included insecticide-treated nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment (IPT), malaria diagnostics, and artemisinin-based combination therapies (ACTs). ITN ownership was reported at 55.1%, but consistent use was only 46.8%. While 80.4% indicated they had access to insecticides, a mere 12.0% had implemented IRS in their households. Although 88.2% acknowledged self-treatment for malaria, most did so without any diagnostic confirmation. Chi-square analysis showed significant associations between sociodemographic variables and adherence to RBM strategies ($p < 0.05$). Logistic regression identified education level, gender, ITN accessibility, and distance to health facilities as significant predictors of adherence. Awareness of RBM strategies in Imo State is relatively high; however, both access and adherence are still lacking. Targeted interventions focusing on education, availability, and ongoing community involvement are crucial to address these gaps and progress towards malaria elimination.

***Keywords:** Awareness, Malaria, Insecticide Treated-Nets, Roll-back, Community*

INTRODUCTION

Malaria continues to be one of the most lethal infectious diseases worldwide, with the highest burden in Sub-Saharan Africa. Nigeria represents approximately 27% of global malaria cases and 32% of malaria-related fatalities, with young children and pregnant women being the most at risk (Burden of Malaria Report, 2023). While global initiatives have led to a decrease in malaria incidence and deaths over the last twenty years, progress has stagnated or even reversed in certain areas due to resistance to antimalarial drugs and insecticides, inadequate health systems, and socio-economic challenges (Burden of Malaria Report, 2023). In addition to its health consequences, malaria also places a considerable economic strain on individuals, families, and national healthcare infrastructures.

To mitigate this burden, the Roll Back Malaria (RBM) Initiative was established in 1998 by a global coalition that includes the World Health Organization (WHO), UNICEF, UNDP, and the World Bank. The goal of the RBM initiative is to decrease malaria-related morbidity and mortality through cost-

effective strategies, vector management, enhanced diagnostics and treatment, and community involvement (RBM 2030 Strategic Plan, 2018). Key RBM strategies encompass the use of insecticide-treated nets (ITNs), indoor residual spraying (IRS), artemisinin-based combination therapies (ACTs), malaria diagnostic tests, and intermittent preventive treatment (IPT) (RBM Partnership, 2020). Nigeria integrated these strategies into its National Malaria Elimination Programme (NMEP), prioritizing community-level implementation to achieve universal coverage (Federal Ministry of Health, 2015).

Imo State, situated in the malaria-endemic southeastern part of Nigeria, faces high rates of malaria transmission, particularly in rural and semi-urban areas. The tropical climate and seasonal rains in the state provide ideal breeding grounds for Anopheles mosquitoes. The state has carried out various RBM interventions, including free distribution of ITNs, subsidized ACTs, IRS initiatives, community awareness campaigns, and the deployment of rapid diagnostic tests (RDTs). Nonetheless, these initiatives are often compromised by limited community awareness, restricted access to services, and inconsistent adherence to recommended practices.

Effective malaria control demands not only the availability of interventions but also community-level knowledge, accessibility, and compliance. Research has shown that sociocultural beliefs, economic challenges, and infrastructural issues can considerably obstruct the adoption of malaria prevention measures (Ugwu *et al.,* 2024). Hence, it is crucial to comprehend how communities engage with RBM strategies, specifically regarding awareness, access, and adherence, to design interventions that are both effective and sustainable. Community awareness is crucial for effective malaria control. For example, a study conducted in southwestern Nigeria revealed that while there was a relatively high awareness of malaria symptoms, knowledge regarding preventive measures, such as using ITNs, was inconsistent, particularly among rural and low-income demographics (Awosolu *et al.,* 2020). Likewise, differences in knowledge and uptake of interventions have been reported across socio-economic and geographical divides, with rural communities often lacking adequate health education and outreach efforts (Akinleye *et al.,* 2019).

Access to malaria control measures is a vital component of successfully managing the disease. Despite governmental initiatives aimed at offering free or subsidized resources, challenges such as inadequate road systems, inconsistent supply chains, and a shortage of healthcare facilities continue to exist (Babalola *et al.,* 2009). Moreover, factors like gender roles, the decision-making authority within families, and financial limitations can hinder access, especially for women and children (Oladimeji *et al.,* 2021).

The degree to which individuals follow malaria prevention and treatment guidelines is influenced by cultural beliefs, health literacy, and confidence in the healthcare system. In certain communities, traditional remedies are favored over biomedical treatments due to beliefs about the origins of the disease or dissatisfaction with available health services (Omagha *et al.,* 2021). Misunderstandings regarding insecticide-treated nets (ITNs), discomfort associated with their use, and insufficient health education have also contributed to low adherence rates (Ekeleme *et al.,* 2023).

Although prior research has looked into national malaria control policies and overall health system effectiveness, there is a dearth of recent information specifically addressing how communities in Imo State interact with the Roll Back Malaria (RBM) strategies. This absence of localized information poses a challenge to the design of effective interventions and the formulation of policies. Gaining insights into community awareness, access, and adherence levels is crucial for addressing gaps in implementation and enhancing outcomes at the local level.

This study aims to evaluate community-level awareness, access, and adherence to Roll Back Malaria strategies in Imo State. By identifying strengths, weaknesses, and contextual barriers, the findings will contribute evidence-based recommendations to inform state and national malaria control policies. The results are expected to support the refinement of current interventions and promote sustainable public health outcomes in malaria-endemic communities.

MATERIALS AND METHODS

The research took place in Imo State, situated in southeastern Nigeria. Established in 1976, Imo borders Abia, Anambra, Delta, and Rivers States, and is divided into 27 local government areas (LGAs) grouped into three senatorial districts: Orlu, Owerri, and Okigwe. With a population exceeding 4.8 million, the state is primarily populated by the Igbo ethnic group. Imo State experiences an equatorial climate marked by a bimodal rainfall pattern, with peaks in July and September, followed by a dry season from November to March. Annual rainfall ranges between 1,500 mm and 2,200 mm, and average temperatures fluctuate from 22.5°C to 31.9°C, with humidity levels averaging 75–90% during the wet season (Climate-Data.Org, 2025). The interplay of climate, topography, and inadequate sanitation contributes to high rates of vector breeding and malaria transmission. Various environmental and socioeconomic factors, such as poverty, overcrowding, and unplanned development, further heighten the risk of malaria in the area. The study focused on adults aged 18 and older living in chosen communities in Imo State. Participants were required to have resided in their communities for at least six months and express a willingness to take part, while those unable to provide consent were not included. In total, 1,272 participants who consented were enlisted for this research. The study utilized a community-based, cross-sectional descriptive design to evaluate awareness, access, and adherence to Roll Back Malaria (RBM) strategies. Respondents were chosen from both rural and urban settings throughout Imo State using a multistage sampling technique.

RESULTS AND DISCUSSION

Table 1: Demographic Characteristics of the Respondents

Variables	Categories	Frequency (n=1272)	Percentage (%)
Age	18-30	125	9.8
	31-40	545	42.8
	41-50	363	28.5
	51-60	189	14.9
	>60	50	3.9
Sex	Male	695	54.6
	Female	577	45.4
Marital status	Single	283	22.2
	Married	661	52.0
	Divorced	183	14.4
	Widowed	145	11.4
Level of education	No formal education	53	4.2
	Primary education	333	26.2
	Secondary/Adult education	527	41.4
	Tertiary education	359	28.2
Religion	Christianity	689	54.2
	Muslim	380	29.9
	Traditionalist	189	14.9
	Others	14	1.1
Occupation	Civil servant	287	22.6
	Trader/Artisan	613	48.2
	Employed in private sector	270	21.2
	None	102	8.0

Data collection was conducted using a structured questionnaire administered by interviewers. For analysis, descriptive statistics, chi-square tests, and logistic regression were performed using SPSS

version 25, with a p-value of < 0.05 denoting statistical significance. Descriptive statistics, including frequencies and percentages, were used to summarize the demographic data and levels of engagement with RBM. Chi-square tests evaluated relationships between categorical variables, while logistic regression identified factors influencing adherence to RBM strategies, setting statistical significance at $p < 0.05$.

Table 2: Awareness of Roll Back Malaria initiative among respondents (n = 1,272)

Awareness Variable	Yes (n)	Yes (%)	No (n)	No (%)
State government provides free ITNs to households	957	75.2	315	24.8
Insecticide-treated nets help prevent malaria transmission	1,231	96.8	41	3.2
Indoor residual spraying (IRS) is effective in killing malaria vectors	603	47.4	669	52.6
Pregnant women are offered IPT in health centers	810	63.7	462	36.3
Rapid Diagnostic Tests (RDTs) are adopted for malaria diagnosis	755	59.4	517	40.6
Artemisinin-based Combination Therapies (ACTs) are approved and adopted for treatment	660	51.9	612	48.1

Table 3: Access and Use of Roll Back Malaria (RBM) Interventions in te area (n = 1,272)

Variable	Yes (n)	Yes (%)	No (n)	No (%)
Have insecticide-treated nets (ITNs) at home	701	55.1	571	44.9
Use ITNs at home	595	46.8	677	53.2
Have access to mosquito insecticides	1,023	80.4	249	19.6
Practice indoor residual spraying (IRS) with insecticides at home	153	12.0	1,119	88.0
Treat malaria using artemisinin-based combination therapies (ACTs)	594	46.7	678	53.3
Test for malaria at health centers when feeling ill	586	46.1	686	53.9
Take malaria treatment without diagnostic testing	1,122	88.2	150	11.8
Aware of free ITNs availability at health centers	30	2.4	1,242	97.6
Visit health center in their area	1,018	80.0	254	20.0
Perceive health center as far from home	262	20.6	1,010	79.4

Table 4: Adherence to RBM Interventions (n = 1,272)

RBM Intervention	Adherent n (%)	Non-Adherent n (%)
Use of ITNs	595 (46.8%)	677 (53.2%)
IRS practice	153 (12.0%)	1,119 (88.0%)
Use of ACTs	594 (46.7%)	678 (53.3%)
Malaria diagnostic testing	586 (46.1%)	686 (53.9%)
Negative adherence (self-treatment without testing)	150 (11.8%)	1,122 (88.2%)

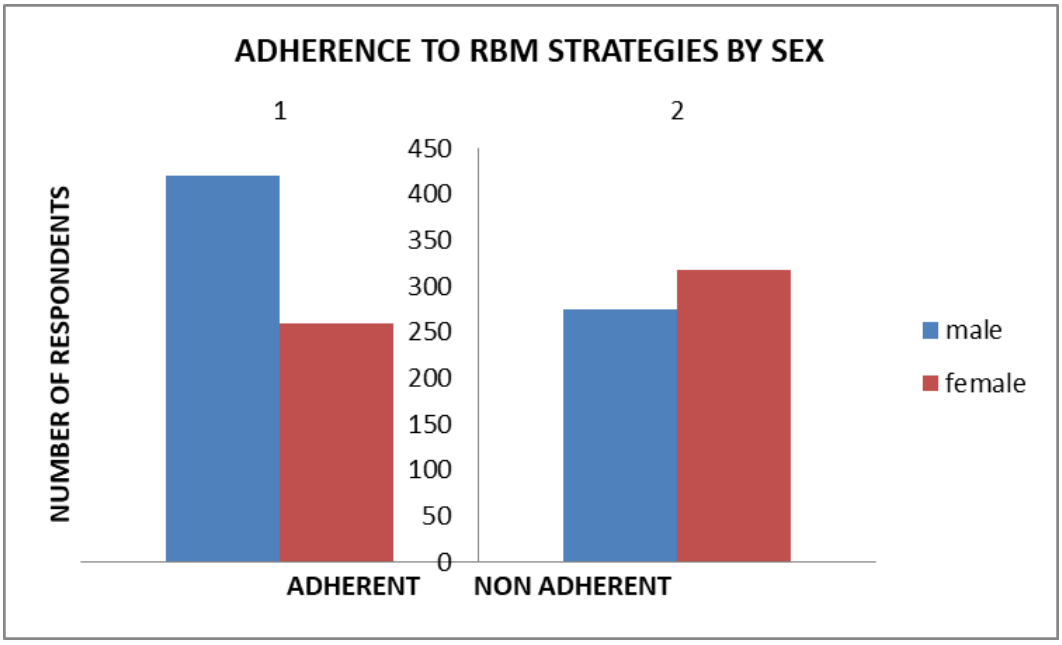

Figure 1: Adherence to RBM strategies by Sex

Test of significance

There is a statistically significant association ((χ^2 = 29.99, df=1, p< 0.001) between sex and adherence to RBM strategies, with males significantly more likely to adhere than females.

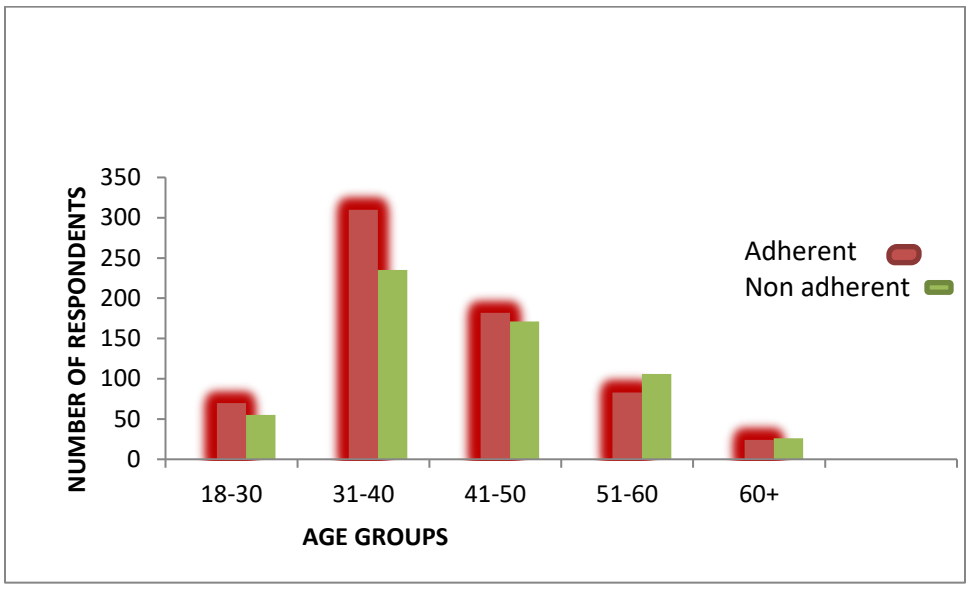

Figure 2: Adherence to RBM Strategies by Age group

Adherence significantly varies across age groups ((χ^2= 18.72, df=4, p= 0.001), indicating age is a determinant of adherence to RBM strategies.

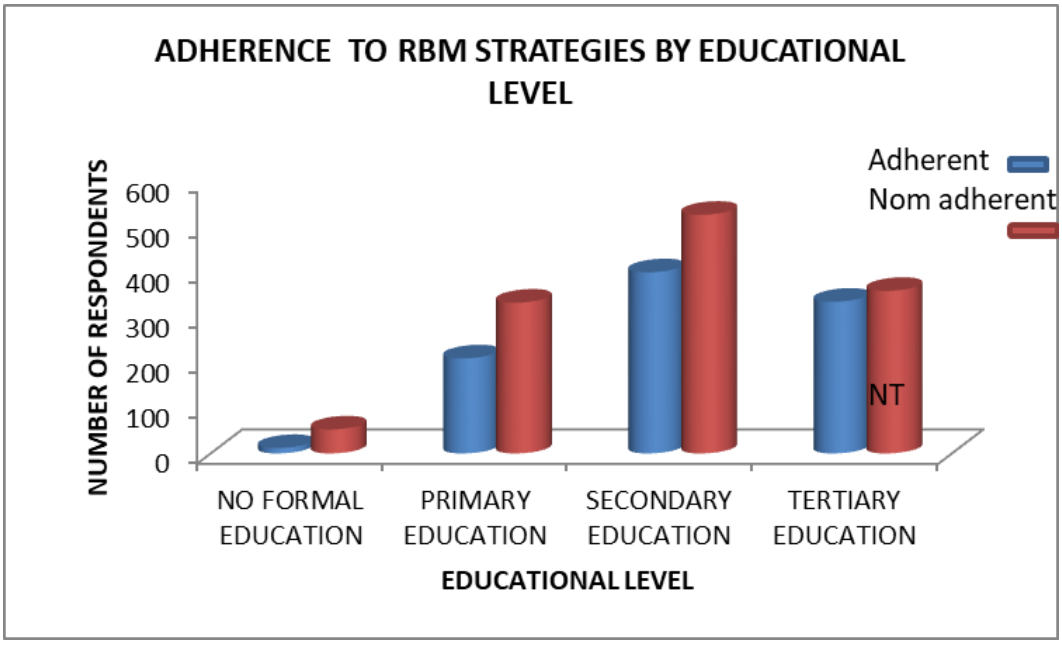

Figure 3: Adherence to Roll Back Malaria (RBM) Strategies by Educational level among respondents in Imo State (n = 1,272)

Figure 3 displays the number of respondents adherent and non-adherent to RBM strategies across various levels of education. Adherence improves with increasing education, peaking among those with tertiary education. However, a notable drop is seen in adherence among those with no formal education. A statistically significant relationship exists between educational attainment and RBM strategy adherence((χ^2 = 149.32, df=3,p< 0.001).

Table 5. Logistic regression analysis of predictors of adherence to Roll Back Malaria (RBM) strategies among respondents in Imo State (n= 1,272)

Predictor Variable	AOR	95% CI	p-value
Sex			
Female (Ref)	1.00	–	–
Male	1.28	1.05–1.56	0.016
Age group (years)			
18–30 (Ref)	1.00	–	–
31–40	1.89	1.30–2.74	0.001
41–50	1.22	0.84–1.76	0.294
51–60	1.05	0.66–1.68	0.828
>60	0.97	0.51–1.86	0.933
Education			
Secondary or below (Ref)	1.00	–	–
Tertiary	2.10	1.49–2.97	<0.001
Access to ITNs	2.44	1.91–3.12	<0.001
Awareness of ACT use	1.44	1.09–1.91	0.009
Distance to health facility	0.50	0.36–0.69	<0.001
Access to malaria testing	1.85	1.34–2.55	<0.001

Model statistics: $\chi^2(8)$ = 98.74, p< 0.001; Nagelkerke R^2 = 0.262; Hosmer–Lemeshow test = 0.421

The logistic regression model was statistically significant, $\chi^2(8) = 98.74$, $p< 0.001$, with a Nagelkerke R^2 of 0.262 and good model fit (Hosmer–Lemeshow test, $p = 0.421$). Several statistically significant predictors of adherence to RBM strategies were identified (Table 5). Males were more likely to adhere than females (AOR = 1.28, 95% CI: 1.05–1.56, $p = 0.016$). Respondents aged 31–40 years showed higher adherence compared with those aged 18–30 years (AOR = 1.89, 95% CI: 1.30–2.74, $p = 0.001$). Tertiary education was positively associated with adherence (AOR = 2.10, 95% CI: 1.49–2.97, $p< 0.001$). Access to ITNs increased the odds of adherence (AOR = 2.44, 95% CI: 1.91–3.12, $p< 0.001$). Awareness of ACT use was also significant (AOR = 1.44, 95% CI: 1.09–1.91, $p = 0.009$). Respondents residing farther from health facilities were less likely to adhere (AOR = 0.50, 95% CI: 0.36–0.69, $p< 0.001$). Access to malaria diagnostic testing was associated with greater adherence (AOR = 1.85, 95% CI: 1.34–2.55, $p< 0.001$).

Table 6: Summary of Barriers and Facilitators to Adoption of RBM Strategies in Imo State

Category	Variable/Indicator	Findings from Study	Interpretation
Facilitators	Access to ITNs	55.1% have ITNs at home	Indicates moderate ITN availability
	Access to insecticides	80.4% have access	Enables vector control at home
	Awareness of ITNs preventing malaria	96.8% agree	Strong knowledge base
	Access to health centers	80.0% can easily go	Positive for treatment-seeking behavior
	Awareness of IPT for pregnant women	63.7% aware	Supports maternal protection
	Awareness of ACTs as recommended treatment	51.9% aware	May improve treatment practices
	Awareness of RDTs	59.4% aware	Supports early and accurate diagnosis
Barriers	Low ITN usage	Only 46.8% use them	Cultural or behavioral resistance likely
	Low IRS practice	12.0% conduct IRS	Poor implementation and awareness
	Limited availability of free ITNs	Only 2.4% report availability in facilities	Indicates funding or supply chain issues
	High rate of presumptive treatment	88.2% treat without diagnosis	Poor health-seeking behavior or diagnostic gaps
	Distance to health centers	20.6% say centers are far	Geographic barrier to adherence
	Limited knowledge of IRS	47.4% understand its benefit	Suggests need for community sensitization
	Low ACT usage	46.7% use ACTs	Possibly due to cost, preference, or access issues
	Low IPT awareness in subgroups	36.3% unaware	Missed maternal health opportunity

A summary of contextual factors influencing RBM uptake is presented in Table 6. Facilitators included widespread awareness and access to key interventions, while barriers ranged from limited IRS and ITN use to high self-medication without testing.

RESULTS

Demographic Characteristics of the Respondents

A total of 1,272 respondents participated in the study. The age group with the highest representation (Table 1) was 31–40 years (42.8%), followed by 41–50 years (28.5%). Respondents aged 18–30 accounted for 9.8%, while those above 60 years made up 3.9%. In terms of sex, 54.6% were male and 45.4% were female. Over half of the participants were married (52.0%), while 22.2% were single, 14.4% divorced, and 11.4% widowed. Regarding education, 41.4% had secondary or adult education, 28.2% had tertiary education, 26.2% had completed primary education, and 4.2% had no formal education. Christianity was the dominant religion (54.2%), followed by Islam (29.9%), traditional beliefs (14.9%), and others (1.1%). The majority of respondents were traders or artisans (48.2%), followed by civil servants (22.6%) and private-sector employees (21.2%). A smaller proportion (8.0%) reported having no job.

Awareness of Roll-back Malaria Intervention

Awareness of Roll Back Malaria (RBM) strategies varied among respondents (Table 2). Majority (75.2%) were aware that the state government provides free insecticide-treated nets (ITNs), and 96.8% correctly identified ITNs as effective in preventing malaria transmission. Regarding other interventions, 63.7% were aware that intermittent preventive treatment (IPT) is offered to pregnant women in health centers, and 59.4% acknowledged the adoption of rapid diagnostic tests (RDTs) for malaria diagnosis. Awareness of artemisinin-based combination therapies (ACTs) as the state-approved treatment was moderate, with a near-even split (51.9% yes, 48.1% no). Chi-square analysis showed statistically significant differences in awareness levels for several RBM interventions including provision of ITNs ($\chi^2 = 316.1$,df=1, $p < 0.001$), ITN effectiveness ($\chi^2 = 1001.6$,df=1, $p < 0.001$), IPT provision ($\chi^2 = 104.2$,df=1, $p < 0.001$), and RDT usage ($\chi^2 = 58.0$,df=1, $p < 0.001$). However, awareness of IRS ($\chi^2 = 1$, df=1,75, $p = 0.186$) and ACT adoption ($\chi^2 = 0.92$, df=1, $p = 0.337$) did not show statistically significant differences, indicating persistent gaps in these areas. Overall, respondents showed strong awareness of ITNs and IPT, but lower awareness or uncertainty regarding IRS and ACTs.

Access to Roll-back Malaria Intervention

Respondents reported varying degrees of access to and use of malaria control interventions (Table 3). Over half (55.1%) had insecticide-treated nets (ITNs) in their homes, yet only 46.8% reported consistent usage. Majority (80.4%) had access to mosquito insecticides, but only 12.0% practiced indoor residual spraying (IRS), indicating low uptake of this intervention. Although 46.7% reported using artemisinin-based combination therapies (ACTs) for malaria treatment, a higher percentage (88.2%) admitted to taking malaria medication without undergoing diagnostic testing. Less than half (46.1%) sought malaria testing at health centers when ill. Availability of free ITNs at health centers was very limited, with only 2.4% of respondents aware of such provisions. Most participants (80.0%) reported accessing health centers in their area, and only 20.6% perceived their nearest facility as distant. Overall, the findings indicate a substantial gap between access and appropriate use of malaria interventions, particularly in areas such as IRS practice, diagnostic testing, and proper treatment. These results highlight the need for improved service availability and community education to promote adherence to RBM strategies. Chi-square analysis revealed statistically significant response patterns across all assessed variables ($p < 0.05$). More than half of respondents owned ITNs (55.1%), but a smaller proportion used them (46.8%), highlighting a notable gap between access and use ($\chi^2 = 5.37$, df=1, $p = 0.020$). Access to mosquito insecticides was high (80.4%), though IRS practice remained low (12.0%, $\chi^2 = 715.00$, df=1, $p < 0.001$), pointing to implementation gaps. A large percentage (88.2%) self-medicated without diagnostic confirmation ($\chi^2 = 730.52$,df=1, $p < 0.001$), while only 46.1% reported getting tested at health facilities.

The availability of free ITNs at health centers was extremely low (2.4%, $\chi^2 = 1154.76$,df=1, $p < 0.001$), despite 80.0% of respondents indicating they could access a nearby health center.

Adherence to RBM

Adherence to RBM interventions was generally low (Table 4). Fewer than half of respondents used ITNs (46.8%) or ACTs (46.7%). IRS adherence was especially low at just 12%, despite significant exposure to vector control messages. Diagnostic testing before treatment was practiced by only 46.1% of participants, while presumptive treatment was alarmingly high (88.2%). Chi-square results supported these observations, with significant disparities between adherence and non-adherence across all practices ($p < 0.001$). Notably, the use of ACTs, IRS, and malaria diagnostic testing were significantly underutilized compared to expectations under random distribution. This indicates behavioral and systemic barriers to full adherence. Gender differences in adherence were also observed (Figure 1). A higher proportion of males (60.4%) were adherent to at least one RBM intervention compared to females (44.9%). This could reflect gender-based differences in decision-making autonomy, health-seeking behavior, or access to resources. Further analysis using logistic regression explored these associations in greater dimension.

DISCUSSION

Demographic characteristics of the and Implications for RBM Initiatives in Imo State

This study aimed to assess the awareness, accessibility, and adherence to the RBM initiative strategies within communities in Imo State. The impetus for this research was the need to make evidence-based decisions for enhancing malaria control strategies in the area. In total, 1,272 participants from Imo State were surveyed. The age distribution of the respondents shows that the largest group (42.8%) falls within the 31–40 years age range, followed by 28.5% in the 41–50 years category. This indicates that most participants are in their economically active years, likely balancing work and family obligations. A smaller segment of respondents (3.9%) are over 60 years, suggesting a predominance of younger to middle-aged individuals in our sample. This age distribution benefits malaria prevention efforts, as those in this range are often key decision-makers in their households and can greatly influence health practices, including the usage of malaria control measures like ITNs and timely medical care. The sample shows a slight male predominance, with 54.6% male respondents compared to 45.4% female. This relatively even split creates an opportunity for gender-sensitive analysis, which is crucial since access to and adherence to malaria control measures can be shaped by gender dynamics, particularly in caregiving and health decisions. Women, as primary caregivers, are pivotal in preventing malaria among children and pregnant women, who face the highest risk. More than half of the respondents (52.0%) are married, 22.2% are single, and a smaller portion is divorced (14.4%) or widowed (11.4%). Marital status can play a vital role in accessing health services and following malaria prevention strategies, as married individuals may enjoy greater household stability and shared decision-making, fostering the utilization of malaria control interventions. In contrast, divorced or widowed individuals, particularly women, might encounter financial or social barriers that limit their access to services. The respondents' educational backgrounds are diverse, with 41.4% having completed secondary or adult education, while 28.2% hold tertiary qualifications and only 4.2% lacked formal education. This points to a considerable portion of the community being literate and possessing at least basic health knowledge. Higher education levels typically correlate with enhanced health awareness, better information access, and a higher likelihood of engaging in preventative health behaviors, like using ITNs or seeking immediate medical attention (Ujuju *et al.,* 2022; Onwujekwe *et al.,* 2008; Okeke *et al.,* 2010; Oladepo *et al.,* 2018). The study also examined this association further. Most respondents identified as Christians (54.2%), followed by Muslims (29.9%) and Traditionalists (14.9%). Religious affiliations may influence health-seeking behavior, especially in communities where traditional or faith-based healing practices are common. Understanding the religious landscape is important for tailoring health messages and interventions through appropriate channels that are trusted by different faith groups.

Almost half of the respondents (48.2%) identified as traders or artisans, followed by civil servants at 22.6%, and those in the private sector at 21.2%. A small portion, 8.0%, reported being unemployed. The type of occupation significantly influences access to healthcare resources. For instance, civil servants and private-sector employees often enjoy more consistent income and better access to healthcare benefits. In contrast, traders and artisans, while active in the economy, tend to have less organized access to health services and information, particularly if they work in informal sectors or rural areas.
This demographic profile indicates a largely literate and economically active population, enriched by a variety of occupational and religious backgrounds. These aspects are crucial for shaping the design and implementation of malaria interventions. Tailoring malaria control strategies to align with the community's demographic realities will enhance the effectiveness and sustainability of the Roll Back Malaria Initiative in Imo State. Thus, these demographics illustrate a diverse adult population that includes key community stakeholders in the fight against malaria, supporting WHO's findings that demographic factors—such as age, education, and socio-economic status—are essential determinants of malaria control actions (WHO, 2023; WHO, 2022).

Awareness and Understanding of RBM strategies

The study revealed high awareness of insecticide-treated nets (ITNs) as both a distributed commodity and a preventive tool whereby a higher percentage (75.2%) of the respondents knew the government provides free insecticide treated nets to households. These respondents demonstrated varying levels of awareness concerning RBM strategies. Awareness of free ITN distribution (75.2%), was significantly above chance. A study by (Onyebueke *et al.,* 2021) in Anambra state, Nigeria found out that 98.1% of the respondents were aware of the Roll Back Malaria program in their state.

This aligns with findings from Iwuafor *et al.* (2016), which revealed that 93.2% of insecticide-treated net (ITN) owners received them for free. A significant majority of respondents (96.8%) recognized that ITNs play a vital role in preventing malaria transmission, demonstrating nearly universal awareness. This is consistent with the work of Iwuafor et al. (2016), where over half (51.5%) of respondents viewed ITNs as an effective strategy for malaria prevention, underscoring the success of public sensitization campaigns, particularly in urban settings (FMoH, 2020; Ujuju *et al.,* 2022).

These findings suggest that communities in Imo State have achieved a high level of awareness regarding the implementation of the Roll Back Malaria (RBM) program. On the other hand, awareness and acceptance of artemisinin-based combination therapies (ACTs) for malaria treatment were moderate at 51.9%, slightly higher yet still within a similar range to findings from a study conducted by Abdullahi *et al.* (2020) in Zamfara State. This may indicate a deficiency in effective communication about approved malaria treatments, as a significant portion (90.8%) reported using Paracetamol for malaria treatment. While awareness of Intermittent Preventive Treatment in pregnancy (IPTp) and Rapid Diagnostic Tests (RDTs) was statistically considerable, knowledge regarding Indoor Residual Spraying (IRS) and ACT adoption did not differ significantly from chance. Consequently, the understanding of other RBM strategies, including IRS, RDTs, IPTp, and ACTs, remains considerably limited within a large segment of the population, highlighting an important area for improvement. The unfamiliarity with IRS, reported by more than half of respondents, signals a potential gap in implementation or communication efforts, especially in rural areas.

Additionally, the relatively low visibility of RDTs and IPTp (around 59.4% and 63.7% awareness, respectively) could impede malaria elimination efforts (Onwujekwe *et al.,* 2008; Okeke *et al.,* 2010). Most importantly, the limited understanding of ACTs—the frontline treatment for malaria in Nigeria—indicates an urgent need for more comprehensive health education. Misinformation or insufficient knowledge could result in ongoing reliance on less effective treatments or traditional remedies, which may exacerbate drug resistance and elevate the malaria burden (WHO, 2022).

These results reflect a solid community awareness of ITN initiatives and IPTp while revealing substantial gaps in knowledge regarding IRS and ACTs, which need to be addressed through focused educational campaigns. Findings are consistent with national and regional studies that illustrate how gaps in ITN usage, despite ownership, are often linked to cultural beliefs, discomfort, and knowledge deficits (Thomas, 2014; Ezeoke *et al.,* 2018; Ujuju *et al.,* 2022). The underutilization of testing (with 59.4% awareness but only 46% usage) alongside high rates of self-treatment mirrors evidence from Nigeria and Ghana, indicating that diagnostic distrust or access barriers (Onwujekwe *et al.,* 2008; Kyabayinze *et al.,* 2012) and provider distrust are prevalent issues. Although awareness of ITNs and IPT is relatively high, misconceptions about IRS and ACTs persist. Consistent with previous studies (Adebayo *et al.,* 2021; Oladepo, *et al.,* 2018), knowledge gaps hinder optimal community response.

Access and Utilization of RBM strategies

More than half of the population studied (55.1%) had insecticides treated nets in their homes. This finding is in disagreement to what was observed by Ajaero et al (2015) in Owerri West as only 6.7% of the households had Long Lasting Insecticide Nets (LLIN) distributed by the State government. A highly significant percent (80.9%) ($p<0.05$) of the households did not have the LLIN. This showed a significant increase in ownership of insecticide treated nets in the state. However, even though there was high net ownership, most of the respondents did not use insecticide treated net at home as 53.2% of the respondents indicated they do not use insecticide treated nets at home while 46.8% of the respondents used them at home. In a similar study,Nwoke et al (2014)observed that only 19.0% of the respondents used long-lasting insecticidal bed net which aligns to low usage of insecticide treated nets in this study. Iwuafor et al (2016) also observed an increased (71.5%) ownership of insecticides treated net and a low (35.6%) usage of insecticide treated nets. However, Adaji *et al.* (2019) disagree with the finding of this study as their study in rural communities in Benue state observed high ownership of insecticide treated nets and high usage of insecticide treated nets as a majority of the respondents (93.8%) had LLINs in their households while 93% of the respondents used insecticides treated nets. This can be attributed to their attitude and knowledge of good preventive malaria practices (Abdullahi *et al.,* 2020)]. Such findings in the present study are worrisome in the context of Roll Back Malaria (RBM) targets which emphasize universal coverage and consistent utilization of ITNs. The persistently high non-usage observed in our setting calls for reinforcement of continuous distribution mechanisms, targeted health education and monitoring systems to ensure that ownership translates into effective use.

The findings from the study indicated a high level of access to insecticides at 80.4%, yet the implementation of indoor residual spraying (IRS) was disappointingly low at just 12%. This aligns with the work of Nwoke *et al.* (2014), which reported that only 24.5% of respondents utilized indoor insecticidal spray. In contrast, Abdullahi et al. (2020) found a significant difference in Zamfara state, Nigeria, where 67.7% of respondents regularly practiced indoor residual spraying with insecticides—likely due to their effective preventive measures. This disparity highlights a critical gap between access to malaria control strategies and the actual implementation of IRS, which is vital for malaria control and elimination efforts in the state. Consequently, there is an urgent need for focused awareness campaigns on this issue.

The usage of Artemisinin-based combination therapies (ACT) was also found to be low at 46.7%. This contradicts the findings from Abdullahi et al. (2020), where 54.6% of respondents reported using ACT for malaria treatment, potentially due to a more favorable attitude towards malaria treatment observed in their study. Moreover, Dimas *et al.* (2019) noted an increase in ACT usage in western Kenya, rising from 48% in 2010 to 69% in 2016. The lower ACT usage in our study may stem from insufficient awareness regarding the endorsement and adoption of ACT within the state, suggesting a clear need for public health initiatives to promote approved malaria treatments.

Furthermore, malaria testing at health centers was found to be suboptimal at 46.1%, leading to an alarming 88.2% of respondents self-treating without proper testing. This contrasts with Abdullahi et al. (2020), who found that 61.9% of respondents pursued a diagnosis before initiating treatment. This

difference might be explained by the respondents' perceptions of the importance of diagnosis, as 66.6% in their study considered it significant. Similarly, Dimas et al. (2019) reported that 82.1% of respondents in Ethiopia regularly visited health facilities when feeling unwell, likely driven by the belief that it is very risky to not take malaria medication properly or completely, as indicated by 92.3% of respondents. These findings emphasize the low ACT usage in this study as a critical area for further investigation to uncover the reasons behind the limited adoption of ACT in the state.

Most respondents (97.6%) reported that there were no free insecticide-treated nets available at their health centers, while only a small minority (2.4%) indicated otherwise. This finding is consistent with Noland *et al.* (2014), which noted that a significant portion (56.3%) of respondents in Abia State, Nigeria, experienced a lack of free insecticide-treated nets in their health centers. Similarly, 44.3% of respondents in Plateau State reported the same issue. In terms of access, it was generally favorable, with 80.0% of individuals able to easily reach their health centers ($\chi^2 = 449.2$, $p < 0.001$). Conversely, 20.6% cited considerable distances as a barrier ($\chi^2 = 451.1$, $p < 0.001$). This aligns with the findings of Titus et al. (2015), which found that over half (58%) of people could easily access a health center nearby. However, it is concerning that 40.5% of respondents reported that their healthcare facilities were far from home, nearly double the figure from this study. Improved access to healthcare is crucial, as it can enhance the utilization of facilities, leading to better diagnosis and management of diseases (Awoyemi *et al.,* 2011). While awareness of key malaria control interventions is relatively high, actual usage remains inconsistent and often insufficient. Many households report having access to insecticide-treated nets and insecticides, yet less than half utilize them regularly. This discrepancy between ownership and consistent use may be linked to issues such as discomfort, improper net installation, or a lack of behavioral reinforcement, as highlighted in other studies conducted in Nigeria (Ujuju *et al.,* 2022). The alarmingly low rate of indoor residual spraying usage (12.0%) further emphasizes concerns about a lack of trust or inadequate knowledge regarding this approach (WHO, 2022). Likewise, although the Ministry of Health recognizes ACTs as the first-line treatment (FMoH, 2020), less than half (46.7%) of the respondents actually use them. This indicates a potential reliance on substandard or traditional alternatives. A critical observation is the high rate (88.2%) of self-treatment without proper diagnostic confirmation, which raises the risk of drug resistance and misdiagnosis.

This trend suggests that even when rapid diagnostic tests (RDTs) and testing facilities are accessible, cultural or economic barriers may discourage their use (Onwujekwe *et al.,* 2008). Despite 80.0% of respondents claiming easy access to health centers, this does not equate to optimal utilization of malaria control services. Furthermore, only 2.4% reported having access to free insecticide-treated nets at health centers, which contradicts national policy goals and points to possible stock shortages, weak distribution channels, or inadequate community communication (FMoH, 2020). Although access to commodities is strong, consistent usage and adherence to malaria control measures are still lacking, likely influenced by behavioral, logistical, and perceptual challenges.

Adherence, Facilitators and Barriers to RBM Initiatives in Imo States

Despite reasonable levels of awareness and access, the study shows low adherence to RBM strategies. The gap between ITN ownership and use, poor uptake of IRS, and widespread treatment without diagnosis reflect behavioral and structural barriers (Ezire *et al.,* 2015; WHO, 2023) echoing findings from studies in Nigeria, Ghana, and Kenya (Ezire *et al.,* 2015; Ameyaw *et al.,* 2021; Ye *et al.,* 2017) . Hence underscores the central role of behavioral determinants in malaria control, which require more than information dissemination to address.

The logistic regression findings emphasize the role of education, proximity to health centers, and knowledge of malaria interventions as key facilitators. Addressing these determinants is essential for scaling up malaria control in Imo State. Presumptive treatment without diagnosis is the most common behavior, showing major deviation from RBM guidelines (WHO, 2023). The lack of influence of IRS awarene**ss** aligns with WHO recommendations, noting that community skepticism can impede uptake (WHO, 2022). Furthermore, proximity to health facilities emerged as a predictor of adherence, with

individuals living closer to services more likely to utilize malaria prevention and treatment thereby reinforcing the importance of improving geographic access Ameyaw *et al.,* 2021;Obinna&Maduka, 2017). The RBM Adherence logistic model's explanatory power (26.2%) is comparable to similar studies where tertiary education, access, and awareness consistently predict preventive health behaviors, including malaria interventions (Oladimeji *et al.,* 2023; Thomas, 2014;Ye *et al.,* 2017). Educational level, ITN access, proximity to health centers, and ACT knowledge significantly predicted adherence. This supports earlier findings by Okeke & Okeibunor (2010), on the social determinants of malaria prevention behavior. The study revealed high general awareness of ITNs and IPT, broad physical access to health centers (80.0%), availability of mosquito insecticides (80.4%) as facilitators; and Low IRS practice (12%), minimal free ITNs in health centers (2.4%), poor testing behavior and overreliance on presumptive treatment (88.2%) as barriers to RBM initiatives in Imo State. These findings align with WHO (2023) and Onyeneho *et al.* (2016) emphasizing logistical and behavioral gaps in malaria control therefore underscore the need to address structural barriers in malaria programming, especially in underserved rural areas.

CONCLUSION

This study reveals that, although there is a considerable awareness of malaria control measures under the Roll Back Malaria initiative in Imo State, the actual implementation and regular use of these interventions are still lacking. Through logistic regression analysis, it was determined that factors such as education level, access to preventive tools, and the distance to health facilities play a crucial role in adherence. These results point out the ongoing gaps between knowledge, availability, and actual practices, which compromise the overall effectiveness of malaria control efforts. To tackle these issues, it is vital to enhance community-based health education that encourages testing prior to treatment and ongoing use of preventive measures. Increasing the distribution of insecticide-treated nets via primary health centers and improving supply chains can help ensure that rural populations, in particular, have equitable access. Additionally, expanding indoor residual spraying and raising community awareness about its benefits could lead to better coverage. Addressing financial and logistical barriers is also critical; subsidizing Artemisinin-based Combination Therapies (ACTs) and Rapid Diagnostic Tests (RDTs), along with developing primary health infrastructure, is essential for boosting adherence. Lastly, incentivizing health care outreach and implementing tailored interventions may help bridge the gap between awareness and actual practice, ultimately ensuring that malaria prevention strategies make a significant impact.

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