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Acceptance of Insecticide-Treated Nets for Malaria Prevention among Pregnant Women in Omuoko Community, Rivers State, Nigeria

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Abstract

Background: Malaria in pregnancy poses serious risks in Nigeria, including maternal anemia, low birth weight, preterm delivery, and increased mortality. Insecticide-treated nets (ITNs) are a key, cost-effective preventive measure recommended by the World Health Organization for pregnant women in malaria-endemic areas. Utilization, however, remains inconsistent, especially in rural communities with limited healthcare infrastructure. This study evaluated ITN acceptance among pregnant women in Omuoko Community, Rivers State, Nigeria.

Methods: A descriptive cross-sectional study targeted 100 pregnant women in the community; a sample of 80 was determined using Taro Yamane's formula (margin of error 0.05) and selected via convenience sampling. Data were collected using a validated, reliable (Pearson r = 0.80) self-structured Likert-scale questionnaire covering socio-demographics, malaria prevention knowledge, ITN acceptance/utilization, and influencing factors. Questionnaires were administered personally over one week, with all 80 retrieved and analyzed in SPSS using frequencies, percentages, means, standard deviations, and chi-square tests. Ethical clearance was obtained from the community chief, with informed consent and confidentiality assured.

Results: Participants were mainly aged 30–35 years (43.8%), Christian (93.8%), secondary-educated (62.5%), married (68.8%), and farmers/traders (31.3% each). Acceptance was strong: 90.1% agreed/strongly agreed on ITN ownership, 92.5% on effectiveness, 80% on accessibility, 78.8% on ease of use, and 75% on no side effects. All mean scores (1.575–2.000) were rated "Good."

Conclusion: Pregnant women in this rural setting showed good acceptance of ITNs, with favorable perceptions of their value and practicality. However, barriers such as heat discomfort, hanging challenges, and reliance on traditional birth attendants may limit consistent use. Targeted interventions—improved antenatal distribution, community education, and regular net replenishment—are recommended to bridge the acceptance–utilization gap and reduce malaria burden in similar rural Nigerian communities.

Keywords: Insecticide-treated nets, malaria prevention, pregnant women, acceptance, rural Nigeria, Rivers State

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1. Introduction

Malaria continues to pose a major global public health threat, with the greatest impact felt in sub-Saharan Africa. Recent estimates from the World Health Organization (WHO) indicate that about 282 million malaria cases and 610,000 related deaths occur worldwide, with Africa accounting for roughly 95% of these figures (WHO, 2025). Within this region, Nigeria carries the largest share of the burden, contributing approximately 27–31% of global malaria morbidity and mortality (WHO, 2022). In recent years, the country has recorded an estimated 68 million cases and close to 200,000 deaths, with sustained transmission occurring across most parts of the nation (WHO, 2022). Young children and pregnant women remain the most at-risk populations because of biological vulnerabilities such as weakened immunity during pregnancy.

Malaria in pregnancy (MiP) presents serious health concerns due to the ability of *Plasmodium falciparum* parasites to accumulate in the placenta, causing placental malaria even in women without obvious symptoms. This condition can lead to adverse maternal outcomes such as anemia, severe illness, and increased risk of maternal death. It also negatively affects fetal and neonatal health, contributing to low birth weight, premature delivery, intrauterine growth restriction, stillbirth, miscarriage, congenital malaria, and increased infant mortality. In endemic regions, MiP is responsible for a substantial proportion of these complications and has been associated with up to one-fifth of low birth weight cases in areas of stable malaria transmission in Africa. Meta-analytical evidence further indicates that infected pregnant women are significantly more likely to experience anemia, deliver low birth weight infants, have preterm births, or suffer stillbirths. In Nigeria, malaria affects a considerable percentage of pregnancies, with reported prevalence ranging from 8% to

58% across studies, while pooled African estimates frequently indicate infection rates of about 17–21% during antenatal visits or at delivery (Eshetu et al., 2023; Demoze et al., 2024; Yirsaw et al., 2021).

Several factors contribute to Nigeria's high malaria burden, including widespread population exposure, environmental conditions favorable for mosquito breeding, inadequate sanitation, and limited healthcare access, particularly in rural settings. Transmission occurs throughout the year in many regions of the country. Findings from the Nigeria Malaria Indicator Survey (NMIS) 2021 reported a national malaria parasite prevalence of approximately 22% among children aged 6–59 months, with higher levels observed in rural and northern areas, highlighting the persistent endemicity of the disease. Pregnant women are especially susceptible because pregnancy-related immunological changes increase vulnerability to infection and complications. Although Nigeria has adopted malaria prevention policies consistent with WHO recommendations, significant gaps remain in the uptake of preventive measures (Koenker et al., 2023; Theiss-Nyland et al., 2019).

To address malaria in pregnancy, the WHO advocates an integrated prevention strategy that includes effective case management, intermittent preventive treatment using sulfadoxine-pyrimethamine beginning in the second trimester, and regular use of insecticide-treated nets (ITNs), particularly long-lasting insecticidal nets (LLINs). ITNs play a vital role in vector control by reducing human–mosquito contact and eliminating disease-carrying mosquitoes, thereby lowering infection risk. Universal access to ITNs is recommended for vulnerable groups such as pregnant women, with distribution commonly conducted through antenatal care services and immunization programs (Carlson et al., 2011). Evidence suggests that consistent ITN use decreases malaria incidence during pregnancy, improves neonatal outcomes, and is safe for both mother and fetus (Ouattara et al., 2014).

Despite these benefits, ITN utilization among pregnant women remains inadequate in many settings. In Nigeria, data from surveys such as the 2021 NMIS indicate that only about half of pregnant women reported sleeping under an ITN the night before the survey. Although over half of households owned at least one net, far fewer had sufficient nets for all members, and overall population access remained limited. Utilization rates also vary across regions and are influenced by socio-economic status, educational attainment, place of residence, and level of awareness. Reported usage among pregnant women has ranged between 39% and 50% in some studies, with barriers including discomfort due to heat, concerns about side effects, limited availability, and preference for alternative or traditional healthcare practices (Musa et al., 2009; Esimai & Aluko, 2014; Aliyu & Alti-Mu'azu, 2009). Similar trends have been observed across sub-Saharan Africa, where ITN use is often shaped by socio-demographic and economic inequalities (Haileselassie et al., 2023).

Earlier Nigerian studies documented limited awareness and inconsistent ITN use among antenatal clinic attendees, while subsequent research has identified factors such as educational level and urban residence as important determinants of utilization (Musa et al., 2009). More recent investigations have examined behavioral and motivational influences affecting long-lasting net usage among pregnant women, highlighting gaps in both knowledge and practical skills (Balami et al., 2019). Regional analyses have also demonstrated disparities in ITN access and adoption during pregnancy across high-burden African countries (Demoze et al., 2024).

Evidence from other African settings supports these observations. Studies conducted in Ethiopia and East Africa have identified education, parity, and access to antenatal services as key predictors of ITN utilization (Belay & Deressa, 2008; Donacho et al., 2025), while community-based research has linked perceptions, beliefs, and socio-economic conditions to net usage (Yirsaw et al., 2025). Additional investigations have shown that increased ITN coverage is associated with reduced malaria transmission, and policy-focused analyses have explored strategies for achieving universal net distribution (Ouattara et al., 2014; Koenker et al., 2023).

In rural Nigerian communities such as Omuoko in Rivers State, limited healthcare infrastructure, reliance on traditional birth attendants, and low literacy levels may further hinder ITN acceptance and use despite national malaria control efforts. Evaluating community-level acceptance—including ownership, perceived effectiveness, accessibility, ease of use, and possible side effects—is therefore essential for designing targeted interventions. This study examines these factors among pregnant women in Omuoko Community with the aim of informing evidence-based approaches to improve ITN uptake in line with Nigeria's National Malaria Strategic Plan objectives for reducing malaria burden among vulnerable populations.

2. Methodology

2.1 Research Design

This study employed a descriptive cross-sectional design to examine the knowledge, acceptance, and utilization of insecticide-treated nets (ITNs) for malaria prevention among pregnant women in Omuoko Community, Rivers State, Nigeria. Descriptive research systematically describes phenomena as they occur in their natural environment, without experimental manipulation or alteration of variables. This approach was selected to provide an accurate portrayal of the participants' perceptions, behaviors, and influencing factors in their real-world context.

2.2 Study Area

The study was conducted in Omuoko Community, located in Aluu, Ikwerre Local Government Area of Rivers State, Nigeria. The name "Omuoko" translates to "children of Oko," referring to the descendants of Oko, the third son of Aluu. Omuoko is the third of nine communities that constitute Aluu. The population comprises both indigenes and non-indigenes (often referred to as "strangers" or settlers). The primary livelihoods in the community are farming and trading. Infrastructure remains limited, with only one primary health center available. Many pregnant women in the area prefer traditional birth attendants over the health center for antenatal and delivery care, largely due to low educational levels, limited community development, and accessibility challenges. This setting was chosen because it offered convenient access

to a sufficient number of pregnant women with the relevant characteristics for the study.

2.3 Study Population The target population consisted of all 100 pregnant women residing in Omuoko Community at the time of the study. This figure was considered adequate to represent and generalize findings to the entire group of pregnant women in the community.

2.4 Sample Size Determination The sample size was calculated using Taro Yamane's formula (1967), a widely applied method for determining appropriate sample sizes from finite populations in survey research:

$$n = \frac{N}{1 + N(e^2)}$$

where:

- n = required sample size
- N = population size (100)
- e = margin of error (set at 0.05 for a 95% confidence level)

Substituting the values:

$$n = \frac{100}{1 + 100(0.05)^2}$$

$$n = \frac{100}{1 + 100(0.0025)}$$

$$n = \frac{100}{1 + 0.25}$$

$$n = \frac{100}{1.25}$$

$$n = 80$$

Thus, a sample size of 80 pregnant women was determined.

2.5 Sampling Technique
A convenience sampling technique was adopted. Participants were recruited based on availability and willingness to participate during the data collection period.

2.6 Data Collection Instrument
Data were collected using a self-structured questionnaire formatted on a five-point Likert scale. The instrument comprised four main sections:

- Section A: Socio-demographic characteristics (e.g., age, educational level)
- Section B: Knowledge of malaria prevention
- Section C: Level of acceptance and utilization of ITNs for malaria prevention
- Section D: Factors influencing acceptance and utilization of ITNs

2.7 Validity of the Instrument
To ensure validity, the draft questionnaire was submitted to the research supervisor for expert review of face and content validity. Suggested corrections, deletions, and additions were incorporated, and the revised version was finalized under the supervisor's guidance and approval.

2.8 Reliability of the Instrument
Instrument reliability, reflecting consistency and stability, was assessed using the test-retest method. Ten copies were initially administered to a pilot group of available participants. After a one-week interval, the same instrument was re-administered to another set of respondents. Responses from both administrations were compared using the Pearson Product Moment Correlation Coefficient, yielding a reliability coefficient of 0.80, which indicates acceptable reliability.

2.9 Data Collection Procedure
Data collection occurred over a one-week period. The researcher personally administered the questionnaires on alternate days, providing clear instructions and guidance to participants during completion. A total of 80 questionnaires were distributed, and all were retrieved and deemed valid for analysis.

2.10 Data Analysis
Collected data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics—including frequencies, percentages, means, and standard deviations—were computed and presented in tables. Inferential statistics, specifically the chi-square test, were applied where appropriate to examine associations.

2.11 Ethical Considerations
Ethical approval was obtained by presenting a letter of introduction and research proposal to the traditional chief of Omuoko-Aluu Community, who granted permission to proceed. Informed consent was secured from all participants, with assurances of confidentiality, anonymity, and voluntary participation. Pregnant women were explicitly informed that they could withdraw from the study at any time without providing reasons or facing consequences.

3. Results

3.1 Demographic details of participants
Table 1 shows the socio-demographic characteristics of the respondents. Out of 80 respondents studied, majority 35(43.8%) were aged 30-35 years, 20(25%) were aged 24-29 years, 13(18.8%) were aged 36-45 years, 10(12.5%) were aged 18-23 years; majority 75(93.8%) were Christians, 5(6.2%) were islam while none were traditional; majority 50(62.5%) completed their secondary education, 20(25%) completed their primary education while 10(12.5%) completed their tertiary education; majority 55(68.8%) were married, 15(18.8%) were single; 20(25%) were unemployed, 25(31.3%) were farmers, 25(31.3%) were traders,10(12.5%) were teachers.

Table 1: Socio-demographic characteristics of the respondents (n=80)

S/n	Items	Variables	Frequency (f)	Percentage (%)
1	Age	18-23 years	10	12.5
		24-29 years	20	25
		30-35 years	35	43.8
		36-45 years	13	18.8
		Total	**80**	**100**
2	Religion	Christianity	75	93.8
		Islam	5	6.2
		Traditional	0	0
		Total	**80**	**100**
3	Level of education	Primary	20	25
		Secondary	50	62.5
		Tertiary	10	12.5
		Total	**80**	**100**
4	Marital status	Single	15	18.8
		Married	55	68.8
		Divorced/Separated	10	12.5
		Total	**80**	**100**
5	Occupation	Unemployed	20	25
		Farming	25	31.3
		Trading	25	31.3
		Teaching	10	12.5
		Total	**80**	**100**

3.2 Acceptance of insecticide treated bed net among pregnant women (n= 80)

Table 2 shows the acceptance of insecticide treated bed nets among pregnant women. Out of 80 respondents studied, majority of the respondents 45(56.3%) agreed they own insecticide treated bed net while 5(6.3%) disagreed; 30(37.5%) agreed that insecticide treated bed net is an effective method of malaria control, 44(55%) strongly agreed that insecticide treated bed net is an effective method of malaria control, 4(5%) disagreed that insecticide treated bed net is an effective method of malaria control while 2(2.5%) strongly disagreed; 30(37.5%) agreed that insecticide treated bed net is accessible, 34(42.5%) strongly agreed that insecticide treated bed net is accessible, 14(17.5%) disagreed that insecticide treated bed net is accessible, 2(2.5%) strongly disagreed; majority of the respondents 45(56.3%) agreed that insecticide treated bed net is easy to use, 18(22.5%) strongly agreed that insecticide treated bed net is use to use, 8(10%) disagreed that insecticide treated bed net is easy to use while 9(11.3%) strongly disagreed;30(37.5%) agreed that insecticide treated bed net has no side effect while 10(12.5%) disagreed.

Table 2: Acceptance of insecticide treated bed net among pregnant women (n= 80)

S/N	Items	A f(%)	SA f(%)	D f(%)	SD f(%)	MEAN±SD	REMARK
1	I own insecticide treated bed net?	45(56.3%)	27(33.8%)	5(6.3%)	3(3.8%)	1.575±0.775	Good
2	Insecticide treated bed net is an effective method of malaria control.	30(37.5%)	44(55%)	4(5%)	2(2.5%)	1.725±0.675	Good
3	Insecticide treated bed net is accessible.	30(37.5%)	34(42.5)	14(17.5%)	2(2.5%)	1.850±0.797	Good
4	Insecticide treated bed net is easy to use.	45(56.3%)	18(22.5%)	8(10%)	9(11.3%)	1.763±1.034	Good
5	Insecticide treated bed net has no side effect	30(37.5%)	30(37.5%)	10(12.5%)	10(12.5%)	2.000±1.006	Good

4. Discussion

The findings of this study indicate a generally positive level of **acceptance** of insecticide-treated nets (ITNs) among pregnant women in Omuoko Community, a rural setting in Rivers State, Nigeria. With 56.3% of respondents owning an ITN and an additional 33.8% strongly agreeing to ownership (totaling high agreement), alongside strong perceptions of effectiveness (92.5% agreement/strong agreement), accessibility (80%), ease of use (78.8%), and absence of side effects (75%), the results reflect good overall acceptance. Mean scores across items ranged from 1.575 to 2.000 on the Likert scale, consistently rated as "Good." These perceptions align with

broader evidence that ITNs are recognized as a safe and effective malaria prevention tool, particularly in high-burden areas.

This acceptance is encouraging given Nigeria's persistent malaria challenge. According to the **WHO (2025)** malaria fact sheet, there were 282 million global cases and 610,000 deaths in 2024, with Africa bearing 95% of the burden; Nigeria alone accounted for a substantial share, including 31.9% of deaths in the African Region. The **WHO (2022)** report on malaria in Nigeria similarly highlights ongoing high transmission, emphasizing the need for sustained vector control. In this context, positive community perceptions in rural Omuoko could support national goals, but gaps between acceptance (perceived benefits) and actual consistent utilization warrant attention, as ownership here (around 90% agreement) exceeds typical reported use in many Nigerian studies.

The observed high agreement on effectiveness and lack of side effects contrasts with some barriers noted in prior research, where discomfort (e.g., heat) or misconceptions sometimes hinder use. For instance, in rural northern Ethiopia, Belay and Deressa (2008) identified associated factors like education and access influencing ITN use among pregnant women, with utilization often lower despite awareness. Similarly, Esimai and Aluko (2014) in southwestern Nigeria found determinants such as education and urban residence affecting ITN use among caregivers, suggesting that in rural settings like Omuoko—characterized by limited education and preference for traditional birth attendants—perceived ease and no side effects represent a strength that could be leveraged.

Ownership at 56.3% (with strong agreement pushing higher) is notable in this underdeveloped rural community with only one health center. This may reflect periodic distribution efforts, though lower than universal coverage targets. Koenker et al. (2023) updated estimates on nets needed for universal coverage, stressing that maintaining high access requires ongoing replenishment, as nets wear out or are insufficient per household. In rural Nigeria, distribution often occurs through antenatal care (ANC) or campaigns, but Theiss-Nyland et al. (2019) analyzed Demographic and Health Survey (DHS) data and showed that policies targeting children can indirectly boost use, though pregnant women-specific channels remain key. Carlson et al. (2011) examined ANC and Expanded Programme on Immunization (EPI) attendance in Chad, Mali, and Niger, highlighting implications for ITN delivery; similar equity issues apply in Nigeria, where Webster et al. (2005) reviewed coverage of treated nets and immunizations, noting that delivery systems often fail to reach the poorest equitably.

In southern Nigeria, including Rivers State, utilization varies. Recent studies in Bayelsa and Rivers States have assessed factors influencing ITN use among pregnant women and children, with ownership sometimes high but consistent use challenged by local barriers. The current study's high acceptance (e.g., 80% on accessibility) suggests community-level awareness efforts may be effective, differing from earlier northern Nigerian findings like Aliyu and Alti-Mu'azu (2009), where usage was linked to reduced malaria episodes but not always universal.

Systematic evidence supports moderate to good utilization in sub-Saharan Africa but highlights gaps. Kassie et al. (2023) conducted a meta-analysis in Ethiopia showing associated factors for ITN use among pregnant women, with pooled rates varying by context. Miller et al. (2022) reviewed routine ITN distribution data across countries, questioning whether ANC and EPI channels achieve full potential—often not, due to low attendance or follow-through. Doe et al. (2022) discussed positive ANC responses in sub-Saharan Africa for preventing malaria in pregnancy, emphasizing integrated approaches.

The predominantly Christian (93.8%), secondary-educated (62.5%), married (68.8%), and farming/trading (31.3% each) sample in Omuoko may contribute to favorable perceptions, as education and stable partnerships often correlate with better health-seeking. However, reliance on traditional birth attendants and low tertiary education (12.5%) could limit full utilization, echoing broader rural-urban disparities.

Overall, while acceptance is good, translating it to consistent use requires addressing contextual barriers like heat, hanging difficulties, or cultural preferences. Strengthening ANC-based distribution and education could bridge gaps, as seen in multi-country reviews. Sustained efforts, informed by these findings, are essential to reduce malaria's impact on pregnant women in rural Nigeria, aligning with global targets for elimination.

5. Conclusion

This study on the acceptance of insecticide-treated nets (ITNs) for malaria prevention among pregnant women in Omuoko Community, Rivers State, Nigeria, reveals a generally positive outlook despite the rural and resource-limited setting. The majority of the 80 participants demonstrated good acceptance, with high agreement on ITN ownership (90.1% combined agree/strongly agree), perceived effectiveness (92.5%), accessibility (80%), ease of use (78.8%), and absence of side effects (75%). These favorable perceptions, reflected in mean scores rated as "Good" across all items, indicate that pregnant women in this community recognize ITNs as a safe, practical, and valuable tool for protecting themselves and their unborn children from malaria.

However, the findings also highlight potential gaps between acceptance and consistent utilization. While ownership appears relatively high in this context, actual nightly use may be influenced by contextual barriers such as discomfort from heat, difficulties in hanging nets properly, reliance on traditional birth attendants rather than the single primary health center, and low levels of tertiary education. These factors align with broader patterns observed across sub-Saharan Africa, where knowledge and positive attitudes do not always translate into optimal coverage.

Strengthening malaria prevention in such communities requires targeted, multi-faceted interventions. Enhancing antenatal care attendance to improve free ITN distribution, conducting community-based education on correct and consistent use, addressing local misconceptions, and ensuring regular replenishment of nets are critical steps. Integrating these efforts with existing national strategies could bridge the acceptance–utilization gap and contribute meaningfully to

reducing malaria burden among pregnant women in rural Nigeria.

Ultimately, the good level of acceptance documented here provides a strong foundation for scaling up effective vector control. Sustained investment in awareness, access, and support mechanisms will be essential to protect vulnerable pregnant women and advance toward malaria elimination goals in high-burden regions like Rivers State.

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