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Acceptance and Utilization of Insecticide Treated Nets in Prevention and Control of Malaria by Parent of Under-Five Children in Ozuoba, Rivers State, Nigeria

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Abstract

Malaria remains one of the leading causes of morbidity and mortality in sub-Saharan Africa, with children under five years being the most vulnerable group. Insecticide-treated nets (ITNs) are among the most effective preventive strategies, yet their acceptance and utilization often fall below expected levels despite widespread distribution. This study assessed the acceptance and utilization of ITNs in malaria prevention among parents of under-five children in Ozuoba, Rivers State. The study aimed to determine the knowledge of malaria transmission and prevention, assess the acceptance of ITNs, and evaluate their utilization among parents of under-five children in the study area. A descriptive survey design was adopted, with a sample size of 153 parents selected through multistage sampling. Data were collected using a structured questionnaire and analyzed using descriptive statistics such as frequencies and percentages, presented in tables and charts. Findings revealed that parents demonstrated a high level of knowledge of malaria transmission and prevention, with over 80% recognizing mosquito bites as the main cause of malaria and acknowledging the protective role of ITNs. Acceptance of ITNs was also high, particularly when provided free of charge; however, willingness to purchase ITNs independently was lower, highlighting affordability as a barrier. Utilization was moderate, with 62.1% reporting ownership of ITNs, but only 52.3% consistently ensuring their under-five children slept under them. Heat discomfort and difficulty with installation were cited as key challenges. The study concluded that while ITN knowledge and acceptance were satisfactory, utilization remained suboptimal due to socioeconomic and practical barriers. It recommended sustained free or subsidized ITN distribution, intensified health education by nurses and health workers, improved community engagement, and design modifications for greater comfort. Future studies should explore cultural influences and seasonal variations in ITN use.

Keywords: *Malaria prevention, Insecticide-treated nets, Acceptance, Utilization, Under-five children.*

Introduction

Malaria continues to be a significant global health concern, especially in sub-Saharan Africa, where it disproportionately affects vulnerable populations, particularly children under five years of age and pregnant women. According to the World Health Organization (WHO, 2023), an estimated 249 million malaria cases and 608,000 malaria-related deaths were recorded globally in 2022, with about 80% of these deaths occurring in children under five years. Nigeria alone accounts for nearly 27% of global malaria deaths, underscoring the urgent need for effective prevention and control strategies (WHO, 2023). Among the proven and cost-effective tools for malaria prevention, insecticide-treated nets (ITNs) have shown remarkable success in reducing malaria transmission, morbidity, and mortality. Studies have demonstrated that consistent and correct use of ITNs can reduce child

mortality from malaria by up to 20% and decrease malaria episodes by approximately 50% (Bhatt, 2015). As a result, ITNs are central to national and global malaria control programs, including the WHO's Global Technical Strategy for Malaria 2016–2030.

The use of ITNs has been widely promoted as a simple and effective way to prevent malaria (Lindsay & Gibson, 2019). ITNs work by killing or repelling mosquitoes that come into contact with them, thereby reducing the transmission of malaria parasites (Curtis & Lines, 2017).

Three broad approaches are currently recommended by WHO to preventing the adverse effects of malaria in areas with high level of transmission of plasmodium falciparum, they are use of insecticide- treated bed nets, intermittent preventive treatment (IPT) with anti-malaria drugs and febrile malaria case management. This has been adopted by Nigeria. Following the Abuja malaria summit in 2000, the Nigeria government set a midterm target to have 65% of the population at risk, pregnant women and children under 5 years sleeps under insecticide treated nets by the end of 2005. This led to the initiation of the insecticides Treated Nets massive promotion and awareness campaign in 2002 with the aim of promotion awareness and improving availability and utilization of ITNs through distribution of nets to pregnant women and children of Under-five old who have completed their routine immunization free of charge.

Insecticide-treated nets (ITNs) are a form of personal protection and mosquito control that reduce malaria illness, severe disease, and death due to malaria in endemic regions. The Nets vary in size, shape, color, material, insecticide treatment status, and number and type of active insecticide ingredients within the nets. Most nets are made of polyester, polyethylene, or polypropylene. The insecticides used on ITNs have been shown to pose very low health risks to humans and other mammals but are toxic to insects and kill them. (CDC, 2023). Despite widespread distribution campaigns and increased availability through public health initiatives, ITN utilization rates remain below target levels in many malaria-endemic countries. The 2021 Nigeria Malaria Indicator Survey revealed that although 61% of households owned at least one ITN, only 51% of children under five slept under an ITN the night before the survey (National Malaria Elimination Programme [NMEP], 2021). This gap between ITN ownership and actual use highlights a significant barrier to malaria control.

Several factors contribute to the low utilization and acceptance of ITNs among parents of under-five children. These include limited knowledge about malaria transmission, poor perception of ITN efficacy, cultural and traditional beliefs, discomfort caused by heat, fear of adverse reactions to insecticides, and improper net installation and maintenance (Pulford, 2011; Aregawi, 2021). Socioeconomic status, educational level, and access to health information also play crucial roles in influencing behavioral responses to malaria prevention measures (Okeke, 2020).

Furthermore, misconceptions about malaria causation—such as attributing it to dirty water or spirits—have been found to deter appropriate preventive behaviors, including ITN use (Ahorlu, 2019). In some cases, ITNs are repurposed for fishing or gardening due to poverty and lack of understanding of their intended purpose (Eisele, 2020). These behaviors undermine the effectiveness of malaria interventions and expose under-five children to increased risk.

Malaria infection is a recalcitrant disease that has been an impediment to human development; it is both a cause and consequence of underdevelopment and poverty to the Pregnant women, the developing fetus and the new born infant, the wide range of adverse effects and consequences on maternal health, pregnancy/ birth outcome and Under-five are of great concern. Researchers has observed, with keen and utmost interest the various measures involved in taking the menace of malaria among Under-five children and all the efforts by governments, donor agencies and other stakeholders to reduce the burden of this disease and check its scourge among pregnant women and parents of Under-five children. These efforts includes use of ITNs, health education, awareness, campaigns, advertisement in mass media, free Antenatal care provided. However, despite all these most women and under five children do not have or like to sleep in nets, also it is alarming to see most of them still having malaria attacks. This has a very serious negative effect on both the women and Under-five children.

Ozuoba is in a community surrounded by forest vegetation which is a site for mosquito breed, this has led to continual malaria outbreak. In 2015, insecticide treated nets (ITNs) were distributed by the federal government to different communities in Rivers States including Ozuoba Community. Notwithstanding the distribution of insecticide treated net, Malaria outbreak continued to increase especially among under-five children. Within the years (2016 -2020), a total of 8,154 (out of 17,469) of the Under-five children that attended Model Primary Health Centre, Ozuoba, Rivers State Nigeria, were found to be positive for malaria parasite at the Centre, leading to an overall infection rate of 46.7% within the study period, The remaining 9315 (53.3%) had no malaria infection. Thus, this research is focused on investigating the level of acceptance and Utilization of the recommended Insecticides Treated Nets in the prevention and control of malaria by parents of Under-five children. The study provided answers to the following research questions:

1. What is the level of knowledge of transmission, prevention and control of malaria by parents of Under-five children in Ozuoba, Obio-Akpor Local Government Area, Rivers State?
2. What is the level of acceptance of ITNs in the prevention and control of malaria by parents of Under-five children in Ozuoba, Obio-Akpor Local Government Area, Rivers State?
3. What is the rate of utilization of ITNs by parents of Under-five children in Ozuoba, Obio-Akpor Local Government Area, Rivers State?

Methodology

The study employed a descriptive survey design with a target population which comprised of parents or primary caregivers of children under five years old residing in Ozuoba community. According to the most recent local health records, there are approximately 250 households with children under five in the area (Obio-Akpor Local Government Health Department, 2022). The sample size for the study was 153 which was selected using the purposive sampling technique. The inclusion criteria include: parents or primary caregivers of children under five years old, residents of Ozuoba for at least six months, and willingness to participate in the study. Exclusion criteria include: parents or caregivers of children five years old and above, residents of Ozuoba for less than six months, individuals with cognitive impairments that prevent them from providing informed consent, and non-permanent residents or visitors to the area. The instrument for data Collection was a self-structured questionnaire with a reliability coefficient of 0.80, validated by experts. The data was collected using a questionnaire that was administered (face-to-face) to the respondents by the researcher. Analysis was done using frequency and percentages.

Table1: Showing the Socio-demographic data of respondents (parent of under-five children) in Ozuoba, Rivers State

S/N	Item	Description	Frequency	Percentages
1.	Age	18–25	23	15.0
		26–35	89	58.2
		36–45	20	13.1
		46 and above	21	13.7
		Total	**153**	**100%**
2.	Sex	Male	43	28.1
		Female	110	71.9
		Total	**153**	**100%**
3.	Marital Status	Single	25	16.3
		Married	116	75.8
		Widowed/Divorced	12	7.9
		Total	**153**	**100%**
4.	Education Level	No formal education	14	9.2
		Primary		
		Secondary	24	15.7
		Tertiary	75	49.0
		Total	40	26.1
			153	**100%**
5.	Number of children under five years	0ne	22	14.4
		Two	25	16.3
		Three or more	106	69.3
		Total	**153**	**100%**

From the table 1, the findings shows that out of 345 respondents, Age (years) between 18-25 was 23(15.0%), 26-35years was 89(58.2%), 36-45years was 20(13.1%), while 46 and above 21(13.7%). 43(28.1%) of the respondent were male while 110(71.9%) were female. 25(16.3%) of the respondent were single, 116(75.8%) were married, while 12(7.9%) were divorced. 14(9.2%) had no formal education, 24(15.7%) had primary education, 75(49.0%) had secondary education, 40(26.1%) had a tertiary education. 22(14.4%) had only one child, 25(16.3%) had two children while 106(69.3%) had three or more.

Table 2: shows the result on the level of knowledge of malaria transmission, prevention and control of malaria among parents of under-five children in Ozuoba, Rivers State

S/N	Item	Strongly Agree (Frequency, Percent)	Agree (Frequency, Percent)	Disagree (Frequency, Percent)	Strongly Disagree (Frequency, Percent)
6.	Malaria is caused by mosquito	100 (64.4%)	40 (26.1%)	8 (5.2%)	5 (3.3%)
7.	Standing water and dirty surroundings increase mosquito breeding?	90 (58.8%)	50 (32.7%)	10 (6.5%)	3 (2.0%)
8.	ITNs help in preventing mosquito bites and malaria?	95 (62.1%)	45 (29.4%)	10 (6.5%)	3 (2.0%)
9.	Under-five Children are more vulnerable to malaria?	80 (52.3%)	55 (35.9%)	12 (7.8%)	6 (3.9%)
10.	Malaria can lead to death if not treated.	85 (55.6%)	50 (32.7%)	10 (6.5%)	8 (5.2%)

From the analysis in the table 2, in Item 6 which states that malaria is caused by mosquito bites 100(58.8%) of the respondent strongly agreed, 40(26.1%) agreed, 8(5.2%) disagreed, 5(3.3%) strongly disagreed. In item 7, standing water and dirty surroundings increases mosquito breeds 90(58.8%) strongly agreed, 50(32.7%) agreed, 10(6.5%) disagreed while 3(2.0%) strongly disagreed. In item 8, ITNs prevent mosquito bites and malaria 95(62.1%) strongly agreed, 45(29.4%) agreed, 10(6.5%) disagreed while 3(2.0%) strongly disagreed. In item 9, Children under-five are more vulnerable to malaria 80(52.3%) strongly agreed, 55(35.9%) agreed, 12(7.8%) disagreed, 6 (3.9%) strongly disagreed. In item 10, malaria can lead to death if not treated 85(55.6%) strongly agreed, 50(32.7%) agreed, 10(6.5%) disagreed, 8(5.2%) strongly disagreed. Hence the results indicate a high level of knowledge among respondent with over 80% strongly agreeing to all items suggesting a strong awareness of malaria transmission and prevention.

Table 3: Showing the result on the level of acceptance of insecticide treated net (ITNs) in the prevention and control of Malaria by Parents of under-five children in Ozuoba, Rivers State, 2025

S/N	Item	Strongly agree (Frequency, Percent)	Agreed (Frequency, Percent)	Disagree (Frequency, Percent)	Strongly disagree (Frequency, Percent)
11.	I Have heard about insecticide treated nets (ITNs)	110 (71.9%)	35 (22.9%)	5 (3.3%)	3 (2.0%)
12.	I believe ITNs are effective in preventing malaria	95 (62.1%)	45 (29.4%)	10 (6.5%)	3(2.0%)
13.	I Have received health education about ITNs	85 (55.6%)	50(32.7%)	12 (7.8%)	6 (3.9%)
14.	I accepted/collected an ITN when offered free.	100 (65.4%)	35 (22.9%)	10 (6.5%)	8(5.2%)
15.	I Will buy an ITN if not provided for free.	70 (45.8%)	50 (32.7%)	20 (13.1%)	13 (8.5%)

From the analysis in table 3, Data analyzed and interpreted revealed that, in Item 11, I have heard about insecticide treated nets(ITNs), 110(71.9%) respondent strongly agreed, 35(22.9%) agreed, 5(3.3%) disagreed, 3(2.0%) strongly disagree. In Item 12, 95(62.1%) of the respondent strongly believed that ITNs is effective in preventing malaria, 45(29.4%) agreed, 10(6.5%) disagreed while 3(2.0%) strongly disagreed. In Item 13, 85(55.5%) strongly agreed that they have receive health education about ITNs, 50(32.7%) agreed, 12(7.8%) disagreed while 6(3.9%) strongly disagreed. In item 14, 100(65.4%) strongly agreed that they have collected/accepted ITNs when offered free, 35(22.9%) agreed, 10(6.5%) disagreed while 8(5.2%) strongly disagreed. In item 15, 85(55.6%) strongly agreed that they will buy ITNs if not provided for free, 50(32.7%) agreed, 10(6.5%) disagreed while 8(5.2%) strongly disagreed. Hence the result showed that (65.4%) of the respondents strongly agreed that they accepted ITNs when offered for free and a good number are willing to purchase them. This indicates generally high acceptance although affordability may be barrier.

Table 4: Showing result of the rate of utilization of insecticide treated net (ITNs) in the prevention and control of malaria in Ozuoba, Rivers State

S/N	Item	Strongly Agree (Frequency, Percent)	Agree (Frequency, Percent)	Disagree (Frequency, Percent)	Strongly Disagree (Frequency, Percent)
16.	I currently have an insecticide treated net in your house	95 (62.1%)	40 (26.1%)	10 (6.5%)	8 (5.2%)
17.	My under-five children sleep under an ITN every night	80 (52.3%)	50 (32.7%)	15 (9.8%)	8 (5.2%)
18.	I find it easy install and use ITNs.	85 (55.6%)	45 (29.4%)	13 (8.5%)	10 (6.5%)
19.	I avoid using ITNs because they are too hot or uncomfortable.	25 (16.3%)	30(19.6%)	50(32.7%)	48(31.4%)
20.	I replace damaged ITNs with new ones when needed.	70 (45.8%)	45 (29.4%)	20(13.1%)	18 (11.8%)

From the analysis in the table 4, data analyzed and interpreted revealed that, in item 16, 95(62.1%) of the respondents strongly agreed that they currently have insecticide treated net in their homes, 40(26.1%) agreed, 10(6.5%) disagreed, while 8(5,2 %) strongly disagreed. In item 17, 80(52.3%) strongly agreed that their under-five children sleeps under an ITN every night, 50(32.7%) agreed, 15(9.8%) disagreed while 8(5.2%) strongly disagreed. In item 18, 85(55.6%) strongly agreed that they find it easy to install ITNs in their homes, 45 (29.4%) agreed, 13(8.5%) disagreed while 10(6.5%) strongly disagreed. In item19, 25(16.3%) strongly agreed that they avoid using ITNs because they are too hot or uncomfortable, 30(19.6%) agreed, 50(32.7%) disagreed while 48(31.4%) strongly disagreed, In item 20, 70(45.8%) strongly agreed that they replace damaged ITNs when needed, 45(29.4%) agreed, 20(13.1%) disagreed while 18(11.8%) strongly disagreed. Hence, the ownership of ITNs is relatively high (62.1%) but consistent use among under-five children (52.3%) is lower partly due to discomfort or inconvenience.

Discussion of Findings

Findings from research questions one found a high level of knowledge among parents in Ozuoba: most respondents correctly identified mosquito bites as the main cause of malaria, recognized under-five children as a vulnerable group, and knew that ITNs prevent malaria. These results are consistent with several empirical studies. Oluwasogo (2021) reported that about 78% of parents in selected Nigerian communities correctly associated malaria with mosquito bites; Birhane (2020) found similarly high recognition (≈89%) among mothers in Ethiopia; and Nkoka's systematic review (2019) showed that awareness of ITN effectiveness strongly correlates with knowledge and higher use across multiple African settings. These similarities suggest that ongoing public health messaging and ANC/child welfare services have raised basic malaria awareness across diverse settings.

There are also documented dissimilarities in the literature. For example, Dhiman & Yadav (2020) describe persistent misconceptions in certain rural communities—such as attributing malaria to dirty water, food, or spiritual causes—which were less evident in the study conducted at Ozuoba. Possible reasons for these differences include variations in educational level, intensity and reach of local health-education campaigns, and prior mass-distribution or community engagement activities in Ozuoba. Additionally, timing (recent campaigns) and the presence of local health

workers or NGO programs can quickly shift community knowledge compared with areas that have received less reinforcement.

Findings from research questions two shows generally high acceptance of ITNs (many respondents had heard of ITNs, believed they were effective, and accepted free distributions). This mirrors Afolabi (2022) in Nigeria whose study showed 78.5% acceptance rate, Msellemu (2017) in Tanzania 82% acceptance rate, and Nkoka (2019) who found rising acceptance trends across sub-Saharan Africa following mass-distribution campaigns. The similarity across these studies indicates that when communities are exposed to targeted messaging and free or heavily subsidized distribution, acceptance tends to be high.

However, findings also shows that the willingness to buy ITNs is lower (affordability as a barrier) this also appears in other studies but with different magnitudes. For example, Afolabi (2022) and Msellemu (2017) reported comparatively higher willingness-to-pay in some populations, while Ankomah (2021) and Eisele (2020) documented that poorer households or those with competing financial needs were far less willing to purchase nets. Reasons for these differences include household wealth/occupation mix, perceived opportunity costs, local net-market availability, and social marketing presence. Where social marketing (subsidized sales, vouchers) or commercial availability were present, willingness to buy increased; where free mass campaigns were the only source, households tended to expect free provision and showed lower purchase-intent. Cultural trust in free public programs versus private sellers also influences acceptance-to-purchase transitions.

Findings from research questions three shows that although ownership in Ozuoba was moderate (62.1%), consistent nightly use among under-five children was lower (52.3%). This pattern of ownership being greater than use is widely reported. Andrada's meta-analysis (2019) found pooled utilization rates across sub-Saharan Africa around the mid-60s but with wide heterogeneity; Afolabi (2021) reported about a 62% utilization in rural Nigeria; Birhane (2020) recorded higher use where mothers had better access to care and ITN maintenance education. These similarities show that ownership does not automatically translate into regular use without addressing behavioral and practical barriers.

Key differences emerge in the reasons for non-use. Respondents cited heat/discomfort and installation difficulty as main barriers. Ahorlu (2019) (Ghana) and Koenker (2019) (multi-country seasonal analysis) similarly reported reduced use in hot/dry seasons and where sleeping arrangements made hanging nets impractical. In contrast, Ricotta (2021) and Kilian (2020) documented that strong community-education interventions and involvement of local leaders significantly improved usage despite similar climatic challenges. The possible reasons for these dissimilarities are: Contextual design factors of some nets (LLINs) with better ventilation or larger shapes are more comfortable, Household structures and sleeping patterns like cramped rooms, mats, or multiple sleepers per bed reduce practical feasibility, Seasonal behavior I.e communities may perceive malaria risk as lower in dry seasons and stop using nets and lastly, Supportive services for example, settings with active follow-up (community health volunteers demonstrating hanging, repair, retreatment info) show higher retention and use. Thus, while the underlying behavioral drivers are common across studies, the local mix of infrastructural, climatic and programmatic factors explains differences in utilization rates.

Conclusion

The study concluded that while parents of under-five children in Ozuoba generally accept ITNs as effective malaria prevention tools, consistent utilization remains suboptimal. Knowledge and acceptance do not always translate into regular use due to affordability and comfort-related barriers. Strengthening education, improving accessibility, and addressing practical challenges are crucial for enhancing ITN utilization and reducing malaria burden among under-five children.

Recommendations

Based on the findings, the following recommendations are made:

1. Government and health agencies should sustain free or subsidized ITN distribution, particularly for vulnerable households.
2. Nurses and health workers should intensify health education campaigns to dispel misconceptions and emphasize the importance of consistent ITN use.
3. Community engagement should involve local leaders and role models to encourage behavioral change and proper ITN use.
4. Manufacturers should consider producing nets with better ventilation and comfort to address heat-related concerns.
5. Integration into routine services: ITN education should be incorporated into ANC, immunization, and child welfare clinics.

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