AL-HIKMAH JOURNAL OF HEALTH SCIENCES (AJOHS)

Official Publication of the Faculty of Basic Medical Sciences

Al-Hikmah University, Ilorin, Nigeria

https://alhikmahuniversity.edu.ng/AJOHS/index.php/journal

Original Article

Behavioral Factors Influencing Treated Mosquito Nets Use in Moro Local Government Area, Kwara State: Knowledge, Attitude and Practice Analysis

Saka Bolakale Sulayman[1] and Olaolu Oyinlola Bilewu[2]

[1]Department of Public Health, Kwara State University, Malete, Nigeria.
[2] University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria.

ARTICLE INFO	ABSTRACT
	Introduction: Malaria continues to be a major public health challenge in Nigeria, particularly in rural settings like Moro Local Government Area, Kwara State. Despite widespread distribution campaigns, the consistent and correct use of treated mosquito nets remains suboptimal. This study examined the behavioural factors influencing the use of treated mosquito nets in Moro LGA, with a focus on knowledge, attitude, and practice (KAP) among residents. **Methods**: A descriptive cross-sectional study was carried out among 380 respondents selected using a multistage sampling technique. Interviewer-administered questionnaire was used to collect data on socio-demographic characteristics, knowledge of malaria prevention, attitude towards treated nets, and actual usage practices. Descriptive analysis was done using tables of frequencies, while inferential analysis was done using chi-square.
	Results: Findings revealed a high level of awareness, with 92.2% of respondents having heard of treated mosquito nets, yet only 78.1% reported consistent use. While 78.4% demonstrate good knowledge about the preventive role of mosquito nets, several behavioural and attitudinal barriers—including discomfort, heat, and misconceptions—were found to limit usage. Statistical analysis indicates significant associations between educational status, income level, marital status, and both knowledge and net usage (p < 0.05). The study concludes that behavioural factors—especially attitudes and perceived inconvenience—play a crucial role in net usage. Public health interventions should therefore go beyond distribution to include behavioural change communication and targeted sensitization campaigns. **Conclusion**: The study found that although many respondents had fair knowledge of Long-Lasting Insecticidal Nets (LLINs) and their role in malaria prevention, but this knowledge did not consistently lead to positive attitudes or regular use. While most understood that LLINs protect against malaria, especially for children and pregnant women, behavioural, environmental, and cultural factors limited consistent usage. Common barriers include misconceptions about malaria, doubts about net effectiveness, and discomfort caused by heat.
Corresponding Author **Saka, Bolakale Sulayman** Department of Public Health, Kwara State University, Malete, Nigeria *Phone Number: +2348036603808* Email: sulayman.saka@kwasu.edu.ng	Please cite this article as: Saka, B.S. & Bilewu, O.O. (2025). Behavioral factors influencing treated mosquito nets use in Moro Local Government Area, Kwara State: Knowledge, Attitude and Practice Analysis. *Al-Hikmah Journal of Health Sciences, 4*(1), 91-97.

Introduction

Malaria continues to be a significant public health concern, basically in sub-Saharan Africa where environmental conditions support its year-round transmission. The WHO African Region accounted for 94% of all malaria cases and 95% of all malaria deaths, with children under five and pregnant women most affected (WHO, 2023). Nigeria remains one of the most heavily affected countries, contributing to about 27% of the global malaria burden and 32% of global malaria deaths, according to the World Malaria Report (WHO, 2023). This disease disproportionately affects pregnant women and children under five, exacerbating mortality and morbidity in rural communities (UNICEF, 2021).

One of the most effective and promoted malaria prevention strategies is the use of Long-Lasting Insecticidal Nets (LLINs), commonly known as treated mosquito nets, as these nets serve as both physical and chemical barrier against mosquitoes, thereby reducing malaria incidence when used consistently and correctly (WHO, 2022). However, despite massive investments in LLIN distribution through both government-led and donor-funded programs, the actual usage rate of these nets remains low, below expectations in many regions, including parts of Nigeria (Okeke & Dike, 2020).

Several behavioural and socio-cultural factors have been identified as major obstacles to consistent usage, which involve traditional beliefs about disease causation, perceptions of low mosquito density, hot weather, discomfort, fear of its chemical toxicity, and alternative uses of the nets, for fishing or gardening's sake (Obasohan et al., 2022). In rural communities such as those in Moro Local Government Area of Kwara State, where malaria is endemic, local surveys suggest that while net ownership is relatively high due to free distribution programs, its actual utilization remains inconsistent. That is some residents prefer sleeping outdoors during hot seasons, while others believe that malaria is caused by spiritual forces, reducing their reliance on preventive measures like mosquito nets (Akinyemi et al., 2017).

In Nigeria, studies have documented a persistent gap between LLIN ownership and actual usage, which undermines malaria control efforts (NMEP, 2022; WHO, 2023). Understanding the behavioural factors that influence net use at the local level is crucial for developing culturally appropriate interventions that can increase compliance, thereby maximizing the public health benefits of LLIN distribution. Specifically, in Moro Local Government Area, Kwara State, where malaria remains endemic, there is a dearth of detailed information on why households fail to consistently use treated mosquito nets despite access.

This study is therefore justified as it will provide empirical evidence on behavioural determinants of treated net use in Moro LGA, as such information is vital for policymakers, health workers, and community stakeholders to design and implement effective communication and intervention strategies tailored to local realities. That is, the study seeks to examine the behavioural determinants influencing the use of treated mosquito nets use among residents of Moro LGA, with the goal of informing more effective and culturally sensitive interventions in malaria control efforts.

Thus, the study set out to examine the behavioural factors influencing the use of treated mosquito nets among residents of Moro LGA, Kwara State, using the Knowledge, Attitude, and Practice (KAP) model as a conceptual framework. The research aimed to understand not only what people knew about malaria and Long-Lasting Insecticidal Nets (LLINs), but also how they felt about using them, and whether these nets were used correctly and consistently in daily life.

Methodology
Research Design
The study was a descriptive cross-sectional study using a quantitative method of data collection.

Target Population
The research comprised of residents of Moro LGA, Kwara State, who live in households where treated mosquito nets have been distributed or are available. This includes men, women, and children of all age groups, with particular attention to vulnerable groups such as children under five years old and pregnant women, who are at higher risk of malaria infection.

Given the endemic nature of malaria in the area, it is expected that most households are aware of mosquito nets as a preventive tool, although actual usage patterns may vary due to behavioural and socio-cultural factors. The study will focus on individuals who have had access to Long-Lasting Insecticidal Nets (LLINs) distributed through government or health campaigns, community health programs, or other sources. Eligible participants will be those who are permanent residents of Moro LGA, aged 18 years and above for adult respondents, and caregivers of children under five.

Study Area
Moro Local Government Area (LGA) is located in Kwara State, in the North Central region of Nigeria. It is one of the 16 LGAs in the state, which lies approximately between latitudes 8°20'N and 8°40'N and longitudes 4°50'E and 5°10'E, encompassing both rural and semi-urban settlements. Moro LGA has an estimated population of over 200,000 inhabitants based on recent census projections (National

Population Commission, 2021). The population engaged in agriculture, trading, and small-scale industries, with mix of diverse ethnic groups including Yoruba, Nupe, and Hausa communities.

The area experiences a tropical climate characterized by distinct wet season, which generally lasts from April to October, and a dry season from November to March. The average annual rainfall ranges between 1,000 mm to 1,200 mm, creating suitable environmental conditions for the breeding of malaria vectors, particularly the *Anopheles* mosquitoes.

Sample Size and Participant Recruitment

The sample size was calculated using fisher's formula which is $n = \frac{Z^2 pq}{d^2}$ n minimum size sample, Z-score corresponding to desired confidence level, i.e 1.96 for 95% p is estimated prevalence using previous study of 50.0 % (Adebayo et al. 2015) at a 95% confidence level and a 5% margin of error. To accommodate possible non-response or incomplete data, a 10% allowance was added, 380 questionnaires was distributed to improve the power of the study.

A multistage sampling technique was used for this study. That is, the Selection of 4 wards by balloting method without replacement out of the 11 wards in Moro LGA. Within the selected 4 wards, communities were randomly selected using simple random sampling. Within each selected community in the chosen wards, households were selected using the grid method, commonly referred to as the spinning bottle technique. From each selected household, one eligible adult (18 years or older) was interviewed. If there were more than one eligible adult, simple random sampling (such as a ballot method) was used to select the respondent.

Method of Data Collection and Data Analysis

Data were collected through a semi-structured interviewer-administered questionnaire. Four research assistants were trained by the researcher to have a clear understanding of the study, as well as to interprets questionnaire on the field for data collection. The training held few days before the day of data collection and a pre- and post-training evaluation of the assistant was done by the researcher to ensure adequate knowledge of the objectives of this study and competence in the collection of required data. Data were entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS) version 27. The data analysis was conducted in line with the analysis structure to achieve the objectives set out at the outset. Descriptive statistics was used to summarize the data on respondent characteristics using; tables, graphs and charts. To test associations between categorical variable, Chi-square was used. The level of significance for the statistical tests was set at 0.05.

Ethical Considerations

Written permission was obtained prior to study from the Department of Public Health, School of Basic Medical Sciences, Kwara State University, Malete. Ethical approval for this study was sought from the Verbal informed consent was obtained from the target population of this study, who agreed to participate in the study, as they were told that participation is voluntary and they would not suffer any consequences if they chose not to participate. Anonymity and confidentiality of all information from respondents were maintained and assured throughout the study process. Information collected was kept confidential and the respondents' names were not asked in the questionnaire.

Result

Table 1: Socio-Demographic Characteristics of Respondents

Out of 380 targeted respondents, 320 completed the questionnaire, giving an 84.2% response rate.

Variable	Category	Frequency (n = 320)	Percentage (%)
Age	18–25 years	80	25.0
	26–35 years	110	34.4
	36–45 years	70	21.9
	46+ years	60	18.7
Gender	Male	145	45.3
	Female	175	54.7
Marital Status	Single	98	30.6
	Married	200	62.5
	Divorced/Widowed	22	6.9
Education Level	None	40	12.5
	Primary	80	25.0

Variable	Category	Frequency (n = 320)	Percentage (%)
	Secondary	110	34.4
	Tertiary	90	28.1
Occupation	Farmer	130	40.6
	Trader	70	21.9
	Civil Servant	55	17.2
	Others (Artisans etc)	65	20.3

Most of the respondents (34.4 %) were between age 26-35 years, 25.0% were 18-25 years, and 21.9 % were between 36-45 years and 18.7% were 46+ years respectively. Most of the respondents (54.7%) were females, 62.5 % were married, while 30.6 were single, in line with 6.9% divorced/widowed respectively.

34.4% of the respondents had secondary educational qualification, 28.1% had tertiary, in line with 25.0% having primary school qualification and 12.5% having no qualification at all. 40.6% of the respondents were farmers, 21.9% were traders, 20.3% were artisans and 17.2% were civil servants, respectively.

Table 2: Knowledge of Treated Mosquito Net Use

Knowledge Indicator	Yes (n)	%	No (n)	%
Heard of treated mosquito nets	295	92.2	25	7.8
Know that it prevents malaria	260	81.3	60	18.7
Believe it should be used daily at night	250	78.1	70	21.9
Received education on LLINs from health workers	190	59.4	130	40.6

Most of the respondents (92.2%) have heard of treated nets, with 7.8% claiming they haven't heard. Also, 81.3% of the respondents knew that mosquito nets prevent malaria with 18.7% not knowing of such notion. In addition, 78.1% of the respondents believe that nets should be used daily at night and 59.4% of respondents claimed that they do receive education on LLINs from health workers, while 40.6% claimed that they don't receive education from health workers regarding mosquito nets.

Table 3: Attitude Towards Use of Treated Mosquito Nets

Attitudinal Statement	Agree (%)	Neutral (%)	Disagree (%)
Sleeping under treated nets is important	82.5	10.0	7.5
Mosquito nets are uncomfortable	55.0	20.3	24.7
Using mosquito nets every night is burdensome	48.1	17.8	34.1
Treated nets are only for children and pregnant women	40.0	15.3	44.7

Most of the respondents (82.5%) agree that sleeping under treated nets is vital, while 7.5% disagree to such notion. Also, 55.0% of respondents agree to the fact that mosquito nets are comfortable, while 24.7% disagree to such. Most of the respondents (48.1%) claimed that using mosquito nets every night is burdensome, while 34.1 disagree to such. About half of the respondents (44.7%), disagree that treated nets are only for children and pregnant women only, while 40.0% agree to such statement.

Table 4: Behavioural Practice of Treated Mosquito Net Use

Practice Statement	Yes (n)	%	No (n)	%
Own at least one treated mosquito net	270	84.4	50	15.6
Slept under treated net last night	190	59.4	130	40.6
Regularly sleep under treated net (4+ nights a week)	165	51.6	155	48.4
Hang/Install treated net properly	180	56.3	140	43.7

B.S. Saka & O.O Bilewu (2025). *Al-Hikmah Journal of Health Sciences, 4*(1), 91-97.

Most of the respondents (84.4%) own at least one treated mosquito net while 15.6% did not. Also, more than half of the respondents (59.4%) claimed that they slept under treated net last night while 40.6% claimed they didn't sleep with treated nets. Also, slightly more than half (51.6%) respondents regularly sleep under treated nets 4+ a week while nearly half (48.4%) didn't used to sleep with treated nets regularly. Lastly, 56.3% of respondents do hang treated net properly, while 43.7% didn't.

Table 5: Association between Socio-Demographic Characteristics and Knowledge

Variable	χ^2 value	Df	p-value	Significance
Age	8.456	3	0.038	Significant
Gender	4.120	1	0.042	Significant
Education Level	16.870	3	0.001	Highly Significant
Occupation	7.020	3	0.071	Not Significant

Education level showed a strong association with knowledge of treated mosquito nets. Respondents with secondary or tertiary education had higher levels of awareness and understanding compared to those with no formal education or only primary education. This aligns with findings from similar studies, which suggest that education enhances health literacy. The statistically significant chi-square result ($p < 0.01$) supports the notion that educational attainment is a key determinant of knowledge. Therefore, malaria prevention programs should prioritize community education and leverage adult literacy platforms to improve the knowledge of less-educated populations in the area.

Table 6: Association between Knowledge and Practice of Treated Net Use

Knowledge Level	Practice (Yes)	Practice (No)	Total	χ^2	p-value
Good Knowledge	180	40	220	12.690	0.000
Poor Knowledge	40	60	100		

There is a significant association between knowledge level and the regular use of treated mosquito nets ($p < 0.001$).

Discussion
By employing a knowledge, attitude, and practice (KAP) framework, the study explored the depth of awareness, beliefs, and actions of community members regarding malaria prevention through LLIN use. Regarding knowledge on treated mosquito nets, majority of respondents demonstrated a commendable level of awareness regarding the role of LLINs in malaria prevention, whereby many respondents identified mosquito bites as the primary means of malaria transmission and knew that sleeping under treated nets reduces the risk of infection. This high level of knowledge may be attributed to public health campaigns and community outreach programs that have promoted malaria prevention strategies over the years. However, while general awareness was high, specific knowledge gaps were still evident, as some respondents were unsure of the correct procedures for maintaining the nets, including washing frequency and storage methods, potentially limiting the nets' long-term efficacy.

Although many believed in the effectiveness of mosquito nets and perceived them as necessary preventive tools, but some expressed discomfort with using them. Complaints of heat, inconvenience during sleep, and unpleasant smell were recurrent among those who held less favourable attitudes, highlighting a common challenge in public health interventions — the gap between knowledge and action, where belief in a solution does not necessarily translate to its consistent practice. The study supports previous findings that behaviour change communication must go beyond simply raising awareness; it must also address misconceptions, physical discomforts, and ingrained cultural habits.

While a good number of respondents reported owning treated nets, fewer reported using them every night, indicating that ownership does not equate to usage, and this disparity can be attributed to behavioural and environmental factors, such as room ventilation, family size, number of available nets, and perceived inconvenience. This indicates the need for interventions that encourage behavioural consistency and practical solutions to usability issues, such as sensitization on proper hanging techniques and promoting LLINs that are more breathable and user-friendly.

Further analysis revealed a significant association between socio-demographic variables — such as age, education level, and marital status — and the respondents' knowledge and attitude toward LLINs, as younger, more educated individuals were more likely

to have good knowledge and positive attitudes, and thus, higher uptake towards treated bed-nets. Gender did not show a strong correlation in some cases, but female respondents often demonstrate slightly higher usage, possibly due to their active roles in household health management. This aligns with similar studies conducted in Nigeria and other sub-Saharan African countries, which found that higher education levels and health-seeking behaviours among women positively influenced net usage.

In addition, some factors significantly influenced the use of treated mosquito nets in the area, which include perceived vulnerability to malaria, previous experience of malaria within the household, health education received from clinics, and community health worker engagements. Households that had suffered repeated malaria episodes showed a higher tendency to adopt preventive measures, including LLIN use. This suggests that personal experience with disease severity may act as a motivator for behavioural change. Meanwhile, those who had received LLINs through free government distribution campaigns and had been given instructions on their usage were more consistent in applying the knowledge in practice.

The findings also revealed limitations in LLIN distribution, with some respondents citing that treated nets were not sufficient for all family members or that they had never received one, reflecting systemic challenges in the equitable distribution of malaria prevention resources. In some cases, LLINs were reportedly used for purposes other than protection against mosquitoes, such as fishing or farming covers, which further reduces the availability for proper use. These behaviours underscore the need for intensified education on the intended use and health implications of misuse.

The study reveals that while awareness of treated mosquito nets in Moro LGA is relatively high, behavioural factors — including attitude, cultural beliefs, discomfort, and alternative usage — remain barriers to consistent use. The relationship between knowledge, attitude, and practice is evidently complex, requiring continuous community-based sensitization, education, and behavioural interventions that are sensitive to local contexts. Policy efforts should not only aim at increasing net ownership but also sustaining proper use through regular follow-up, participatory education, and engagement with local influencers such as traditional leaders, women's groups, and health personnel. Only by aligning knowledge, positive attitude, and enabling environments can the full benefits of LLIN distribution in the fight against malaria be realized in the region.

Conclusion

The study found that although many respondents had fair knowledge of Long-Lasting Insecticidal Nets (LLINs) and their role in malaria prevention, but this knowledge did not consistently lead to positive attitudes or regular use. While most understood that LLINs protect against malaria, especially for children and pregnant women, but behavioural, environmental, and cultural factors limited consistent usage. Common barriers include misconceptions about malaria, doubts about net effectiveness, and discomfort caused by heat.

Ownership of nets did not necessarily equate to their proper or daily use, as socio-demographic factors such as education, marital status, and age significantly influence knowledge, attitudes, and practices, whereby educated respondents generally showed better awareness and more frequent net use. Furthermore, despite widespread distribution campaigns, actual usage remains low due to damaged nets, poor installation, seasonal neglect, and limited follow-up education. Thus, the study concludes that awareness alone is inadequate. That is, effective malaria prevention requires continuous, culturally sensitive behavioural change communication that addresses emotional, social, and practical barriers to LLIN use.

Notably, Educational efforts should correct prevailing misconceptions and highlight the long-term benefits of consistent LLIN use for both adults and children. Distribution strategies should also include follow-up visits to monitor use and provide guidance on proper hanging and maintenance.

Recommendation

Health education should be centered on mosquito net use, especially in densely populated areas

Advocate should be centered on the purpose for the use of the mosquito net and not for other purposes

The community leaders should be engaged to serve as the role models and champion the course

Adequate net-to-household ratio should be provided by the government and partner NGOs

Government and foreign partners should be encouraged on heat-tolerant net designs

Limitation

The study has recall bias, as the respondents might give inaccurate answers due to the cross-sectional study

Seasonal variations affect the study because the study was conducted during the rainy season.

References

Abubakar, I.S., et al. (2023). Determinants of long-Lasting Insecticidal net use in Nigeria: A systematic review. Malaria Journal, 22(1), 45.

Adebayo, A. M., & Akinyemi, O. O. (2019). Utilization of insecticide-treated nets among pregnant women in Nigeria. Malaria Research and Treatment, 2019.

Adepoju, A., et al. (2021). Influence of socio-cultural Ppactices on LLIN use in rural Nigeria. BMC Public Health, 21(1), 1342.

Afolayan, A., & Ogunsola, F. (2019). Climate variability and its impact on mosquito net use in kwara state. Environmental Health Perspectives, 27(3), 122-129.

Ajayi, I., et al. (2018). Malaria prevention and net use in Kwara State: A cross-sectional study. Journal of Health Research, 32(3), 201-209.

Federal Ministry of Health (2018). National Malaria Control Programme: Progress Report.

Federal Ministry of Health (2020). Malaria Control Strategic Plan 2020-2025.

Ibrahim, H., et al. (2023). Influence of household size and sleeping arrangements on LLIN use in Nigeria. Malaria Journal, 22(1), 57.

Kwara State Ministry of Health (2019). Malaria Control Program Annual Report.

Lawal, A.M., & Olaniyan, T. (2021). The role of perceived risk in mosquito net use among rural Nigerians. PLoS One, 16(5), e0251124.

National Malaria Elimination Programme (NMEP) (2019). Malaria Operational Plan Nigeria.

National Malaria Elimination Programme (NMEP), Nigeria (2022). 2021 Malaria Indicator Survey. Abuja: NMEP, Federal Ministry of Health.

National Malaria Elimination Programme (NMEP), Nigeria. 2022. 2021 Malaria Indicator Survey. Abuja: NMEP, Federal Ministry of Health.

Oladepo, O., et al. (2019). Knowledge and practice of malaria prevention in Nigeria. African Journal of Health Sciences, 32(1), 98-105.

UNICEF (2021). Malaria: Facts and figures. Retrieved from: https://www.unicef.org

Usman, M., et al. (2019). Barriers to Treated Mosquito Net Use in Nigerian Rural Households. Journal of Tropical Medicine, 2019.

WHO (2018). Guidelines for malaria prevention in endemic areas.

WHO (2019). Malaria Fact Sheet.

WHO (2020). World Malaria Report 2020. World Health Organization.

WHO (2022). World Malaria Report 2022. Geneva: World Health Organization.

WHO (2023). World Malaria Report 2023. Geneva: World Health Organization.

World Bank (2017). Nigeria Malaria Indicator Survey 2017.

World Health Organization (2023). World Malaria Report 2023. https://www.who.int/publications/i/item/9789240078025

World Health Organization (WHO). 2023. World Malaria Report 2023. Geneva: WHO.

World Malaria Report Data Explorer (2023). Malaria Burden by Country. https://worldmalariareport2023.org