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Assessment of ownership and utilisation of long-lasting insecticide-treated nets among households in Kaiama Local Government Area, Kwara State, North-Central, Nigeria

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ABSTRACT: Mosquito nets, most commonly in the form of long-lasting insecticide-treated nets (LLINs), are a central component of current global malaria control initiatives. Ownership rates remain low in many malaria-endemic regions or amongst particular groups in such regions. Malaria continues to be the leading cause of childhood mortality and morbidity despite government efforts, donors and the private sector's interventions to ensure that the children under five, who are most vulnerable, own and sleep under LLINs. This study aims to assess ownership and utilisation of long-lasting insecticide-treated nets among households in Kaiama LGA, Kwara State, North-central, Nigeria. A descriptive cross-sectional study, interviewer-administered questionnaire, which had been pretested in a similar community, was used for data collection. The respondents were the heads of household in the selected communities in Kaiama LGA of Kwara State. Data analysis was done using SPSS version 20. The mean age of the respondents was 34.6 ± 11.9 years. The majority of the respondents, 385 (81.9%), had knowledge of LLINs. Similarly, most of the respondents, 261(67.8%), got to know about LLINs through health workers, while 111 (28.8%) heard through the radio. The majority of the respondents, 164 (42.6%), agreed that LLINs cause heat when you sleep in them. Almost all the respondents, 436 (92.8%), owned nets. Utilisation among age groups among 1-year-olds was 97 (35.7%); while 1-5 years was 117(43.0%), and 5-14 years accounted for 13 (4.8%). Utilisation among non-pregnant women was 6 (2.2%), while pregnant women had 105 (38.6%). The knowledge of the importance of LLITN among the study community was encouraging; however, negative perception affected utilisation by the most vulnerable groups despite adequate ownership of nets.

Keywords: Kaiama communities, LLITN, ownership, perception, Nigeria, north-central, utilisation.

INTRODUCTION

Mosquito nets, most commonly in the form of long-lasting insecticide-treated nets (LLINs), are a central component of current global malaria control initiatives (Federal Ministry of Health, 2009a). The evidence in support of LLINs as a malaria control strategy is overwhelming. Systematic reviews of randomised controlled trials confirm

a significant reduction in individual risk of malaria-related morbidity and mortality associated with LLIN use (Federal Ministry of Health, 2009a; World Health Organisation, 2012). Individuals who do not sleep under an LLIN, but live within an area with high LLIN coverage, have also been shown to be at a decreased risk of infection due to the resulting reduction in overall malaria transmission (Federal Ministry of Health, 2009b; Federal Ministry of Health, 2013). Encouragingly, then, and largely as a result of donor-funded distribution programmes, LLIN ownership has substantially increased in many malaria-endemic countries over the past decade (World Health Organisation (WHO), 2012; Aina and Ayeni, 2011; Federal Ministry of Health, 2010; Wanzira *et al*., 2015; WHO, 2016).

Ownership of mosquito nets is far from universal coverage despite the aforementioned gains. Ownership rates remain low in many malaria-endemic regions or amongst particular groups in such regions (Gerstl *et al*., 2010; Noor *et al.,* 2007). Furthermore, mosquito net ownership in itself is not synonymous with utilisation. Eisele *et al.* (2009) reported 33% of their respondents who owned nets used them the night before the survey. The rate of mosquito net use in LLIN-owning households was substantially less than 100% (Eisele *et al*., 2009). Factors other than availability were reported as being responsible for the non-use of mosquito nets.

Other studies, again in contexts where fewer than 100% of household members reported use of mosquito nets, have reported between 15-50% of available nets unused (Afolabi *et al.* 2009; Hetzel *et al*., 2010; Thwing *et al.,* 2008). Thus, ownership is not the only obstacle to achieving the reductions in malaria morbidity and mortality associated with LLIN use; rather, individuals who own (or who have available) mosquito nets must use them in order for the potential health impact to be fully realised.

Determining whether sub-optimal mosquito net utilisation in a given population is due to a lack of availability or a failure to utilise available nets is operationally important in a malaria control context, as it would inform the subsequent response (Baume and Marin, 2008). This targeted approach to mosquito net promotion is encapsulated in a recently proposed framework designed to inform “evidence-based and country-specific strategies to increase population coverage with LLINs and work towards the interruption of malaria transmission (Baume and Marin, 2007). The utilisation of mosquito nets is still unacceptably low in Africa: only 43% of children under 5 are currently sleeping under LLINs, and about 20% are sleeping under any kind of net (NDHS, 2024; WHO, 2020).

Worse still, malaria continues to be the leading cause of childhood mortality and morbidity in spite of government efforts, donors and the private sector’s interventions to ensure that the children under five, who are most vulnerable, own and sleep under LLINs (Hlongwana *et al.,* 2009). In Nigeria, about 132 Billion Naira is lost to malaria annually in the form of treatment costs, prevention, loss of work time, etc (Federal Ministry of Health, 2009a). Consequently, this reduction of human work capacity and productivity adversely affects the socio-economic development of the nation. For example, the high rate of absenteeism among school children in Nigeria is attributed in part to malaria.[20] Malaria is the number one public health problem in Nigeria (World Health Organisation, 2016; Federal Ministry of Health, 2009b). By preventing malaria, it will reduce the need for treatment and the pressure on health services (World Health Organisation, 2016; Federal Ministry of Health, 2009b)

Studies on LLINs among people have focused on the effectiveness of LLINs in malaria control, accessibility, availability, and ownership of LLINs: some studies have been done to investigate the factors that affect the ownership and utilisation of LLINs in households with children under five years, which this study also sought to investigate (NDHS, 2024). This is to improve utilisation among households and promote prevention among women and children under 5 years old who are critically affected by morbidity and mortality in sub-Saharan African countries.

METHODOLOGY

Study area

The study area is the Kaiama Local Government Area of Kwara State. Kaiama Local Government was created in 1984 with its Headquarters at Kaiama. It shares borders with the Bussa Emirate to the North and Niger State to the northeast. On the East, Ilorin and Oyo to the South and Yashikira District in Baruten Local Government to the West. It is made up of ten political wards, namely: Adena, Bani, Gwanabe I, Gwanabe II, Gwaria, Kaiama I, Kaiama II, Kaiama III, Kemanji, and Wojibe (Kwara State Government, 2024). It has a land area of 8,460 km^2 and a population of 124,164 at the 2006 census, projected to 322,826 population (2023). Annual growth rate of 2.6% and population density of 22.01/km (2022) (Kwara State, 2024). The major ethnic group and language spoken is Bokobaru, while other smaller ethnic groups include Yoruba, Hausa, Fulani, Batonu, Nupe, Tiv, Dakankari and Igbo. The majority of the inhabitants are Farmers, while there are also civil servants and artisans practising various vocations like carpentry, tailoring, hairdressing, and automobile technicians, among others (Kwara State, 2024). The predominant religion is Islam. There are two (2) state-owned health facilities, two (2) Model Primary Health Care Centres and 22 Primary Health Care facilities, 4 Health posts and 4 private clinics. There is one (1) pharmacy shop and 26 patent medicine vendors and traditional birth attendants.

There is one tertiary institution, namely Distance Learning Studies/National Certificate of Education (DLS/NCE) at Government Unity School, Kaiama. There are 5 senior secondary schools, 12 junior secondary schools, 84 primary schools and 1 Qur’anic school in the LGA. There is electricity and pipe pipe-borne water supply

in Kaiama town. Other sources of water supply are boreholes and Wells scattered around the local government Area.

Study design

The study design was a descriptive cross-sectional study. Data collection was by structured, face-to-face, interviewer-administered questionnaire.

Study population

The study focused on heads of household, who had lived within the selected community for not less than 6 months, including men and women and were 18 years and above as at the time of data collection in the selected communities.

Sample size determination

The minimum sample size for the study was determined using Fisher's formula for estimating sample size to determine the prevalence or proportion of a factor where the population is greater than 10,000 (Jekel *et al.,* 2013).

$$n = \frac{Z^2 pq}{d^2}$$

Where n = minimum sample size desired (when the Population is greater than 10,000), Z = the standard normal deviate, usually set at 1.96, which corresponds to the 95% confidence interval, and p = the proportion in the target population estimated to have a particular characteristic.

P = 0.29 (prevalence of net utilisation in a study done in Niger state) (Hetzel *et al.,* 2010)

q = 1.0 – p

d = degree of accuracy/precision desired, usually set at 0.05

$$n = \frac{(1.96)^2(0.29)(0.71}{(0.05)^2}$$

≈ 316

Therefore, n = 316. However, in this study, 470 households were sampled. Four Hundred and Seventy (470) households were recruited for this study.

Sampling technique

A multistage sampling technique was used for the selection of the Heads of household. At the first stage, wards were selected, while communities were selected in the second stage. Considering that each ward has an equal probability of being selected, five wards were selected from a list of 10 wards in the LGA using simple random sampling using–ballot method. Two communities were selected from each of the wards previously selected, making a total of 10 communities altogether, using a simple random sampling technique. The cluster sampling technique was used for the selection of households to be interviewed. The grid method was used to select the first house, and thereafter, other households were selected. Simple random sampling was used to select household heads to avoid personal bias and ensure representation of all household heads in the communities.

Inclusion criteria

All household heads in selected communities who were 18 years and above were interviewed. Household heads who had been dwelling within the selected communities for not less than 6 months prior to the study were selected.

Exclusive criteria

The household heads with severe ailments, who cannot answer questions during the interview, were excluded. Household heads with poor mental capacity to provide answers to the questions or provide consent for the study were excluded. Household heads who had lived less than 6 months in the community were excluded.

Research instruments

The questionnaire contains both open and closed-ended questions. The questionnaire aimed at eliciting respondents' socio-demographic information, their awareness of the ownership and utilisation of LLINs. It was then standardised after the pre-test. The research assistants were trained to familiarise themselves with the research tool administration and the sampling techniques. The questionnaire was administered using an interviewer-administered format.

The questionnaire was made up of 37 questions divided into Section A: Socio-demographic characteristics; Section B: Knowledge-related questions. A positive response scores 1 point, and a negative response scores 0 points. Respondents who scored 8-10 points were graded as having poor knowledge, those who scored between 11-12 points were graded as having fair knowledge, and those who scored between 13-15 points were graded good knowledge. Section C: are perception-related questions. Section D had ownership-related questions, and Section E had utilisation questions. The last section was F, which addressed factors that determined both ownership and utilisation.

Pre-testing of the questionnaire

The research instrument was pre-tested among household heads in Baruten L.G.A. Pre-testing was to ensure validity, clarity and reliability. The pre-tested questionnaire was analysed and necessary amendments made before the administration of the questionnaire.

Data collection

Four research assistants from tertiary institutions were trained as research assistants for the purpose of data collection. Data collection was done during the evening when the respondents were at home. The study period was between March 28th 2019, and May 8th, 2019, covering a duration of six (6) weeks.

Data analysis

The data from the questionnaire was retrieved. Quality control checks were performed on the questionnaire to ensure that all answers were filled in correctly. The analysis was done using the Statistical Package for Social Sciences (SPSS) version 20. The frequency distribution of the quantitative variable was generated. Determination of measures of central tendency and dispersion of quantitative variables in line with the research objectives was analysed. Presentation of results in tables, graphs, and charts. Significance tests were determined using chi-square, students'-test, and Fisher's exact test. The level of significance at 0.05, which is equivalent to a 95% confidence level, was used.

Ethical consideration

Ethical approval for this study was sought and obtained from the Ethical Committee of the University of Ilorin Teaching Hospital, Ilorin, Kwara State. Informed consent was obtained from the subjects after the nature and purpose of the study were made known to them. The study was at no cost to the subjects, and all information obtained was treated confidentially.

Limitations of the study

The major limitation was that the study was restricted only to two communities in a ward. It is thus recommended that future research in this area should be designed to have a wider coverage, at least to represent the LGA, to enhance better representation of views and thoughts. The scope of the study in future should be extended to include more sample wards from different parts of the LGA. This will allow comparison between different communities in the LGA and hence provide a clear picture of factors that affect ownership and utilisation of LLINs within households. The sample size of 470 respondents might not represent the views of all communities' inhabitants of Kaiama LGA at large

RESULTS

Overall, the questionnaire was administered to four hundred and seventy (470) respondents. Findings are presented in accordance with different characteristics. First, we present findings on the socio-demographic characteristics of the respondents. Others are based on knowledge and perception about LLIN.

Sociodemographic variables

The majority of the respondents were female, 282 (60.0%), and male, 188 (40.0%). Most of the respondents, 176 (37.5%), were aged between 30-39 years, while 40 (8.5%) of the respondents were aged 50 and above. The mean age of the respondents was 34.6±11.9 years. There were more married respondents, 361 (76.8%), than single, 94 (20.0%). The major tribe of the respondents was Bokobaru 341(72.6%). One hundred and eighty-three (38.9%) had no formal education, while 48 (10.2%) had tertiary education. Most of the respondents were farmers, 220 (46.8%), 92 (19.6%) were civil servants, while 13 (2.8%) were unemployed. Respondents' households with children under 5 years were the majority, 406 (86.4%), while 64 (14.6%) respondents' households had no children less than five years. The average number of respondents' households with under 5 years was 2.8±1.5 (Table 1).

Knowledge of the use of long-lasting insecticide-treated

The majority of the respondents, 385 (81.9%), had knowledge of LLINs, while 85 (18.9%) of the respondents had no knowledge of LLINs. Of the 385 (81.9%) who had knowledge of LLINs, 356 (92.5%) knew the difference between LLINs and non-treated nets, while 29 (7.5%) did not know. The majority of the respondents, 261(67.8%), got to know about LLINs through Health workers, while 111 (28.8%) of the respondents heard through the radio. Only 2 (0.5%) got their source of information from other sources. Among the respondents who had knowledge of how long LLINs are spread before use, 176 (55.5%) had correct knowledge of spreading before use for 24 hours, while 141 (44.5%) had incorrect knowledge (others) (Table 2).

Knowledge of respondents on how LLINS prevent malaria among Households

The majority of the respondents, 346(89.9%), knew that LLINs are necessary in preventing malaria. Various reasons

Table 1. The sociodemographic characteristics of the respondents.

Variable n=470	Frequency (n)	Percentage (%)
Sex		
Male	188	40.0
Female	282	60.0
Age		
<20	14	3.0
20-29	159	33.8
30-39	176	37.5
40-49	81	17.2
≥50	40	8.5
Mean± SD	34.6±11.9	
Marital Status		
Single	94	20.0
Married	361	76.8
Widowed	10	2.1
Divorced	5	1.1
Tribe		
Bokobaru	341	72.6
Yoruba	66	14.0
Nupe	*32*	6.8
Hausa	21	4.5
Batonu	10	2.1
Educational Level		
No education	183	38.9
Primary	176	37.5
Secondary	63	13.4
Post secondary	48	10.2
Occupational Status		
Farmer	220	46.8
Trading	92	19.6
Civil Servant	66	14.0
Artisan	62	13.2
Student	17	3.6
Unemployed	13	2.8
Distribution of households with under five children		
Yes	406	86.4
No	64	13.6
Number of under five children		
1	143	35.2
2	217	53.4
3	34	8.4
4	12	3.0
Mean± SD	2.8±1.5	

Table 2. Respondents' knowledge on long lasting insecticide treated net use.

Variables	Frequency (n)	Percentage (%)
Knows the airing duration of LLINs before use		
Yes	317	82.3
No	68	17.7
The waiting period before use	**(317)**	
Correct (24 hours)	176	55.5
Wrong (Others)	141	45.5
Knows what LLINs is		
Yes	385	81.9
No	85	18.1
Knows the difference between LLIN and non-treated Net		
Yes	356	92.5
No	29	7.5
*Sources of Information (n=385)		
Health workers	261	67.8
Radio	111	28.8
Neighbors'/Friends	37	9.6
Brochure/Posters	32	8.3
Home visit	17	4.4
Counselor/Field workers	7	1.8
Television	6	1.6
News papers	4	1.0
Others	2	0.5

*Multiple response.

were given on how LLINs aid malaria prevention among households. Almost half of the respondents, 168 (48.6%), identified that LLINs prevent mosquito bites, 89 (25.7%) identified that LLINs prevent malaria, and 53 (15.3%) indicated that LLINs are more effective than a non-treated net in the prevention of malaria. Among the 39 (10.1%) respondents who do not know that LLINs is necessary in the prevention of malaria; 28 (71.8%) of them gave the reason that LLINs are not effective as it was made to be believe, 11 (28.2%) gave no reason why they indicated that LLINs are not necessary in prevention of malaria (Table 3).

Perception of respondents on LLINS use

The majority of the respondents, 164 (42.6%), agreed that LLINs cause heat while sleeping in them. Two hundred and fourteen (55.6%) respondents disagreed with the statement that LLINs are not convenient to sleep in. Only 21 (5.5%) strongly agreed that LLINs cause suffocation when you sleep under it. However, the majority, 204 (53.0%), disagreed with the perception that LLITNs could cause death when you sleep inside it; only 12 (3.1%) strongly agreed it could cause death when you sleep inside it (Table 4).

Ownership and use of LLITN among respondents

Almost all the respondents, 436 (92.8%), owned a net in this study. Of these numbers, 335 (76.8%) were LLITN, 62 (14.2%) were insecticide-treated nets, and 39 (9.0%) were ordinary nets. Utilisation among age 1 year old was 97 (35.7%); while 1-5 years was 117(43.0%), and 5-14 years accounted for 13 (4.8%). Utilisation among non-pregnant women was 6 (2.2%), while pregnant women had 105 (38.6%). Utilisation among adult males was 4 (1.5%).

Decisions on who sleeps under the LLINs in the households were mostly taken by the mothers, 181 (67.0%), while 64 (23.0%) decisions were taken by the father and 27 (10%) by other household members. On the patterns of use, 116 (54.2%) under 5 years used the nets last night before the survey. Furthermore, 52 (24.3%) use them sometimes, while 56 (20.6%) of the respondents use LLINs every night. The patterns among pregnant women

Table 3. Knowledge of respondents on how LLINS prevent malaria among households.

Variables	Frequency (n)	Percentage (%)
Knows if LLINs is necessary in the prevention of malaria		
Yes	346	89.9
No	39	10.1
How LLINS prevents malaria among household		
It helps in preventing mosquitoes bite	168	48.6
It prevents malaria/fever	89	25.7
It is more effective than ordinary net	53	15.3
The LLINs is treated	36	10.4
Why LLINs are not necessary in preventing malaria among household		
it is not effective as made to be believed	28	71.8
No reason given	11	28.2
Knowledge grading	**Frequency/percentage**	**Mean value**
Poor	32 (8.3)	2.1 ± 0.7
Fair	85 (22.1)	4.8 ± 0.4
Good	268 (69.6)	6.4 ± 0.5

Table 4. Perception of respondents on LLINS use.

Perception (n=385)	Strongly Agree	Agree	Disagree	Strongly Disagree
LLINs cause heat inside while sleeping	137 (35.6)	164 (42.6)	54 (14.0)	30 (7.8)
LLINs is not convenient to sleep in	29 (7.5)	44 (11.4)	214 (55.6)	98 (25.5)
LLINs cause suffocation when you sleep inside it	21 (5.5)	33 (8.6)	255 (66.2)	76 (19.7)
LLINs could cause death when you sleep inside it	12 (3.1)	16 (4.2)	204 (53.0)	153 (39.7)

Table 5. LLINs use, ownership and other variables among respondents

Variables	Frequency (n)	Percentage (%)
Utilization of LLIN by households		
Yes	272	81.0
No	63	19.0
Who takes decision for net use	(272)	
Mother	181	66.5
Father	64	23.5
Others	27	10.0
Net use according to age	(342)	
<1 years old	97	28.4
1-5years	117	34.2
5-14 years	13	3.8
Non-pregnant women	6	1.8
Pregnant women	105	30.7
Adult male 15 years above	4	1.1

Table 5. Contd.

Variables	Frequency (n)	Percentage (%)
Frequency of use among under5	(214)	
Every night	46	21.5
Last night	116	54.2
Sometime	52	24.3
Frequency of use among pregnant women	(105)	
Every night	17	16.2
Last night	31	29.5
Sometime	57	54.3
Net owned by household	(470)	
Yes	436	92.8
No	34	7.2
Type of mosquito net own by respondents	(436)	
Long Lasting Mosquito Treated Net	335	76.8
Insecticide treated Mosquito net	62	14.2
Ordinary	39	9.0

Multiple response n=272

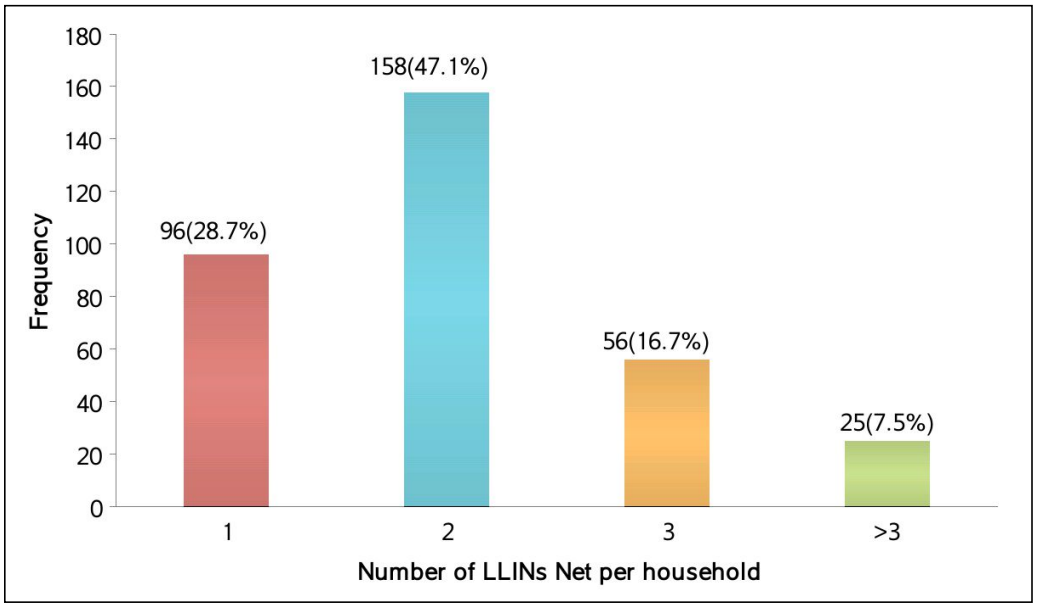

Figure 1. Number of LLINS per household (Mean ± SD = 2.2±1.4).

showed that 57 (54.3%) of the women used LLINs sometimes and 31 (23.2%) used them last night, and 17 (16.2%) used them every night (Table 5 and Figure 1).

Sociodemographic variables and knowledge score of respondents

Sex (X^2 – 3.88; p-0.0001); Age (X^2 – 10.7966; p-0.000), Marital Status (X^2 – 22.912; p- 0.000), Tribe (X^2- 3.3599; p-0.0099), educational status (X^2 -15.934; p-0.0000) and occupation (X^2 – 17.35; p-0.0002) were all found to be statistically significant with mean knowledge score of respondents (Table 6 and Figure 2).

Sociodemographic variables and ownership of LLINS by households

Sex (X^2 – 150.73; p-0.0000), Age (X^2- 24.1862; p-0.0007), Marital status (X^2- 129.77; p-0.0000), Tribe (X^2 -28.924; p-

Table 6. Sociodemographic variables and knowledge score of respondents.

Variable	Mean ± SD	F/T. test	p-value
Sex			
Male	5.3±2.1	3.8807	0.0001
Female	6.0±1.6		
Age			
<20	4.9±1.6		
20-29	4.8±2.3		
30-39	5.5±1.9	10.7966	0.0000
40-49	6.2±1.4		
≥50	4.2±1.5		
Marital Status			
Single	4.2±2.5		
Married	5.9±1.6	22.912	0.0000
Widowed	4.7±0.8		
Divorced	5.4±0.5		
Tribe			
Bokobaru	5.5±2.2		
Yoruba	5.8±1.7		
Nupe	6.0±0.7	3.3599	0.0099
Hausa	5.7±0.8		
Batonu	3.5±0.7		
Educational Level			
No education	4.5±2.6		
Primary	5.5±1.3	15.9344	0.0000
Secondary	5.8±1.4		
Post secondary	6.2±1.2		
Occupational Status			
Farmer	4.6±1.6		
Trading	4.8±1.8		
Civil Servant	6.3±1.1	17.35	0.0002
Artisan	5.3±1.7		
Student	5.7±1.7		
Unemployed	4.7±1.8		

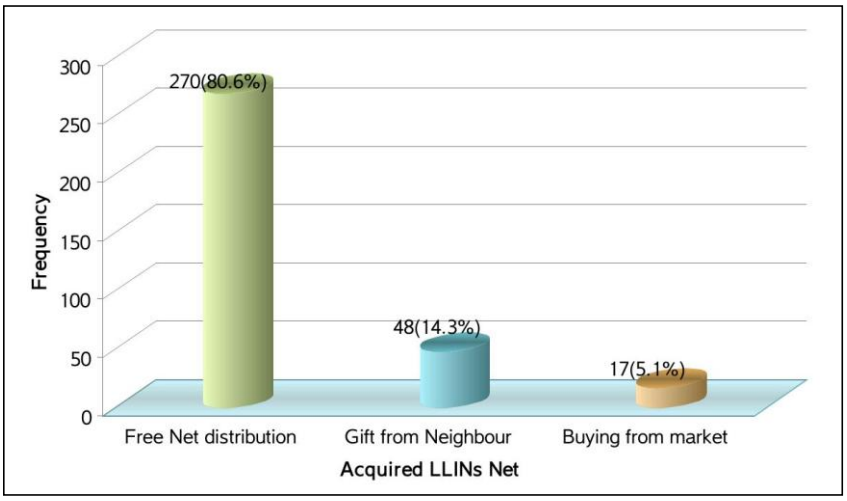

Figure 2. Sources of household nets.

Table 7. Sociodemographic variables and ownership of LLINS by households.

Variable	Yes: N=335		No (%): 135		X^2	df	p-value
	Freq.	%	Freq.	%			
Sex							
Male	75	(39.9)	113	(60.1)			
Female	260	(92.2)	22	(7.8)	150.73	1	0.0000
Age							
<20	6	(42.9)	8	(57.1)			
20-29	133	(83.6)	26	(16.4)			
30-39	119	(67.6)	57	(32.4)	24.1862	4	0.0007
40-49	55	(67.9)	26	(32.1)			
≥50	22	(55.0)	18	(45.0)			
Marital status							
Single	23	(24.5)	71	(75.5)			
Married	303	(83.9)	58	(16.1)			
Widowed	6	(60.0)	4	(40.0)	129.77	3	0.0000
Divorced	3	(60.0)	2	(40.0)			
Tribe							
Bokobaru	264	(77.4)	77	(22.6)			
Yoruba	42	(63.6)	24	(36.4)			
Nupe	14	(43.8)	18	(56.3)	28.9242	4	0.0001
Hausa	9	(42.9)	12	(57.1)			
Batonu	6	(60.0)	4	(40.0)			
Educational level							
No education	135	(73.8)	48	(26.2)			
Primary	123	(69.9)	53	(30.1)			
Secondary	41	(65.1)	22	(34.9)	2.2341	3	0.5262*
Post secondary	36	(75.0)	12	(25.0)			
Occupational status							
Farmer	184	(83.6)	36	(16.4)			
Trading	54	(58.7)	38	(41.3)			
Civil Servant	58	(87.9)	8	(12.1)			
Artisan	23	(37.1)	39	(62.9)	73.2678	5	0.0000
Student	8	(47.1)	9	(52.9)			
Unemployed	8	(61.5)	5	(38.5)			

*Not statistically significant

0.0000), and occupation of respondents (X^2 – 73.267; p-0.0000) were found to be statistically significant with ownership of LLITN (Table 7).

Sociodemographic variables and use of LLINS by households

The Gender (X^2 – 129.26; p-0.0000), Age (X^2- 25.34, p-0.00004), Marital status (X^2 – 0.0000), Tribe (X^2- 30.76, p-0.00003), Educational Level (X^2 -15.56, p-0.0014) and Occupation status (X^2 – 12.83, P-0.0250) were all found to be statistically significant to utilization of LLINs (Table 8).

DISCUSSION

Whereas Long Lasting Insecticide Nets (LLITNs) are the mainstay in malaria prevention, their effectiveness largely depends on the knowledge and perceptions of the people in the households who directly use them. The study takes households as rational actors in making choices and decisions about access to responsive and malaria preventive measures in the communities. Their rationality is traced to socio-demographic characteristics. The gender distribution of the study participants shows that there were more females than males. This study also found a mean age of 34.6±11.9 years for household heads. This finding

Table 8. Sociodemographic variables and use of LLINS by households.

Variables	Yes: N=272		No: N=63		X^2	df	p-value
	Freq.	%	Freq.	%			
Sex							
Male	27	(36.0)	48	(64.0	129.26	1	0.0000
Female	245	(94.2)	15	(5.8)			
Age							
<20	1	(16.7)	5	(83.3			
20-29	115	(86.5)	18	(13.5)			
30-39	101	(84.9)	18	(15.1)	25.34	4	0.00004
40-49	38	(69.1)	17	(30.9)			
≥50	17	(77.3)	5	(22.7)			
Marital Status							
Single	8	(34.8)	15	(65.2)			
Married	261	(86.1)	42	(13.9)	50.80	2	0.0000
Widowed	2	(33.3)	4	(66.7)			
Divorced	1	(33.3)	2	(66.7)			
Tribe							
Bokobaru	229	(86.7)	35	(13.3)			
Yoruba	28	(66.7)	14	(33.3)			
Nupe	8	(57.1)	6	(42.9)	30.76	4	0.00003
Hausa	3	(33.3)	6	(66.7)			
Batonu	4	(66.7)	2	(33.3)			
Educational Level							
No education	96	(71.1)	39	(28.9)			
Primary	108	(87.8)	15	(12.2)	15.56	3	0.0014
Secondary	35	(85.4)	6	(14.6)			
Post secondary	33	(91.7)	3	(8.3)			
Occupational Status							
Farmer	148	(80.4)	36	(19.6)			
Trading	42	(77.8)	12	(22.2)			
Civil Servant	54	(93.1)	4	(6.9)	12.83	5	0.0250
Artisan	19	(82.6)	4	(17.4)			
Student	4	(50.0)	4	(50.0)			
Unemployed	5	(62.5)	3	(37.5)			

was almost similar to what was reported by Nyavor *et al.* (2017) and Ezire *et al.* (2015).

The inhabitants of the selected community were predominantly Bokobaru, and the education pattern found in the study was in consonance with the report of NDHS (2018), which shows that more urban dwellers attain a higher level of education than rural dwellers (Ezire *et al.,* 2015). Basic education still needs to be given greater priority for both self and community development. In addition, the level of education is a determinant of health-seeking behaviour and socio-economic attainment of any population.

This study also found that a higher proportion of households (86.4%) had under-5-year-old children among the respondents (Aderibigbe *et al.*, 2014) in North-central, Nigeria, reported that 68.6% of the households had at least one under-five child living in the household. These findings underscore the importance of ownership of insecticide-treated nets in the household to enable the prevention and control of Malaria. The prevalence of knowledge of long-lasting insecticide-treated nets in this study was 81.9%. Nyavor *et al.* (2017) found 52.9% among their respondent

in Ghana. The high prevalence of knowledge of LLITN among our respondents might be due to the long existence of the strategy as a means of malaria control in the African sub-region. This level of knowledge was also demonstrated in other research in other parts of the country (Aderibigbe *et al.,* 2014).

The source of the knowledge among the majority of our respondents in this study was the health workers, 67.80%. The study by Nyavor *et al.* (2017) in Ghana reported that 33.6% knew about ITNs from the Reproductive and Child Health (RCH) Clinic and the antenatal care ANC clinic. Interestingly, health workers continue to play a significant role in the dissemination of information on the Roll Back Malaria Strategy. Vector control through LLITNs constitutes one of the effective control measures in reducing deaths due to malaria (Role Back Malaria, 2005; World Health Organisation, 2019). Malaria occurs every year, and efforts by the WHO and Roll Back Malaria (RBM) partners have promoted LLITNs as a form of personal protection that reduces illness, severe disease, and deaths in malaria-endemic regions (Role Back Malaria, 2015).

The term ownership was used in this study to classify individuals who possessed at least one LLITN (Omonijo *et al.,* 2021 and Tula *et al.,* 2023). Our study showed that 28.7% owned at least one LLITN while 47.1% owned two nets. Zerdo *et al.* (2020) in Ethiopia reported ownership of at least one LLIN among 19.3%, Nyavor *et al.* (2017) reported LLITN ownership of 81.3%. Higher proportions were reported in Kenya (Zerdo *et al*, 2020), 71.0%, South Africa (Nyoyor KD, 2019), 75.3%, Cameroon (Kanyangarara *et al*., 2017), 90.0% and Kenya (Ng'ang'a *et al.,* 2021a), 96.9%. Ownership of LLITN was determined by gender (p-value < 0.0001); age (p-value = 0.0007); marital status (p-value < 0.0001); occupational status (p-value < 0.0001), among other factors; surprisingly, educational status was not statistically significant as a determinant (p-value = 0.526) of LLITN ownership in this study. This contrasts significantly with the findings of Sunday *et al.* (2014) in Ilorin, where they argued that increased ownership and usage of LLINs were associated with a strong educational status of respondents and information component of the MSF distribution campaign (Ng'ang'a *et al*., 2021a; Komomo *et al*., 2016; Ng'ang'a *et al*., 2021b). They further postulated that households that received LLIN during the bed net distribution campaign were significantly more likely to retain and hang such nets than those who got their nets from other sources without the necessary background understanding and knowledge.

In spite of the low level of ownership of LLITN reported in this study, a significant proportion, 81.0% of participants, use the net. The high usage reported in this study is a significant milestone in order to achieve epidemiological impact in malaria control. In this same study, about 21.5% testified to using the net every night (Nyavor *et al*.,2017) in Ghana, reported usage of 66.4% with a strong belief that LLITNs were effective for malaria prevention. Komomo *et al*. (2016) in Calabar, South-south, Nigeria reported that despite a high rate of ownership of Insecticide Treated bed nets in their study, the overall utilisation in the study area was 40.68%. This level of utilisation was below the 60% standard recommended by the Roll Back Malaria programme (RBM Partnership; 2015). Komomo *et al.* (2016) in Calabar, South-south, Nigeria reported that despite a high rate of ownership of Insecticide Treated bed nets in their study, the overall utilisation in the study area was 40.68%. This level of utilisation was below the 60% standard recommended by the Roll Back Malaria programme. In another related study, Ezire *et al.* (2015) reported that 64.6% of the respondents owned an ITN/LLIN in their household, while the actual use was just 19.2%. They also found education, location (urban–rural), confidence to use a net, and knowledge that the use of a net can protect a pregnant woman from malaria to be significantly related to use. This current study showed that gender, age, marital status, and educational status were found to significantly determine LLITN use in this study (Ezire Onoriode *et al.,* 2015; Gerstl *et al*., 2010).

The perception surrounding LLITN use was a major influence in this study; about 11.4% were of the opinion that LLITN is not convenient to sleep under, 5.5% strongly agree it causes suffocation, and another 3.1% believe LLITN could cause death when you sleep inside it. Poor perception and knowledge of LLITN among the populace or its control is common among people living in areas where malaria is endemic, and these have been associated with poor utilisation of malaria control services (Ntonifor and Veyufambom, 2016). In order to sustain net use in the community, it is important to find out what motivates people to use nets and what prevents them from using them. Studies have demonstrated that emphasising information such as preventing mosquito bites is often a much stronger motivator for bed net ownership and use than preventing malaria (Ntonifor and Veyufambom, 2016; Ng'anga'a *et al*., 2021b and Komomo *et al.,* 2016).

Conclusion

In conclusion, the ownership of nets was impressive, but utilisation among the respondents was low due to the poor perceptions of LLINs among the participants in our study. It is expected that the expansion of LLINs distribution networks and increasing coverage to all communities in the LGA may lead to a successful malaria control drive if sustained among households and the community at large. Communities should be sensitised to the importance of LLINs for malaria prevention. In addition, massive sensitisation should be able to erase poor perceptions among household members reported in this study.

Recommendation

Based on the findings in this study, the following recommendations were made:

1. Community and household knowledge on long-lasting

insecticidal nets (LLINs) should be strengthened to increase ownership and consistent usage, thereby enhancing malaria control.
2. Public–private partnerships should be established to improve the availability of LLINs, ensuring access at the community and village levels for households willing to purchase.
3. Sustained behaviour change strategies, including large-scale community education, should be implemented to address misconceptions and improve perceptions, ownership, and utilisation of LLINs.

CONFLICT OF INTEREST

The author declare that they have no conflict of interest.

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