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ORIGINAL RESEARCH

A rural-urban comparison of ownership and utilization of Long-Lasting Insecticide Treated Nets among pregnant women in Ogun State Nigeria

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Abstract

Background: The use of Long-Lasting Insecticide Treated Nets (LLINs) in Africa increased mean birth weight by 55g, reduced the incidence of low birth weight by 23% and decreased miscarriages/stillbirths by 33%. However, the benefit of the LLINs may be limited by the rate of ownership and utilization by pregnant women.

Objective: To determine and compare the ownership and utilization of LLINs among pregnant women in urban and rural areas of Ogun State.

Methods: A community-based comparative cross-sectional study on 72 and 74 pregnant women living in urban and rural areas, respectively of Ogun State was carried out. Using a multi-stage cluster sampling technique and a pretested semi-structured interviewer-administered questionnaire, information on LLINs ownership and use were obtained.

Results: Ownership of LLINs was 81.1% in rural areas compared to 66.7% in urban areas. About 65% of participants in rural versus 44.4% in urban areas slept under LLINs. The predictor of ownership of LLIN was age group 15-24 years [AOR 0.10 (95%CI 0.01 - 0.56)]. The predictors of utilization of LLINs included urban residence [AOR 0.29 (95%CI 0.13 - 0.65)], age group 15-24 years [AOR 0.17 (95%CI 0.04 - 0.70)], registration of pregnancy for antenatal care [AOR 5.12 (95%CI 1.14 - 23.03)] and knowledge on prevention of malaria [AOR 4.94 (95%CI 1.51 - 16.17)].

Conclusion: Pregnant women should visit ANC clinics regularly, and health education on malaria should focus more on the prevention of malaria as well as encouraging the consistent use of the nets, particularly in the urban areas.

Keywords: Comparative study, Long Lasting Insecticide Treated Nets, Malaria, Ownership, Pregnant women, Rural, Urban, Utilization.

Introduction

The burden of malaria has led to a massive international effort to increase prevention and treatment measures. The past 15 years have

brought remarkable advances in malaria research, as well as increases in funding by bilateral and international organizations to support malaria control.^[1] This support has aided malaria-endemic countries to increase coverage of malaria interventions, including Insecticide-Treated Bed Net (ITN) distribution, indoor residual spraying, Intermittent Preventive Treatment of pregnant women and treatment with effective antimalarial drugs.^[2] Most commonly, the insecticide kills the malaria vectors that come into contact with the ITN. By reducing the vector population in this way, ITNs, when used by a majority of the target population, protect all people in the community, including those who do not themselves sleep under nets.^[3]

Malaria affects maternal health and pregnancy outcome. In Africa, it causes anaemia in pregnancy, which increases the risk of maternal deaths with an estimated associated 10,000 annual maternal deaths.^[4-5] Malaria in pregnancy also causes low birth weight, preterm delivery, congenital infection and reproductive loss.^[4] Over 90% of malaria burden occurs in Sub-Saharan Africa.^[6] Malaria is endemic in Nigeria, with a prevalence of over 100,000 population and global malaria deaths of 19%; hence it remains one of the leading causes of morbidity and mortality.^[7] Malaria accounts for 30% and 11% of child and maternal deaths, respectively.^[8] The disease overburdens the already-weakened health system and exerts a severe social and economic burden on the nation, retarding the gross domestic product (GDP) by 40 per cent annually and costing approximately 480 billion naira in out-of-pocket payment for treatments, prevention cost, and loss of man-hours.^[9]

There are two types of nets; (a) the untreated nets and (b) the insecticide-treated nets. An insecticide-treated net is a mosquito net which repels, disables and kills mosquitoes coming into contact with the insecticide on the netting material. There are two categories of

insecticide-treated nets; namely the conventionally treated nets (ITNs) and the Long-Lasting Insecticidal Nets (LLINs).^[10] A conventionally treated net is a mosquito net that has been treated by dipping in a WHO-recommended insecticide. To ensure its continued insecticidal effect, the net should be re-treated after three washes, or at least once a year. On the other hand, a LLIN is a factory-treated mosquito net made with a netting material that has an insecticide incorporated within or bound around the fibres.^[10] The net must retain its effective biological activity without re-treatment for at least twenty WHO standard washes under laboratory conditions and three years of recommended use under field conditions.^[10]

The use of mosquito nets by pregnant women is an important strategy to prevent malaria morbidity and to reduce the adverse effects of malaria on pregnancy and pregnancy outcomes. The 2013 national demographic health survey reported that 18% of pregnant women slept under a mosquito net, 10% of women slept under an ITN, and 16% slept under long-lasting insecticide nets (LLIN).^[10] The use of all three types of nets was slightly higher in urban areas than in rural areas. Trends in the utilization of ITNs among pregnant women in Nigeria were as follows: 5% (2008 NDHS), 34% (2010 NMIS), 16% (2013 NDHS) and 49% (2015 NMIS).^[11] Despite the slight increase in the utilization of ITNs, it falls short of the Roll Back Malaria Initiative (RBM) set targets for malaria control which stipulates that at least 60% of the people at risk of malaria, (especially young children and pregnant women) should benefit from ITN, and a minimum of 60% of pregnant women would have access to effective preventable treatment.^[3]

Regardless of the type of net (any net, ITN, or LLIN), net usage has been reported to be higher among rural women (32 to 34%) compared to urban women (18 to 19%).^[12] The variation by background characteristics in ITN

use by pregnant women in households with at least one ITN followed patterns similar to those observed for pregnant women in all households. [12,13] There is a wide variation in the availability, [14] and use of ITNs/LLINs at the household level, [15-20] despite the broad-scale distribution of ITNs in many malaria-endemic countries.

The Ogun State Government and the National Malaria Control Programme partner distributed free LLINs to pregnant women at booking sessions during Antenatal Clinic visits and to infants, after their routine immunisation at the age of nine months in 2009. To improve access to LLINs, the government of Ogun State, under the National Malaria Control Programme and in collaboration with the RBM partners, also embarked on free mass distribution of 1,639,028 LLINs in the state. Utilizing a strategy of two nets per household, the aim was to ensure wide-scale and equitable distribution of LLINs among other malaria control tools in the state. [21] [22] There have been several subsequent free LLINs distribution in the state up-till May 2018 when 3.3 million LLINs were distributed. In a quest to meet the Sustainable Development Goals and the RBM targets, it will be indispensable to determine the actual levels of ownership and utilisation and to take timely corrective actions. Therefore, the objective of the study was to determine and compare the level of LLIN ownership, use and identify barriers to their use among pregnant women in a rural and an urban area of Ogun State, Nigeria.

Methods

Study Area

The study was carried out in a rural area and an urban area of Ogun State, south-west Nigeria. Ogun State is one of the 36 States in the Federal Republic of Nigeria. It covers a total land area of 16,409.26 sq. Km and is bounded in the north by Oyo and Osun States,

in the east by Ondo State, in the south by Lagos State and in the west by the Republic of Benin. The state capital, Abeokuta, lies about 100km north of Lagos, Nigeria's business capital. [23] Ogun State has twenty Local Government Areas (LGA), and the state is generally divided into eight geo-political zones, three senatorial districts (Ogun East, Ogun Central and Ogun West), and nine federal and 26 state constituencies.

Sagamu LGA is an urban area with an estimated population of 269,890 and a total land area of 640sq. Km and an average density of 420 persons per square kilometre. [24] Ijebu-East LGA is a rural area, with an estimated population of 142,879 (projections from 2006 population census) and occupies an area of 1985 sq kilometre with an average density of 72 persons per square kilometre. [25] The two LGAs are located in the eastern part of Ogun State with Sagamu LGA and Ijebu-East LGA having 15 and 11 political wards, respectively.

Study Design

A community-based comparative, cross-sectional study design was used.

Study Population

The study population consisted of pregnant women residing in Sagamu and Ijebu-East LGAs of Ogun State as at the time of the study. The inclusion criteria included pregnant women who had been living in the selected houses for at least six months before the survey and slept in the houses chosen a night before the study.

Sample Size Determination

The results of the 2010 National Malaria Indicator Survey revealed that ownership of at least one LLIN was 39% in rural households and 16% in urban households. [12] These values were used to calculate the estimated sample size. Using a power of 80% and confidence level of 95%, the minimum required sample size was obtained from the formula for

comparing proportions between two groups.^[26]

$$n \text{ (each group)} = [2(Z\alpha + Z\beta)^2 pq] / d^2$$

where:

n = minimum required sample size in each of the group

Z α = standard normal deviate corresponding to 5% level of significance (α) = 1.96

Z β = standard normal deviate corresponding to 20% level of significance

$$(\beta) = 0.84$$

p = proportion of prevalence

$$p = \text{average of P1 and P2} = (39+16)/2 = 27.5\% = 0.28$$

$$q = \text{proportion of failure} = (1-p) = (1-0.28) = 0.72$$

d = expected difference

$$d = P2 - P1 = 0.39 - 0.16 = 0.23$$

Therefore, the final sample size was 67 for each arm of the study and a total of 134 for the entire study.

A multistage cluster sampling technique was used to recruit participants into the study right from the senatorial district level to household level.

One pregnant mother in a household was interviewed. Therefore, all the households with pregnant women in the selected streets in the urban areas and selected settlements in the rural areas were recruited into the study after obtaining their consent. These made a total of 146 households with pregnant women in both the urban (72 households) and rural (74 households) areas.

Data Collection tools and techniques

The study was conducted in April and May 2014. The questionnaire was adapted from the 2010 Nigeria Malaria Indicator Survey (NMIS).

^[12] The semi-structured, interviewer-administered questionnaire was used to collect data from the participants. The questionnaire was translated into Yoruba for better understanding of the questions by the participants. The questionnaire was then translated back into English to be sure that each question still maintained its original

meaning. The questionnaire was designed in five sections as follows: Section A - sociodemographic characteristics of the participants; Section B- Knowledge of the participants on symptoms and mode of transmission of malaria; Section C- Knowledge of the participants on the importance of LLINs; Section D- Assessment of the participants owning LLINs and sleeping under LLINs; and, Section E- Assessment of the factors associated with the use and non-use of LLIN in the households.

The questionnaires were pre-tested in Ikenne LGA on fifteen pregnant women. After the pre-test, corrections were made on the tools appropriately before proceeding with the main study.

Statistical analyses

Information obtained from the questionnaire were entered into SPSS (IBM Corp. released 2011 IBM SPSS Statistics for Windows, version 22.0 Armonk, NY: IBM Corp) for analysis and statistical calculations. Data were summarized using mean, median and mode, standard deviation and proportions. The data were presented using tables, while relationships between categorical variables were tested using the Chi-Square test. Logistic regression model was used to determine the predictors associated with use and non-use of LLINs. The level of significance was set at 0.05.

Ethical considerations

Ethical clearance was obtained from the Olabisi Onabanjo University Teaching Hospital Health Research Ethics Committee and the Primary Health Care Board, Ogun State Ministry of Health. Permission to conduct the research was also sought from the Chairmen and the Medical Officers of Health in the LGAs.

Results

Sociodemographic and other characteristics of the participants

One hundred and forty-six pregnant women participated in the study; these comprised 72 and 74 pregnant women from urban and rural households, respectively. Overall, the rates of ownership and utilization of LLINs were 73.9% (66.7% in the urban vs 81.1% in the rural households) and 54.8% (44.4% in the urban vs 64.9% in the rural households) respectively. The highest number of participants were within the age range 25 - 34 years of age in both the urban (59.7%) and rural (52.7%) areas with the mean (SD) age of 26.8 (5.5) years and 28.1(6.2) years respectively. A higher proportion of urban participants booked the index pregnancy for antenatal care ($p = 0.046$), and a higher percentage of rural participants were engaged in skilled non-manual occupations ($p = 0.023$). Both were statistically significant (Table I).

Participants' knowledge on malaria, malaria prevention and acquisition of LLINs

Almost equal proportions of the participants in the urban (94.4%) and rural households (97.3%) were aware of malaria ($p = 0.385$). Majority of the participants in the urban (90.3%) and the rural (93.0%) areas identified mosquitoes as the vector that transmits malaria ($p = 0.306$). The ownership rate of LLINs ($p = 0.031$), training on the use of LLINs ($p = 0.035$) and utilization rate of LLINs the night preceding the interview ($p = 0.008$) were statistically significantly associated with the location of the participants as shown in Table II.

Association between the characteristics of pregnant women and ownership of Long-Lasting Insecticide Nets

Table III depicts a statistically significant association between the ownership rate of LLINs and the following variables: age ($p = 0.003$), occupation ($p = 0.046$), type of marriage ($p = 0.010$), antenatal booking of the index pregnancy ($p = 0.038$), collection of LLINs after antenatal booking ($p < 0.001$), knowledge of ways to prevent malaria ($p = 0.013$), message seen on malaria prevention ($p = 0.021$) and

sleeping under LLINs the night preceding the interview ($p < 0.001$)

Association between the characteristics of pregnant women and the utilization of LLINs

Table IV shows a statistically significantly higher proportion in the utilization rate of LLINs among pregnant women in the rural areas (60%) compared to the urban dwellers (40%) households ($p = 0.005$). Significantly higher proportions of participants in the age range 25-34 years used LLINs the night preceding the interview ($p = 0.001$), and more of the participants in the monogamous type of marriage used the LLINs ($p = 0.006$). The use of LLINs was also statistically significantly higher among participants who booked their index pregnancy for antenatal care ($p = 0.008$), among participants who collected LLINs at antenatal booking and slept under it ($p < 0.001$), participants who knew ways of preventing malaria ($p = 0.001$), and participants who owned LLINs and also slept under it ($p < 0.001$).

Information on participants use, and non-use of Long-Lasting Insecticide Treated Nets

Table V showed data on the participants' use and non-use of LLINs. Urban dwellers did not use LLINs because they did not receive the freely distributed samples (70.8%), did not think LLINs is essential (12.5%), disliked LLINs (12.5%) and were not around during the distribution of free LLINs (16.6%). On the other hand, the rural dwellers did not use LLINs because they did not receive the free samples (40%), were absent during distribution (13.3%), did not know where to get LLINs (13.3%) and thought LLINs is not essential (26.7%).

The reasons given by the urban and rural dwellers for not hanging their LLINs in their homes included difficulty in hanging (15.4% and 17.5%), felt no mosquitoes around (7.7% and 2.5%) and absence of a right place to hang LLIN (7.7% and 10%), respectively. The major motivation for sleeping under the LLIN by the urban and rural dwellers included

encouragement by health workers (53.1% vs 47.9%), and non-frequent treatment of malaria (37.5% vs 43.8%). The major problems encountered when sleeping under the LLIN by both the urban and the rural dwellers was heat as reported by 96.9% and 75% respectively. *Predictors of ownership of LLINs among pregnant women*

Table VI shows that participants in the 15-24 years age group were 90% less likely to own LLINs compared with those in the age group 35 years and above {AOR 0.10 [95% confidence

interval [CI] 0.01 - 0.56]]. Participants who booked their pregnancies for antenatal care were two times more likely to own LLINs compared with those who did not book their pregnancy {AOR 2.11 [95% confidence interval [CI] 0.57 - 7.78]]. Participants in the monogamous type of family were three times more likely to own LLINs compared with pregnant women in polygamous family type {AOR 3.33 [95% confidence interval [CI] 0.77 - 14.40}}.

Table I: Sociodemographic and other characteristics of the participants (n=146)

Variables	Location n (%)		Total n (%)	Statistics (χ ²)	p-value
	Urban (n=72)	Rural (n=74)			
Age (years)					
15 -24	22(30.6)	22(29.7)	44(30.2)	2.484	0.478
25 -34	43(59.7)	39(52.7)	82(56.2)		
35 +	7(9.7)	13(17.6)	20(13.6)		
Mean (SD)	26.8(5.5)	28.1(6.2)			
Highest level of education					
None formal	2(2.8)	4(5.4)	6(4.1)	7.873*	0.055
Primary	7(9.7)	13(17.6)	20(13.7)		
Secondary	48(66.7)	52(70.3)	100(68.5)		
Tertiary	15(20.8)	5(6.7)	20 (13.7)		
Occupation					
Unskilled	8(11.1)	8(10.8)	16(11.0)	11.884*	0.023
Skilled manual	17(23.6)	20(27.0)	37(25.3)		
Skilled non-manual	39(54.2)	46(62.1)	85(58.2)		
Professional	8(11.1)	0(0.0)	8(5.5)		
Religion					
Christianity	49(68.1)	48(64.9)	97(66.5)	0.167	0.683
Islam	23(31.9)	26(35.1)	49(33.5)		
Marital status					
Married	70(97.2)	74(100.0)	144(98.6)	2.856*	0.353
Not married	2(2.8)	0(0.0)	2(1.4)		
Type of marriage					
Monogamy	62(86.1)	71(95.9)	133(91.0)	3.457*	0.063
Polygamy	10(13.9)	3(4.1)	13(9.0)		
Pregnancy booked					
Yes	69(95.8)	63(85.1)	132(90.4)	4.818*	0.046
No	3(4.2)	11(14.9)	14(9.6)		
Ownership of LLIN at booking					
Yes	31(44.9)	24(38.1)	62(47.0)	3.811	0.051
No	38(55.1)	39(61.9)	70(53.0)		

*Fisher exact, SD == Standard deviation, LLIN - Long Lasting Insecticide Nets

Table II: Participants' knowledge on malaria, malaria prevention and acquisition of LLINs

Variables	Location n (%)		Total n (%)	Statistics (χ^2)	p - value
	Urban (n=72)	Rural (n=74)			
Awareness about malaria					
Yes	68(94.4)	72(97.3)	140(95.9)	0.766*	0.385
No	4(5.6)	2(2.7)	6(4.1)		
Vector causing malaria					
	(n=68)	(n=72)			
Housefly	0(0.0)	1(1.4)	1(0.7)	7.954*	0.306
Cockroach	1(1.4)	1(1.4)	2(1.4)		
Mosquito	65(90.3)	67(93.0)	132(91.6)		
I don't know	2(8.3)	3(4.2)	5(6.3)		
Mode of transmission					
	(n=68)	(n=72)			
Stagnant water	18(26.5)	40(55.5)	58(41.4)	16.110*	0.004
Dirty surrounding	26(38.2)	20(27.7)	46(32.9)		
Mosquito bite	20(29.4)	9(12.5)	29(20.7)		
I don't know	4(5.9)	3(4.2)	7(5.0)		
Symptoms of malaria**					
Fever	30(41.7)	40(54.1)	70(47.9)	2.244	0.134
Headache	50(69.4)	44(59.5)	94(64.5)	1.587	0.208
Vomiting	9(12.5)	17(23.0)	26(17.8)	1.133	0.287
Joint pain	4(5.6)	13(17.6)	17(11.6)	5.118*	0.024
Poor appetite	6(8.3)	12(16.2)	18(12.3)	2.098	0.147
Knowledge about malaria prevention					
	(n=68)	(n=72)			
Yes	62(91.2)	61(84.7)	123(87.9)	0.024	0.876
No	6(8.8)	11(15.3)	17(12.1)		
Seen any message on malaria prevention in the last four weeks					
Yes	59(81.9)	57(77.0)	116(79.5)	0.541	0.462
No	13(18.1)	17(23.0)	30(20.5)		
Ownership of LLINs					
Yes	48(66.7)	60(81.1)	108(73.9)	3.938	0.047
No	24(33.3)	14(18.9)	38(26.1)		
Used LLINs previous night					
Yes	32(44.4)	48(64.9)	80(54.8)	6.144	0.013
No	40(55.6)	26(35.1)	66(45.2)		
Training on the use of LLINs					
	(n=48)	(n=60)			
Yes	44(91.6)	58(96.6)	102(94.1)	4.428*	0.035
No	4(8.4)	2(3.4)	6(5.9)		
Used LLINs previous night					
	(n=48)	(n=60)			
Yes	32(66.7)	48(81.7)	80(72.2)	6.988	0.008
No	16(33.3)	12(18.3)	28(25.8)		

*Fisher exact, LLIN- Long Lasting Insecticide Nets, **Multiple responses

Participants who had seen health education messages and knew ways of preventing malaria were almost 2 times more likely to own LLIN compared with those who had not seen such messages nor knew about prevention of malaria {AOR 1.61 [95%

confidence interval [CI] 0.57 - 4.52]} and {AOR 1.73 [95% confidence interval [CI] 0.59 - 5.03]}.

Predictors of utilization of LLINs among pregnant women

The urban dwellers were 71% less likely to use LLINs compared with the rural dwellers {AOR 0.29 [95% confidence interval [CI] 0.13 - 0.65]}. Participants in the 15 - 24 years age group

were 83% less likely to use LLINs compared with those in the 35 years and above age group {AOR 0.17 [95% confidence interval [CI] 0.04 - 0.70]}.

Table III: Association between the characteristics of pregnant women and ownership of Long-Lasting Insecticide Nets

Variables	Ownership of LLINs n (%)		Statistics (χ^2)	P - value
	Yes (n=108)	No (n=38)		
Location				
Urban	48(44.5)	24(61.5)	3.181	0.075
Rural	60(55.5)	14(38.5)		
Age (years)				
15-24	24(22.4)	20(51.3)	13.674*	0.003
25-34	65(59.9)	17(46.1)		
35+	19(17.7)	1(2.6)		
Occupation				
Unskilled	9(8.4)	7(17.9)	8.023*	0.046
Skilled manual	31(29.0)	6(15.4)		
Skilled non-manual	60(55.1)	25(66.7)		
Professional	8(7.5)	0(0.0)		
Level of education				
No education	3(2.8)	3(7.7)	5.528*	0.137
Primary	18(16.8)	2(5.1)		
Secondary	70(65.4)	30(76.9)		
Tertiary	17(15.0)	3(10.3)		
Type of marriage				
Monogamy	103(95.3)	31(82.1)	6.678	0.010
Polygamy	5(4.7)	7(17.9)		
Booking of pregnancy				
Yes	100(93.5)	32(82.1)	4.290	0.038
No	8(6.5)	6(17.9)		
Collection of LLIN after booking				
Yes	68(68.0)	2(6.2)	37.111*	<0.001
No	32(32.0)	30(93.8)		
Awareness of malaria				
Yes	104(96.3)	36(94.9)	0.140*	0.708
No	4(3.7)	2(5.1)		
Knowledge about malaria prevention				
Yes	95(88.8)	28(71.8)	6.217	0.013
No	13(11.2)	10(28.2)		
Message seen on malaria prevention				
Yes	90(84.1)	26(66.7)	5.328	0.021
No	18(15.9)	12(33.3)		
Slept under LLIN the previous night				
Yes	78(72.9)	2(5.1)	52.994*	<0.001
No	30(27.1)	36(94.9)		

*Fisher exact, LLIN- Long Lasting Insecticide Nets, **Multiple responses

Participants who booked for antenatal care were five times more likely to use LLINs compared with those who did not book for prenatal care {AOR 5.12 [95% confidence interval [CI] 1.14 - 23.03]}. The utilization of LLINs was five times higher among

participants who knew about malaria prevention compared with participants without such knowledge {AOR 4.94 [95% confidence interval [CI] 1.51 - 16.17]} (Table VII).

Table IV: Association between the characteristics of pregnant women and the utilization of Long-Lasting Insecticide Nets

Variables	Use of LLINs n (%)		Statistics (χ^2)	P - value
	Yes (n=80)	No (n=66)		
Location				
Urban	32(40.0)	40(60.6)	7.903	0.005
Rural	48(60.0)	26(39.4)		
Age group (years)				
15-24	14(17.5)	30(45.5)	15.942*	0.001
25-34	50(62.5)	32(48.5)		
35+	16(20.0)	4(6.0)		
Occupation				
Unskilled	6(7.5)	10(15.1)	5.403*	0.145
Skilled manual	20(25.0)	17(25.8)		
Skilled non-manual	47(58.8)	38(57.6)		
Professional	7(8.8)	1(1.5)		
Level of education				
No formal education	2(2.5)	4(6.1)	1.336*	0.720
Primary	12(15.0)	8(12.1)		
Secondary	55(68.8)	45(68.2)		
Tertiary	11(13.8)	9(13.6)		
Type of marriage				
Monogamy	78(97.5)	56(84.8)	7.673*	0.006
Polygamy	2(2.5)	10(15.2)		
Booking of pregnancy				
Yes	77(96.2)	55(83.3)	6.960*	0.008
No	3(3.8)	11(16.7)		
Collection of LLIN at booking				
Yes	53(68.8)	17(30.9)	18.523	<0.001
No	24(31.2)	38(69.1)		
Awareness of malaria				
Yes	79(96.8)	61(92.4)	3.672*	0.055
No	1(1.2)	5(7.6)		
Knowledge about malaria prevention				
Yes	75(93.8)	48(72.7)	12.043*	0.001
No	5(6.2)	18(27.3)		
Message seen on malaria prevention				
Yes	67(83.3)	49(74.2)	2.002	0.157
No	13(16.7)	17(25.8)		
Ownership of LLIN				
Yes	78(97.8)	29(43.9)	52.994*	<0.001
No	2(2.5)	37(56.1)		

*Fisher exact, LLIN- Long Lasting Insecticide Nets, **Multiple responses

Discussion

Over 90% of the participants in this study had heard of malaria, consistent with the result of the 2010 Nigeria Malaria Indicator Survey (NMIS), where 94% of the women interviewed have heard of malaria. [12] Nevertheless, there was a decrease as reported in the 2015 Nigeria Malaria Indicator Survey where 87% of the women interviewed have heard of the illness.

[11] A community-based study conducted in Ethiopia also reported that 95.5% of the participants had heard of malaria. [13] This is not surprising as almost everybody in the adult population would have been treated for malaria at one time or the other in the tropics. Not less than 90% of the participants knew that malaria is transmitted through mosquito bite; this finding is similar to the result from NMIS. [12, 27]

Table V: Information on participants use, and non-use of Long-Lasting Insecticide Treated Nets

Variables	Location n (%)	
	Urban n (%)	Rural n (%)
Reasons for not owning LLINs**		
Did not receive during free distribution by the government	17(70.8)	6(40.0)
Do not know where to get it	0(0.0)	2(13.3)
Do not think it is important	3(12.5)	4(26.7)
Do not like it	1(4.2)	0(0.0)
Too much rush during free distribution	2(8.3)	2(13.3)
Was not around during distribution	4(16.6)	2(13.3)
Reason for not hanging LLIN**		
Don't know how to hang it	2(7.7)	0(0.0)
Too difficult to hang	4(15.4)	7(17.5)
No mosquito around me	2(7.7)	1(2.5)
No good place to hang it	2(7.7)	4(10.0)
People said LLIN is hot	2(7.7)	1(2.5)
Don't like it	0(0.0)	3(7.5)
Gave it out	3(11.5)	1(2.5)
No reason	0(0.0)	3(7.5)
Motivation for sleeping under LLIN**		
Health workers	17(53.1)	23(47.9)
Don't treat malaria often again	12(37.5)	21(43.8)
Usually have a sound sleep	3(9.4)	4(8.3)
No problem using it	1(3.1)	2(4.1)
Problems encountered when sleeping under LLINs**		
Heat	31(96.9)	36(75.0)
Skin Rashes	2(6.3)	5(10.4)
Inability to sleep	0(0.0)	2(4.2)
Peppery and itchy eyes	2(6.3)	5(10.4)

LLIN- Long Lasting Insecticide Nets, **Multiple responses

More than half of rural dwellers compared with less than a third of their urban counterparts identified stagnant water as a mode of transmission of malaria. However, over a third of urban dwellers compared with less than a third of their rural counterparts identified dirty surrounding as a mode of transmission of malaria. Surprisingly, only a few (29.4% urban versus 12.5% rural dwellers) of the participants identified mosquito bite as a mode of transmission of malaria. More needs to be done about health education of pregnant women on malaria transmission as good knowledge about the mode of transmission of malaria will help in taking appropriate preventive measures.

A larger proportion of urban dwellers compared with rural dwellers (69.4% vs

59.5%) recognised headache as a symptom of malaria while more of rural dwellers compared with the urban dwellers identified fever (54.1% versus 41.7%) as a symptom of malaria. This finding is consistent with the results from NMIS, where 69% and 52% of the women identified fever and headache as symptoms of malaria, respectively. [11] More than three-quarters of the participants (both urban and rural) knew about prevention of malaria; this finding is similar to the finding from NMIS where 93% of the participants knew about prevention of malaria. [11] This could be related to the endemicity of malaria in Nigeria, and on-going several awareness and intervention programmes are on the prevention of malaria.

Table VI: Predictors of ownership of LLINs among pregnant women

Variables	Odds ratio	95% Confidence Interval	p-value
Age (years)			
15-24	0.10	0.01 - 0.56	0.013
25-34	0.14	0.02 - 1.23	0.076
35 and above	1.00		
Occupation			
Unskilled	1.00		
Skilled manual	0.00	0.000	0.999
Skilled non-manual	0.00	0.000	0.999
Professional	0.00	0.000	0.999
Booking of the index pregnancy			
No	1.00		
Yes	2.11	0.572 - 7.780	0.262
Type of marriage			
Polygamy	1.00		
Monogamy	3.33	0.771-14.398	0.107
Knowledge about malaria prevention			
No	1.00		
Yes	1.73	0.594 - 5.031	0.315
Message seen on malaria prevention			
No	1.00		
Yes	1.61	0.574 - 4.521	0.365

Table VII: Predictors of utilization of LLINs among pregnant women

Variables	Odds ratio	95% Confidence Interval	p-value
Location			
Urban	0.29	0.13 - 0.65	0.003
Rural	1.00		
Age group (participants)			
15 - 24	0.17	0.04 - 0.70	0.014
25 - 34	0.50	0.13 - 1.84	0.296
35 and above	1.00		
Type of marriage			
Monogamy	5.27	0.868 - 31.969	0.071
Polygamy	1.00		
Booking of the index pregnancy			
Yes	5.12	1.14 - 23.03	0.033
No	1.00		
Knowledge about malaria prevention			
Yes	4.94	1.51 - 16.17	0.008
No	1.00		

Over 80% of rural households' compared with about two-thirds of urban households owned at least one LLIN; this proportion is higher than the finding from a similar study in Nigeria where ITN was owned by only 28.8% of the participants [28], 41% in the 2010 NMIS [12] and 69% in the 2015 NMIS. [11] This finding is consistent with findings from NMIS, where a larger percentage of rural households own

LLIN (73%) compared with urban household (63%). [11] This may reflect the massive community level distribution campaign targeted at rural communities. This finding is consistent with findings from similar studies in Imo State [29] and Anambra State. [30] Having these LLINs in most of the households could be as a result of the free net distribution where

a household with a net card is entitled to two LLINs.

The higher proportion rural dwellers who slept under LLINs compared to urban dwellers could be due to a lot of emphases laid on the use of LLINs as a preventive measure in malaria during antenatal care visits and free distribution of LLINs. This finding is different from the report in a similar study in Nigeria, where the use of ITN was 32.1% among pregnant women in urban areas and 20.7% among pregnant women in rural areas. [28] Another study conducted in Enugu, Nigeria reported utilization rate of LLINs among pregnant women as 39.1%. [31] It is also in congruence with the findings from a study conducted in Edo-State where it was revealed that indices of household usage of LLINs are poor among pregnant women and ironically worse in urban areas compared to rural areas. [32] However, the finding is consistent with the result of NMIS, where a higher proportion of pregnant women in the rural areas slept under an ITN compared with their urban counterpart. [11]

Among the participants who used the LLINs, the reasons identified as motivation for sleeping under the LLINs included health talk by the health workers and decreased visits to health facilities to treat malaria. The major challenge encountered among the participants who used LLINs were excessive heat, similar to the findings from a study in Ghana where over 70% of the participants identified extreme heat as their challenge to use of LLINs. [33] This could be as a result of overcrowding in the urban areas compared with the rural households and associated skin rashes (6.3% urban vs 10.4% rural). This could be because there is no constant supply of electricity, so electric fans are not working. This is coupled with the fact that the weather is scorching, especially during the dry season.

The proportion of pregnant women in households not owning LLINs was higher in

the urban areas compared with the rural areas. The reasons identified by the majority of the participants for not owning LLINs were consistent with findings from NMIS [11] and another similar study conducted in Anambra State. [30] These could probably be due to the high level of migration in the urban areas compared with the rural areas.

The only predictor of ownership of LLINs by pregnant women in both rural and urban areas was age. Pregnant women in the younger age group (15-24 years) were less likely to own LLINs compared with pregnant women in the age group 35 years and above. This is probably because most pregnant women in this age group are adolescents and youths who might not attach much importance to preventive measures such as the use of LLINs. It could also be attributed to the fact that most of these young pregnant women are ashamed to register for antenatal care and may miss the opportunity of being educated on self-protection against malaria. This finding is contrary to the result of a study in Nigeria, where the predictors of ownership of LLINs by pregnant women included residence, the knowledge that ITN prevents against malaria and registration for antenatal care. [28]

The location of the participants was a significant predictor of utilization of LLINs among pregnant women. Pregnant women who live in urban areas are less likely to use LLINs compared with those who live in rural areas. This is because most pregnant women in urban areas complained of heat when sleeping under the LLIN. Also, the majority of urban dwellers had a net on their windows and doors already, and they tend to believe there was no mosquito around them. Age was another predictor of utilization of LLINs among pregnant women. Pregnant women in 15-24 years age group were less likely to use LLINs compared with pregnant women in the age group 35 years and above because ownership of LLINs was lesser in this age group, probably because they did not register

for antenatal care. Pregnant women who registered for antenatal care were five times more likely to use LLINs compared with those who did not register. Usually, there are health education sessions during antenatal clinics on the importance of LLINs as well as a lot of behavioural change communications. At the antenatal booking clinic, every attendee is given LLINs and will continuously be encouraged at every clinic visit by the health workers to sleep under the LLINs to protect them and their unborn baby from malaria attack. Pregnant women with adequate knowledge on prevention of malaria were more likely to use LLIN compared with those without such knowledge. This finding is consistent with the result from studies in other parts of Nigeria, where the major predictor of ITN use by pregnant women was the knowledge that ITN use prevents malaria. [28, 34] Effort should be directed towards the LLINs distribution campaign at the community level as well as during antenatal clinic visits. This is to intensify interventions in terms of appropriate behavioural changes as a way of emphasizing the efficiency of LLINs in malaria prevention. The present study was limited in that our findings were based on self-report. Another limitation of this study was the small sample size; hence, the conclusions of this study could not be generalized. Therefore, it is attractive to suggest that the study could be replicated in a larger population.

Conclusion

The ownership rate of LLINs was higher among pregnant women living in rural areas compared with their urban counterparts. More than half of pregnant women living in rural areas slept under LLINs compared with pregnant women living in urban areas. There should be a continuous distribution of LLINs and health education on malaria at antenatal clinics should focus more on knowledge and preventive measures in malaria as well as encouraging the consistent use of the treated

nets, even in hot nights. This will address the community level perceptions of LLINs and positively position LLINs as a useful device of malaria prevention, particularly in the urban areas. There should be age-specific health education to the young pregnant mothers in the community, using their parents for health education.

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References

1. The World Bank. The World Bank Global Strategy and Boostern Program. Washington, DC. 2005.
2. Berman J, Alilio M, White N. Defining and defeating the intolerable burden of malaria III. Progress and perspectives. *Am J Trop Med Hyg* 2007; 77(6): 10-20.
3. Hawley WA, Phillips-Howard PA, ter Kuile FO, Terlouw DJ, Vulule JM, Ombok M, et al. Community- wide effects of permethrin-treated bed nets on child mortality and malaria morbidity in western Kenya. *Am J Trop Med Hyg* 2003; 68: 121-127.

4. Mugisha F, Arinatwe J. Sleeping arrangements and mosquito net use among under-fives: results from the Uganda demographic and health survey. *Malar J* 2003; 103(12): 1204-1210.
5. Dagne G, Deressa G. Knowledge and utilisation of insecticide-treated mosquito nets among freely supplied households in Wonago Woreda, Southern Ethiopia. *Ethiop J Health Dev.* . 2008;22:34-41.
6. Abebe E, Mosanya ME, Amajoh C, Otsemobor O, Ezedinachi EN, Afolabi BM, *et al.* Nigeria roll back malaria consultative mission: Essential actions to support the attainment of the Abuja targets. 2003. Available from: http://www.rollbackmalaria.org/partnership/country/docs/WAfrica/reaping_nigeria.pdf. 2003. Date accessed: 15/08/2015
7. WHO. World Malaria Report, 2018. Geneva: World Health Organization; 2018
8. Federal Ministry of Health. A road map for impact on malaria in Nigeria, National Malaria Control Programme. Abuja. 2006.
9. Federal Ministry of Health. National Malaria Elimination Programme. Abuja.2014.
10. National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey, 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.
11. National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS), and ICF International. 2016. Nigeria Malaria Indicator Survey 2015. Abuja, Nigeria, and Rockville, Maryland, USA: NPopC, and ICF International.
12. National Population Commission. Nigeria Malaria Indicator Survey 2010. Abuja, Nigeria: NPC, NMCP, and ICF International. 2012.
13. Negash K, Haileselassie B, Tasew A, Ahmed Y, Getachew M. Ownership and utilization of long-lasting insecticide-treated bed nets in Afar, northeast Ethiopia: a cross-sectional study *Pan Afr Med J* 2012;13: 9.
14. Monasch R, Reinisch A, Steketee RW, Korenromp EL, Alnwick D, Bergevin Y. Child coverage with mosquito nets and malaria treatment from population based surveys in African countries: a baseline for monitoring progress in RBM. *Trop Med Hyg* 2004; 71: 232-238.
15. National Population Commission (NPC) [Nigeria] and ICF Macro. Nigeria Demographic and Health Survey 2008. National Population Commission and ICF Macro, Abuja, Nigeria; . 2009.
16. Kleinschmidt I, Schwabe C, Benavente L, Torrez M, Ridi FC, Segura JL *et al.* Marked increase in child survival after four years of intensive malaria control. *Am J Trop Med Hyg* 2009; 80: 882-888.
17. Baume CA, Marin MC. Gains in awareness, ownership and use of insecticide-treated nets in Nigeria, Senegal Uganda and Zambia. *Malaria J* 2008; 7: 153.
18. Haileselassie B, Ali A. Assessment of insecticide-treated nets coverage for malaria control in Kafta-Humera district, Tigray: Possession versus use by high-risk groups. *Ethiop J Health Dev* 2008; 22: 259-267.
19. Blackburn BG, Eigege A, Gotau H, Gerlong G, Miri E, Hawley WA, *et al.* Successful integration of insecticide-treated bed net distribution with mass drug administration in Central Nigeria. *Am J Trop MedHyg.*2006 75: 650-655.
20. Roll Back Malaria Vector Control Working Group. Continuous Long-lasting Insecticidal Net Distributions: A Guide to Concepts and Planning. 2011: 4-5.
21. Pulford J, Hetzel MW, Bryant M, Siba PM, Mueller I. Reported reasons for not using a

- mosquito net when one is available: a review of the published literature. *Malar J* 2011; 10(83). doi:10.1186/1475-2875-10-83.
22. Federal Ministry of Health. Department of Public Health, National Malaria and Vector Control Division. Abuja. Implementation of Long Lasting Insecticide Nets (LLINs) Universal Campaign in 20 LGAs of Ogun State. 2009.
 23. Ogun State Ministry of Health. Department of Planning Research and Statistics. Ogun State Health Bulletin, Volume 4. 2007 - 2009. Ogun State Health Bulletin. 2010;4.
 24. Ogun State Regional and Local Perspectives. Sagamu Local Government Area, Data and Annual Report of Primary Health care activities. 2008.
 25. Ogun State Regional and Local Perspectives. Ijebu-East Local Government Area, Data and Annual Report 2010.
 26. Taofeek I. Research methodology and dissertation writing for health and allied health professionals. Sample Size Determination. Cress Global Link Limited, Abuja. 2009: 70-75.
 27. Nyavor K, Kweku M, Agbemaflle I, Takramah W, Norman I, Tarkang E, Binka F Assessing the ownership, usage and knowledge of Insecticide Treated Nets (ITNs) in Malaria Prevention in the Hohoe Municipality, Ghana. *The Pan Afr Med J* 2017; 28: 67. doi:10.11604/pamj.2017.28.67.9934.
 28. Ankomah A, Adebayo SB, Arogundade E D, Anyanti J, Nwokolo E, Inyang U, et al. Determinants of insecticide-treated net ownership and utilization among pregnant women in Nigeria. *BMC Public Health* 2012; 12:105. doi 10.1186/1471-2458-12-105.
 29. Chukwuocha UM, Dozie INS, Onwuliri COE, Ukaga CN, Nwoke BEB, Nwankwo BO, et al. Perceptions on the Use of Insecticide Treated Nets in parts of the Imo River Basin, Nigeria: Implications for Preventing Malaria in Pregnancy. *Afr J Reprod Health* 2010; 14(1): 117-128.
 30. Mbachu CO, Onwujekwe OE, Uzochukwu BSC, Uchehgbu E, Oranuba J, Ilika AL. Examining equity in access to long-lasting insecticide nets and artemisinin-based combination therapy in Anambra state, Nigeria. *BMC Public Health* 2012; 12: 315.
 31. Ugwu EO, Ezechukwu PC, Obi SN, Ugwu AO, Okeke TC. Utilization of insecticide-treated nets among pregnant women in Enugu, South Eastern Nigeria. *Niger J Clin Pract* 2013; 16: 292-296.
 32. Ogbeide A, Aruoture I, Wagbatsoma V. Utilization of insecticide-treated net among pregnant women attending antenatal care in Etsako east local government area of Edo state. *J Med Biomed Res* 2014; 13(2): 106-116.
 33. Axame W K, Kweku M, Amelor S, Kye-Duodu G, Agboli E, Agbemaflle I, Takramah W, Tarkang E, Binka F N. Ownership and Utilization of Long-Lasting Insecticide Treated Nets (LLIN) and Factors Associated to Non-utilization Among Pregnant Women in Ho Municipality of Ghana. *Central Afr J Public Health*. 2016; 2(1): 35-42. doi: 10.11648/j.cajph.20160201.16.
 34. Ezire O, Adebayo SB, Idogho O, Bamgboye EA, Nwokolo E. Determinants of use of insecticide-treated nets among pregnant women in Nigeria. *Int J Women's Health*. 2015; 7: 655-661. doi: 10.2147/IJWH.S77807



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