

Ownership and Use of Insecticide Treated Nets in Selected Rural Communities of Oyo State, Nigeria: Implication for Policy Action

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Abstract Introduction: Insecticide Treated Net (ITN) coverage and use remain low in Sub-Saharan Africa. The study assessed factors associated with ITN use in the rural settings of Nigeria. Methodology: Descriptive epidemiological design was employed and multi-stage sampling technique used to select 381 consenting participants in four rural communities of Oyo State, Nigeria. Interviewer-administered, semi-structured questionnaire was used for data collection and analyses done using SPSS; bi-variate analyses were done using chi-square test and binary-logistic regression was used to identify factors that were significantly associated with ITN use. Level of statistical significance was set at $p < 0.05$. Result: The mean age of the respondents was 30 ± 8 years. While 90.1% of the participants possessed ITNs, only 69.3% of them slept under the nets a night before the survey. Respondents who were less than 19 years of age had significantly lesser odds of ITN use compared to older women (OR; 0.87, CI; 0.82-0.93). Also, women with no formal education had significantly lesser odds of ITN use compared to those with tertiary education (OR; 0.14, CI; 0.02-0.73). Respondents whose households' monthly income was more than \$64 had significantly higher odds of ITN use compared to households earning less (OR; 6.94, CI; 2.76-17.42). Pregnant women were ten times more likely to use ITN compared to non-pregnant participants (OR; 9.84, CI; 1.03-93.88). Conclusion: There is urgent need for more awareness creation on benefits of ITN use particularly among teenage mothers in Nigeria.

Keywords: insecticide treated nets, ITN ownership and use, malaria, prevention

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1. Introduction

Malaria has remained a major public health problem particularly in the tropical countries. This is in spite of various interventional programmes designed to reduce its burden world-wide. For instance, the 2011 World Malaria Report of the World Health Organization (WHO) revealed that 216 million malaria cases and 655,000 deaths were recorded for 2010 alone. Not less than 91% of these deaths occurred in Africa; pregnant women and under-five-children accounted for the largest proportion of the deaths [1].

According to report from Centre for Disease Control and Prevention (CDC), Nigeria has more reported cases and deaths from malaria than any other countries of the world [2]. Studies have also demonstrated that about 50% of Nigerians suffer from at least one episode of malaria

each year and that malaria accounts for more than 45% of out-patient visits in the country [3].

Globally, efforts had been made towards reducing malaria burden; policies and programmes have been developed to reduce the scourge of the disease. An example of such pragmatic efforts is the establishment of the Roll Back Malaria (RBM) programme by the WHO and other implementing partners in 1998. The programme aimed at reducing malaria burden by 50% by the year 2010 [4]. Governments of African nations had equally demonstrated their willingness to reduce malaria burden in the continent in line with the vision of RBM. Thus on April 25th, 2000, all African heads of states gathered in Abuja, Nigeria to make commitments to malaria reduction. Among many resolutions, all member states were to ensure that at least 60% of vulnerable groups which includes pregnant women and under-five-children sleep under Insecticide treated nets (ITNs) by year 2005 [5]; this target was raised to 80% in 2010.

Use of Insecticide-treated mosquito nets comprising the Conventional (cITNs) and long lasting insecticide treated nets (LLITNs) has proven to be a cost-effective malaria reduction intervention [6,7]. As a result, the Roll Back Malaria partners recommended distribution of free or highly subsidized LLINs in each of the World Health Organization's sub-regions as one of the main malaria prevention strategies [8]. This is to ensure rapid scaling up of ITN coverage. Moreover, scaling up ITN coverage and use by young children and pregnant women was made the consensus target of the Millennium Development Goals (MDGs), the Roll Back Malaria Partnership (RBM), and the US President's Malaria Initiative (PMI) [9].

In trying to achieve this target of universal ITN coverage, the international community has invested billions of dollars in the provision of at least 700 million LLINs since 2004 [10]. While this health expenditure has led to increased access to ITNs [11,12], the target of universal coverage remains distant and millions of African households at risk remain unprotected [10]. In Nigeria, governmental and non-governmental organizations had embarked on mass distribution of ITNs at different times, yet ITN coverage and use remains abysmal particularly in rural communities.

Although several studies have been conducted on ITN ownership and use, only a few of them had concentrated on identifying factors associated with the use particularly in the rural communities which are often characterized by socio-economic features that are different from that of urban communities. There is currently limited information on community-based actual use of nets owned and area specific reasons for non-use. This study aimed at bridging this gap in knowledge and provides base-line information for monitoring ITN ownership and use in Nigeria.

2. Materials and Methods

2.1. Study Area

The study was conducted in four rural communities of Orire Local Government Area (LGA) of Oyo state, Nigeria. The administrative headquarters of the LGA is located at Ikoyi-Ile. The LGA has ten electoral wards and estimated population size of 170,858 according to the 2006 population figure [13]. The inhabitants of the LGA have different religious affiliations such as Christianity and Islamic religions. The people engage in diverse kind of occupations including trading, farming and white collar jobs.

Study design- The research made use of descriptive cross-sectional study design.

Sample size calculation: The required sample size was calculated using the Leslie Kish sample size formula for estimating single proportion. Based on 2013 NDHS report for Nigeria, it was assumed that 50% of households in the communities visited owned at least one ITNs [14]. The margin of error was set at 5%, a non response rate of 10% was envisaged among our respondents and correction for this was made.

Inclusion criteria: All consenting pregnant women and women with at least one under-five children were recruited for the study.

Exclusion criteria: Women who were too ill or whose children were too sick to give valid information and those

who were not permanent residents of the communities visited were exempted from the study.

Sampling technique: A total of 381 study participants were interviewed between April and May, 2016. They were selected using multi-stage sampling technique. In the first stage, four wards were selected by balloting from the 10 electoral wards in the LGA. This was followed by selection by balloting of one enumeration area each from all the enumeration areas in the selected wards. Finally, all households with eligible respondents in the selected enumeration areas were recruited into the study. Recruitment from the four enumeration areas was proportionate to their sizes.

Ethical consideration: Approval for the study was obtained from the Ethical Review Committee of Bowen University Teaching Hospital, Ogbomosho and permission obtained from respective community leaders. Written consents were obtained from study participants before the study. Participation was entirely voluntary and confidentiality was ensured; codes rather than participants' names were used as identifiers and data stored in a computer that was only accessible to the principal investigator.

2.2. Data Collection Method and Instruments

The study made use of quantitative data that was collected using semi-structured interviewer-guided questionnaire developed based on findings from previous studies. The questionnaire was written in simple English language but translated to Yoruba language and back translated to English language to preserve the original meanings of the questions. The instrument collected information on respondents' socio-demographic characteristics, their knowledge on malaria as well as on malaria prevention practices.

Five Junior Community Health Extension Workers (CHEW) who were familiar with the selected communities were recruited and trained to assist in data collection. They were trained for two days by the principal investigator on questionnaire administration. The training involved practical demonstrations

Pre-testing: The instrument was pretested in an enumeration area different from the ones used for the main study. The exercise helped in assessing appropriateness of the questions in eliciting desired responses. Ambiguous questions were either re-phrased or removed completely in line with study objectives.

2.3. Operational Definitions

ITN ownership: This referred to households with at least one ITN which could be cITN or LLITN

ITN use: This referred to respondents from households where under-five children or a pregnant woman slept under ITNs the night preceding the survey.

Respondents' socio-economic class: Using Oyedepi's classification of Social Class [15], respondents' socio-economic status was classified into three; low, middle and high. This classification used a composite score of respondents' educational levels and occupational types of their spouses. Educational levels of respondents as well as occupational types of their spouses were scored. The score

ranged from 1 to 5 for educational level. A score of 1 stood for respondents who could barely read or write or were illiterates while a score of 5 was for those with university education or its equivalent. For spousal occupational types, the score also ranged from 1 to 5 with 1 standing for the unemployed, full-time housewives and students and 5 standing for professionals such as doctors, lawyers and engineers. Respondent's scores from each of the occupational and educational categories were added together and rated over 10. Those who scored less than 5 points were grouped into lower social class; scores from 5 to 7 points were grouped into middle-social class while those who scored between 8-10 points were grouped into high social-class.

Data analysis: The data were field-edited daily and Statistical Package for Social Sciences (SPSS) version 21 (SPSS Inc, Chicago, IL, IBM Version) was used for analysis. Data were analyzed using descriptive and inferential statistics. Chi-square test was used to compare proportions at the bi-variate level. The level of statistical significance was set at $p < 0.05$. At the multivariate level, stepwise model of binary logistic regression analysis was performed. Variables imputed into the model were selected based on whether they were significant at the bi-variate level. Potential confounders such as age of respondents, their educational status and parity were controlled for by analyzing them in different categories. Adjusted odds ratio and 95% confidence interval were obtained to identify factors that were significantly predicting ITN use.

3. Results

A total of 381 questionnaires were returned completely filled out of the 426 that were distributed; this gave a response rate of 90.0%. The mean age of the respondents was 30 ± 8 years with most (42.5%) of them belonging to the 20-29 age categories. Majority (93.2%) of the respondents were married and only 9.7% of them were currently pregnant. More than half (57.0%) of them practiced Islamic religion. Only 5.2% of the women had tertiary education while 25.7% of them had no formal education. Only 7.1% of the respondents belonged to high socio-economic class while more than half of them (50.9%) were in the lower social stratum. Almost three quarter (70.9%) of the respondents were from Yoruba ethnic group and 55.6% of them had two to four children as at the time of the survey (Table 1).

As shown in Table 2, almost all the respondents (97.9%) had heard about ITN; health workers was the main source of information as reported by 65.4% of the respondents (Figure 1). More than three quarter (79.4%) of the respondents opined that ITN were used to prevent mosquito bite while 53.9% of them believed that ITN use can prevent malaria. Not less than 60.6% of the respondents thought that entire family members should be sleeping under ITN for adequate malaria prevention while 41.3% of them believed that only under-five children needed to be sleeping under ITN. Not less than 90.1% of the women approached possessed at least one ITN in their households; more than half of them (57.9%) got their nets from healthcare facilities (Figure 2). More than half

(51.2%) of the nets were at least one year old, however 67.3% of them were long lasting ITNs. Only 69.3% of the women and their babies slept under ITN a night preceding the survey. However, 97.4% of those who slept under ITNs said this practice is a daily routine for them. Fear of sleep disturbance was the main reason for non use; reported by 34.0% of the respondents (Figure 3).

Table 1. Socio-demographic variables of respondents

Socio-demographic variable	Frequency (N = 381)	Percent
Age		
≤ 19	22	5.9
20 – 29	162	42.5
30 – 39	143	37.5
≥ 40	54	14.2
Mean ± SD	30.41 ± 8.0	
Marital status		
Single/ Never married	8	2.1
Married	355	93.2
Separated	6	1.6
Divorce	12	3.1
Religion		
Christianity	164	43.0
Islam	217	57.0
Educational level		
No formal education	98	25.7
Primary education	134	35.2
Secondary education	129	33.9
Tertiary education	20	5.2
Social class		
Low	194	50.9
Middle	160	42.0
High	27	7.1
Tribe		
Yoruba	270	70.9
Non –Yoruba	111	29.1
Number of children		
None	75	19.7
1	45	11.8
2 – 4	212	55.6
≥ 5	49	12.9
Currently pregnant		
Yes	37	9.7
No	344	90.3
Average income		
< 20, 000	191	50.1
≥ 20, 000	190	49.9

Table 2. Respondents' awareness, perception, knowledge and use of ITN

Variable	Frequency (N = 381)	Percent
Awareness of ITN		
Yes	373	97.9
No	8	2.1
Perceived reasons why people use ITN*		
Don't know	9	2.4
For comfort	70	18.8
To keep warm	49	13.1
To prevent mosquito bite	296	79.4
To prevent malaria	201	53.9
People who should sleep under ITN*		
Under five children alone	154	41.3
Older children	57	15.3
Entire family members	226	60.6
Pregnant women	145	38.9
Adults	63	16.9
Visitors	62	16.6
Household ITN ownership		
Yes	336	90.1
No	37	9.9
Age of ITN (n = 336)		
< 1 year	164	48.8
≥ 1 year	172	51.2
Type of ITN (n = 336)		
Normal ITN	97	28.9
Long lasting ITN	226	67.3
Both	13	3.9
Received training on ITN usage or treatment (n = 336)		
Yes	285	84.8
No	51	15.2
Slept under ITN last night (n = 336)		
Yes	233	69.3
No	103	30.7
Frequency of ITN use (n = 233)		
Every night	227	97.4
Occasionally	6	2.6

*: Multiple responses allowed.

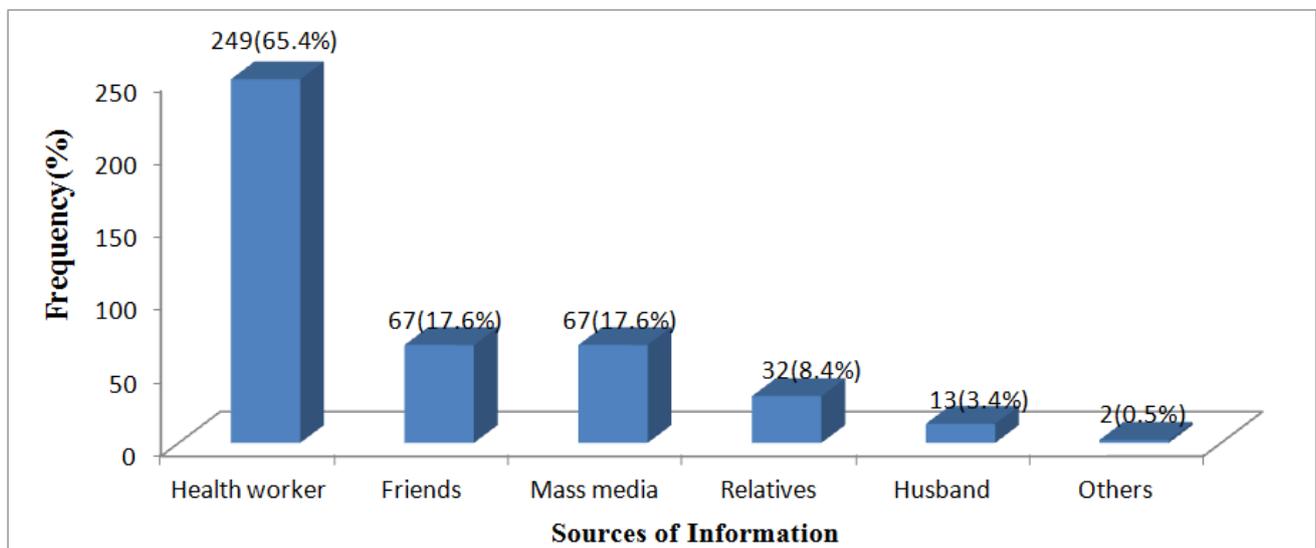


Figure 1. Respondents' sources of information on ITN (Multiple responses allowed)

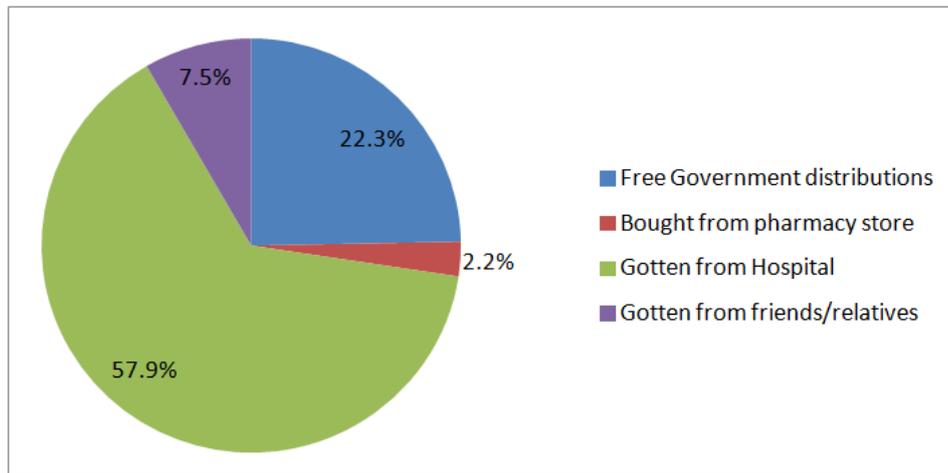


Figure 2. Respondents' sources of ITN

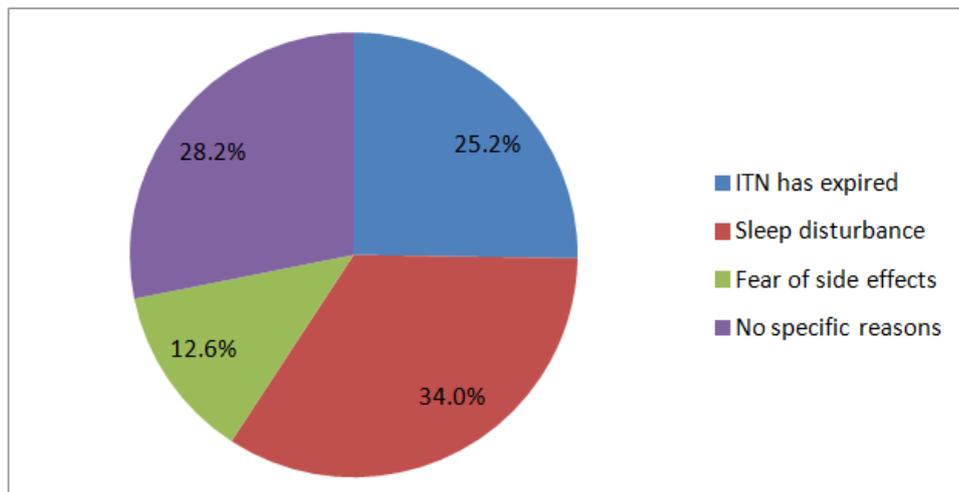


Figure 3. Respondents Reasons for non use of ITN

In Table 3, the proportion (76.8%) of respondents who slept under ITN was significantly higher among women in the 20-29 age range ($p=0.001$). The proportion (84.2%) was also significantly higher among women who had tertiary education ($p=0.016$). Households with only one child constituted a significantly higher proportion (89.7%) of the women who used ITN ($p=0.001$).

Table 4 shows the results of the multi-variate analyses; respondents who were less than 19 years of age had significantly lesser odds (13%) of ITN use compared to those in the 20-29 age categories (OR; 0.87, CI; 0.82-0.93). Moreover, women with no formal education had 14% reduced odds of ITN use compared to those with tertiary education; this was statistically significant (OR; 0.14, CI; 0.02-0.73). In addition, respondents whose households' monthly income was more than 20,000.00 (75 US dollars) naira had a significantly higher odds (7%) of ITN use compared to households earning less than 20,000.00 naira (OR; 6.94, CI; 2.76-17.42). Pregnant women had statistically significant increased odds (10.0%) of ITN use compared to non-pregnant participants (OR; 9.84, CI; 1.03-93.88).

4. Discussion

Our study revealed that 90.1% of the women approached possessed at least one ITN in their households.

This figure is in consonance with 95.3% reported by Sunday et al as the percentage of ITN ownership in Ekiti State in 2014 [16]. Berkessa et al, in a study published early 2016 also reported that 72.6% of Ethiopian households possessed ITNs [17]. In Rwanda, the proportion of households with at least one net was reported to be 92% by Kateera et al in 2015 [18]. Our figure is however much higher than 48.0% reported in the 2013 NDHS report for Nigeria [14]. The reason for the higher figure in the national survey could have been due to methodological differences. In the current study, household possession was defined as ITN ownership, whereas, a distinction between cITN and LLINs was made in the NDHS and the percentages reported separately for the two types of ITNs, thus the 90.1% in the current study was the cumulative figure for both cITN and LLIN ownership. Also, our finding contrast the 28.8% and 64.6% ITN ownership rate reported by Augustine et al [19] and Onoriode et al [20] among pregnant women in selected states of Nigeria. Reason for the higher figure in the current figure could have been due to difference in the study population used; whereas the current study included Under-5-children, the two studies were conducted among pregnant women alone. In rural settings of Nigeria such as the ones used for the current study, children are considered to be more vulnerable to malaria, thus more attention is placed on them regarding malaria prevention.

Besides, some of the pregnant women in the two studies might have been pregnant for the first time and may not have considered themselves as vulnerable to malaria attacks, hence they might not have seen the need for ITN ownership.

Table 3. Factors associated with use among ITN owners

Variable	Use ITN		χ^2	p value
	Yes n=233 (%)	No n=103 (%)		
Age group				
<19	21 (100.0)	0 (0.0)	28.038	<0.001*
20 – 29	106 (76.8)	32 (23.2)		
30 – 39	87 (65.4)	46 (34.6)		
≥ 40	19 (43.2)	25 (56.8)		
Marital status				
Single/never married	6 (100.0)	0 (0.0)	6.585 ^Y	0.086
Married	221 (70.4)	93 (29.6)		
Separated	2 (40.0)	3 (60.0)		
Divorced	4 (36.4)	7 (63.6)		
Religion				
Christianity	102 (68.9)	46 (31.1)	0.023	0.880
Islam	131 (69.7)	57 (30.3)		
Educational status				
None	48 (57.1)	36 (42.9)	10.354	0.016*
Primary	89 (76.1)	28 (23.9)		
Secondary	80 (69.0)	36 (31.0)		
Tertiary	16 (84.2)	3 (15.8)		
Social class				
Low	110 (65.9)	57 (34.1)	1.897	0.387
Middle	105 (72.9)	39 (27.1)		
High	18 (72.0)	7 (28.0)		
Tribe				
Yoruba	164 (60.7)	106 (39.3)	0.179	0.672
Non –Yoruba	70 (63.1)	41 (36.69)		
Number of children				
None	51 (82.3)	11 (17.7)	20.288	<0.001*
1	35 (89.7)	4 (10.3)		
2 – 4	124 (64.9)	67 (35.1)		
≥ 5	23 (52.3)	21 (47.7)		
Currently pregnant				
Yes	28 (90.3)	3 (9.7)	7.069	0.008*
No	205 (67.2)	100 (32.8)		
Average income				
< 20, 000	97 (50.8)	94 (42.9)	18.270	<0.001*
≥ 20, 000	137 (72.1)	53 (27.9)		

χ^2 : Chi square; Y: Yates corrected chi square; *: p value < 0.05.

Table 4. Determinants of ITN use among the respondents

Variables	B	p value	AOR	95% C.I	
				Lower	Upper
Age (Years)					
≤19	-0.136	<0.001*	0.87	0.82	0.93
20-29	1.202	0.002*	3.33	1.58	7.03
30-39	0.968	0.008*	2.63	1.28	5.41
≥40 ^{REF}					
Educational status					
None	-1.988	0.025*	0.14	0.02	0.78
Primary	-2.213	0.014*	0.11	0.02	0.64
Secondary	-2.483	0.008*	0.08	0.01	0.52
Tertiary					
Number of children					
None	-0.226	0.634	0.80	0.32	2.02
1	0.341	0.518	1.41	0.50	3.96
2-4	-0.199	0.593	0.82	0.40	1.70
≥5 ^{REF}					
Currently pregnant					
No ^{REF}					
Yes	2.287	0.047*	9.84	1.03	93.88
Average income					
<N20,000 ^{REF}					
≥ N20,000	1.937	<0.001*	6.94	2.76	17.42

B: Coefficient of logistic regression; AOR: Adjusted Odds ratio; 95% CI: 95% Confidence Interval; REF: Reference category; *: p value <0.05
R²: 0.434; Predictive value: 81.3%; χ^2 : 64.099; p value: <0.001.

Our study shows that only 69.3% of the women and their babies slept under ITN a night preceding the survey. This is in consonance with what has been reported in previous studies. For example, in Ethiopia, Deresa et al reported that 63.0% of all children under the age of 5 years and 52.1% of pregnant women had slept under an ITN the night before their survey [21]. Also, Berkessa et al reported that 80% of households interviewed slept under ITNs a night before their survey [17]. Our figure is however higher than 36% reported in 2013 NDHS for Nigeria [14] and 19.2% reported by Onoriode et al [20]. While the current study was rural-based, NDHS and Onoriode et al recruited women from both rural and urban communities. Women in rural communities are more likely to sleep under ITNs than their urban counterparts because of high population density in most urban areas of Nigeria. In the urban areas where overcrowding is usually the norm, there is often not enough spaces to hang ITNs thereby reducing the possibilities that people will sleep under the nets. In addition, most urban communities are congested and tend to higher atmospheric temperature than rural communities as a result of rapid population growth from rural-urban migration of people. Sleeping under ITNs is thus seen as a very discomforting exercise in those areas compared to the rural communities. In fact, fear of sleep disturbance was the main reason for non use of ITNs in the current study as it was reported by 34.0% of the respondents.

In the current study, respondents who were less than 19 years of age had significantly lesser odds (13%) of ITN use compared to those in the 20-29 age categories. This is not un-expected as adolescent/teenage mothers and pregnant women are more likely to be un-employed, un-educated with very low per-capital income resulting in their inability to seek quality healthcare for themselves and their babies.

Moreover, women with no formal education had statistically significant reduced odds of ITN use compared to those who attained tertiary education. Level of education reflects the socio-economic status of people. Socio-economic status has been shown to be a determinant of ITN use [18]. Women in lower socio-economic class are most likely uneducated and unemployed and may not either know the benefits of ITN use or unable to afford it.

In addition, respondents whose households' monthly income was more than 20,000.00 naira (75US dollars) had significantly higher odds (7%) of ITN use compared to households earning less. This is also not unexpected because poverty reduces ability of people to access healthcare services, ITN acquisition is no exception. Sometimes families had to buy ITNs in order to augment free government ITN distribution efforts. In a country where a timid population of people live below poverty line; ITN acquisition for all family members particularly the vulnerable group may be catastrophic.

Similarly, respondents who were currently pregnant at the time of the survey were more likely to use ITN compared to non-pregnant respondents. This is not surprising because pregnant women have better opportunity to access ITN and receive health education on benefits of ITN use during ANC visits compared to those who were not pregnant.

5. Conclusion

The rate of ITN usage among women in the rural areas of Oyo state, southwest Nigeria is low. This is in contrast to a very high ITN awareness and ownership rates observed among the women in the communities visited. This implies that ITN ownership does not predict usage. There is urgent need for more awareness creation on benefits of sleeping under ITN by the vulnerable group. This is particularly necessary among adolescent mothers and pregnant women who had been revealed by the current study as the least likely group of women to use ITN. Government should not stop at mass distribution of ITN, there is need to constitute ITN-use monitoring committee to ensure that nets are hung and used by vulnerable people in different households.

Low educational attainment has also been shown in the current study as one of the strong determinants of ITN-use. Thus, there is need to embark on massive female education campaign by the Nigerian government; predominantly for females in the rural communities since such communities are often characterized by poor educational infrastructures. Specifically, women in rural areas of Nigeria need to be given health related information for appropriate and timely health action as it relates to malaria prevention. Government must partner the media houses, religious organization, Non-governmental organizations and different

associations in various rural communities for adequate information dissemination on ITN use. Sensitization efforts towards ITN use should incorporate men who are the main decision makers in many Nigerian homes.

Generally, there is urgent need for economic empowerment for the rural community dwellers of Nigeria. The current huge unemployment rate in the country appears to be impacting negatively on access and utilization of healthcare services by various families, especially those in the rural areas. There is urgent need for immediate implementation of the "conditional fund transfer policy" a promise to the vulnerable people of Nigeria by the current government. Doing this will raise the purchasing power of every family thereby improving access to healthcare services such as ITN acquisition and use.

6. Study Limitations

The study was conducted in one out of thirty three LGA in Oyo State. This was due to financial, material and time constraints, thus the result may not be generalizable to the entire population of Nigeria. Effort was therefore made to interview respondents in four rather than one ward of the LGA.

Conflict of Interest

Authors declared no conflict of interest.

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