



Determinants of Use of Insecticide-Treated Nets Among Pregnant Women Attending Antenatal Clinic at Chukwuemeka Odimegwu Ojukwu University Teaching Hospital (COOUTH)

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ABSTRACT

BACKGROUND	<i>One of the major health issues in Nigeria is malaria which accounts for about 33% cause of death in pregnant women. Although huge efforts have been made for pregnant women to have and use insecticide-treated nets (ITN), reports have indicated that the number of women using the ITN in Anambra State, South east, Nigeria, is still low. This study was conducted to identify facilitators and inhibitors for the use of ITN/Long Lasting insecticide net (LLIN) among pregnant women attending antenatal clinic at Chukwuemeka Odimegwu Ojukwu University Teaching Hospital.</i>
METHOD	<i>This study was cross-sectional study of pregnant women attending Antenatal clinic at COOUTH, Amaku, Awka, Anambra State. The sample size was 850, Data were collected between 10th October 2021 and 20th October 2021. For the analysis, a statistical package for social sciences (SPSS) version 20 was used.</i>
RESULT	<i>The total percentage of respondent that has net is 93.2%, those who were confident they can hang or use a net is 82.6%, 64.6% of the respondent owned an ITN (LLIN in their household while 19.2% actually used it), about 70% of the respondent were neither educated nor had a primary school education and 73.2% of them were based in rural locations. Data from the study showed that; Location (Urban-rural), confidence to use a net, education and the knowledge that a pregnant woman can be protected from malaria by using net significant at 5% level. Compared to those who cannot confidently hang a net or use it, pregnant women who knows were 10 times more likely to use a net and those who have the knowledge that using an ITN/LLIN can protect them during pregnancy were about two times more likely to use than those who didn't have the knowledge. Marital status, age, the length of time the net is owned and number of nets owned per household, had no significance on the use of net.</i>
CONCLUSION	<i>Using a net can facilitate its use but generally, owning a net does not mean one is using it. It showed in this study as households owning multiple ITN/LLIN was not significant in the usage of ITN/LLIN by pregnant women and neither was the time frame the net has been owned. Therefore, distributing multiple nets to households might not facilitate the usage of the nets. It is recommended that there will be massive sensitization on the usage of treated nets. Also, teaching pregnant women to hang, use nets and the benefits of using nets will likely improve the use of ITN among pregnant women attending antenatal clinic.</i>
KEYWORDS	Insecticide-Treated Nets Long-Lasting Insecticide Nets Pregnant Women Antenatal Clinic



Background to the Study

Malaria still remains one of the main causes of mortality and morbidity in Nigeria and in most Sub-Saharan African countries¹. Malaria is endemic in Nigeria, with year-round transmission. In Nigeria, 98% of all cases of malaria are due to *Plasmodium falciparum*¹. This is the species that is responsible for the severe form of the disease that leads to death. It is transmitted from bites of an infected female *Anopheles* mosquito to man². Before 2010, there was lack of available data to clearly classify epidemiological profile of Nigeria's malaria. However, in 2010, it was revealed using Nigeria Malaria Indicator Survey that the Nigerian malaria parasite prevalence is still high. Among children under age 5, the average percentage of the prevalence is 42% and have zonal variations ranging from 50% in the South West to 28% in the South East³. In Nigeria, malaria is associated with one-tenth of maternal death and responsible for about one-third of children under age 5⁴. Malaria patients in Nigeria make up about 63% of hospital attendance health care facilities⁴. Malaria is responsible for three out of ten childhood deaths^{1,4}. It is estimated that a child dies of malaria in every 30 seconds⁴. The prevalence is so high that about 300,000 children die of malaria annually and causes 70% of illness in children under age 5 years leading to absenteeism in school⁴. Malaria also affects pregnant women by causing low birth weight and possible abortions⁴.

It has been reported that each year, an estimated 25 million pregnancies are at risk of malaria in Sub-Saharan Africa, the consequences of which can be serious for both mother and fetus in terms of morbidity and mortality⁴. Malaria in pregnant women is a major health concern in Nigeria, its responsible for about 33% of maternal death⁶. Despite massive efforts to make insecticide-treated net (ITN) available to pregnant women in Nigeria, the use is still low^{1,3,5}.

Addressing development priorities and national health, The National Malaria Control Strategic Plan (NMCSP) includes the millennium Development Goal and Roll Back Malaria goals⁷. The NMCSP priority is ensuring that the number of pregnant women and children under age 5 that owns and use the ITNs and long-lasting insecticidal nets (LLINs)⁷. One of the three core interventions of the 2009–2013 NMCSP is preventing and treating malaria in pregnant women⁷. The focus of the updated NMSP is to increase the use of LLIN to 80% by increasing the ownership of nets per household to at least two⁷.

The Cochrane review in 2009 reported that in preventing malaria infection and its consequences in pregnancy, the evidence for the efficiency of ITNs is strong⁹ in a recent meta-analysis¹⁰, examination of malaria prevention in pregnancy datasets from different African nations showed a strong correlation between the use of ITNs and improvement in birth weights of babies, reduction in the prevalence of parasitemia and anemia in pregnant women and stillbirths. It has been observed in some settings that there's correlation between communal protective effect of ITNs and reduction in the overall vector density¹¹.

The wide use of ITN is still low despite the available information on its health benefits during pregnancy (the percentage 16.0% for LLIN and 16.4% for ITN)¹² with variations across geopolitical areas. Understanding the profile of users can provide very useful information in understanding the facilitators and/ or inhibitors for the use of ITN among pregnant women.

This study attempts to answer the question: What are the facilitators for net use among pregnant women? Which population subgroups of pregnant women should be targeted to scale-up ITN use? What messages should be reinforced and what skills should be built to promote the use of an ITN/LLIN?

Material and Methods

The eligibility criteria for respondents for this survey were women of childbearing age (15–49 years.) Irrespective of their place of residence (rural or urban), eligible respondents were given an equal chance of being included in the final sample.

Sample size was calculated based on a 5% level of significance and 80% power of the test. Medical students were trained to interview and administer pretested questionnaires.

Analysis

Data were entered and cleaned using Census and Survey Processing System software. Analysis was done using Statistical Package for Social Sciences (SPSS) version 20. Chi-square test was used to test the significance of selected demographic variables on the use of net. Multiple logistic regression was used to estimate the strength of the association.

Variables in the Analysis

Dependent Variable

Usage of ITN/LLIN by pregnant women is the dependent variable in this study. For the purpose of this study, we used the number that reported sleeping under mosquito net the last night before the survey. The variable is coded 1 if the respondents slept under a net and 0 if not.

Independent Variables

Independent variables used in the study include:

1. Place (locality) of residence: Place of residence was measured based on whether the respondent resided in an urban or rural area at the time of the survey. This was coded as 1 if the respondent resided in an urban area and 0 if the respondent resided in a rural area.
2. Age of the respondents: The current age of the respondent was measured in years, and the age range is 15-49 years. As a categorical value, the age of the respondents was included and subdivided into 15–19 years, 20 years to 24 years, 25–29 years, 30–34 years, 34–39 years, and 40–49 years.
3. Educational attainment: educational attainment was categorized into five categories: no education, others, at most primary, at most secondary, and tertiary. In the multiple regression analysis, two dummy variables were created for educational attainment: attained at least a secondary school education or not. Attained at least a secondary school education is coded 1 and not is coded 0. The second dummy created is never attended a formal school or have some level of formal education, with some level of formal education coded 1 and never attended formal school coded 0 (reference group).
4. Marital status: Marital status was grouped into three categorical variables: married or cohabiting, formally married (divorced, separated, or widowed), and never married. In the multivariate analysis, married or cohabiting and formally married were grouped and coded 1, while never married was coded 0 (reference group).
5. Ever heard of nets: Being aware of the benefits of mosquito net or ITN was measured as yes or no. Yes was coded 1, while no was coded 0.
6. Ownership of net: Respondents were asked if they own a mosquito net or ITN. Those who responded affirmative were coded 1, while no was coded 0.
7. Average number of nets owned per household: We attempted to tease out the effect of number of nets owned on use. We came up with four categories based on respondents' responses: owns one net, owns two nets, owns three nets, and owns four or more nets.
8. Length of time ITN is owned: We created two variables from this by categorizing length of time: an ITN/ LLIN is owned 0–6 months and more than 6 months (variable 1) and 0–12 months and more than 12 months (variable 2).
9. Confidence can hang and use a net: Information on the ability and confidence to hang and use a net was solicited. Those who reported they can hang and use a net were coded 1, while those who cannot were coded 0.
10. Knowledge that sleeping under a net protects pregnant women from malaria: Respondents were asked questions on the awareness of benefits of using a net. Those who were aware of the benefits of using nets (mosquito net or ITN) during pregnancy were coded 1, while those who were not aware were coded 0.

Results

Characteristic of the Study Population

About 850 out of 900 responded which was 94.4%. An analysis of demographic characteristics shows that (Table 1) in terms of marital status, about 56% were either married or cohabiting with a partner. Over 70% resided in rural areas. In terms of education, about 38% had not received formal education.

Knowledge, Ownership, and use of ITM among Pregnant Women

Awareness of net is very high among studied pregnant women (92%). Eight out of every ten pregnant women were confident that they can use or hang a net, while almost four out of ten knew that the use of an ITN/LLIN can protect a pregnant woman from malaria. Ownership of at least one ITN/LLIN in a household was just 67%, while the use was as low as 19% among all women who are pregnant. Among women who owned at least one net in a household, the use was 29.9% (Figure 1).

Table 1 Background characteristics of study population

Background characteristics (n=850)	%
<i>age category</i>	
15–19 years	12.2
20–24 years	22.5
25–29 years	23.2
30–34 years	17.7
35–40 years	15.7
40–49 years	8.7
<i>Marital status</i>	
Married or cohabiting	94.2
never married	3.2
Formally married	2.6
<i>educational attainment</i>	
no education	36.8
others	14.1
Primary only	19.3
secondary	25.2
Tertiary	4.6
<i>location (urban–rural)</i>	
Urban	26.8
rural	73.2
Total	100.0

Bivariate Analysis

Findings from bivariate analysis are shown in Table 2. The independent variables were tested at 5% level of significance. The result shows that location ($P=0.020$), educational attainment ($P=0.001$), ever heard ($P=0.002$), ownership ($P<0.0001$), confidence to hang and use a net ($P<0.0001$), and knowledge that sleeping under an ITN/LLIN can protect pregnant women from malaria ($P<0.0001$) were significant variables. Age, marital status, length of time a woman has owned a net, and the average number of nets owned in a household were not significant. The relationship between using nets and education is positive, meaning that the higher the level of education, the higher the level of use of an ITN/LLIN.

Multivariate Analysis of Factors Associated with the use of ITN Among Pregnant Women

Multivariate analysis was conducted using multiple logistic regression in an attempt to establish possible association between using ITN by pregnant women and some independent variables. Goodness-of-fit test was based on Hosmer–Lemeshow test¹³ with a P-value of 0.750. Only variables that were significant using chi-square test were included in the logistics regression model, and they include location (with urban location as the reference); educational attainment (with at most primary or others education as the reference), ever heard of nets (never heard as the reference), confidence to hang or use a net, and knowledge that using an ITN/LLIN can protect pregnant woman from malaria.

At 5% level of significance, we found only two of the independent variables to be significant: confidence to hang or use a net ($P=0.002$), and knowledge that the use of nets can protect a pregnant woman from malaria ($P=0.012$). At 10% level of significance, educational attainment was significant ($P=0.099$). The other variables used in the logistics regression were not significant.

Pregnant women who know how to hang or use a net were found to be almost ten times more likely to use a net compared with pregnant women who do not know how to use or hang a net (odds ratio [OR]: 9.506; 95% confidence interval [CI]: 2.276 and 39.700). Pregnant women who know that the use of an ITN/LLIN can protect a pregnant woman against malaria were found to be almost two times more likely to use a net compared with those who do not know

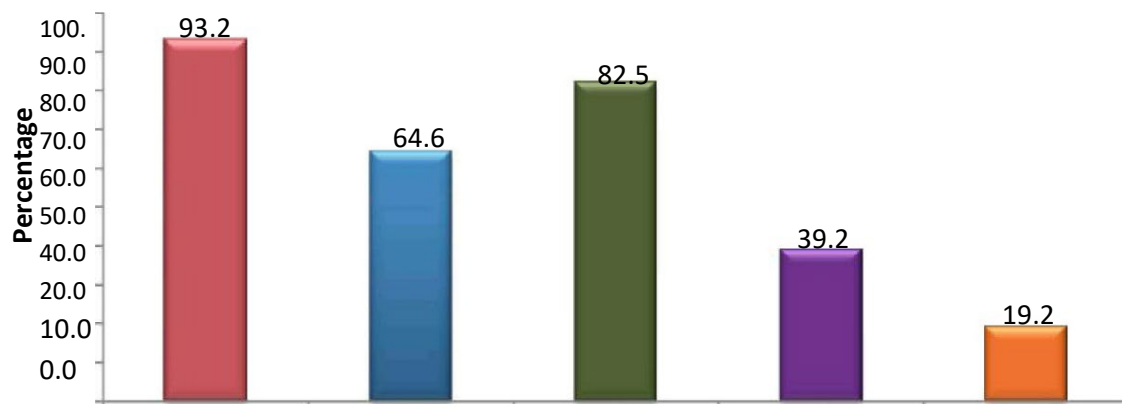


Figure 1 Proportion of pregnant women who have ever heard of a net, own a net, are confident can hang or use a net, and slept under a net

Table 2 Percentage of pregnant women who slept under ITN the last night before the survey by selected characteristics

<i>Selected characteristics (n=850)</i>		<i>%</i>	<i>P-value</i>
Age category 1			
15-19	21.2	0.129	
20-24 years	25.1		
25-29 years	18.8		
30-34 years	15.3		
35-40 years	18.0		
40-49 years	12.2		
Marital category			
Married or cohabiting	19.8	0.221	
Never married	7.4		
Formerly married	13.6		
Educational attainment			
No education	21.7	0.001	
Others	30.8		
Primary only	14.0		
Secondary	13.1		
Tertiary	17.9		
Location (urban-rural)			
Urban	14.5	0.020	
Rural	20.9		
Level of education (at least primary or others)			
Some education	17.7	0.089	
No education	21.7		
Level of education (at least a secondary school education)			
Secondary or tertiary	13.8	0.018	
Primary or others	21.1		
Ever heard of nets			
No	5.3	0.002	
Yes	20.3		
Owns a net			
No	0.3	0.0001	
Yes	29.7		
Confident to hang or use a net			
No	3.4	0.0001	
Yes	22.7		
Knows that use of an ITN/LLIN can prevent malaria in pregnancy			
No	14.0	0.0001	
Yes	27.5		
Length of time net is owned			
Within last 6 months	27.8	0.322	
More than 6 months	30.5		
Length of time net is owned (at least 12 months)			
Within 12 months	30.1	0.487	
More than 12 months	29.5		
Number of nets owned by household (one net)			
Owns one net	30.4		
More than one net	29.6		
Number of nets owned by household (two net)			

<i>Owens one net</i>	30.4	0.487
<i>More than one net</i>	29.6	
Number of nets owned by household (at least two nets)		
<i>Owens at most two nets</i>	28.2	0.067
<i>Owens more than two nets</i>	35.8	
Number of nets owned by household (at least three nets)		
<i>Owens at most three nets</i>	28.2	0.023
<i>Owens more than three nets</i>	40.4	
Number of nets owned by household (two nets)		
<i>Owens two nets</i>	26.9	0.080
<i>More or less than two nets</i>	32.7	

Abbreviations: ITN: Insecticide-treated net; LLIN: long-lasting insecticidal net

Discussion

The use of an ITN/LLIN by pregnant women is a strongly recommended approach to preventing malaria in pregnant women as it ensures not only the mother's health but also that of the fetus.⁷ The result shows that only 19.2% of pregnant women used a net the previous night before the survey. This study attempts to find some of the facilitators of ITN/LLIN use among pregnant women. It was deduced from the results that confidence to use or hang an ITN/LLIN and knowing that the use of an ITN/LLIN can protect a pregnant woman from malaria are facilitators to use an ITN/LLIN by pregnant women. We also found some significant differences between rural and urban locations, those with at least secondary education and those without, such that the higher one's level of education, the less likelihood of using an ITN/LLIN. In terms of messages to be reinforced and skills to be built, we found messages on knowledge that the use of an ITN/LLIN can protect a pregnant woman from malaria and skills on how to hang or use a net to be very significant.

With over 90% of pregnant women being aware of nets, malaria interventions, especially those targeting pregnant women, need to go beyond creating awareness on net use to deepening knowledge and skills on the benefits of using and also building skills on the use of an ITN/LLIN. Inter- personal communications and community engagement has been shown in some other studies as very good options to increase knowledge and build skills. While ownership of a net is very significant, we did not find a significant relationship with the number of nets owned, the length of time the household has owned the net, and the actual use of the net.

This seems to suggest that the use of a net is not necessarily a function of the number of nets owner but having the right information and skills to use it.

The findings of this study are close to what were found in some other studies that identified the need to scale-up community awareness and malaria education to promote net use in Nigeria. Marital status and age, like in most other studies, were not significant variables explaining the use of nets among pregnant women. Ankomah et al¹⁶ reported that pregnant women who consumed mass media were more likely to adopt strategies to protect themselves from malaria and recommended that behavior change communication messages that aimed at promoting net use and antenatal attendance are necessary in combating malaria. Our findings suggest that the messages should be tailored toward building skills and messages that increase pregnant women's knowledge of the benefit of using an ITN/LLIN.

Table 3 Result of Multiple Logistics Regression

	P-value	OR	95% CI Lower	Upper
Location (urban–rural)	0.368	1.258	0.763	2.072
Had at least a secondary education	0.099	1.496	0.926	2.415
ever heard of nets	0.258	2.364	0.532	10.497
Knows that the use of an ITN/LLIN can protect pregnant woman from malaria	0.012	1.813	1.142	2.877
Confident can hang or use a net	0.002	9.506	2.276	39.700
constant	0.0001	0.006		

Abbreviations: OR: Odds Ratio; CI: Confidence Interval; ITN: Insecticide-Treated Net; LLIN: Long-Lasting Insecticidal Net

We found no significant difference between those who own just one net and those who own more than one net in a household, implying that while ownership of net is important, actual number owned by a household does not significantly determine the use. This sounds contrary as there is huge programmatic emphasis on each household owning at least two nets. It may be useful to own more than one net in a household, but real focus should be on promoting right knowledge and building skills on net use. In a resource- constrained environment like that of Anambra State and most Sub-Saharan African countries, decisions need to be made on where investment should be directed. This evidence among others can provide some insight in making these decisions. We also found that the length of time pregnant women owns a net is not significant in explaining the use. This suggests that interventions targeting net use, including those distributing ITN/LLIN, can commence anytime in the woman's life.

We did not explore other possible options pregnant women are using to protect themselves against malaria. It is possible that those more educated or living in urban location are using other ways to prevent malaria in pregnancy.

We recommend that other research works should explore to know whether educated and/or urban-based. Finally, we did not observe respondents actually hanging or using nets, and we depended on their responses of either yes or no to the question “how confident are you to hang or use a net” with “yes I am confident” and “no I am not” as possible responses.

Conclusion

In this study, we found some variables that significantly explain the use of an ITN/LLIN among pregnant women (confidence to hang or use an ITN/LLIN and knowledge that the use of an ITN/LLIN can protect a pregnant woman from malaria). We also found out that just increasing the number of nets per household is not enough to promote the use of an ITN/LLIN among pregnant women. We strongly recommend education of all categories of women on the benefits of using an ITN/LLIN. It is important that skills should be built on the use of a net as these may contribute to improve ITN/LLIN use among pregnant women in Nigeria.

Cost-effectiveness analysis of the current strategy of two nets per household is recommended as future work.

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