USE OF LONG-LASTING INSECTICIDE-TREATED NETS AMONG ANTENATAL CLINIC ATTENDEES IN DELTA STATE, NIGERIA: A CROSS-SECTIONAL STUDY

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Abstract: The use of long-lasting insecticide-treated net (LLITN) is an evidence-based approach to reducing malaria transmission and burden. This study was aimed at evaluating the factors responsible for the low usage of long-lasting insecticide-treated nets among pregnant women attending antenatal clinics in Ughelli North, Delta State, Nigeria. This study was a hospital-based descriptive cross-sectional study of 413 pregnant women conducted using a structured interviewer-administered questionnaire. The participants were recruited using the non-probability convenience sampling method. Chi-square test was used to determine the association between variables and LLITN usage while multivariate binary logistic regression was used to determine the significant predictors of LLITN utilization. Most of the respondents had at least secondary education (92%). More than 50% of the participants were self-employed, multiparous, earned less than the minimum wage and lived in urban areas. Most of the respondents (81.4%) own a LLITN and had used it at least once in their current pregnancy (78.5%). However, only a few (36.1%) use it daily. The main reason for not using the LLITN was heat (65.2%). The place of residence – living in a rural area (Adjusted Odds Ratio (AOR): 4.15; 95% CI 2.07-8.34), being multiparous (AOR: 4.09; 95% CI 1.71-9.76) and earning above the national minimum wage (AOR: 2.11; 95% CI 1.17-3.82) were found to be the significant determinants for the daily usage of the LLITN. Aside from increasing the distribution of free LLITNs to pregnant women, there is a need for policies that will promote its daily usage.

Keywords: Antenatal, long-lasting insecticide-treated net (LLITN), malaria, mosquito, pregnant women, Nigeria

Introduction

Malaria is one of the leading causes of global morbidity and mortality mostly in sub-Saharan Africa. Presently, *Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae* and *Plasmodium ovale* are the four species that affect man. A fifth species of *Plasmodium* infecting man, *Plasmodium knowlesi* has been identified (White et al., 2008). Of all the human *Plasmodium* species, the most virulent is *P. falciparum* which is abundant in Africa. Aside from children between the ages of 0 – 5 years, pregnant women are vulnerable to malaria due to reduced immunity (McLean et al., 2015) and preventing malaria in this class of persons is very important as it will reduce malaria-induced morbidity and mortality.

The World Health Organization (WHO) reported an estimated 249 million malaria cases in 2022 (World Malaria Report, 2023). The WHO African region accounted for almost half of all the cases globally in 2022 and Nigeria alone was responsible for 27% of the total cases and 31% of malaria-related deaths worldwide (World Malaria Report, 2023). There were an estimated 35.4 million pregnancies in 2022 in 33 moderate and high-transmission countries in the WHO African region and 36% of the pregnant women were exposed to malaria (World Malaria Report, 2023). Based on the WHO sub-region, West Africa accounted for the highest (39.3%) prevalence of exposure to malaria during pregnancy (World Malaria Report, 2023). One of the reasons for the high malaria transmission in Africa has been linked to the distribution of the vector of the disease, the female *Anopheles* mosquito which thrives majorly in the continent (Carlton et al 2015).

Malaria is one of the leading causes of fetal morbidity and mortality during pregnancy, especially in sub-Saharan Africa. Previous studies have reported malaria prevalence in Nigeria among expecting mothers to be 41.6% (North-East) and 7.7% (South-West) (Kagu et al., 2007; Agomo et al., 2009). Prolonged exposure to malaria infection in malaria-endemic regions results in some level of acquired immunity due to the production of immunoglobulin (Barua et al., 2019). However, this immunity against malaria is significantly diminished during pregnancy, especially in *primigravidas* (Schantz-Dunn et al., 2009). In populations not immune to malaria, during pregnancy, malaria results in stillbirth, severe disease and a high risk of hypoglycaemia (Cowman et al., 2016). However, in areas endemic to malaria with a high population with partial protection, malaria during pregnancy results in maternal anaemia and low birth weight (McLean et al., 2015).

Nigeria adopted three control measures for malaria in pregnancy in 2004 and they include intermittent preventive treatment in pregnancy (IPTp) using Sulphadoxine-Pyrimethamine, distribution and use of long-lasting insecticide-treated nets (LLITNs), and case management of malaria in pregnancy (MiP) (USAID, 2018). LLITNs reduced malaria infection by 50%, childhood mortality (20%) (Lengeler et al., 2004) and

also protected pregnant women from malaria (Binka et al., 2006). To successfully control malaria, the distribution of LLITNs to people who are most susceptible to this infection is pertinent. Based on the effectiveness of LLITNs in controlling malaria, the 2000 Abuja Summit on Roll Back Malaria (RBM) set a target of 60% (pregnant women) and 80% (children < 5 years of age) coverage by 2005 and 2010, respectively (Roll Back Malaria, 2000). Free distribution of LLITNs in Nigeria was adopted in 2001 according to WHO recommendations. The WHO reported that 260 million LLITNs were delivered to sub-Saharan Africa in 2022 and Nigeria distributed more than 85% of its nets (World Malaria Report, 2023).

There is low usage of LLITN among expecting mothers in sub-Saharan Africa despite increased awareness (Obol et al., 2013). Access to the use of LLITN appears to be minimal (NPC, 2009) and this is due to the inability of people to afford these nets and not a lack of knowledge (Guyatt and Snow, 2004; Binka et al., 2006). The target of the Abuja summit set 19 years ago has elapsed and the 80% expected coverage in 2010 has also not been met in many states in Nigeria (Yusuf et al., 2016) although 85% of received LLITNs were distributed in 2022 (World Malaria Report, 2023). Uhomoibhi et al. 2022 in a study on LLITN utilization and parasitaemia in some states in Nigeria revealed that 4 of the 13 states with high malaria burden had increased prevalence despite the high level of net distribution (2015 – 2018). This implies that there is a need for deeper insights into factors that affect the continuous or frequent usage of the net. This brings about the question: what could be responsible for the infrequent usage of LLITNs? Therefore, this study was aimed at evaluating the factors responsible for the low usage of long-lasting insecticide-treated nets among pregnant women attending antenatal clinics in Ughelli North, Delta State, Nigeria.

Methods

Study area

This study was conducted in Ughelli North Local Government Area of Delta State in Nigeria. Ughelli is located thirty miles east of Warri with latitude and longitude coordinates; 5.500187, 5.993834. Delta state shares boundaries with Edo and Ondo States to the North West, Imo and Anambra States to the North East, Rivers and Bayelsa States to the South East. Delta State has a tropical wet and dry climate with a relatively constant temperature throughout the year. The wet season is longer than the dry season and it runs from March to October. The temperature and humidity in the state are favourable to malaria vectors. The data for this study was collected from Central Hospital, Ughelli. It is a public healthcare centre that caters to most of the people in Ughelli. It attracts different patients with diverse socio-economic statuses due to its quality of service and low cost.

Study design and data collection

This study was a hospital-based cross-sectional study on the use of LLITN among consenting antenatal clinic attendees in Central Hospital, Ughelli North, Delta State. The participants were recruited using the non-probability convenience sampling method. Data was collected using a structured interviewer-administered questionnaire. The questionnaire was pretested to determine its reliability, exclude ambiguities, determine its ability to measure variables and identified problems in the questionnaire were addressed. The Cronbach's alpha reliability coefficient was calculated to be 0.75 and the study response rate was 82.6%. The knowledge of malaria was assessed by evaluating participants' responses (yes or no) to questions regarding the role of control measures in malaria prevention, the effect of malaria on fetus and the role of mosquitoes in malaria transmission.

The outcome variable for this study was the participant's response (yes/no) to questions on using the LLITN at least once in the current pregnancy or using it the night before responding to the survey. Occasionally or every day was the outcome variable for how often the net was utilized. The independent variables include sociodemographic factors (age, educational status, occupation, marital status, religion, place of residence, income) and obstetric factors (parity and trimester of pregnancy). This study was reported in line with the STROCSS criteria (Mathew and Agha, 2021).

Sample size

The sample size for the collected data was determined using the formula described by Vaughan and Morrow (1989). Using the average malaria prevalence rate of 21% reported by Jemikalajah (2017) in a study on malaria parasite prevalence among pregnant women in Ughelli, a total of 256 participants were recommended however, 413 participants were recruited for this study.

$$\mathrm{N} = \frac{Z^2 pq}{\mathrm{e}^2}$$

Where Z is the standard deviation at 1.96 (which corresponds a to 95% confidence interval). p = 0.21 is the probability of the event occurring. $q = 1-p = 0.79$ is the probability of the event not occurring. e is the desired level of precision, also known as sampling error: 5% = 0.05. $N = (1.96)^2 \times 0.21 \times 0.79 / (0.05)^2 = 256$.

Exclusion and inclusion criteria

A structured interviewer-administered questionnaire was utilized for sample collection. Pregnant women who provided informed consent and attended antenatal clinics during the period of data collection were included in this study. Those who decided not to take part in the study and those too weak or ill to take part were excluded. Also, pregnant women at the point of labour and those yet to live more than six months in the study area were not included.

Data analysis

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) for Windows, version 26.0 (SPSS Inc., Chicago, IL, USA). Chi-square (x^2) and Fisher exact test were used to assess the bivariate association of the use of LLITN with the socio-demographic characteristics of the participants. Odd ratios with a 95% confidence interval were used as a measure of the association. Data were collected on three main themes: used LLITN at least once, how often the net was utilized and used the net the night prior to responding to the survey. Only variables that were significant in the Chi-square and Fisher's exact test were further analysed using the multivariate stepwise model of binary logistic regression analysis. This is to determine the significant demographic and socioeconomic predictors of the usage of LLITNs among antenatal clinic attendees. P values of ≤ 0.05 were considered statistically significant. The model goodness-of-fit was evaluated with the Hosmer–Lemeshow test.

Results

The socio-demographic characteristics of the respondents are shown in Table 1. A total of 413 participants took part in this study and most participants were within 20 - 34 years (88.7%), married (59.6%) and had at least secondary education (92%). Most of the respondents were self-employed (54.5%) and civil servants (21.3%). A total of 57.4% of the respondents lived in an urban area. Most of the participants were multiparous (69.8%) and nulliparous (26.4%) (Table 1). A higher number of respondents in their second trimester (43.6%) participated in this study as against 29.8% and 26.6% in their first and third trimesters, respectively (Table 1).

Assessment of the usage of LLITNs among antenatal clinic attendees is shown in Table 2. Most participants (336, 81.4%) own a LLITN and had used it at least once in their current pregnancy (324, 78.5%). However, 62.2% of the 413 participants used the net, the night before responding to the questionnaire. One hundred and seventeen (36.1%) respondents used LLITN every day and most of the participants (67.6%) got the net free of charge. Most of the participants (55%) knew that LLITN can be retreated. Discomfort resulting from heat (219, 65.2%) was the main factor that affected the use of LLITNs (Figure 1). Most of the respondents had good knowledge of malaria as three hundred and fifty eight (89.3%) participants were aware that mosquito bite results in malaria infection (Table 3). Similarly, 334 (85%) participants knew that malaria could affect the fetus negatively. More than 90% of the participants were informed of the various methods that can be used to prevent malaria infection (Table 3).

The relationship between sociodemographic characteristics and the use of LLITNs among antenatal clinic attendees is presented in Tables 4 - 6. The Chi-square analysis revealed that educational qualification, marital status, occupation, place of residence, trimester and average monthly income of respondents were significantly associated with using LLITNs at least once during the current pregnancy (Table 4). However, from the multivariate binary logistic regression, only place of residence was a significant predictor of using LLITN at least once as participants living in rural areas were 3.7 times more likely to use the net in comparison to those in urban areas (AOR: 3.70; 95% CI 1.09-12.59). Chi-square test revealed a statistically significant association between how often the LLITN were utilized and the age, education, occupation, place of residence, parity, trimester and income of respondents (Table 5). Multivariate binary logistic regression revealed that participants living in rural areas were 4.15 times more likely to use the LLITN daily in comparison to those living in urban areas (AOR: 4.15; 95% CI 2.07-8.34). Similarly, multiparous pregnant women were found to be 4.09 times more likely to use the net daily when compared to nulliparous women (AOR: 4.09; 95% CI 1.71-9.76). Also, participants earning above the minimum wage (≥ $45.79) had significantly higher odds of using the LLITN daily in comparison to those earning below the minimum wage (AOR: 2.11; 95% CI 1.17-3.82). Living in a rural area (AOR: 1.64; 95% CI 1.04-2.59) and being in the third trimester (AOR: 2.10; 95% CI 1.10-4.01) were the significant determinants of using the LLITN the night prior to responding to the survey (Table 6).

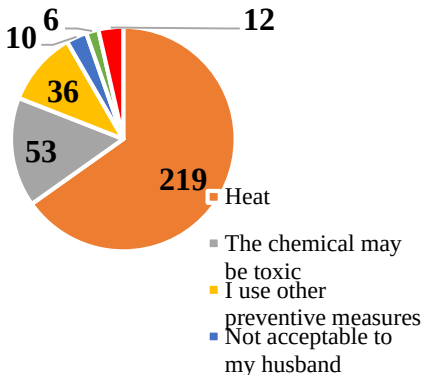

Figure 1: Factors that affect the usage of LLITN (n = 336)

Discussion

The use of LLITN is strongly recommended during pregnancy as it not only protects the health of the mother from malaria infection but also that of the fetus. In this study, we observed that most of the participants used LLITN as a control measure for malaria infection. While most of the respondents (81.4%) own a LLITN, 62.2% used it the night before responding to the survey and only 36.1% use it daily. The utilization rate in this study was lower than the 78.4% utilization rate in Bayelsa reported by Ibegu et al. (2020) and 77% reported in Mozambique (Boene et al., 2014). However, the ownership of LLITN and how often it is used in this study were higher than the 64.2% ownership and 19.2% utilization rate of LLITN reported in a study conducted among pregnant women in 18 states of Nigeria by Ezire et al. (2015). The percentage of participants utilizing LLITN daily and those who have used it at least once in their current pregnancy was higher than the findings from Anikwe et al. (2020) in a study involving antenatal clinic attendees in Southeast, Nigeria and the 13% utilization rate reported by Isah and Nwobodo (2009).

The relatively high level of education among the participants in this study may be responsible for the high utilization rate of LLITN. Interestingly, most of the participants in this study had knowledge that mosquito bite causes malaria and that it may be harmful to the fetus. Our findings are consistent with the report of Ibegu et al. (2020), where the authors linked ownership and usage of LLITN to education and the place of residence of participants. In contrast, the frequency of usage of LLITN in this study was lower than 60.8% daily usage among pregnant women in some parts of western Nigeria reported by Adeola and Okwilagwe (2015) and 93.8% ownership and 86% utilization rate of LLITN reported by Adaji and Gabriel (2019) in Benue state. The disparity in the ownership and frequency of usage of LLITN in these studies in comparison to our study may be due to differences in the study duration, study participants, study site and the period of data collection.

We observed that despite the high number of respondents owning LLITN, very few (36.1%) use the net daily. The ownership and utilization rate of LLITN in this study still falls below the national target of 100% and 80% respectively (Ibegu et al., 2020). This low utilization rate was previously observed in northern Nigeria and other parts of sub-Saharan Africa (Isah and Nwobodo, 2009; Ugwu et al., 2013; Singh et al., 2013). This is worrisome as LLITN is one of the control measures that can

significantly reduce malaria transmission and burden. Singh et al. (2013) in a review, pointed out that a great discrepancy occurs between ownership and usage of LLITN and the top reasons for low usage were discomfort, lack of knowledge of LLITN and proper use of the nets. In our study, the main factor affecting the use of LLITN was discomfort resulting from heat. This is also the main reason for reduced LLITN utilization reported in a similar study conducted in Abakalili (Anikwe et al., 2020). Aside from the interventions from government and not-for-profit organizations aimed at increasing the distribution and availability of these nets, there is a need for sensitization on the reasons to use the nets and improve power supply.

A large number (67.6%) of the respondents in this study got their LLITNs free of charge. However, the number of respondents (32.4%) who bought their net was higher than the 15.5% reported in Ekiti State (Omonijo and Omonijo, 2019) and less than 1% reported in Rwanda (Kateera et al., 2015). While there is no clear reason for these differences, one may posit that the period of data collection may have accounted for this variation. The study of Omonijo and Omonijo (2019) was conducted after the mass distribution of LLITN and this may have contributed to the low number of participants buying the net. In other to make LLITN readily available to antenatal clinic attendees, there is a need for free distribution of these nets or for the cost of these nets to be greatly reduced. Indeed, a study conducted in Madagascar identified the free distribution of LLITN and its reduced price as a major factor that increases demand and effective coverage (Comfort and Krezanoski, 2017).

The place of residence was one of the significant predictors of LLITN utilization. Participants living in rural areas were 3.7 times more likely to use the net at least once in the current pregnancy, 4.15 times more likely to use it daily and 1.64 times more likely to use it the night prior to responding to this survey when compared to those living in urban areas. Those in rural areas may favour the use of LLITN over other malaria control measures that are relatively expensive such as the indoor residual spray etc. Similar studies among pregnant women have also observed that living in rural areas increased the odds of using LLITN in comparison to urban areas (Ibegu et al., 2020; Seyoum et al., 2023). Our study revealed that those with tertiary education had higher odds of using LLITN daily in comparison to participants with lower or no degrees. Findings from this study corroborate previous research that observed a positive correlation between education and LLITN utilization (Salami and Umego, 2018; Ibegu et al., 2020; Anikwe et al., 2020). This implies that educating the girl child is one of the ways to reduce the disease burden in areas that are at risk of high malaria transmission. Similarly, our result corroborates the study reported in Bandundu province of the Democratic Republic of Congo where the authors, Song et al. (2016) reported that uneducated individuals are at higher risk of malaria due to a lower rate of LLITN usage.

Aside from education, the average monthly income of the respondents was a significant determinant of LLITN utilization. This may be because women who earn more would have the financial capability to purchase LLITN when they are not available for free of charge. Ibegu et al. (2020) report on antenatal clinic attendees in Bayelsa State also identified earning above the minimum wage as a determining factor in using LLITN. This study revealed that participants earning above the minimum wage (≥ $45.79) were 2.11 times more likely to use LLITN daily when compared to those earning less than the minimum wage. Yitayew et al. (2018) posit that the association between income and usage of the net may be because mothers with higher income may have more exposure to health facilities and information on LLITN usage. The findings in this report are consistent with Sangare´ et al. (2012) who reported an association between the household wealth index and usage of LLITN in Jinja, Uganda.

Parity was a significant determinant of how often the LLITN was used among the antenatal clinic attendees. This study revealed that multiparous women were 4.09 times more likely to use LLITN daily and primiparous women were 1.77 times more likely to use the net daily in comparison to nulliparous women. A similar study by Sangare´ *et al.* (2012) in Uganda reported slightly lower odds of LLITN usage among nulliparous women in comparison to multiparous women. It is therefore possible that multiparous women with more experience in childbirth may be more knowledgeable on the dangers of malaria and, hence are more likely to use the net. While the trimester of pregnancy was not a significant determinant of how often the net was used, those in the second and third trimesters had higher odds of using the net the night before responding to the survey. Those in their late trimester may be more conscious of the need to use the net in comparison to women in their first trimester.

Study limitation

The results of our study are subject to the following limitations. As our study is hospital-based, its findings may not be a true representation of the entire population. The selection of the study population was not randomized, and this may impact the generalizability of the findings to the population of pregnant women in Ughelli. It is also possible that the insecticides in some of the LLITNs were no longer active and this may have affected the usage of the nets. Another limitation of this study was the reluctance of some antenatal clinic attendees to participate. Also, due to social desirability, some respondents may have exaggerated or underreported their experiences. This bias may have had an impact on our findings. We tried to reduce these biases by explaining the concept of the study to the participants and encouraging them to respond honestly. Lastly, our study also shares the limitation of quantitative research as it did not consider the feelings of the participants which may have also affected their responses.

Conclusion

The use of LLITNs was relatively high among the respondents in this study. The place of residence, parity and average monthly income of respondents were the significant determinants of using LLITN daily in our study. It is also important to note that owning LLITN did not translate to its daily usage among our study participants. Hence, there is a need to update the policies on the distribution of LLITN to include strategies that will encourage its daily usage such as educating pregnant women on the safety and usefulness of the net. Also, making the net more aesthetically pleasing may increase its acceptance and usage.

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Table 1: Frequency distribution of socio-demographic characteristics of respondents

Variables	Frequency (n = 413)	Percentage (%)
Age		
≤ 19	21	5.1
20 – 24	80	19.4
25 – 29	213	51.6
30 – 34	73	17.7
≥ 35	26	6.3
Marital Status		
Single	146	35.4
Married	246	59.6
Divorced	21	5.1
Religion		
Christianity	387	93.7
Islam	6	1.5
Traditionalist	10	2.4
Atheist	2	0.5
Others	8	1.9
Ethnicity		
Urhobo	171	41.4
Ijaw	60	14.5
Itsekiri	48	11.6
Ika	39	9.4
Others	95	23.1
Place of residence		
Urban	237	57.4
Rural	176	42.6
Parity		
0	109	26.4
1	146.4	35.4
2 - 4	142	34.4
≥ 5	16	3.9
Trimester		
First	123	29.8
Second	180	43.6
Third	110	26.6
Educational qualification		
Primary	29	7
Secondary	150	36.3
Tertiary	230	55.7

No formal education	4	1
Occupation		
Self-employed	225	54.5
Civil servant	88	21.3
Private sector	80	19.4
Unemployed	20	4.8
Monthly income		
< Minimum wage (< $45.79)	224	54.2
≥ Minimum wage (≥ $45.79)	189	45.8

The minimum wage in Nigerian naira is N30,000 and an exchange rate of $1 to N655 as of 18th June 2023 was used to estimate the dollar equivalent.

Table 2: Assessment of usage of LLITN among respondents

Variables	Frequency (n)	Percentage (%)
Do you own a LLITN? (n = 413)		
Yes	336	81.4
No	77	18.6
Used LLITN at least once in current pregnancy? (n = 413)		
Yes	324	78.5
No	89	21.5
Did you use LLITN, the night prior to the interview? (n = 413)		
Yes	257	62.2
No	156	37.8
How often do you sleep under LLITN? (n = 324)		
Everyday	117	36.1
Occasionally	207	63.9
Source of LLITN? (n = 336)		
Free	227	67.6
I bought it	109	32.4
Can LLITN be retreated? (n = 307)		
Yes	169	55.0
No	30	9.8
I do not know	108	35.2

Table 3: Knowledge of malaria among antenatal clinic attendees

Variables	Yes n (%)	No n (%)	I do not know n (%)
Does mosquito bite lead to malaria? (n = 401)	358 (89.3)	12 (3)	31 (7.7)
Is malaria harmful to the fetus? (n = 393)	334 (85.0)	12 (3.1)	47 (11.9)
Can malaria be prevented by:			
a. Door and window nets? (n = 349)	316 (90.5)	33 (9.5)	
b. Indoor spray of insecticides (n = 341)	326 (95.6)	15 (4.4)	
c. LLITNs (n = 336)	318 (94.6)	18 (5.4)	
d. Antimalarial drugs (n = 331)	309 (93.4)	22 (6.6)	

Table 4: Cross-tabulation of sociodemographic characteristics and the use of LLITN at least once during pregnancy

	Used LLITN at least once					
Variables	Yes n(%)	No n(%)	Total	df	Statistics	AOR (95% CI)
Age (years)						
≤ 24	85 (84.2)	16 (15.8)	101	3	$x^2 = 4.31$	
25 – 29	166 (77.9)	47 (22.1)	213		$p = 0.23$	
30 – 34	52 (71.2)	21 (28.8)	73			
≥ 35	21 (80.8)	5 (19.2)	26			
Total	324 (78.5)	89 (21.5)	413			
Educational qualification						
Primary	28 (96.6)	1 (3.4)	29	-	Fisher's = 12.78	0.11 (0.01-2.19)
Secondary	125 (83.3)	25 (16.7)	150		$p < 0.01$*	0.60 (0.06-6.01)
Tertiary	168 (73.0)	62 (27.0)	230			1.11 (0.11-10.80)
No formal education	3 (75.0)	1 (25.0)	4			1

Total	324 (78.5)	89 (21.5)	413			
Marital Status						
Single	122 (83.6)	24 (16.4)	146	2	$x^2 = 8.66$	1
Married	182 (74.0)	64 (26.0)	246		$p = 0.01$	0.93 (0.28-3.08)
Divorced	20 (95.2)	1 (4.8)	21			0.71 (0.07-7.87)
Total	324 (78.5)	89 (21.5)	413			
Occupation						
Self-employed	185 (82.2)	40 (17.8)	225	3	$x^2 = 13.55$	0.19 (0.02-1.99)
Civil servant	64 (72.7)	24 (27.3)	88		$p < 0.01$	0.52 (0.05-5.43)
Private sector	65 (81.3)	15 (18.7)	80			0.22 (0.02-2.80)
Unemployed	10 (50.0)	10 (50.0)	20			1
Total	324 (78.5)	89 (21.5)	413			
Religion						
Christianity	307 (79.3)	80 (20.7)	387	-	Fisher's = 4.76	
Islam	4 (66.7)	2 (33.3)	6		$p = 0.26$*	
Traditionalist	6 (60.0)	4 (40.0)	10			
Atheist	1 (50.0)	1 (50.0)	2			
Others	6 (75.0)	2 (25.0)	8			
Total	324 (78.5)	89 (21.5)	413			
Place of residence						
Urban	204 (86.1)	33 (13.9)	237	1	$x^2 = 19.13$	1
Rural	120 (68.2)	56 (31.8)	176		$p < 0.01$	3.70 (1.09-12.59)
Total	324 (78.5)	89 (21.5)	413			
Parity						
0	82 (75.2)	27 (24.8)	109	3	$x^2 = 4.49$	
1	123 (84.2)	23 (15.8)	146		$p = 0.11$	
≥ 2	119 (75.3)	39 (24.7)	158			
Total	324 (78.5)	89 (21.5)	413			
Trimester						
First	103 (83.7)	20 (16.3)	123	2	$x^2 = 17.16$	1
Second	150 (83.3)	30 (16.7)	180		$p < 0.01$	1.05 (0.19-5.95)
Third	71 (64.5)	39 (35.5)	110			3.47 (0.61-19.8)
Total	324 (78.5)	89 (21.5)	413			
Average income						
< Minimum wage ($45.79)	166 (74.1)	58 (25.9)	224	1	$x^2 = 5.46$ $p = 0.02$	0.67 (0.24-1.87)
≥ Minimum wage ($45.79)	158 (83.6)	31 (16.4)	189			1
Total	324 (78.5)	89 (21.5)	413			

*Fisher's exact test applied. $P \leq 0.05$ = significant. AOR = Adjusted Odds Ratio

Table 5: Cross-tabulation of sociodemographic characteristics and how often the LLITN was utilized

	Frequency of usage of LLITN					
Variables	**Everyday n(%)**	**Occasionally n(%)**	**Total**	**df**	**Statistics**	**AOR (95% CI)**
Age (years)						
≤ 24	41 (50.0)	41 (50.0)	82	4	$x^2 = 10.13$	1
25 – 29	51 (30.4)	117 (69.6)	168		$p = 0.02$	1.42 (0.69-2.96)
30 – 34	16 (30.8)	36 (69.3)	52			0.61 (0.23-1.68)
≥ 35	9 (40.9)	13 (59.1)	22			0.46 (0.12-1.81)
Total	117 (36.1)	207 (63.9)	324			
Educational qualification						
Primary	12 (44.4)	15 (55.6)	27	-	Fisher's = 38.89	0.63 (0.05-7.75)
Secondary	68 (55.7)	54 (44.3)	122		$p < 0.01$*	0.40 (0.04-4.49)
Tertiary	36 (20.9)	136 (79.1)	172			1.89 (0.17-21.42)
No formal education	1 (33.3)	2 (66.7)	3			1
Total	117 (36.1)	207 (63.9)	324			
Marital Status						
Single	50 (41.0)	72 (59.0)	122	2	$x^2 = 2.04$	
Married	61 (33.3)	122 (66.7)	183		$p = 0.36$	
Divorced	6 (31.6)	13 (68.4)	19			
Total	117 (36.1)	207 (63.9)	324			
Occupation						

Self-employed	79 (42.0)	109 (58.0)	188	3	$x^2 = 7.91$	1.92 (0.43-8.61)
Civil servant	16 (24.2)	50 (75.8)	66		$p = 0.05$	4.04 (0.77-21.31)
Private sector	18 (30.0)	42 (70.0)	60			3.40 (0.66-17.39)
Unemployed	4 (40.0)	6 (60.0)	10			1
Total	117 (36.1)	207 (63.9)	324			
Religion						
Christianity	115 (37.5)	192 (62.5)	307	4	$x^2 = 9.01$	
Islam	1 (25.0)	3 (75.0)	4 (		$p = 0.06$	
Traditionalist	0 (0.0)	6 (100)	6			
Atheist	1 (100)	0 (0.0)	1			
Others	0 (0.0)	6 (100)	6			
Total	117 (36.1)	207 (68.9)	324			
Place of residence						
Urban	95 (47.5)	105 (52.5)	200	1	$x^2 = 29.38$	1
Rural	22 (17.7)	102 (82.3)	124		$p < 0.01$	4.15 (2.07-8.34)
Total	117 (36.1)	207 (63.9)	324			
Parity						
0	44 (56.4)	34 (43.6)	78	3	$x^2 = 23.44$	1
1	45 (36.6)	78 (63.4)	123		$p < 0.01$	1.77 (0.86-3.63)
≥ 2	28 (22.8)	95 (77.2)	123			4.09 (1.71-9.76)
Total	117 (36.1)	207 (63.9)	324			
Trimester						
First	48 (47.5)	53 (51.5)	101	3	$x^2 = 14.38$	1
Second	55 (36.4)	96 (63.6)	151		$p < 0.01$	1.04 (0.52-2.05)
Third	14 (19.4)	58 (80.6)	72			1.59 (0.62-4.06)
Total	117 (36.1)	207 (63.9)	324			
Average income						
< Minimum wage ($45.79)	41 (25.6)	119 (74.4)	160	1	$x^2 = 15.07$	1
≥ Minimum wage ($45.79)	76 (46.3)	88 (53.7)	164		$p < 0.01$	2.11 (1.17-3.82)
Total	117 (36.1)	207 (63.9)	324			

*Fisher's exact test applied. $P \leq 0.05$ = significant. AOR = Adjusted Odds Ratio

Table 6: Cross-tabulation of sociodemographic characteristics and the use of LLITN the night prior to responding to the survey

	Used LLITN the night prior to responding to survey					
Variables	**Yes n(%)**	**No n(%)**	**Total**	**df**	**Statistics**	**AOR (95% CI)**
Age (years)						
≤ 24	70 (69.3)	31 (30.7)	101	4	$x^2 = 7.26$	
25 – 29	136 (63.8)	77 (36.2)	213		$p = 0.06$	
30 – 34	38 (52.1)	35 (47.9)	73			
≥ 35	13 (50.0)	13 (50.0)	26			
Total	257 (62.2)	156 (37.8)	413			
Educational qualification						
Primary	24 (82.8)	5 (17.2)	29	-	Fisher's = 15.04	0.09 (0.01-1.17)
Secondary	104 (69.3)	46 (30.4)	150		$p < 0.01$*	0.17 (0.02-1.89)
Tertiary	128 (55.7)	102 (44.3)	230			0.23 (0.02-2.58)
No formal education	1 (25.0)	3 (75.0)	4			1
Total	257 (62.2)	156 (37.8)	413			
Marital Status						
Single	103 (70.5)	43 (29.5)	146	2	$x^2 = 9.98$	1
Married	138 (56.1)	108 (43.9)	246		$p = 0.01$	1.25 (0.77-2.02)
Divorced	16 (76.2)	5 (23.8)	21			0.62 (0.20-1.92)
Total	257 (62.2)	156 (37.8)	413			
Occupation						
Self-employed	144 (64.0)	81 (36.0)	225	3	$x^2 = 7.92$	0.30 (0.11-0.85)
Civil servant	52 (59.1)	36 (40.9)	88		$p = 0.05$	0.28 (0.09-0.84)
Private sector	54 (67.5)	26 (32.5)	80			0.21 (0.07-0.63)
Unemployed	7 (35.0)	13 (65.0)	20			1
Total	257 (62.2)	156 (37.8)	413			
Religion						
Christianity	246 (63.6)	141 (36.4)	387	-	Fisher's = 5.21	
Islam	2 (13.3)	4 (86.7)	6		$p = 0.12$*	
Traditionalist	8 (44.4)	10 (55.6)	18			

Atheist	1 (50.0)	1(50.0)	2			
Total	257 (62.2)	156 (37.8)	413			
Place of residence						
Urban	166 (70.0)	71 (30.0)	237	1	$x^2 = 14.45$	1
Rural	91 (51.7)	85 (48.3)	176		$p < 0.01$	1.64 (1.04-2.59)
Total	257 (62.2)	156 (37.8)	413			
Parity						
0	67 (61.5)	42 (38.5)	109	3	$x^2 = 10.64$	1
1	105 (71.9)	41 (28.1)	146		$p < 0.01$	0.60 (0.34-1.07)
≥ 2	85 (53.8)	73 (46.2)	158			0.95 (0.53-1.69)
Total	257 (62.2)	156 (37.8)	413			
Trimester						
First	90 (73.2)	33 (26.8)	123	2	$x^2 = 21.75$	1
Second	118 (65.6)	62 (34.4)	180		$p < 0.01$	1.13 (0.64-1.98)
Third	49 (44.5)	61 (55.5)	110			2.10 (1.10-4.01)
Total	257 (62.2)	156 (37.8)	413			
Average income						
< Minimum wage ($45.79)	134 (59.8)	90 (40.2)	224	1	$x^2 = 1.21$	
≥ Minimum wage ($45.79)	123 (65.1)	66 (34.9)	189		$p = 0.27$	
Total	257 (62.2)	156 (37.8)	413			

*Fisher's exact test applied. $P \leq 0.05$ = significant. AOR = Adjusted Odds Ratio