

The Rate and Determinants of Regular Utilization of Long-lasting Insecticide-treated Nets for Malaria Prevention among Pregnant Women in Keffi, Nigeria

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Abstract

Malaria is endemic in the tropics with pregnant women at increased risk. Malaria in pregnancy causes fetomaternal morbidity and mortality. The regular use of long-lasting insecticide-treated nets is a cost-effective vector-control strategy with synergistic insecticidal and barrier-protective dual actions.

This study explored the rate and socio-demographic determinants of long-lasting insecticide-treated nets utilization in 100 randomly-selected pregnant women attending a private ultrasound center in Keffi, Nigeria. It was a quantitative cross-sectional survey using a structured interviewer-administered questionnaire. The data was analyzed using statistical package for social sciences.

The results revealed a rate of 70% of regular utilization of long-lasting insecticide-treated nets and a statistically significant association between religion and regular long-lasting insecticide-treated nets use (OR 1.51, 95% CI 0.98- 2.34, p .02). The relationship between the free distribution of long-lasting insecticide-treated nets and regular use was not significant (p .363).

Regular use of long-lasting insecticide-treated nets would prevent malaria in pregnancy, reduce fetomaternal morbidity and mortality, and improve fetomaternal survival in Nigeria and other malaria-endemic parts of the world.

Keyword: Rate, Determinants, Utilization, Insecticide-treated-Nets, Pregnancy, Malaria.

Introduction

The objectives of this study were to determine the rate and determinants of consistent utilization of long-lasting insecticide-treated nets among pregnant women attending Hamamah Diagnostic Services Center Keffi and to recommend ways of improving regular usage of long-lasting insecticide-treated nets among pregnant women.

Malaria is a female anophelids' mosquito-borne protozoan infection caused by Plasmodium species with falciparum (75%) and vivax (20%) being the most common infections (Dalrymple et al., 2018). Malaria is endemic in the tropics with pregnant women, under-fives, sicklers, immunosuppressed, and non-tropical immigrants having the highest risk.

Globally, 3.3 billion people are prone to Malaria; 198 million suffer from malaria annually, and ½ million dies, with 90% of deaths occurring in sub-Saharan Africa (WHO, 2018). Malaria in pregnancy causes fetomaternal morbidity and mortality. It accounts for frequent hospital visits, hospital admissions, absenteeism at work and school, and decreased productivity including house chores and care for children. The cost of treatment and opportunity cost of malaria of pregnancy are huge. Therefore, malaria in pregnancy is a public health priority.

Malarial transmission requires Plasmodium, susceptible human host, and favorable environmental factors. Hot and humid climate ensures the survival of Plasmodia in the mosquito. Overgrown grasses, stagnant waters, poor drainages, flood, and solid wastes provide breeding grounds for mosquitoes. Environmental hygiene and use of insecticides, insect repellents, and screen and clothing barriers are measures at minimizing mosquito bites. The use of long-lasting insecticide-treated nets is a cost-effective vector-control strategy with synergistic dual actions of insecticide and barrier protection.

In Nigeria, long-lasting insecticide-treated nets are expensive for ordinary citizens that live below the poverty line of \$2 per day. Up to 172 Naira (\$1.2) is spent daily by an individual household on malaria prevention in Nigeria (Onwujekwe et al., 2014). Fortunately, governmental and non-governmental agencies provide long-lasting insecticide-treated nets free of charge, but the rate of regular utilization in

pregnancy reported as low as 19.2% across 18 states in Nigeria (Ezire et al., 2015) needs to be further studied.

Therefore, this study explored regular long-lasting insecticide-treated nets use in pregnant women attending the cheapest ultrasound center in Keffi, Nigeria, the Hamamah Diagnostic Services Center.

Available literature revealed only a few studies on the regular use of long-lasting insecticide-treated nets by pregnant women in Nigeria and none in Keffi, Nasarawa state, Nigeria. Additionally, no previous study explored the possible relationship between free ownership of long-lasting insecticide-treated nets and regular (everyday) use - this research principally aimed at exploring and addressing these gaps.

The limitation of this study was the exclusion of pregnant women less than 18 years old for ethical reasons in a community where early marriage is the norm. Girls can get married as early as 15 years of age. This exclusion had denied this category of pregnant women from participation in the study. Other limitations were time and resources constraints, small sample size (100) and low statistical power.

Methods

The study took place at Hamamah Diagnostic Services Center, Keffi, Nigeria. Hamamah Diagnostic Services Center is a private ultrasound services provider that charges 500 Naira only (\$1.5) for a scan. Despite the out-of-pocket payment, employees of different organizations with health insurance cover elsewhere patronize this center. Keffi is a cosmopolitan town about 50km from Abuja, the capital of Nigeria (Figure 1).

A quantitative cross-sectional approach was chosen because of the limited time and resources and the exigency of work. The strength of this design was the feasibility of data collection within the six weeks. The findings can be generalized because of the random sampling technique and would add to the existing body of knowledge and give direction for further research on the topic.

The independent variables were socio-demographic characteristics (age, gravidity, educational level, occupation, and religion) and source of long-lasting insecticide-treated nets. The dependent variable was regular long-lasting insecticide-treated nets use.

The sample frame was pregnant women using long-lasting insecticide-treated nets who attended Hamamah Diagnostic Services Center Keffi for obstetric ultrasound within the study period. The sample consisted of every other pregnant woman within the sample frame that gave informed consent and aged at least 18 years.

The sample size (n) calculation was based on the prevalence (p) of long-lasting insecticide-treated nets use by pregnant women of 49.6% from Ikeako et al. (2017) study in Awka, Anambra state, south-east Nigeria and a precision (d) of 10%. Using the formula, $n = 4pq/d^2$ (where $q = 1-p$): $n = 100$.

The systematic probability sampling technique of choosing every other eligible pregnant woman was used, and the first sample was chosen by simple balloting of the first two participants.

This study used primary data collected through an interviewer-administered structured questionnaire. The researcher and two research assistants collected the data over six weeks in July and August 2018. The survey took place at Hamamah Diagnostic Services Center Keffi, Nigeria from 18th July 2018 to 30th August 2018.

Names and hospital numbers were not captured for ethical reasons. Similarly, excluded were those without informed consent and those less than 18 years of age. Approval was obtained from Hamamah Diagnostic Services Center to carry out the study.

Statistical Package for Social Sciences (SPSS) version 23 was used for the analysis with a Confidence Level (CL) of 95% and a Level of Significance of 0.05. The data was entered into SPSS from the questionnaires. Data was double-entered to ensure accuracy. Cases with missing values were excluded and replaced with valid ones. Age and gravidity were grouped. The qualitative variables were coded into numeric values to aid analysis. The statistical analysis included basic statistics, cross-tabulation, and X^2 test, and logistic regression to control for confounders. When p-value was < 0.05 , the null hypothesis (H_0) was rejected, and the research hypothesis (H_r) accepted.

Results

The dataset contained one hundred (100) eligible pregnant women sampled randomly. Cases with missing data were excluded and replaced by appropriate ones. The dataset was captured in SPSS. Age and gravidity were transformed into nominal variables. The data was analyzed, and the results presented.

The age of the 100 respondents ranged from 19 to 40 years, with a mean of 28.2 ± 6.2 years, the median age was 28 years, and the mode was 20 years (Figure 2). Most of the women were carrying a second pregnancy (21%), but the gravidity ranged from 1 to 12 with high-risk primigravida and grand multiparous women accounting for 18% and 31% respectively (Figure 3). As shown in Table 1, the participants were predominantly literate (88%) with Islamic education (30%) being the commonest, followed by a senior secondary school certificate (26%), and those with a degree constituted only 8%. In contrast, their spouses had a higher literacy level of 90% with Ph.D. (1%) as the highest qualification. Besides full-time housewives, the women and their spouses were mostly sustenance farmers, petty-traders, and artisans (34-57%) with unemployment kept at 5%. 78% of the respondents were Muslims while 22% were Christians.

In Figure 4, 82% of the respondents got long-lasting insecticide-treated nets free of charge, while 18% bought them. 70% of the participants reported everyday use of long-lasting insecticide-treated nets, while 30% were using long-lasting insecticide-treated nets not regularly.

Hypothesis testing was done with suitable statistical tests using SPSS. Cross-tabulation/ X^2 -Test was used to determine associations between qualitative variables at an alpha value of 95%. A p-value of $<.05$ rejects the Null hypothesis (H_0).

Pearson's X^2 -Test of independence explored possible relationships between the independent and the nominal dependent variables. Where $>25\%$ of cells had counts <5 , Likelihood Ratio (LR) was used. The strength of the association (effect size) was determined with Cramer's V (CV) for asymmetrical tables and Phi or Odds Ratio (OR) for 2x2 tables and Standardized Residuals (SR) for locating the statistically significant differences.

Age, gravidity, educational level, and occupation of the respondents were not significantly associated with regular long-lasting insecticide-treated nets use: $p > 0.05$ (Table 2). However, there was strong evidence of an association between religion and regular long-lasting insecticide-treated nets use ($X^2(1) = 5.372$, $p = .02$). The effect size was small-to-moderate and statistically significant (Phi = .232, $p = .02$); the difference was among Christians with inconsistent use of long-lasting insecticide-treated nets (SR = 1.7); the odds of Muslims using long-lasting insecticide-treated nets regularly was 1.5 times more than that of Christians (OR 1.513, 95% CL = .98, 2.34).

There was no statistically significant association between free ownership and regular use ($X^2(1) = .826$, $p = .363$).

Logistic regression confirmed the association between religion and regular long-lasting insecticide-treated nets use was statistically significant (OR 4.47, 95% CI 1.49, 13.40, $p = .007$) after controlling the confounding effects of other socio-demographic variables.

Discussion

In this study, the rate of everyday utilization of long-lasting insecticide-treated nets by pregnant women of 70% closely correlates with the finding of Sangaré et al. (2012) in Jinja, Uganda who reported a rate of 73%. This rate is higher than the previous night long-lasting insecticide-treated nets use reported in sub-Saharan Africa (60%), Ethiopia (58.4%), Ghana (61%), and Nigeria (49.6%).

This high rate of regular long-lasting insecticide-treated nets use among pregnant women in Keffi can be explained by the proximity of Keffi to Abuja, the high educational level of the participants and their spouses, and possible increased long-lasting insecticide-treated nets awareness as supported by Adeola and Okwilagwe (2015), Belay and Deressa (2008), and Ezire et al. (2015), and Sangaré et al. (2012).

Religion was the only statistically significant predictor of regular long-lasting insecticide-treated nets use by pregnant women ($X^2(1) = 5.372$, $p = .02$). Logistic regression to control for confounders confirmed statistical significance (OR 4.47, 95% CI 1.49, 13.40, $p = .007$). Other socio-demographic variables were not shown to be significant predictors in contrast to the findings of previous studies that

reported education, long-lasting insecticide-treated nets awareness, gravidity, free distribution, urban residence, willingness to purchase long-lasting insecticide-treated nets, confidence to use a net, and being married as significant predictors of long-lasting insecticide-treated nets use (Adeola and Okwilagwe (2015), Belay and Deressa (2008), and Ezire et al. (2015), and Sangaré et al. (2012).

This finding might not be unconnected with long-lasting insecticide-treated nets campaigns in mosques and religious gatherings.

Conclusion

The objectives of this study of determining the rate and determinants of consistent, long-lasting insecticide-treated nets use among pregnant women attending Hamamah Diagnostic Services Center Keffi were primarily achieved. The following recommendations were put forward to improve access to and utilization of Long-lasting insecticide-treated nets by pregnant women in sub-Saharan Africa:

1. The local, state, and federal governments and non-governmental organizations in Nigeria should intensify efforts at the free distribution of long-lasting insecticide-treated nets to pregnant women.
2. Public campaigns should be scaled-up using mass media, social media, and non-medical personnel such as local celebrities, drama actresses/actors, and renowned sportsmen to increase the level of Long-lasting insecticide-treated nets awareness.
3. Religious leaders should be more engaged in long-lasting insecticide-treated nets awareness campaigns and long-lasting insecticide-treated nets distributed at religious gatherings.
4. Pregnant women need to be targeted specifically, and incentives like free delivery kits can be given along with long-lasting insecticide-treated nets to encourage ownership and utilization of long-lasting insecticide-treated nets.

The recommendations would enhance ownership and regular usage of long-lasting insecticide-treated nets by pregnant women. Regular long-lasting insecticide-treated nets use would prevent malaria in pregnancy, reduce fetomaternal morbidity and mortality, and improve fetomaternal survival and standard of living.

The statistically significant associations between religion and everyday use of long-lasting insecticide-treated nets by pregnant women in Keffi, Nasarawa state, Nigeria should serve as a basis for further exploration by researchers. The sample size should be increased, and a qualitative component added in future studies.

Figures and tables



Figure 1. Map of Keffi (Source: HTG)

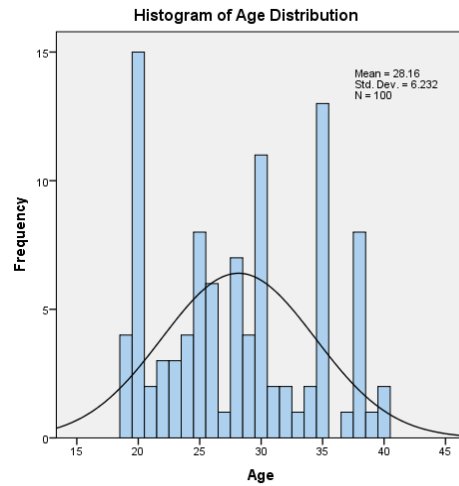


Figure 2. Participants age distribution with normality curve

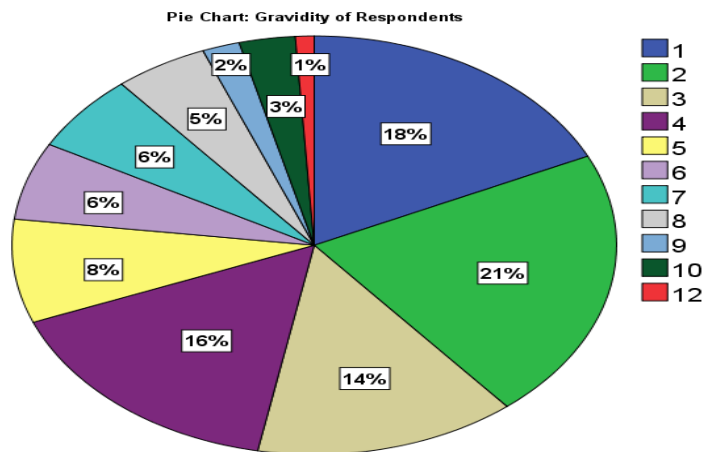


Figure 3. Distribution of respondents by gravidity

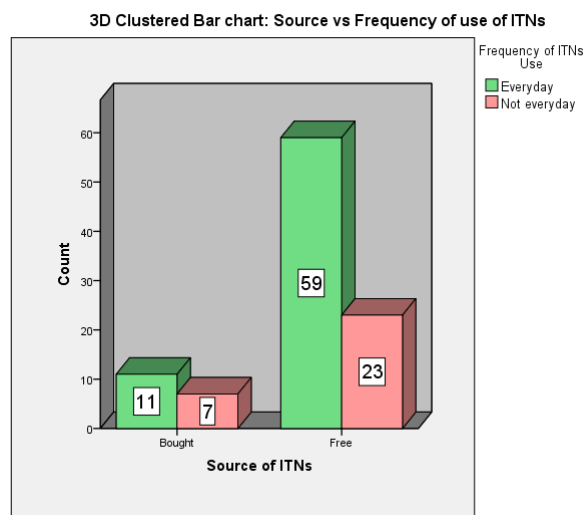


Figure 4. Frequency of Long-lasting insecticide-treated nets Use versus Source

Table 1. Educational level and employment status of respondents and their spouses

Educational Level		
Categories	Respondents (%)	Spouses (%)
Illiterate	12	10

Islamic education only	30	21
Primary school certificate	3	2
Junior secondary school certificate	8	1
Senior secondary school certificate	26	22
National diploma/NCE	9	21
Higher national diploma (HND)	4	3
Degree	8	15
Master degree	0	4
PhD	0	1
Employment Status		
Categories	Respondents (%)	Spouses (%)
Unemployed	5	0
Housewife	49	0
Employed	12	43
Others (farmers, traders, artisans)	34	57

Table 2. Association between socio-demographic variables and regular Long-lasting insecticide-treated nets use

Predictors	Outcome	Test	X ² /LR Value	df	P-value	Effect size	SR
Age group	Regular Use	X ²	.863	2	.65	-	-
Gravidity group	Regular Use	X ²	5.531	2	.063	-	-
Literacy	Regular Use	X ²	1.171	2	.557	-	-
Spouse literacy	Regular Use	X ²	.866	2	.649	-	-
Occupation	Regular Use	LR	1.643	3	.650	-	-
Spouse occupation	Regular Use	X ²	.857	1	.355	-	-
Religion	Regular Use	X ²	5.372	1	.020	.232(.020) OR 1.513 (.98- 2.34)	1.7

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