INCIDENCE OF MALARIA AND USE OF INSECTICIDE TREATED NETS (ITN) IN ENUGU STATE, NIGERIA.

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Abstract

Malaria is a major public health concern to all government; especially in Sub-Sahara Africa. In Nigeria it takes the life of one in six children before their 5th birthday. Economic losses from prevention, treatment, loss of man-hours etc is estimated at N132billion or $660,000 annually. The objective of this work is to find out if the incidence of malaria in a particular area of Enugu state and whether the insecticide treated nets (ITNs) have contributed in any significant way to lowering the incidence of malaria amongst the children and pregnant women. This study examined 300 pregnant women from Enugu State between December 2023 and January 2024. The simple survey method was used to collect data directly from the primary sources. Analysis was by simple statistical inferences and regression analysis. Inconsistent use of ITNs was flagged as a major rea son for malaria prevalence. The regression analysis showed that marital status was negatively associated with inconsistent use of ITNs amongst pregnant women in Enugu State ($\beta = -0.34$) with $p = < 0.001$. Location of the pregnant women was positively associated with inconsistent use of ITNs among them in Enugu State ($\beta = -0.33$ with a $P< 0.001$, Occupation was positively associated with ITNs among pregnant women in Enugu State ($\beta = -0.33$ with $P<0.05$). Monthly income and level of education were not significant. The major limitation of this study was the limited sample size (300). Nevertheless, it is significant for policy makers and donor agencies. There is the need to increase the campaign levels and ITNs distribution in Enugu state to reduce malaria incidence and increase productivity.

Keywords: Malaria, Insecticide treated nets.

Introduction

Malaria is a common tropical public health concern that is rampant in Nigeria (Okafor & Ognonnaya, 2020). Malaria has been a world health burden and a major public health problem in tropical and subtropical regions of the world. It is transmitted through the bite of infected *Anopheles* mosquitoes (Budu et al., 2022). In its periodic health report, the World Health Organization (WHO) stated that more than 90% of the world's malaria cases (an estimated 0.8 million annually) are unreported (World Health Organization, 2010). It affects an estimated 350 to 500 million people annually and accounts for 1 to 3 million deaths per year worldwide (Eckhoff, 2011; Centers for Disease Control and Prevention, 2010; Isah & Nwobodo, 2009). In African countries malaria infection during pregnancy is estimated to cause as many as 10000 maternal deaths and 200000 neonatal deaths per year. It is also said to be responsible for 8–14% of all low birth-weight babies and 3–8% of all infant deaths, and over 30 million pregnancies threatened throughout Africa each year (Okafor & Ogbonnaya, 2020; Onyeneho, 2013). About 19–24 million women are at risk of malaria during pregnancy (Kuti, Owolabi and Martins 2006). Since it has been established that mosquitoes are the major transmitters of malaria, it behooves on the public to find solutions to this endemic in the form of adopting the use of insecticide treated nets (ITN). This was a measure put in place to protect pregnant mothers as well as unborn babies from been infected with malaria as they are the most vulnerable to malaria attack (Okafor & Ogbonnaya, 2020). This is in line with achieving the Millennium Development Goals (MDGs) that sought to control the transmission of malaria across the globe (Modebe et al., 2020; Ter Kuile, 2003). Efforts were made to ensure that ITN were made free, cheaper and available for the public to use (Okafor & Ogbonnaya, 2020). The most vulnerable in terms of pregnant women were not left out. In the light of this, the 2008 Nigeria Demographic and Health Survey (NDHS) results indicate that 17% of households in Nigeria own a mosquito net (treated or untreated), and 8% of households own more than one mosquito net and 16% of households own at least one net that has never been treated (Onyeneho, 2013). Even though there are gray areas that have been of great concern in terms of possession of ITN, there are even greater concerns about the inconsistent usage of ITN by those who own one or more Insecticide Treated Nets (ITNs) (Onyeneho, 2013). Studies have shown that the inconsistent usage of ITNs vary by demographic factors such as marital status, level of education, and as well socioeconomic factors (Musa et al. 2009).

Marital status has been associated with the non-use of ITNs among pregnant women (Mwangu et al., 2022). The result is in line with two studies done in Kenya and

Congo that found that pregnant women in a union are more likely to use an ITN (Choonara et al., 2015; Songs et al., 2016). The findings indicate that pregnant women who had never been in a union are less likely to use an ITN. A possible explanation is that pregnant women in union may be influenced by their partner's decision to practice malaria prevention behaviours (Aberese-Ako et al., 2019).

Findings have shown that levels of education play significant role in the use of ITNs in that it with letter education, they are able to grasp information provided by the newspapers and other mass media (Musa et al. 2009). However, by level of education, the studies have demonstrated that the odds of utilizing ITN was low among pregnant women with higher education (Dadzie et al., 2020; Forty & Keetile, 2022; Lukwa et al. , 2020; Musa et al. 2009).One of the reasons for this is that, women with no formal education often view themselves to be highly vulnerable to malaria infection, so they are motivated to properly utilize ITNs unlike those with formal education who may have greater access to information about alternative malaria prevention methods (Dadzie et al., 2020). Another argument put forth is that pregnant women with higher education have to practice better environmental hygiene, hence, explaining the lower ITNs use. (Dadzie et al., 2020).

Luukwa et al. (2020) argued that pregnant women from poor rural households had the highest usage of ITNs, compared to pregnant women from well to do areas. This was supported by Bawuah and Ampaw (2021) who revealed that place of residence and wealth predict ownership and use of ITN such that pregnant women from higher wealth indexed households were more likely to own ITNs, the utilization was rather higher among women from poorer households (Kanmiki et al., 2019). This could be as a result of the pregnant women from wealthy households to have alternatives to prevent transmission of malaria like the use of insecticide sprays, repellant creams and so on, unlike pregnant women from poor households who may not be able to afford them and so have to stick with ITNs (Baume & Franca-Koh, 2011; Kanmiki et al., 2019).

In recent years, the distribution of ITNs has been inadequate, with only a few local government areas targeted in various states. This has made it impossible to attain saturation in any one area. The approach since 2009 has been to start afresh a coordinated strategy to deliver two nets to every household across the country through a series of stand-alone campaigns to achieve universal coverage. In 2010, the world-bank booster-supported states (Kano, Jigawa, Bauchi, Gombe, Anambra, Akwaibom, and Rivers) conducted net campaigns, and health workers distributed free nets to households. The aim was to promote net-use in households, especially among pregnant women and children below 5 years of age5. According to the

Federal Ministry of Health, 57.7 million nets were distributed between 2009– 2013 across Nigeria, representing 90.2% of the national overall coverage target. This coverage represented a huge success in the collective efforts to scale up the intervention. Again, anecdotal reports from both tertiary health facilities and primary healthcare centres in Enugu, South- Eastern Nigeria, show that the use of ITNs is somewhat limited. Our literature review and observations also show that documentations on the knowledge, accessibility, and use of ITNs by this vulnerable group are also limited. It is not known whether the poor usage observed is due to a lack of knowledge about ITNs and their importance, or because access to ITNs is poor, or because there are other constraining factors. It is also not known whether usage and opinions about access to ITNs have improved over time. These issues motivated this study among antenatal care attendees of Redeemer Maternity, Abakpa Nike, Enugu, South-Eastern Nigeria to determine the knowledge, accessibility and utilisation of insecticide treated nets during pregnancy. The framework here is inductive. It will focus on examining the 300 pregnant women and the incidence of malaria in them.

The objectives of the study thus are:

i) To examine the demographics of pregnant women who are susceptible to inconsistent use of ITNs

ii) To find out if there will be a significant difference among the demographic variables and inconsistent use of ITNs among pregnant women in Enugu state.

iii) The volume of investment in ITNs and the effectiveness of these investments.

Method

The current quantitative study was undertaken at Redeemer Hospital and Maternity, Abakpa Nike, Enugu State, South- Eastern Nigeria. The study population consisted of all the pregnant women who attend the antenatal care clinic within 6 weeks of the study. Three hundred pregnant women were recruited and included in the study. The inclusion criteria included: 1) must be a pregnant woman; 2) must be attending ANC at Redeemer Hospital and Maternity, Abakpa Nike; and 3) must be willing to participate in the study. On the other hand, the exclusion criterion entailed those who refused to sign the consent form. The proposal for this study was reviewed and approved by the hospital ethics board. Participants were informed about the purpose and details of the study and written consent was obtained from them prior to the

commencement of the study. A self-developed questionnaire was used for the study. The questionnaire was constructed based on the research objective. The questionnaire had two sections. Section A comprised the socio demographic data, while Section B comprised questions or items set to generate data for the research, based on the research questions. Most of the questions were designed in close ended format, which gives the respondent the opportunity to choose from the options provided, while others were in open ended format where the respondents were expected to write their own opinions answers.

The reliability of the instrument was tested by carrying out a pilot survey in which 25 copies of the questionnaire were administered to 25 pregnant women at Annunciation Specialist Hospital, Emene, Enugu East LGA. Data generated were tested for internal consistency (the degree to which all of the items measure a common characteristic). A reliability coefficient of 0.89 was obtained using Cronbach's alpha. Thus, the instrument was considered reliable. Data was analysed using SPSS (version 23) and are presented in frequency tables below:

Results

The demographic profile of participants is presented in Table below

Table 1. Socio demographic characteristics of respondents (N=300)

Marital status

	Frequency	Percent	Valid Percent	Cumulative Percent
Single	103	34.3	34.3	34.3
Married	195	65.0	65.0	99.3
Divorced	2	.7	.7	100.0
Total	300	100.0	100.0	

By marital status, 103 (34.3%) were single, 195 (65.0%) were married while 2 (7%) were divorced

Location/ area

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Rural	145	48.3	48.3	48.3
Urban	155	51.7	51.7	100.0
Total	300	100.0	100.0	

The location of the pregnant women showed that 145 (48.3%) stay in rural areas while 155 (51.7%) lived in urban areas.

In terms of monthly income, 144 (48.0%) had no means of income, those who earn below 30,000 were 75 (25.0%); 33 (11.0%) earned from 31,000-60,000; 20 (6.7%) earned from 61,000-100,000; 13 (4.3%) earned from 100,000-150,000 while 15 (5.0%) earned from 150,000 and above.

Occupation

	Frequency	Percent	Valid Percent	Cumulative Percent
none	148	49.3	49.3	49.3
Housewife	11	3.7	3.7	53.0
civil servant	58	19.3 o	19.3	72.3
trader	65	21.7	21.7	94.0
Farmer	18	6.0	6.0	100.0
Total	300	100.0	100.0	

By occupation, 148 (49.3%) had no occupation, 11 (3.7%) were housewife, 58 (19.3%) were civil servants, 65 (21.7%) were traders, while 18 (6.0%) were farmers.

Level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
	no school	12	4.0	4.0	4.0
	primary	27	9.0	9.0	13.0
	secondary	108	36.0	36.0	49.0
	Tertiary	153	51.0	51.0	100.0
	Total	300	100.0	100.0	

By level of education, 12 (4.0) had no education, 27 (9.0%) had primary school education, 108 (36.0%) had secondary school education, 153 (51.0%) had tertiary education

Table 2. Knowledge of pregnant women regarding prevention of malaria in pregnancy using ITNs, Nigeria (N=300)

Knowledge of prevention

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	51	17.0	17.0	17.0
	use mosquito net	121	40.3	40.3	57.3
	clean environment	37	12.3	12.3	69.7
	ITN& Disinfectant	19	6.3	6.3	76.0
	sanitation	13	4.3	4.3	80.3
	take treatment	24	8.0	8.0	88.3
	use anti-mal-drug	35	11.7	11.7	100.0
	Total	300	100.0	100.0	

Knowledge of prevention of malaria, 51 (17%) do not know about how to prevent malaria, 121 (40.3%) attests that the use of mosquito net prevents malaria, 37 (12.3%) say that clean environment prevents malaria, 19 (6.3%) say that using ITN and disinfectant prevents malaria, 13 (4.3%) say that sanitation prevents malaria, 24 (8.0%) say that taking treatment for malaria prevents malaria while 35 (11.7%) say that using anti-malaria drugs prevents malaria.

Table 3; Accessibility to ITNs by pregnant women, Nigeria (N=300)

Accessibility

	Frequency	Percent	Valid Percent	Cumulative Percent
None	137	45.7	45.7	45.7
Antenatal	83	27.7	27.7	73.3
mass campaign	24	8.0	8.0	81.3
Immunization	56	18.7	18.7	100.0
Total	300	100.0	100.0	

By accessibility, 137 (45.7%) had no access to ITN, 83 (27.7%) had access through antenatal care, 24 (8.0%) had access through mass campaign, while 56 (18.7%) had access through immunization (table 3).

Table 4: Regression analysis showing demographic variables and Inconsistent use of ITN among pregnant women in Enugu state, Nigeria.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.585	.468		5.519	.000
	Marital status	-1.253	.227	-.337	-5.510	.000
	Level of education	-.180	.134	-.080	-1.342	.181
	Location/ area	1.208	.216	.334	5.588	.000
	Monthly income	.109	.073	.086	1.490	.137
	Occupation	.122	.057	.127	2.136	.033

The regression analysis showed that marital status was negatively associated with inconsistent use of mosquito ITNs (β=-.34) with $p<.001$, level of education was not significant, the location of the pregnant women was positively associated with inconsistent use of ITNs (β=.33) with p<.001, monthly income was not significant and occupation was positively associated with ITNs (β=.13) with $p<.05$

Monthly income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	144	48.0	48.0	48.0
	below 30,000	75	25.0	25.0	73.0
	31,000-60,000	33	11.0	11.0	84.0
	61,000-100,000	20	6.7	6.7	90.7
	100,000-150,000	13	4.3	4.3	95.0
	150,000 and above	15	5.0	5.0	100.0
	Total	300	100.0	100.0	

Discussion

Marital status was negatively associated with inconsistent use of ITNs which may suggest that those who are married may be more likely to use ITNs compared to those who may be divorced or single. This may be due to the preponderance of not having a partner to offer support in terms of re-emphasis on the use of ITNs to prevent malaria during pregnancy. The pregnant women in this case may be nonchalant in their resolve to use ITNs. This is consistent with Choonara et al., 2015; Songs et al., 2016.

Those who stay in urban areas are more likely to be inconsistent with the use of ITNs. This is consistent with the findings of Luukwa et al. (2020) who found that pregnant women from poor rural households had the highest usage of ITNs, compared to pregnant women from well to do areas. This may be due to urban areas having several means of preventing mosquito bites and mosquito breeding, such as the use of repellant or fumigation and keeping the environment clean. Also, there are less bushes or slumps in urban areas and this could also contribute to the low usage of ITNs as there may be less opportunity for mosquitos to breed.

The occupation of the pregnant women showed a positive association with inconsistent use of ITNs. This may suggest that when they are well to do in their occupation, they are less likely to use ITNs as there are other alternative methods to prevent malaria. This supports the findings of Dadzie et al. (2020). This may also

mean that those who feel that they are in a well to do occupation may be more likely to feel that the continuous use of ITNs may be too degrading in their households or may make their households look too clumsy for their taste.

Accessibility of ITNs by pregnant women

Our findings revealed that the majority of the respondents do not have access to ITNs. This supports the findings of Ugwu et al. on the accessibility of ITNs among pregnant women in Enugu, South-Eastern Nigeria, which showed that only a few of the respondents (43.1%) owned ITNs. This may suggest that there is a low level of accessibility to ITNs.

Limitations

The limitation of the current study is the small sample size, considering the large demographic population of Nigeria. The study included 300 participants selected at convenience and this might limit its generalizability.

Conclusions/ Recommendations

All pregnant women were ready to use ITNs if adequate information was provided and the nets made readily available at affordable price or provided free-of-charge. Government is encouraged to continue the provision of ITNs to attain a broader coverage. Health workers at all levels, especially primary level, are encouraged to increase awareness of the correct usage of ITNs to ensure their full benefit. There may also be fears regarding the toxicity of the ITNs, care must be taken by primary health providers to allay the fears of these pregnant women through correct orientation on the safety precautions of using the ITNs. This study has implications in how health care policies would be formulated going forward.

That is there will be need to provide greater orientation to rural dwellers as well as underserved areas. There would be need for greater orientation for complimentary actions to be taken as regards keeping the environment neat especially in areas where there is poor environmental hygiene. In such areas, use of ITNs may not be restricted to night use.

This is because beyond keeping contact away from mosquitoes in areas where they sleep, they also do other activities in their environment, and so mosquitoes may lurk in other areas other than the bedroom. Effectiveness includes ensuring that breeding places for mosquitoes are eradicated as quickly as possible. There is also need to examine longitudinal studies with proper funding to see the dynamics in the use of ITNs over the years so as to determine if there is going to be improvement in the use

of ITNs such that the ITNs can repel mosquitoes in a given geographical area. Also, the government of Nigeria should also invest in the use of aerosols that can incapacitate the mosquitoes from transmitting malaria as it is done in other tropical regions in Africa.

More so governments need to train her field workers and encourage them to go out more often to attend to the needs of the people. A reduction of the level of mosquito induced labour hour losses will directly impact our development.

The donor spends $ on ITN's and need to get adequate returns for their investment with the inconsistent use of these ITNs such investments are sub-optimized.

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