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Available Online at www.achieverssciencejournal.org**Ownership and Utilization of Long Lasting Insecticide Treated Bed Nets during pregnancy in Calabar, Nigeria**O. A. Oduwole^{1*} and E. O. Oyekanmi²¹Department of Medical Laboratory Science, Achievers University, Owo, Nigeria*.²Department of Mathematical Sciences, Achievers University, Owo, Nigeria.*Corresponding author: olabisioduwole@yahoo.co.uk; olabisioduwole@achievers.edu.ng,

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ABSTRACT

To evaluate ownership and use of Long Lasting Insecticide-treated bed nets (LLITNs) among pregnant women attending secondary and tertiary health facilities in Calabar, Nigeria, a prospective study was undertaken over four months using a pre-tested questionnaire. Two hundred and four pregnant women were interviewed, 200(98%) registered for ANC, 124 (61%) owned ITN, only nine (7%) of these pregnant women who owned ITN slept under it every night. There was a great disparity between ownership and use of LLITNs among pregnant women (p -value=.000021). The low utilization of LLITNs could partly explain why up to 72% of the pregnant women in this study self-reported at least one episode of clinical malaria in this study. The utilization of LLITN by pregnant women is still sub-optimal, even years after this study was conducted. There is a need for a concerted effort by stakeholders to educate pregnant women that the benefit of LLITNs utilization outweighs its discomfort.

Keywords: LLITN, ITN, malaria, LLITN utilization, Pregnancy**1. Introduction**

Globally, over 200million malaria cases were reported in 2019 according to the World Health Organization report (WHO, 2020). Although malaria cases are declining in Nigeria, the malaria burden is still high in Nigeria, this is because it is responsible for about 30% of hospital admission and 60% of all outpatient visits (Ozims and Eberendu, 2014; Mutabingwa *et al.*, 2005). Furthermore, the burden of malaria in pregnancy is very high in endemic countries especially in areas with a stable transmission. Each year about 30 million women in malaria-endemic areas of Africa become pregnant. About 25 million of these pregnancies are threatened by *Plasmodium falciparum* malaria which is also responsible for

up to 200,000 newborn deaths each year (Okoye and Isara, 2011; WHO, 2020). In such areas, adult women acquire immunity to the infection but continue to have symptomatic and asymptomatic parasitaemia resulting in adverse pregnancy outcomes such as low birth weight, preterm deliveries, and maternal anaemia. Pregnant women are at higher risk of malaria infection than their non-pregnant counterparts due to transient depression of immunity during foetal development (Uneke, 2007).

Long-lasting insecticide-treated net is one of the integrative malaria control measures that is recommended by African Leaders and the World Health Organization (WHO) (Van *et al.*, 2011; WHO, 2004). Long Lasting Insecticide Treated

Net (LLITN) is a mosquito net that has been pre-treated in the factory by absorbing the insecticide in the net so that it can protect an individual who sleeps under it from mosquitoes bites for at least 3 years or after 20 washes (Erlanger *et al.*, 2004).

A target of 60% LLITN coverage was set by African leaders and the Rollback malaria program to reduce the burden of malaria among the vulnerable groups in the continents (Roll Back Malaria, 2000). Furthermore, the Nigeria National Malaria Control Program targets 80% coverage among pregnant women (Federal Ministry of Health, National Malaria Control Programme (NMCP), 2010). The WHO reported that there is a steady increase in LLITN coverage globally, from a distant 3% to 46% in 2019 (WHO, 2020). Furthermore, a lot of studies carried out across Africa showed that the level of awareness regarding ITN for preventing mosquito bites is high (Ozims and Eberendu, 2014; Habimana *et al.*, 2020). However, ownership does not translate to utilization (Komomo *et al.*, 2016; Anikwe *et al.*, 2020). A Cochrane systematic review showed that sleeping under an insecticide-treated net (ITN) every night will prevent malaria morbidity and mortality (Pryce *et al.*, 2018). In Cross River State, mass distribution campaigns for LLINs have been key in the scale-up of preventive interventions and effective management of malaria. *President's Malaria Initiative (PMI)* has supported campaigns that delivered millions of LLINs targeted at children under-five years of age in Cross River State to reach a target of two LLINs per household (USAID, 2019). The objective of this study is to report the ownership and utilization of LLITNs among pregnant women in secondary and tertiary health facilities in Calabar, South-Eastern, Nigeria.

2. Materials and Methods

This was a cross-sectional prospective study of the ownership and use of Long Lasting insecticide-treated bed nets among pregnant women in Calabar, southeastern Nigeria. This is a retrospective report on ownership and use of insecticide-treated bed nets during pregnancy between March and June 2009 in the delivery

rooms; after the women had delivered and rested for at least 30 minutes.

The subjects for this study were pregnant women who were in the labour ward. A convenient sampling of women among pregnant women delivering at the labour wards of the University Teaching Hospital and the General Hospital both located in Calabar city, south-eastern Nigeria was done. Malaria transmission in the study area is stable and uniformly intense throughout the year (Oduwole *et al.*, 2017).

2.1 Ethical Approval

We obtained ethical approval from the Ethical Review Committees of the University of Calabar Teaching Hospital and the Ministry of health, Cross River State government. Participants also gave informed consent before enrolment in the study.

2.2 Data Collection

A pre-tested questionnaire was used to obtain information on demographic data, ante-natal care, gravidity, and gestational age of the women. Consecutive women were enrolled in the study as they were admitted into the delivery room. All willing women were included in the study. The tool was also used to collect information on the history of fever, episodes of clinical malaria during pregnancy, ownership, and use of ITNs as well as the use of intermittent preventive treatment with sulphadoxine-pyrimethamine combination during pregnancy. The questionnaire was administered by interviewers who have been trained with the tool. Pregnant women who had operative delivery or had any debilitating diseases or refuse to give consent were excluded from the study.

2.3 Statistical Analysis.

The data collected was entered into Epi-Info version 6 statistical software (Centers for Diseases Control and Prevention, Atlanta, GA). We tested for association between variables using Pearson's and Yates chi-square test using SPSS statistical software, version 20.0. The level of significance was placed at $< .05$

3. Results

Two hundred and four (204) pregnant women were enrolled in the study. The mean age of the women was 27 ± 5.5 years. One hundred and six (52%) participants, 76 (37.3%), and 15 (7.4%) had tertiary, secondary, and primary education respectively. One hundred and twenty-nine (65%) registered during the second trimester with lower proportions in the first (19.1%) and third (16.1%) trimesters. Overall, 200 (98%) participants received antenatal care (ANC) during pregnancy. One hundred and fifty-five participants (77.5%) received ANC at the Teaching Hospital, 28 (14%) at the General Hospital, and 17 (8.5%) at other secondary health facilities including private hospitals. Eighty-nine (43.6%) of the women were multigravidae, 50 (24.5%) were secundigravidae, while 65 (31.9%) were primigravidae. One hundred and forty-six (72%) women had at least one episode of clinical malaria during pregnancy, Table Thirty (14.7%), 40 (19.6%), and 47 (23.0%) had malaria attacks at the first, second, and third, trimesters respectively. Seven (3.4%) suffered from malaria in more than one trimester. Out of the 204 pregnant women that participated in the study, 124 (61%) responded that they owned ITN ($X^2 = 18.1275$, $p\text{-value} = .000021$) ($p\text{-value} =$). Also, 25% of them took intermittent preventive treatment with sulphadoxine-pyremethamine (IPT-SP) as the only prophylactic measure which was significantly low ($X^2 = 102$, $p\text{-value} = .00001$).

Of these 124 women who owned LLITNs, only 9 (7%) slept under LLITNs every night and 22 (18%) slept under LLITNs occasionally ($X^2 = 5.3088$, $p\text{-value} = .021219$). There was no correlation between educational attainment and the use of LLITNs in this study ($X^2 = 0.005$, $p\text{-value} = .972894$), Table 2. The reasons given by the women for not sleeping under ITNs were that (1) the net generated excess heat (34%), (2) planned to use it after delivery (19%), (3) had 'no place to hang the net' (18%), (4) have no reason (16.7%) and (5) did not like the net (11.9%).

4. Discussion

The current study also shows a wide gap between bed net ownership and utilization. This study shows that 61% of pregnant women that delivered in tertiary and secondary health facilities in Calabar, Southeastern Nigeria owned an insecticide-treated bed net. However, only 4% of the women slept under the treated bed nets every night ($p\text{-value} = .021219$) and 18% of the women slept under LLITN occasionally during pregnancy. A household survey of LLITN ownership and utilization in Calabar showed that utilization was still lower than the 60% target of the Roll back malaria program at 46% (Komomo et al., 2016). Furthermore, other studies carried out in another area of the South East showed that while a significant number of pregnant women were aware that LLITN will protect them from malaria, utilization of ITN was very low (Ozims and Eberendu, 2014; Anikwe et al., 2020). Similarly, in a study of malaria preventive measures during pregnancy in Ibadan Southwest Nigeria, only 20% of pregnant women used insecticide-treated bed nets during pregnancy (Tongo et al., 2011). It was not clear from other studies whether utilization was the daily use of LLITN or occasional use. This study defines the utilization of LLITN as pregnant women sleeping under LLITN 'every night' which may explain the 7% utilization compared to ownership. These reports showed that utilization of LLITN among pregnant women is still a far cry from the 80% target that was set in the five-year strategic plan of the Nigerian National Malaria control program for ownership and use of treated bed nets by pregnant women by the year 2010 (Federal Ministry of Health, National Malaria Control Programme (NMCP), Abuja, Nigeria (2010)). In contrast to other studies, a study from Ekiti State, Southwest Nigeria reported a 67% uptake of LLITN in a community survey, which is the target of the Abuja declaration (Omonijo 2019; Roll Back Malaria, 2000).

Studies from other countries have equally identified gaps between ownership of bed net and use among pregnant women. Eisele *et al.* (2009) reported that less than half of pregnant women

who owned ITNs did not use them during pregnancy. In a survey of mosquito net ownership and use in rural Kenya, Githinji *et al.* (2010), reported that 95% of households owned a mosquito net and 78% of the nets were treated with insecticide while 59% of those who owned bed nets slept under it the previous night. This is higher than the figures obtained for bed net ownership and use in this study. The fact that the present study was conducted in an urban area while the study from Kenya (Mugisha and Arinaitwe, 2003) was on a rural population shows that a lot more needs to be done to meet the expected target of 80% ownership and use in Sub Sahara Africa.

More than half of the respondents in this study who owned LLITNs did not use it because of heat or because they dislike it. The underlining cause may be connected to a lack of reliable electricity supply in Nigeria, thus pregnant women most times could not sleep with a fan or airconditioning system at night (Komomo *et al.*,

2016; Anikwe *et al.*, 2020). One interesting observation was that about one-fifth of the participants planned to use their LLITNs after delivery. What this suggests is that these women were ignorant of the fact that pregnancy makes them vulnerable to malaria infection and that LLITN protects them if they sleep under it every night (Singh *et al.*, 2013). The findings from our study are in keeping with results from Uganda (Githinji *et al.*, 2010) where it was reported that nursing mothers use LLITNs together with their infants especially those that are breastfeeding. This finding implies that such mothers believe that their babies benefit from the usage of treated bed net rather than during pregnancy.

The observation from this study shows that there is a knowledge gap of the effectiveness of LLITN for preventing malaria in pregnancy in the study area (Komomo *et al.*, 2016). It is important to create awareness to inform the women that the benefits of LLITNs outweigh the discomfort.

Table 1: Characteristics of Respondents

Mean maternal age(years)	27+ 5.5
Tertiary education	106 (52%)
Secondary education	76(37.3%)
Primary education	15(7.4%)
Multigravidae	89(43.6%)
Secundigravidae	65(31.9%)
Primigravidae	50(24.5%)
Clinical malaria in pregnancy	72%
Antenatal care attendance	200(98%)
IPT-sp	50(25%)

Table 2: Association between educational status and ownership of LLITN

Education	Ownership ITN (%)	None (%)	*Total (%)
Tertiary	12(11)	94(88)	106(100%)
Secondary	9(12)	67(88)	76(100%)
Primary	2(13)	13(87)	15(100%)

X² = 0.005, p- value = .972894 *Seven participants did not respond

We also observed that only 25% of respondents took IPT-SP, this is very low compared to 98% of ANC attendants by the respondents. We cannot explain why this was so among our respondents however, Some of the reasons giving for low uptake by another study were “lack of provider knowledge of IPTp protocols, individual women’s beliefs and lack of understanding of IPT” (Diala et al., 2013). The low utilization of LLITNs could partly explain why up to 72% of the pregnant women self-reported at least one episode of clinical malaria in this study.

There has been a remarkable improvement in LLITN ownership and utilization in the last few years in contrast to the time this study was carried out. However, utilization is still a far cry from the target of the Abuja declaration of 60% and 80% targeted by the National Malaria Control Programme for pregnant women. There is a need for more effort by all stakeholders towards improving accessibility and more importantly the utilization of LLITNs among pregnant women in the country to reduce maternal morbidity and mortality which is one of the aims of the millennium development goals (Eisele et al., 2009). We conclude that the distribution of LLITNs to pregnant women should not only continue, however, we strongly recommend implementation research that will help pregnant women should be conducted.

5. Study limitations

The main study limitation was that the sampling was done among pregnant women who deliver at the hospitals and may not reflect the status of women who do not deliver at the hospitals. Also, the data was collected 10 years ago however, the observation is still very relevant because there has not been any improvement in utilization of LLITN in the study area from reports from recent studies.

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