

## ORIGINAL RESEARCH ARTICLE

# Factors affecting usage of insecticide treated nets for malaria control by pregnant women in Enugu, South East Nigeria

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## Abstract

The National Malaria Strategic Plan (NMSP) was set up to ensure transition from malaria control to malaria elimination in Nigeria. One of the targets was to reduce malaria-related mortality by 50% by the year 2020, by ensuring that at least 80% of the targeted populations utilize appropriate preventive measures. This study was aimed at reviewing the success of insecticide treated net (ITN) malaria control efforts and understanding the failures and the need to boost up the intervention measures. The research design used for this study was the descriptive method. Structured questionnaires were used to collect data from 316 pregnant women receiving antenatal care at the Federal Teaching Hospital Abakaliki. Amongst the respondents, 180 (57.0%) owned an ITN while 136 (43.0%) did not. A greater percentage (72.9%) of those who used the ITNs purchased their nets, only 8.4% of mothers who received their ITNs free of charge used the net ( $P=0.159$ ). Dislike by spouses (63.3%), hot weather discomfort (17.8%) and forgetfulness (17.2%) were some of the factors that contributed to failures of net usage by the pregnant women. Cost Free distribution of ITN did not necessarily improve usage. Rather, success of this strategy will require carrying out more awareness campaign. (*Afr J Reprod Health* 2022; 26[1]: 76-81).

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**Keywords:** Malaria; insecticide treated net; pregnancy, mosquitoes

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## Résumé

Le Plan stratégique national de lutte contre le paludisme (NMSP) a été mis en place pour assurer la transition du contrôle du paludisme à l'élimination du paludisme au Nigeria. L'un des objectifs était de réduire la mortalité liée au paludisme de 50 % d'ici 2020, en veillant à ce qu'au moins 80 % des populations ciblées utilisent des mesures préventives appropriées. Cette étude visait à examiner le succès des efforts de lutte contre le paludisme avec des moustiquaires imprégnées d'insecticide (MII) et à comprendre les échecs et la nécessité de renforcer les mesures d'intervention. Le design de recherche utilisé pour cette étude était la méthode descriptive. Des questionnaires structurés ont été utilisés pour recueillir des données auprès de 316 femmes enceintes recevant des soins prénatals à l'hôpital universitaire fédéral d'Abakaliki. Parmi les répondants, 180 (57,0%) possédaient une MII tandis que 136 (43,0%) n'en possédaient pas. Un plus grand pourcentage (72,9%) de ceux qui ont utilisé les MII ont acheté leurs moustiquaires, seulement 8,4% des mères qui ont reçu leurs MII gratuitement ont utilisé la moustiquaire ( $P=0,159$ ). L'aversion des conjoints (63,3 %), l'inconfort dû au temps chaud (17,8 %) et l'oubli (17,2 %) sont quelques-uns des facteurs qui ont contribué à l'échec de l'utilisation des moustiquaires par les femmes enceintes. La distribution gratuite d'ITN n'a pas nécessairement amélioré l'utilisation. Au contraire, le succès de cette stratégie nécessitera de mener davantage de campagnes de sensibilisation. (*Afr J Reprod Health* 2022; 26[1]: 76-81).

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**Mots-clés:** Paludisme; moustiquaire imprégnée d'insecticide ; grossesse, moustiques

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## Introduction

Malaria continues to be a major public health problem in 97 countries and territories in the tropics and subtropics<sup>1</sup>. However, in most of sub-Saharan Africa, malaria infection in pregnancy is frequently asymptomatic and can remain undetected<sup>2</sup>, and Nigeria is one of the hardest hit countries among

malaria endemic countries of sub-Saharan Africa where the disease accounts for 11.0% of maternal mortality and morbidity<sup>3</sup>. Malaria affects maternal health and pregnancy outcome. It has been confirmed that malaria in pregnancy causes low birth weight, preterm delivery, congenital infection and reproductive loss<sup>4</sup>. It causes anemia in pregnancy which increases the risk of maternal

deaths with an estimated 10,000 maternal deaths annually<sup>5</sup>.

In Nigeria, approximately 51 million cases and 207,000 deaths is reported annually while 97% of the total population (approximately 173 million) is at risk of infection<sup>6</sup>. Roll back malaria consultative mission stated that malaria is endemic in Nigeria and remains one of the leading causes of morbidity and mortality, while accounting for 30% and 11% of child and maternal death respectively<sup>7</sup>. It is, therefore, established that children and pregnant women are the most vulnerable to malaria morbidity and mortality<sup>8</sup>.

Insecticide-treated bed nets (ITNs) are designed as personal protective barrier in order to reduce malaria illness and mortality in endemic regions. Insecticide treated net (ITN) is a cost effective measure in the prevention of malaria<sup>9</sup>. It provides protection against nuisance mosquito as well as killing of bedbugs which contributes greatly to the acceptance and its usage by the populace<sup>10</sup>. The ITN usage is amongst the effective tools for reducing malaria transmission and related morbidity and mortality. However, utilization rates among some African communities have not improved<sup>11</sup>.

In Nigeria it has been a 'journey' of an intense battle of malaria control series since the turn of 21<sup>st</sup> century. In 2001, a 5 year plan of Roll Back Malaria (RBM) targets was launched under the National Malaria Control Programme (NMCP) aimed at reducing malaria by 25% by 2005. In 2009 and 2012, mass ITN distribution campaigns were carried out and by April 2012, 50 million long-lasting insecticide treated nets (LLIN) had been distributed. The specific targets for the control during the five-year period (2009–2013) were to reduce malaria-related mortality by 50% by 2013, to increase and sustain net usage to at least 80% of children < 5 years and pregnant women by 2010 and to sustain the coverage until 2013, among others<sup>12</sup>. The National Malaria Strategic Plan with a coverage of 2014 – 2020 and was set up to ensure transition from malaria control to malaria elimination. The national malaria elimination programme therefore, carried out the work. The major national target was to ensure that at least eighty percent of targeted populations utilize appropriate preventive measures by 2020<sup>12</sup>. This research study is, therefore, aimed at understanding

the failures and successes of the ITN malaria control programme by discovering the attitudes of pregnant women towards the use of insecticide treated net and the factors affecting the usage.

## Methods

### *Research design and setting*

The study was carried out at Abakilliki urban in Enugu State. Abakaliki is the capital city of the present-day Ebonyi State in southeastern Nigeria which is located at 64 kilometres (40 mi) southeast of Enugu<sup>13</sup>. It is located between 6° 20'N and 8°06'E. The population was 79,280 by 2006 population data. The inhabitants are primarily members of the Igbo tribe. The study setting is a center of agricultural trade including such products as yams, cassava, and mostly rice which is cultivated in swampy areas that enhances the breeding of mosquito. Descriptive design was used for this study.

### *Population of study*

In this study, the target population was all pregnant women, attending antenatal clinic from Monday to Friday in Federal Teaching Hospital Abakaliki. The average population of women attending antenatal for a period of one month was obtained from the antenatal attendance register at the nurses' bay of the antenatal clinic, Federal Teaching Hospital Abakaliki. For a period of the 6 month study, the population was 1511.

### *Sampling and data collection procedure*

Yaro Yamen's statistical formula was used to calculate the sample size to obtain the number of respondents.

A sample size of three hundred and eighteen (316) respondents was deduced.

The Yaro Yamen's formula was used to select the sample size as follows:

$$n = \frac{N}{1 + N e^2}$$

Where n represents the sample size  
N represents the population of the study  
e represents the margin of error (5%)  
I Constant or unity

Therefore

$$n = \frac{N}{1 + N e^2} - \frac{1511}{1 + 1511 (0.05)^2} = \frac{1511}{1 + 3.7775}$$

$$n = \frac{1511}{4.78} = 316$$

A sample size of three hundred and eighteen respondents were used.

The instrument for collection of data for the study was questionnaire. Validity of the instruments was done by examining the items critically to ensure that it was capable of collecting the desired information for the study before sharing to the respondents. To ensure this, first the questionnaires were drafted and sent to some two researchers who are experts in that field and understood the topic. They read through your questionnaire to evaluate whether the questions effectively capture the topic under investigation. It was also crosschecked by questionnaire expert to eliminate common errors like repeated, confusing, and misleading questions. A pilot test was conducted by giving out the questionnaires to a few of the respondents at first<sup>15</sup>.

After collecting pilot data, the responses were entered into a spreadsheet; this helped to check responses to positively and negatively phrased questions. Questions that appeared to similar or loading onto the same factors can be aggregated or combined during the final data analysis phase. The standard questionnaire was then given for each respondent. The questionnaires were administered in person and with the help of some nurses in the antenatal clinic.

Non probability sampling technique<sup>14</sup> was used. This method was used because of the short time frame. Convenience sampling was employed because of the researcher's ease of getting in touch with the subjects. This was also intended for proximity since the researcher was based at a different location. The non-probability sampling method was also used because of time and cost limitations in obtaining feedback.

### **Data analysis techniques**

Data was analyzed using SPSS version 16. Student T-test and chi-squared test was used to compare proportions. Probability values (p-values) were set at 0.05 level of significance and Confidence Intervals (Cis) were calculated at the 95% confidence limit.

### **Results**

The demographic data of the respondents is represented in Table 1. Responses concerning the

awareness of ITN is shown in Table 2, only 13 (4.1%) of respondents had not heard about ITN, while 303 (95.9%) of the respondents had heard about ITN (P = 0.017). There were 57% respondents that owned ITN but 43% respondents did not have ITN. Table 3 shows the means of net ownership and attitudes of usage. Among the 180 who owned net, 85(4.7%) purchased by themselves while 95 (52.8%) received it through free distribution from government. Among those who purchased the net, 72.9% had positive attitude and used the net but only 8.4% who received their ITNs free of charge used the net (P = 0.159). Table 4 shows the frequency of the ITN usage by age ranges and educational qualifications. In rating the usage of net among the 180 owners, 64(35.5%) of the pregnant women did not use their nets. Few of them (11.7% each) used occasionally or 1–3 times weekly, 23.3% used, up to 6 times weekly, while 17.8% used theirs daily. It was observed that the 62.5% of those who used ITN's everyday fell into the age range of 26–35 years. None of the pregnant women at age range 46–55 years used the net every day. The educational qualification data shows that the correspondents with no education had the least percentage (3.1%) of everyday ITN usage. The 66% of university graduates used their nets consistently every day. Only 3.1% illiterates among them used the nets every day. Table 5 shows the limitations or the factors affecting the use of ITN. Some of the respondents (29.4%) did not use their ITNs because they had windows guard (mosquito nets) at their doors and windows. Others (17.8%) complained of hot weather, while the 17.2 of the mothers forgot to hang the nets.

### **Discussion**

The result of this study shows that a greater part of the respondents, being literates were aware of the ITN. Most respondents were those who attended tertiary institution and with this a high rate of awareness was recorded. Awareness of the malaria disease and the preventive measures can lead to successful implementation of the preventive interventions amongst pregnant women<sup>15</sup>.

Amongst those who got their nets via free distribution some had indifferent attitude. However, purchase of net or free acquisition did not inculcate positive attitude of use (P=0.159). It was disclosed that in Nigerian a total of 10 million ITNs were distributed in 5 years, which was actually inadequate. But yet those who were opportune to

**Table 1:** Demographic data of respondents (N = 316)

Age Range	Frequency	Percentage
5–25	84	26.6
26–35	116	36.7
36–45	102	32.3
46–55	14	4.4
Parity	Frequency	Percentage
Nil	115	36.4
One	53	16.8
Two	74	23.4
3>	74	23.4
Education	Frequency	Percentage
None	9	2.9
Primary	53	16.8
Secondary	106	33.5
Tertiary	148	46.8
Occupation	Frequency	Percentage
Gov. employed	74	23.4
Self-employed	138	43.7
Non-employed	51	16.1
Student	53	16.8
Monthly income(N)	Frequency	Percentage
< 10000	104	32.9
10000–49000	43	13.6
50000–99000	74	23.4
100000>	95	30.1

**Table 2:** Awareness and ownership of ITN (n = 316)

Responses	Frequency	Percentage
Those who were aware	13	4.1
Those not being aware	303	95.9
<b>*P= 0.017</b>		
Ownership of nets	180	57.0
No ownership of nets	136	43.0

get it free misused the offer<sup>16</sup>. In this study many of the respondents purchased the net by themselves with good intentions of using having understood the importance of the ITN observed through their responses on awareness shown in Table 2. Though most of those who used the net purchased by themselves, there was no significant different in the positive or adherence attitude of those who purchased their nets and those who got free gift (P = 0.159). This also compares with a study that reported that 53% preferred to use mosquito nets they bought rather than the one provided for free<sup>17</sup>. This shows that the free ITN did not motivate

usage. These findings agree with that of Pettifor *et al*<sup>18</sup>, who found out in their research that a large number of the nets freely distributed were not hanged, were improperly deployed and unused. This is also consistent with the findings in a study carried out in Nigeria during the Demographic and Health Survey<sup>9</sup>. However in some other studies the key barriers to pregnant women receiving and using ITNs were low knowledge of ITNs, low socio-economic status, high cost and non- availability<sup>19</sup>. In sub-Saharan Africa the main determinants were found to be education level, knowledge of malaria, community involvement, socio-economic status and parity<sup>20</sup>.

In this study it was observed that adherences or non-adherences in net usage were not affected by age differences as shown in Table 4. There was no significant different in every day net usage among the different age groups (P= 0.157, P= 0.112, P= 0.177 and P= 0.071). This is in contrast with study by Ene *et al*<sup>21</sup> who stated that women 30 years and older were nearly 4 times more likely to use their nets compared to women less than 20 years of age. Majority of those who used their nets consistently and every day were the tertiary institution graduates, the illiterates who used the net daily and consistently were only a few. However, good educational qualification did not enhance regular net usage (P=0.135). On the contrarily, a research conducted in South West Nigeria has shown that less educated respondents were reported five times more likely to use ITN<sup>22</sup>.

In this study spouses discouragement was seen to grossly affect the attitude of pregnant mothers towards the use of ITNs. In a typical African setting, husbands have a great influence on their wives irrespective of their views on the importance of the ITN. A study on factors influencing utilization of ITNs amongst pregnant women in Kinshasha stated that encouragement by spouses of pregnant women improved their utilization of ITNs<sup>23</sup>.

Having already net fitted door/ widow were other factors for failure of ITN usage apart from hot weather discomfort. Net-fitted door and window may offer some protection provided the door passages are not opened at all especially at evening sunset or nights when the mosquitoes start flying around. In contemporary African setting it is generally believed that mosquitoes bite more in the dark places. This makes most people leave their doors and windows open throughout the day and

**Table 3:** Attitude of mothers who purchased their ITN's themselves and attitude of mother who received their ITNs Free (N=180)

Attitude towards ITN use	Purchase their ITN		Received theirs free	
Positive	62	72.9%	8	8.4% (P= 0.159)
Negative	3	3.5%	16	16.8%
Nonchalance	20	23.5%	71	74.4%
Total	85	47.2%	95	52.8%

**Table 4:** Usage of net by age ranges and educational qualifications (N= 180)

Characteristics	Usage of Insecticide Treated Nets				
	Everyday	4-6 days weekly	1-3 days weekly	scarcely	No Usage(None)
Total	32 (17.8)	42(23.3)	21(11.7)	21(11.7)	64(35.5)
<b>Age range</b>					
16-25yrs	5 (15.6%)	8(19.0%)	4(19.0%)	5(23.8%)	8(12.5%)
26-35yrs	20 (62.5%)	24(57.1%)	2(9.5%)	6(28.6%)	14(21.9%)
36-45yrs	7(21.9%)	8(19.0%)	14(66.7%)	9(42.9%)	33(51.6%)
46-55yrs	0 (0.0%)	2(4.8%)	1(4.76%)	1(4.76%)	9(14.1%)
<b>Std. Dev</b>	<b>8.52447</b>	<b>9.43398</b>	<b>5.96518</b>	<b>3.30404</b>	<b>11.63329</b>
<b>Std. Err</b>	<b>4.26224</b>	<b>4.71699</b>	<b>2.98259</b>	<b>1.65202</b>	<b>5.81664</b>
<b>P value</b>	<b>0.157</b>	<b>0.112</b>	<b>0.177</b>	<b>0.050</b>	<b>0.071</b>
<b>Educational qualification</b>					
No Education	1(3.1%)	1(2.4%)	2(9.5%)	2(9.5%)	5(7.8%)
Primary School	2(6.3%)	10(23.8)	8(28.1)	10(47.6%)	13(20.3%)
Secondary School	8(25%)	17(40.5%)	5(23.8%)	5(23.8)	26(40.6%)
Tertiary Inst.	21(65.6%)	15(33.7%)	6(28.6)	4(19.1%)	20(31.3%)
<b>Std. Dev</b>	<b>3.20156</b>	<b>7.13559</b>	<b>2.50000</b>	<b>3.40343</b>	<b>9.05539</b>
<b>Std. Err. Mean</b>	<b>1.60078</b>	<b>3.56780</b>	<b>1.25000</b>	<b>1.70171</b>	<b>4.52769</b>
<b>P value</b>	<b>0.135</b>	<b>0.057</b>	<b>0.025</b>	<b>0.054</b>	<b>0.039</b>

**Table 5:** Limitations to use of ITNs

Limitations Characteristics	Frequency	Percentage %
Hot weather	32	17.8
Dislike of usage by spouse	114	63.3
Presence of windows guard (mosquito net) on doors and windows	53	29.4
Forgetfulness	31	17.2
Other reasons	11	6.1

close them at dusk. Otherwise, it is commonly noted that this device becomes disadvantageous instead because when once the mosquitoes gain entrance into the house, they hardly leave but stay there and bite for long time as long as they are alive. So in essence, net fitted door and window offer false sense of protection. The issue of hot weather discomfort is an uncontested fact being that netting does not allow enough air in-flow when sleeping under it. Nigeria as of other tropical regions has extreme hot weather most time of the year coupled with the fact that there is incessant electric power failures of such which the government needed to address before setting up ITN control program.

## Ethical recruitment and enrolment

Before the starting of the study, the aims and objectives of the research were relayed to the hospital authorities to get their co-operation and permission to conduct the survey. The research team was referred to the Medical officers and Heads of Nursing in charge of ante-natal units who were duly informed. The objectives of the research were also explained to them written in consent forms. Ethical clearance was offered by the ethical committee of the Federal Teaching Hospital Abakaliki.

## Conclusion

The effective use of insecticide treated net would be of benefit to these vulnerable pregnant women. Cost Free distribution of ITN may not necessarily improve usage. Rather, success of this strategy will require carrying out more awareness campaign, especially among the male spouses emphasizing the importance of encouraging their wives and dangers of defaulting among others.

## Conflict of interest

None.

## Funding

None.

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