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*Full Length Research Paper*

# Malaria Prevalence and Use of Insecticide-Treated Net among Community Members in Aguleri, Anambra State, Nigeria

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## ABSTRACT

A study on malaria prevalence and use of Insecticide-treated nets (ITN) was carried out in Aguleri community of Anambra State from October 2011-March 2012. A two stage cluster sampling technique was used to select three villages and the individuals used for the study. Giemsa stained thick and thin blood samples of 327 individuals were examined microscopically for malaria parasites. Structured questionnaires to ascertain ownership and use of ITNs were administered to individuals sampled for malaria parasites. Malaria prevalence was found to be 67.0% (219/327) and all were infections with *Plasmodium falciparum*. Knowledge of existence of ITN among the sampled population was 100%, ownership 74.0% (242/ 327) and usage 26.9% (65/242). Malaria prevalence among ITN users and non-users was 44.6% (29/65) and 72.5% (190/262) respectively. This difference was statistically significant ($P<0.05$). This result showed that ITN could be effective in the control of malaria even in the face of low level of usage.

Keywords: Malaria, Prevalence, Insecticide-treated nets (ITN), Ownership, Usage

## INTRODUCTION

Malaria remains a major threat to public health despite decades of control efforts. It is a devastating disease that threatens productivity and economy of endemic countries. According to World Health Organisation (2010), there are still over 200 million cases of malaria and approximately one million death annually. Malaria constitutes 10% of African's overall disease burden, accounting for 40% of public health expenditure, 30-50% of in-patient hospital admissions and up to 50% of outpatient visits in areas with high transmission (WHO, 2006). Malaria morbidity and mortality rate vary from region to region in Sub- Sahara Africa. In Nigeria, malaria is the number one public health problem (Onwujekwe *et al*, 2000) and it is responsible for about 300,000 deaths every year (Coker *et al*, 2001). Approximately 50% of the Nigerian population experience at least one episode per year. However, official estimate suggests as much as four bouts per person per year on the average (WHO, 2002).

Over the last century, valiant efforts were made to control malaria using tools such as anti malarial drugs and insecticides. However, these efforts met with failure as the maintenance of control programs waned, as logistics and behavioral factors limited the effective use of interventions and also as the malaria parasites, *Plasmodium spp* and

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their mosquito vectors, *Anopheles spp* rapidly developed resistance to common drugs and insecticides (National Institute for Allergy and Infectious Diseases, 2008). Among the new advances in the control of malaria is the use of Insecticide Treated Net (ITN) now known as Long Lasting Insecticide Treated Net (LLIN). ITN is known to kill mosquitoes and have proven repellent properties that reduce the number of mosquitoes that enter the house (Curtis *et al*, 2003). It is estimated to be twice as effective as untreated net and offer over 70% protection when compared with no net (Curtis *et al*, 2003). The efficacy and cost-effectiveness of Insecticide-Treated Net (ITN) in reducing malaria related morbidity and mortality is well-known (Goodman *et al*, 1999) and in recent years has led to massive efforts to distribute millions of free or highly subsidized ITN to vulnerable populations in sub-Saharan Africa (Thwing *et al*, 2008). Following the recent mass distribution of LLIN in Nigeria, Anambra State inclusive, it is important to determine the impact of these nets on malaria prevalence. Several studies have been undertaken on the role of LLIN in malaria control elsewhere in Nigeria (Iyaniwura *et al*, 2008; Nwankwo and Okafor, 2009; Edelu *et al*, 2010; Opara e*t al*, 2010). It therefore becomes necessary to study the prevalence of malaria and use of ITN in this community.

## MATERIALS AND METHOD

### Study Area

The study was carried out in Aguleri in Anambra East Local Government Area of Anambra State. Aguleri is a medium sized town in the South Eastern part of the Federal Republic of Nigeria. It is located in latitude $6^{o}21'$N and longitude $6^{o}53'$E. There are two seasons, wet season (From April to October) and dry season (from November to March). The town is bounded on the North by Igala towns (Kogi State), on the South by Awkuzu and Nteje towns, on the East by Nando and Omor towns and on the west by Umuleri and Nsugbe towns. Aguleri has a population of about 39,075 (NPC, 1996). It has five communities which include: Igboezunu, Ivite, Eziagulu, Enugu and Aguleri otu located on the bank of River Omambala. Aguleri is a rural community with fertile soil. The majority of the inhabitants are farmers and petty traders, few civil servants, students and other professionals. The town has four market days: Eke, Orie, Afor and Nkwo. Eke is the biggest market day and it takes place every four days.

### Study Population/Sample Size.

A two-stage cluster sampling technique was employed to select the study population. First, three out of the five communities in the study area were chosen for the study. Secondly, one hundred and nine participants were selected from each of the chosen communities. The sample size was determined according to Cochran, (1999) using the formula: $n = (Z^2\ p\ q) / d^2$. Where n = minimum sample size, Z = standard normal deviation and probability i.e. 0.05 at 95% confidence limits, p = prevalence or proportion of 70% estimated from previous studies, q = 1 – p, and d = tolerance limit, the minimum is 0.05. Samples were collected between October, 2011 and March, 2012.

### Ethical Consideration

All the subjects were verbally notified before sample collection, and their informed consent duly obtained. For children in the study, the consent of their parents were obtained prior to blood collection.

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**Collection of Blood Samples**

Before the collection of blood sample, question was put to the patients whether any anti-malarial drugs had been taken not more than two weeks before. Those who answers to the question were positive were not included in the study, while blood samples were collected from those whose answers were negative. This was to rule out the effect of the drug on the outcome of malaria parasite test. Specimens were collected by venipuncture.

**Preparation of Blood Films**

Both thick and thin blood films were made on the same slide for the detection of malaria parasite and identification of the *Plasmodium species* present respectively. Using a completely grease free microscope slide, a small drop of blood was placed to the center of the slide and another larger drop of blood about 15mm was placed to the right. Immediately, the smaller drop of blood was spread using a smooth edged slide spreader to make a thin film. Without delay, the end of a plastic bulb pipette was used to spread the large drop of blood to make the thick smear. The blood films were then allowed to dry. Ten percent (10%) Giemsa stain was used to stain the blood films. Prior to that, the thin blood films were fixed using methanol for 2 minutes. The diluted stain was then placed on the slides until it covered the thick and the thin blood films. This was allowed to stand for 10 minutes. After that, the stain was washed off the slide. The back of each slide was cleaned and placed in a draining rack for the preparation to dry.

**Examination of the Blood Films**

Both blood films were examined microscopically using 100x oil immersion objective lens. The thick blood film was examined first in order to detect the presence of malaria parasite. This was followed by the examination of the thin blood film for identification of the *Plasmodium species* present according to Cheesbrough (2006).

**Qualitative Data Collection**

Three hundred and twenty seven questionnaires were distributed to individuals sampled for malaria parasites. The section A of the questionnaire contained the demographic data of the respondents. Section B of the questionnaire contained information on the distribution and usage of Insecticide Treated Nets among the study subjects. For the children in the study, their parent/ guardian were of help in filling their questionnaires. Also, respondents who needed assistance in filling the questionnaire were assisted through oral interview and the information given were recorded in their forms.

**Statistical Analysis**

Data were summarized using: tabulations and percentages. Test of statistical significance was carried out using chi-square ($X^2$). The statistical package used was the SPSS software, version 17.0.

**RESULTS**

A total of 327 subjects were sampled. Awareness about ITN was 100% among the respondents as they have all heard about and seen ITN. Ownership and usage of ITN were 74.0% (242/327) and 19.9% (65/327) respectively (Table 1).

**Table 1:** Ownership and usage of ITN

| Ownership | Usage | | Total |
|---|---|---|---|
| | Yes | No | |
| Yes | 65 (26.9) | 117 (73.1) | 242 |
| No | 0 (0.0) | 85 (100.0) | 85 |

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| | | | |
|---|---|---|---|
| Total | 65 (19.9) | 262 (80.1) | 327 |

The overall prevalence of malaria in the study area was 67.0%. The prevalence of malaria among users and non-users of ITN is shown in Table 2. A higher prevalence of 72.5% (190/262) was recorded among non-users of ITN when compared with users, 44.6% (29/65) and this is statistically significant (P<0.05). Also usage of ITN was higher, 33.3% (36/108) among the uninfected persons and lower, 13.2% (29/219) among the infected persons.

**Table 2:** Prevalence of malaria among ITN users and non ITN users

| ITN Usage | Number positive (%) | Number negative (%) | Total |
|---|---|---|---|
| Users | 29 (44.6) | 36 (55.4) | 65 |
| Non-users | 190 (72.5) | 72 (27.5) | 262 |
| Total | **219 (67.0)** | **108 (33.0)** | **327** |

**$X^2$calculated = 18.332, df = 1, confidence level = 95%, P value = 0.000**

## DISCUSSION

The study showed that the overall usage of ITN in the study area was 19.9% and that only 26.9% of those who owned ITN used it; thus, highlighting the alarming gap between net ownership and utilization. This is similar to the result of Edelu *et al* (2010) who recorded 26.1% use by mothers for their children. It also reinforces the result of Tobin-west and Alex-hart (2011) who reported that only 37.2% of people who owned ITNs slept under it. Opara *et al* (2010) reported that only 3.8% have owned and slept under ITN in a rural community in Imo State. The high prevalence of malaria in the study area is comparable with figures obtained by Ilozumba and Uzozie (2009) who reported 93.43% prevalence in Onitsha south local Government area of Anambra State and Onyido *et al* (2011) who reported a prevalence of 58.2% in Ogbunike, Anambra State. Also, Obiukwu and Okwuonu (2008) reported a prevalence of 85.7% in Abba, Anambra State. This contradicts with the result of Okocha *et al* (2005) who reported prevalence of 30.20% among blood donors in a Nigerian teaching hospital. Adeoye and Ogbonnaya (2011) reported a prevalence of 10.1% among blood donors in Lagos State. The high prevalence of malaria in the study area could be due to many breeding sites of mosquitoes created by plants grown around houses as majority of the inhabitants of the area are farmers. Also there are many water bodies in the town and these could also serve as breeding sites for mosquitoes. ITN have been shown in multiple trials to significantly reduce malaria morbidity and mortality (Phillips-Howard *et al*, 2003; ter Kuile *et al*, 2003. The present study showed statistically significant reduction ($p < 0.05$) in the number of malaria outcome with the use of ITN even in the face of low level of usage. This is because the use of ITN offers protection against the infective bite of female anopheles mosquitoes. This reinforces the finding of Nevill *et al* (1996) in one trial that demonstrated a substantial effect on severe malaria disease which provided evidence that ITN can have an impact on preventing severe illness and the associated high costs of treatment to both patients and health care providers. Most notably, the evaluation of a large social marketing programme in Tanzania showed a 27% improvement in survival in ITN users compared to non-users (Schellenberg, 2001). One trial in Kenya further documented a substantial impact of ITN use on cases of severe malaria disease seen in hospital (Lengeler, 2004). In conclusion, the present

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study has shown that ITN could be used as an effective control measure against malaria.

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