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**RESEARCH ARTICLE**

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# MALARIA PREVALENCE IN CHILDREN AND THE USE OF DISTRIBUTED LONG LIFE INSECTICIDE TREATED BED NETS (LLINS) IN ANAMBRA STATE, NIGERIA

**ABSTRACT:**
This is a study on malaria prevalence and use of Long Life Insecticide Treated Bed Nets (LLINs) by mothers/caregivers in Anambra State, Nigeria. Stratified random sampling was used. All clinically good children 0 – 14.9 years and those with acute febrile illness were randomly sampled two times in a month from April 2012 to March 2013. Fifty homes were randomly sampled by balloting in each of the 13 communities for 12 months. Giemsa stained thick blood samples of 82 children were examined microscopically for malaria parasites. Structured questionnaires to ascertain ownership and use of LLINs were administered to mothers/caregivers of sampled children for malaria parasites. Overall prevalence of malaria in the communities in Anambra State was 46.3%. Majority of mothers/caregivers (56.1%) make use of LLINs in the communities. The prevalence of malaria infection among those who sleeps under LLINs that have positive blood smear and those that have negative blood smear is (28.0%). There is no significant difference ($p>0.05$) in the prevalence of infection between those who sleeps under LLINs that were positive and those that were negative. However, there were significant ($p>0.05$) differences in the prevalence of infection between those who sleep under LLINs and those who do not. The none significant difference in prevalence of malaria infection between positive and negative blood smear children who sleep under LLINs can be attribute to improper usage of the nets or that the children were already infected by outdoor biting mosquitoes before they go into their nets in the night.

**KEY WORDS:**
Malaria, Prevalence, Long Life Insecticide Treated Bed Nets (LLINs), Ownership, Usage

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## INTRODUCTION:

Malaria is transmitted throughout Nigeria. Five ecological zones define the intensity and seasonality of the transmission and the mosquito vector species: mangrove swamps; rainforest; guinea-savannah; Sudan-savannah; and Sahel-savannah. *Plasmodium falciparum* is the predominant species. Malaria accounts for about 60% of outpatient visit and 30% of hospitalization in Nigeria. It is a leading cause of mortality in children under five years of age, responsible for an estimated 300,000 deaths in children under five years of age (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 (Egbuche *et al*., 2013; WHO, 2014).

According to Greenwood *et al.* (2005), there is no clear, single path to improve malaria control. Such an approach will probably come from a series of more incremental steps involving better and more widespread use of the methods that have

already been shown to be effective, as well as the stepwise introduction of new treatments and partly effective control measures shown to be effective. Use of effective preventive measures reduces morbidity and transmission of malaria. Prevention must be emphasized as part of an integrated malaria control program. 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 (Egbuche *et al*., 2013). ITN is one of the key prevention tool that have been found to reduce malaria cases by 50% and decrease mortality in young children by 15 – 30% in controlled efficacy trials, where coverage rates are high (Lengeler, 2004; Hill *et al.,* 2006).

In 2014, an estimated 214 million long-lasting insecticidal nets (LLINs) were delivered to malaria-endemic countries in Africa, bringing the total number of LLINs delivered to that region since 2012 to 427 million (WHO, 2014). WHO encouraged the mass distribution of LLINs to every household in malaria endemic regions worldwide Nigeria inclusive? Anambra State, with the support of the World Bank and Federal Ministry of Health, had instituted several measures including distribution of over three million Long Lasting Insecticide nets to families. Following the mass distribution of these nets in Anambra State it became necessary to evaluate impact of this control measure on malaria prevalence in children.

## MATERIAL AND METHODS:

### Study area:

The study area is Anambra State. Anambra is a State in South-eastern Nigeria with a population of about 4 million made up of 2,117,984 males and 2,059,844 females (population estimation of 2006). The stretch of more than 45 km between Oba and Amorka is cluster of numerous thickly populated villages and small towns giving the area an estimated density of 1, 500 – 2000 persons living within every square kilometer of the area (MLS, 2010). Anambra State is made up of twenty-one local government areas.

### Study population and sample size:

This study is part of a lager studies conducted in Anambra State on managements of childhood malaria and was conducted in thirteen communities purposively selected from thirteen local government areas in Anambra State. Stratified random sampling was used. All clinically good children 0 – 14.9 years and those with acute febrile illness were randomly sampled two times in a month from April 2012 to March 2013. Fifty homes were randomly sampled by balloting in each of the 13 communities for 12 months. These communities have an average of 1 or 2 General or Comprehensive Health Centers located in them.

### Ethical clearance:

Ethical clearance was obtained from the University of Nigeria Teaching Hospital Ituku - Ozalla in Enugu State. Informed consent was obtained from the mothers/caregivers before the collection of blood samples and the administration of questionnaires.

### Collection of blood samples:

With the help of the medical team 1 ml venous blood was obtained after cleaning the site with spirit and put in ethylenediamine tetra-acetic disodium acid (EDTA) vacutainers to avoid clotting and ensure preservation of the samples. The samples were kept in ice chips with measuring thermometer to ensure that they were not at freezing point and were taken to the laboratory for assessment. Blood was sampled from malaria symptomatic and non-symptomatic children aged 0 – 14.9 years from their homes.

### Preparation of thick films blood smears for microscopy:

Thick film blood smears were prepared from the blood samples according to Sood (2006). Large drop of blood samples was deposited at one end of the slide and were spread out evenly with the corner of another slide to a diameter of about 20mm. They were put in distilled water for 10 minutes for dehaemoglobinisation, dried in a flat position to ensure even distribution of blood and stained with Giemsa`s stain for 20 minutes. The stain was washed out with buffered water of pH 6.8 and stood upright to dry in the air, and viewed under x 100 objective (oil immersion) lens. The thick smears were used to confirm the presence or absence of malaria parasite. The asexual forms of the parasite were counted in 200 leucocytes. The degree of parasitaemia were graded according to the number of parasite per micro liter thus, 1-999 (+), 1000 - 9999 (++) and > 100000 (+++) (Cheesbrough, 2006).

### Qualitative data collection:

Eighty-two questionnaires were distributed to the mothers/caregivers of children sampled for malaria parasites. The section A of the questionnaire contained the demographic data of the respondents. Some part of section B of the questionnaire contained information on the distribution and usage of Insecticide Treated Nets among the study subjects. Mothers/caregivers who needed assistance in filling the questionnaire were assisted through oral interview and the information given was recorded in their forms.

**Data analysis:**

The SPSS for windows statistical software version 20.0 was used for data analysis. The presence or absence of *Plasmodium* infection (prevalence) was calculated and the significant difference in prevalence across age groups and sex was done using Fisher least significance for 2 x 2 tables (Duncan, 1955). Analysis of variance (ANOVA) was used to evaluate impact of LLINs on the prevalence of malaria infection in children.

## RESULTS:

Table 1 showed that the Female children had higher prevalence (55. 0%) of malaria infection than the males (41.0%), but the difference in prevalence was not significant ($p > 0.05$). In the different age groups, children between 5 – 9.9 years (48.9%) were more infected followed by children between 10 - 14.9 years (44.9%) and 0 – 4.9 years (42.3%). However, the differences were not significant ($p > 0.05$).

Table 1. Sex and age prevalence of malaria infection in children in Anambra State, Nigeria

| Sex | Number | Prevalence |
|---|---|---|
| Males | 39 | 16(41.0) |
| Female | 43 | 22(55.0) |
| $\chi^2$ | | 0.845 |
| P-value | | $0.384^{ns}$ |
| **Age / year** | **Number** | **Prevalence** |
| 0 - 4.9 | 26 | **11(42.3)** |
| 5 – 9.9 | 47 | 23(48.9) |
| 10-14.9 | 09 | 04(44.4) |
| Total | 82 | 38(46.3) |
| $\chi^2$ | | 0.310 |
| P-value | | $0.856^{ns}$ |

Figures in parentheses = %

Majority of mothers/caregivers (56.1%) make use of LLINs in the communities. The prevalence of malaria infection among those who sleeps under LLINs that have positive blood smear and those that have negative blood smear is (28.0%). However, 17.1% of respondents with positive blood smear do not sleep under LLINs while 15.9% of the same group had negative blood smear (Table 2).

Further investigation showed that there is no significant difference ($p>0.05$) in the prevalence of infection between those who sleeps under LLINs that were positive and those that were negative. However, there were significant differences in the prevalence of infection between those who sleep under LLINs and those who do not (Table 3).

Table 2. Ownership and use of LLINs in children and prevalence of malaria infection in the Communities in Anambra State, Nigeria

| Ownership/Use of LLINs | Malaria infection status | Total response (%) |
|---|---|---|
| Yes | Positive | 23(28.0) |
| Yes | Negative | 23(28.0) |
| No | Positive | 14(17.1) |
| No | Negative | 13(15.9) |
| No response | Positive | 6(7.3) |
| No response | Negative | 3(3.7) |
| Total | | 82(100) |

Figures in parentheses = %

Table 3. Effects of use of LLINs on the prevalence of malaria infection in Anambra State, Nigeria

| Use of LLINs | Infection status response | Differences in percentage |
|---|---|---|
| No response | Negative | $3.70^{e}$ |
| No response | Positive | $7.30^{d}$ |
| No | Negative | $15.90^{c}$ |
| No | Positive | $17.10^{b}$ |
| Yes | Negative | $28.00^{a}$ |
| Yes | Positive | $28.00^{a}$ |

Percentage values with different alphabets as superscript are significantly different ($p<0.05$)

## DISCUSSION:

In this study, the overall prevalence of community childhood malaria was 46.3%, the female had a higher prevalence than the males but the difference (55% to 41%) was not significant. Also there was no significant difference in the age groups prevalence, which means that malaria infection in the communities was not selective for sex or age. This result is in line with Nwaorgu and Orajaka (2011) and Iwuora (2014) who reported that malaria infection in Awka North Local Government Area of Anambra State was not gender biased. Also the result of this study contradicts the significant prevalence of *Plasmodium* infection among the age groups and sex in Igbo-Eze South Local Government of Enugu State, Nigeria (Ekpenyong and Eyo, 2008). The higher prevalence rate could just be by chance. The children in the communities were equally disposed to *Plasmodium* infection, hence the insignificant differences in the prevalence, even though the children between the ages 0 - 4.9 years had the lowest prevalence which may be attributed to higher attention given to children under five years of age malaria infection.

The study showed that the overall ownership and usage of LLINs was 56.1% in the study area. This is similar to earlier report by Ukibe *et al.* (2013) on the awareness and use of insecticide treated bed nets among pregnant women in rural communities in Anambra State attending antenatal clinics. The high percentage usage of LLINs by mothers/caregivers observed in this study may be attributed to the mass distribution of

long Life Insecticide Treated Bed Nets (LLITNs) to every house hold in Anambra State through the community health centers between 2009 and 2011. Also the high response to the use of LLINs may be as a result of the socio-economic and educational status of the respondent which failed within the low and middle income group with at least secondary school level of education. However, there was no significant difference in the prevalence of infection between those who sleep under these LLITNs that had positive blood smear and those who had negative blood smear, but there were differences in the prevalence of infection between those who sleep under ITNs and those who do not make use of it at all. This result is in line with Egbuche *et al.* (2013) in the rural community of Aguleri in Anambra State. This shows that the massive distribution of these nets could be effective in the control of malaria.

## CONCLUSION:

Ensuring that Impregnated Treated Bed Nets (ITBNs) use among the highest possible proportion of young children should be a priority and should be financed and distributed within the state programs targeted at young children. Also mothers/caregivers should be educated on the proper use of the nets to ensure effectiveness. The none significant difference in prevalence of malaria infection between positive and negative blood smear children who sleep under LLINs can be attribute to improper usage of the nets or that the children were already infected by outdoor biting mosquitoes before they go into their nets in the night.

## REFERENCES:

Cheesbrough M. 2006. District laboratory practice in tropical countries. Part 2. Second edition. Cambridge University Press. PP 44-45.

Coker HAB, Chukwuani CM, Ifudu HD, Aina BA. 2001. The malaria scourge. Concepts in disease management. Nigerian J. Pharm., 32: 19–48.

Duncan DB. 1955. Multiple ranges and multiple F test. Biometrics, 11(1): 1–42.

Egbuche CM, Eneanya CI, Aroboder DN, Eneanya OA, Ogbuagu CN, Ezugbo-Nwobi IK. 2013. Malaria prevalence and use of ITN among community members in Aguleri, Anambra State, Nigeria. Bioscientist, 1(1): 60–66.

Ekpenyong EA, Eyo JE. 2008. Malaria control and treatment strategies among school children in semi-urban tropical communities. West Indian Med. J., 57(5): 456–461.

Greenwood BM, Bojang K, Whitty CJ, Targett GA. 2005. Malaria. Lancet, 365(9469):1487–1498.

Hill J, Lines J, Rowland M. 2006. Insecticide-treated nets. Adv. Parasitol., 61: 77–128.

Iwuora OI. 2014. Malaria prevalence and use of insecticide treated Nets in Anambra State, Nigeria. http://naulibrary.org/dlibrary/admin/book_directory/Thesis/11026.pdf Accessed 2nd April, 2014.

Lengeler C. 2004. Insecticide-treated bed nets and curtains for preventing malaria. Cochrane Database Syst. Rev., 2: CD000363.

MLS. 2010. Map of Anambra State, Nigeria. Ministry of Lands and Survey (MLS), Awka, Anambra State, Nigeria.

Nwaorgu OC, Orajaka BN. 2011. Prevalence of malaria among children 1 – 10 years old in communities in Awka North Local Government Area, Anambra State South East Nigeria. Afr. Res. Rev., 5(5): 264–281.

Sood R. 2006. Textbook of medical laboratory technology. First edition, New Delhi, India: Jaypee Medical Publisher.

Ukibe SN, Mbanugo JI, Ukibe NR, Ikeakor LC. 2013. Level of awareness and use of insecticide treated bed nets among pregnant women attending antenatal clinics in Anambra State, South Eastern Nigeria. J. Public Health Epidemiol., 5(9): 391–396.

WHO 2014. Estimating population access to ITNs versus quantifying for procurement for mass campaigns. World Health Organization, Geneva. www.who.int/malaria/publications/atoz/who-clarification-estimating-populati on-access-itn-mar2014.pdf