



## Coverage of Llin Among Expectant Mothers in Nwangele, Imo State, Nigeria

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### Abstract

**Background:** long-lasting insecticide-treated nets (LLINs) is one of the major interventions for the control and elimination of malaria, especially among pregnant women.

**Aim:** This study aimed to evaluate the knowledge, occurrence of malaria, utilisation and acquisition of long lasting insecticide treated net (LLINs) among pregnant women in Nwangele L.G.A. Imo State.

**Method:** This was a cross-sectional study among women attending antenatal care in a primary health facility in Nwangele LGA, Imo State, Nigeria. A total of 150 women were interviewed using structured questionnaire to obtain information on their knowledge and the coverage of LLINs. Data analysis was done using SPSS version 20.

**Results:** The mean age of the women was 29years. Most (81.3%) of the respondents had at least a secondary education. 92% used the LLINs at night time. Cost of acquiring these nets were free and in good condition (97.3%). Distance was listed as a hindrance to acquisition of nets (42.7%).

**Conclusion:** Malaria is a very serious public health problem; prompt treatment alone cannot guarantee the achievement of the global eradication goal. All strategies must be strengthened and employed in preventing malaria occurrence if the goal is to be achieved.

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### Keyword

LLIN, Malaria, Nigeria, Maternal health, Public Health

## Introduction

Malaria is vector – borne disease transmitted by the female Anopheles mosquito (Greenwood, 1992; Iyer et al., 2019; Organização Mundial da Saúde, 2019). In Sub – Saharan Africa, Malaria remains a major public health problem that affects every demographic. However, some are at increased risk of severe illness than others. These vulnerable group include under – five children and expecting mothers (Feachem, Jamison, & Bos, 1991; *World malaria report 2019*, 2019). In expectant mothers, malaria increases the risk of low birth weight (LBW) (Beeson, Scoullar, & Boeuf, 2018; Borgella et al., 2013; Dombrowski et al., 2018; Guyatt & Snow, 2004). In Nigeria, malaria in pregnancy was responsible for 11% of maternal deaths (Agomo, Oyibo, Anorlu, & Agomo, 2009). In 2000, the World Health Organization recommended a package of interventions to prevent malaria during

pregnancy. This package includes the promotion of insecticide-treated bed net (LLINs), intermitted preventive treatment in pregnancy and effective case management of malaria illness (Health, 2013; Pérez et al., 2017; WHO/AFRO, 2004). In Nigeria, one of the strategies of the Nigerian national strategic plan for malaria control is to create awareness on prevention of malaria in pregnancy through the use of LLINs, among others. The strategy also promotes the integration of malaria prevention into the safe motherhood package (Ankomah et al., 2014).

In a study among pregnant women in Lagos state, only 11.2% and 37.5% actually used LLINs in two study hospitals (Aina & Ayeni, 2011). In some parts of Nigeria, the use of bed nets among pregnant women is still low. In a study in Northern Nigeria, 73% of respondent have never used LLIN before because of lack of awareness (Omotosho, Ganiyu, & Rabi, 2009). In another study in Ibadan, south west Nigeria, only 20.9% pregnant women use LLINs (Aluko & Oluwatosin, 2012). A 2015 survey of Malaria in Nigeria showed that 69% of the population owned LLINs; of which 37% actually used their nets. Imo State had 46% ownership and 6% usage of LLINs (National Malaria Elimination Program (Nigeria) and ICF International, 2016).

To promote use and uptake of these malaria preventive strategies, mass media campaigns have been initiated to sensitize the general public particularly pregnant women, on the effectiveness and long term benefits of correct and consistent use of the LLINs during pregnancy. In the same 2015 survey, 36% of women age 15-49 have seen or heard a message about malaria (National Malaria Elimination Program (Nigeria) and ICF International, 2016). The mass media campaigns message were aired on national radio and television stations in English, Pidgin English, and the three main local languages in Nigeria. Also bill boards with clear messages about the link between mosquitoes and malaria prevention were place at strategic locations in major cities in Nigeria to further improve access to correct information. The messages on the bill boards were reproduced into posters and handbill that widely distributed across the country (Ankomah et al., 2014).

Despite these efforts, malaria in Nigeria still poses serious threats. The high rate of malaria has been attributed to some factors that affect the distribution, uptake and utilization of in insecticide treated nets (Babalola et al., 2019; Linn et al., 2019). Therefore, the present study aims to evaluate the coverage (access and utilization) of Insecticide Treated Nets among Expectant mothers in Nwangele Local Government Area of Imo State, Nigeria.

## **Materials and Methods**

### **Study Design**

A descriptive cross sectional study was used to determine the malaria distribution and uptake, and usage of Insecticide Treated Nets among women of child bearing age in the study area. To ensure that the question was consistent in evaluating or testing the objective of the study, a pilot study was conducted in Owerri West Local Government (Ihiagwa) and data collected were tested or reliability using the Chronbach's alpha. With the reliability coefficient of 0.5, the questionnaire was found to be reliable.

### **Study Settings**

The area of study is Nwangele Local Government Area, Imo State. It is located at the central part of Amaigbo and it is made up of 11 villages comprising of Amaigbo Community,

Abba Community, Dimnanume community, Isu Ancient Kingdom Community, Umuozu Community, Isiala Umuozu Community, Umunakara Community, Umudurunna Community, Abajah Community, Ogwuaga/Ekitiafor Community and Umunna Community. The urban towns of Nwangele L.G.A. are Abajah, Isu, Amaigbo, Umuozu and Abah, the rest are more of rural towns. The women attending antenatal care in a primary health facility in Nwangele LGA, Imo State, Nigeria were recruited for the study.

### Sample and Sampling Technique

To be included in the study, participants had to be aged 18+, a resident in the selected village and able to speak either English Pidgin or Igbo (the local language) fluently. Convenience sampling was felt to be the most appropriate strategy for selecting participants, due to the somewhat wide inclusion criteria. Additionally, convenience sampling offered more easily available access to data and was the most straightforward to implement.

To select participants, the primary health care centre of the study area was located to recruit the participants. This method was used as the study population are expectant mothers and this group visit the health centres for pre – natal care which include Intermittent Preventive Treatment during Pregnancy.

### Data Collection

The researchers administered the questionnaires to respondents found in the healthcare centers. The purpose of the study was explained to them and their consent obtained before administering the questionnaire.

### Data Analysis

Data collected were coded on a spreadsheet and entered into SPSS version 20 for analysis. Quantitative data were represented on tables and charts for clarity.

## Results and Discussion

The results from the data collected from 150 mothers in the study Area are presented in tables and figures below. Socio – demographic information is found in table 1; coverage (knowledge, access, affordability, availability, ownership and usage is found in tables 2 – 4. Distribution and frequency of malaria in the study population is found in figures 1 and 2.

### Socio-Demographic Characteristics

**Table 1** shows that 30% of the respondents were aged 19 – 29 years and 66% were aged 30 years and above. 90.7% of them were married and the common occupation among them was business (56%), farming (28.7%) and civil/public servants (15.3%). 81.3% have attained secondary education. About 77.3% of them live in a 3 – 4 person household.

**Table 1: Socio-demographic characteristics of the mothers**

Variables	Frequency	Percentage
<b>Age bracket</b>		
< 18 years	6	4.0
19 - 29 years	45	30.0
≥ 30	99	66.0

<b>Marital status</b>		
Married	136	90.7
Widowed	14	9.3
<b>Occupation</b>		
Business	84	56.0
Farmer	43	28.7
Civil/public servant	23	15.3
<b>Educational Qualification</b>		
Primary	4	2.7
Secondary	122	81.3
Tertiary	24	16.0
<b>Household size</b>		
1 – 2	12	8.0
3 – 4	116	77.3
> 5	22	14.7

### Malaria

When asked about having suffered malaria, 57.3% reported that they last had malaria more than two weeks before the study commenced. Only 21(14%) had malaria 1 – 7 days prior (Figure 1). And although they don't suffer from this often (97.3%), 2.7% suffer it very often (Figure 2).

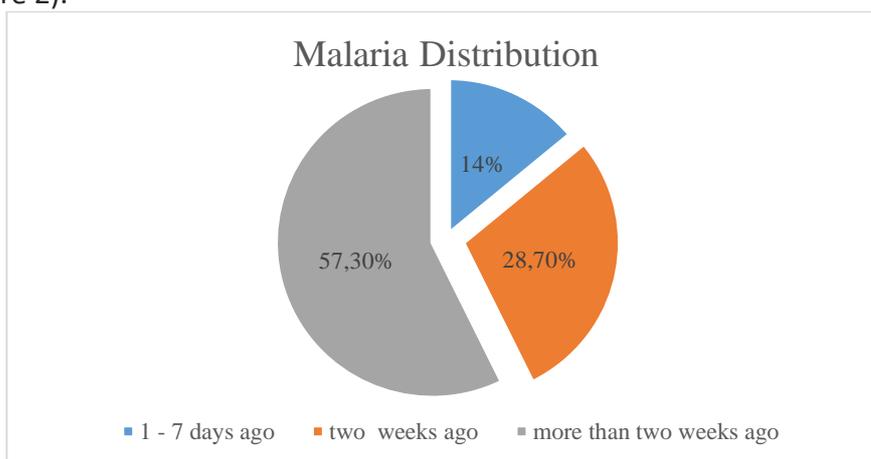


Figure 1: Malaria distribution in Nwangele LGA, Imo State, Nigeria

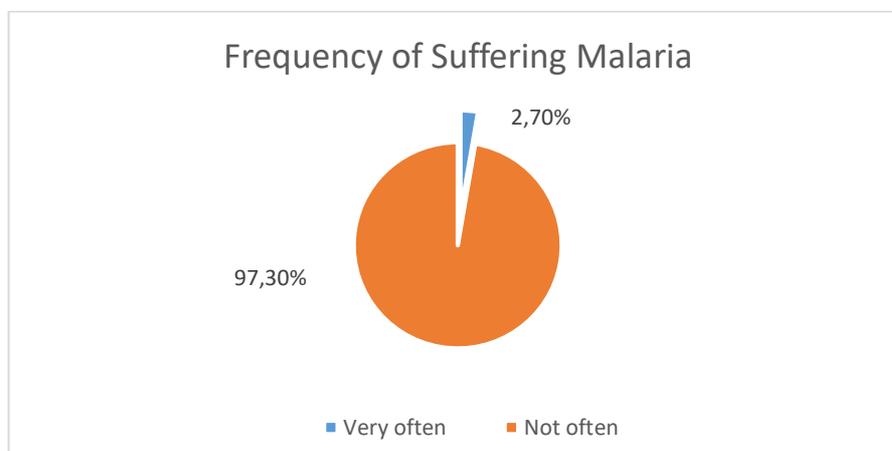


Figure 2: Frequency of Suffering Malaria in Nwangele LGA, Imo State, Nigeria.

### Knowledge of Long-lasting insecticidal net (LLIN)

The common source of information about bed nets in the L.G.A is hospitals and health centers, 134(89.3%) and 80(53.3%) have 1 – 2 bed nets at home while 57(38%) and 13(8.7%) have 3 – 4 and 5 – 6 bed nets at home. Most (96.7%) of the mothers believe that everybody in the house needs the net and no one is special.

**Table 2: Knowledge of Insecticide Treated Bed Nets**

<b>Source of knowledge on mosquito bed nets</b>		
Market	11	7.3
Hospital/health center	134	89.3
Media	4	2.7
Others	1	0.7
<b>Right time to use mosquito bed net</b>		
Night	138	92.0
Mid-night	4	2.7
Other	8	5.3
<b>Who need net most</b>		
Mother	5	3.3
Everybody	145	96.7
<b>Other use of mosquito nets</b>		
Pillow case	2	1.3
Fishing net	20	13.3
Others	128	85.3

### Access to Long-lasting insecticidal net (LLIN)s

These bed nets are commonly sourced at hospitals and health centres for free but despite the availability of the bed nets, only 43.3% stated that two persons in the house sleep under net while three persons sleeps among 47.3%. Distance (42.7%) and bad roads (41.3%) were the major hindrances to access to bed nets.

**Table 2: Access to Long-lasting insecticidal net (LLIN)s**

<b>Cost of acquiring nets</b>		
free of charge	150	100.0
<b>Nature of mosquito bed net when received</b>		
Well packaged	146	97.3
Partly torn	4	2.7
<b>Hindrance to access mosquito bed nets</b>		
Distance	64	42.7
Bad road	62	41.3
Availability	24	16.0

### Utilization of Long-lasting insecticidal net (LLIN)s

49.3% of the respondents used LLIN while 76(50.7%) of the mothers use just treated bed nets and about 138(92%) uses the net every night compared to 8(5.3%) that uses it three time a week.

But the common hindrance to sleeping under the net is because at times it's very hot inside (26.7%) or makes one uncomfortable (36%) and other issues (31.3%) that might influences sleeping under mosquito bed nets.

**Table 3: Utilization of mosquito bed net**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>How many Mosquito bed net available in the house</b>		
1 – 2	80	53.3
3 – 4	57	38.0
5 – 6	13	8.7
<b>How many person sleeping in a room</b>		
One	6	4.0
Two	65	43.3
Three	71	47.3
More than three	8	5.3
<b>Frequency of usage of mosquito net</b>		
Every night	138	92.0
Once a week	4	2.7
Three times a week	8	5.3
<b>How net is hung</b>		
Over the bed	150	100.0
<b>Hindrance to sleeping under net</b>		
Very hot inside	40	26.7
Bed net disturbs breathing	9	6.0
Make one uncomfortable	54	36.0
Others	47	31.3

Every pregnancy comes with its own risks and pregnant women are 3 times more likely to suffer from severe disease as a result of a malarial infection compared with their non - pregnant counterparts (Takem & D’Alessandro, 2013). Malaria in pregnancy compromises the outcome of pregnancy, affecting both the mother and the foetus. In malaria endemic area such as in Imo State, Nigeria, it is estimated that there is an alarming rate of occurrence of placental malaria (Ukaga et al., 2007). The present study sought to provide reference data on the coverage of Insecticide Treated Nets among expectant mothers in Nwangele Local Government Area of Imo State, Nigeria. 66% of the respondents in the present study were aged 30 and above and naturally as one advances in age, childbirth is associated with increased risk of adverse maternal perinatal outcomes, such as postpartum haemorrhage, eclampsia, and cephalopelvic disproportion, as well as adverse infant outcomes including preterm birth, poor foetal growth, low birth weight, and neonatal mortality (Cavazos-Rehg et al., 2015; Cunnington, 2001; Fraser, Brockert, & Ward, 1995). Therefore any intervention should focus more of this age group.

LLIN ownership and use in the study reflects on the level of awareness and campaign that goes on in the study area. These awareness campaigns have proven effective in past studies (Ankomah et al., 2014). This cannot be said for poor use of LLINs among pregnant women in Enugu (Ugwu, Ezechukwu, Obi, Ugwu, & Okeke, 2013). Two-thirds of all households had at least one LLIN acquired free of charge (100%) and in good condition (97.3%). When asked about ease of access to LLINs, 42.7% recorded distance as a hindrance to acquiring more Long-lasting insecticidal net (LLIN). This has been noted in a similar study as a hindrance to accessing timely care for malaria of under – five children in South Eastern Nigeria (Uchechukwu Madukaku Chukwuocha, Okpanma, Nwakwuo, & Dozie, 2014). The mothers showed enthusiasm to accept and use the LLINs. This is very promising for the malaria prevention and elimination programmes. Factors such as high literacy level and

awareness about malaria in the area could have contributed to this (Uchechukwu M. Chukwuocha et al., 2018).

LLINs have been proven to reduce malaria (Binka & Akweongo, 2006; Malaria consortium, 2016). In the present study, reasons for not sleeping under net, there are some beliefs that act as a barrier, such as belief that LLINs disturbs breathing (60%), very hot inside (26.7%), while (36%) says that mosquito net makes one uncomfortable. These findings were consistent with the result in Mukono district, Uganda few pregnant women reportedly do not use LLINs due to the belief that the chemicals used to impregnated nets have dangerous effects on pregnancy and the foetus due to its repellent action against mosquitoes [30], [31]. Reported misuse of LLINs for anything other than protection against malaria was noted. 1.3% of household used mosquito net as pillow case and another 13.3% used it as fishing net. A similar to research from Zambia showed only 3% of households reported misuse of LLINs (Eisele, Thwing, & Keating, 2011). These data also supported a review of evidence that shows that widespread LLIN misuse in Africa has been overblown by media report (Berthe et al., 2019)(Eisele et al., 2011; Minakawa, Dida, Sonye, Futami, & Kaneko, 2008)

Malaria is a huge global health burden due to its mortality, morbidity and cost to economies. It is necessary to eliminate the disease in all countries where possible to achieve the World Health Organization target of > 90% reduction by 2030 (“Global technical strategy for malaria 2016–2030,” 2016).

With every study there are limitations, one of the limitations of the present study is that these results are likely not to be generalizable to rural populations in Imo State or urban populations. In addition, the questions were translated into the local language which creates a risk of loss of meaning through translation.

## **Conclusions**

Malaria is a very serious public health problem; prompt treatment alone cannot guarantee the achievement of the global eradication goal. All strategies must be strengthened and employed in preventing malaria occurrence if the goal is to be achieved. Therefore LLIN must be provided for vulnerable groups and awareness improved to counter unhealthy beliefs on use of LLINs, while environmental management must be given adequate attention so as to reduce the vector population.

## **Ethics approval and consent to participate**

Ethical approval was granted by the research ethics committee of the School of Health Technology, Federal University of Technology, Owerri, Nigeria. Data handling was in accordance with the Data Protection Act. Permission was obtained from the community leaders. Informed oral consent was obtained from all the study participants before they were allowed to take part in the study. Participants were given an individual identification number, so there was no personal identifiable information attached to the data.

## **Consent for publication**

Not applicable.

## Availability of data and materials

The datasets during and/or analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests

No conflicts of interest.

## Funding

No funding was received.

## Authors' Contributions

Dr. UMC designed the study and collected the data. Prof. EN supervised the data collection. Prof. ID proofread the manuscript. Prof. OA interpreted the data. COE drafted the manuscript and analysed the data. All authors read and approved the final manuscript.

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## References

- Agomo, C. O., Oyibo, W. A., Anorlu, R. I., & Agomo, P. U. (2009). Prevalence of malaria in pregnant women in Lagos, South-West Nigeria. *Korean Journal of Parasitology*, 47(2), 179–183. <https://doi.org/10.3347/kjp.2009.47.2.179>
- Aina, B. A., & Ayeni, F. A. (2011). Knowledge and use of insecticide treated nets as a malaria preventive tool among pregnant women in a local government area of Lagos state , Nigeria, 01(07), 162–166.
- Aluko, J. O., & Oluwatosin, A. O. (2012). Utilization of insecticide treated nets during pregnancy among postpartum women in Ibadan, Nigeria: a cross-sectional study. *BMC Pregnancy Childbirth*, 12(21). Retrieved from <https://doi.org/10.1186/1471-2393-12-21>
- Ankomah, A., Adebayo, S. B., Arogundade, E. D., Anyanti, J., Nwokolo, E., Inyang, U., ... Meremiku, M. (2014). The effect of mass media campaign on the use of insecticide-treated bed nets among pregnant women in Nigeria. *Malaria Research and Treatment*, 2014. <https://doi.org/10.1155/2014/694863>
- Babalola, O. J., Sambo, M. N., Idris, S. H., Ajayi, I. O. O., Ajumobi, O., & Nguku, P. (2019). Factors associated with utilization of LLINs among women of child-bearing age in Igabi, Kaduna State, Nigeria. *Malaria Journal*, 18(1), 1–9. <https://doi.org/10.1186/s12936-019-3046-x>
- Beeson, J. G., Scoullar, M. J. L., & Boeuf, P. (2018). Combating low birth weight due to malaria infection in pregnancy. *Science Translational Medicine*, 10(431), 5–8. <https://doi.org/10.1126/scitranslmed.aat1506>

- Berthe, S., Harvey, S. A., Lynch, M., Koenker, H., Jumbe, V., Kaunda-Khangamwa, B., & Mathanga, D. P. (2019). Poverty and food security: Drivers of insecticide-treated mosquito net misuse in Malawi. *Malaria Journal*, 18(1), 1–11. <https://doi.org/10.1186/s12936-019-2952-2>
- Binka, F., & Akweongo, P. (2006). Prevention of Malaria Using ITNs: Potential for Achieving the Millennium Development Goals. *Current Molecular Medicine*, 6(2), 261–267. <https://doi.org/10.2174/156652406776055203>
- Borgella, S., Fievet, N., Huynh, B. T., Ibitokou, S., Hounguevou, G., Affedjou, J., ... Deloron, P. (2013). Impact of pregnancy-associated malaria on infant malaria infection in southern Benin. *PLoS ONE*, 8(11), 1–10. <https://doi.org/10.1371/journal.pone.0080624>
- Cavazos-Rehg, P. A., Krauss, M. J., Spitznagel, E. L., Bommarito, K., Madden, T., Olsen, M. A., ... Bierut, L. J. (2015). Maternal age and risk of labor and delivery complications. *Maternal and Child Health Journal*, 19(6), 1202–1211. <https://doi.org/10.1007/s10995-014-1624-7>
- Chukwuocha, Uchechukwu M., Okorie, P. C., Iwuoha, G. N., Ibe, S. N., Dozie, I. N., & Nwoke, B. E. (2018). Awareness, perceptions and intent to comply with the prospective malaria vaccine in parts of South Eastern Nigeria. *Malaria Journal*, 17(1), 1–7. <https://doi.org/10.1186/s12936-018-2335-0>
- Chukwuocha, Uchechukwu Madukaku, Okpanma, A. C., Nwakwuo, G. C., & Dozie, I. N. S. (2014). Determinants of Delay in Seeking Malaria Treatment for Children Under-Five Years in Parts of South Eastern Nigeria. *Journal of Community Health*, 39(6), 1171–1178. <https://doi.org/10.1007/s10900-014-9872-4>
- Cunnington, A. J. (2001). What so bad about teenage pregnancy? *Journal of Family Planning and Reproductive Health Care*, 27(1), 36 LP – 41. <https://doi.org/10.1783/147118901101194877>
- Dombrowski, J. G., de Souza, R. M., Mendes Silva, N. R., Barateiro, A., Epiphanyo, S., Gonçalves, L. A., & Farias Marinho, C. R. (2018). Malaria during pregnancy and newborns outcome in an unstable transmission area in Brazil: A population-based record linkage study. *BioRxiv*, 1–16. <https://doi.org/10.1101/244178>
- Eisele, T. P., Thwing, J., & Keating, J. (2011). Claims about the misuse of insecticide-treated mosquito nets: Are these evidence-based? *PLoS Medicine*, 8(4), 2. <https://doi.org/10.1371/journal.pmed.1001019>
- Feachem, R. G., Jamison, D. T., & Bos, E. R. (1991). *Changing patterns of disease and mortality in sub-Saharan Africa. Disease and mortality in sub-Saharan Africa.*
- Fraser, A. M., Brockert, J. E., & Ward, R. H. (1995). Association of young maternal age with adverse reproductive outcomes. *The New England Journal of Medicine*, 332(17), 1113–1117. <https://doi.org/10.1056/NEJM199504273321701>
- Global technical strategy for malaria 2016–2030. (2016).

- Greenwood, B. (1992). *Malaria — obstacles and opportunities. Parasitology Today* (Vol. 8). [https://doi.org/10.1016/0169-4758\(92\)90179-6](https://doi.org/10.1016/0169-4758(92)90179-6)
- Guyatt, H. L., & Snow, R. W. (2004). Impact of malaria during pregnancy on low birth weight in sub-Saharan Africa. *Clinical Microbiology Reviews*, 17(4), 760–769. <https://doi.org/10.1128/CMR.17.4.760-769.2004>
- Health, A. (2013). WHO Policy Recommendation : Intermittent Preventive Treatment of malaria in pregnancy using Sulfadoxine-Pyrimethamine ( IPTp-SP ), (October 2012), 1–12.
- Iyer, M., Skelton, J., De Wildt, G., & Meza, G. (2019). A qualitative study on the use of long-lasting insecticidal nets (LLINs) for the prevention of malaria in the Peruvian Amazon. *Malaria Journal*, 18(1), 1–14. <https://doi.org/10.1186/s12936-019-2937-1>
- Linn, S. Y., Maung, T. M., Tripathy, J. P., Shewade, H. D., Oo, S. M., Linn, Z., & Thi, A. (2019). Barriers in distribution, ownership and utilization of insecticide-treated mosquito nets among migrant population in Myanmar, 2016: A mixed methods study. *Malaria Journal*, 18(1), 1–16. <https://doi.org/10.1186/s12936-019-2800-4>
- Malaria consortium. (2016). Malaria prevention through insecticide treated nets, (April), 1–5. Retrieved from [https://www.malariaconsortium.org/media-downloads/802/Malaria prevention through insecticide treated nets](https://www.malariaconsortium.org/media-downloads/802/Malaria%20prevention%20through%20insecticide%20treated%20nets)
- Mbonye, A. K., Neema, S., & Magnussen, P. (2006). Preventing malaria in pregnancy: A study of perceptions and policy implications in Mukono district, Uganda. *Health Policy and Planning*, 21(1), 17–26. <https://doi.org/10.1093/heapol/czj002>
- Minakawa, N., Dida, G. O., Sonye, G. O., Futami, K., & Kaneko, S. (2008). Unforeseen misuses of bed nets in fishing villages along Lake Victoria. *Malaria Journal*, 7, 5–10. <https://doi.org/10.1186/1475-2875-7-165>
- National Malaria Elimination Program (Nigeria) and ICF International. (2016). 2015 Nigeria Malaria Indicator Survey: Atlas of Key Indicators. Retrieved from <https://dhsprogram.com/pubs/pdf/ATR17/ATR17.pdf>
- Omotosho, I. M., Ganiyu, A. S., & Rabi, O. J. (2009). Awareness and use of insecticide treated nets among women attending ante-natal clinic in a northern state of Nigeria. *J Pak Med Assoc.*, 59(6), 354–358. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/19534367/>
- Organização Mundial da Saúde. (2019). *Guidelines for Malaria Vector Control. Guidelines for Malaria Vector Control*. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/30844152>
- Pérez, A., Santamaria, E. K., Operario, D., Tarkang, E. E., Zotor, F. B., Cardoso, S. R. de S. N., ... Volk, J. E. (2017). PREVENTION AND CONTROL OF MALARIA IN PREGNANCY IN THE AFRICAN REGION. *BMC Public Health*, 5(1), 1–8. Retrieved from <https://ejournal.poltektegal.ac.id/index.php/siklus/article/view/298%0Ahttp://reposit>

orio.unan.edu.ni/2986/1/5624.pdf%0Ahttp://dx.doi.org/10.1016/j.jana.2015.10.005%0Ahttp://www.biomedcentral.com/1471-2458/12/58%0Ahttp://ovidsp.ovid.com/ovidweb.cgi?T=JS&P

- Takem, E. N., & D'Alessandro, U. (2013). Malaria in pregnancy. *Mediterranean Journal of Hematology and Infectious Diseases*, 5(1). <https://doi.org/10.4084/MJHID.2013.010>
- Taremwa, I. M., Ashaba, S., Adrama, H. O., Ayebazibwe, C., Omoding, D., Kemeza, I., ... Hilliard, R. (2017). Knowledge, attitude and behaviour towards the use of insecticide treated mosquito nets among pregnant women and children in rural Southwestern Uganda. *BMC Public Health*, 17(1), 4–11. <https://doi.org/10.1186/s12889-017-4824-4>
- Ugwu, E. O., Ezechukwu, P. C., Obi, S. N., Ugwu, A. O., & Okeke, T. C. (2013). Utilization of insecticide treated nets among pregnant women in enugu, South Eastern Nigeria. *Nigerian Journal of Clinical Practice*, 16(3), 292–296. <https://doi.org/10.4103/1119-3077.113449>
- Ukaga, C. N., Nwoke, B. E. B., Udujih, O. S., Udujih, O. G., Ohaeri, A. A., & Anosike, J. C. (2007). Placental malaria in Owerri , Imo State , south-eastern Nigeria, 9(3), 180–185.
- WHO/AFRO. (2004). A strategic framework for malaria prevention and control during pregnancy in the African region. *World Health Organization Regional Office for Africa*. Retrieved from [www.who.int/malaria/publications/atoz/afr\\_mal\\_04\\_01/en/](http://www.who.int/malaria/publications/atoz/afr_mal_04_01/en/)
- World malaria report 2019*. (2019).