



**UNIVERSITI PUTRA MALAYSIA**

***KNOWLEDGE AND ATTITUDE OF INSECTICIDE-TREATED NET USE  
IN MALARIA PREVENTION AND ITS ASSOCIATED FACTORS AMONG  
PREGNANT WOMEN IN UMUAHIA NORTH, NIGERIA***

**OPARA MONICA ONYINYECHI**

**FPSK(M) 2017 59**



**KNOWLEDGE AND ATTITUDE OF INSECTICIDE-TREATED NET USE  
IN MALARIA PREVENTION AND ITS ASSOCIATED FACTORS AMONG  
PREGNANT WOMEN IN UMUAHIA NORTH, NIGERIA**

By

**OPARA MONICA ONYINYECHI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirements for the Degree of Master of Science**

**May 2017**

All material contained within the thesis, including without limitation text, logos, icons, photographs and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

**KNOWLEDGE AND ATTITUDE OF INSECTICIDE-TREATED NET USE  
IN MALARIA PREVENTION AND ITS ASSOCIATED FACTORS AMONG  
PREGNANT WOMEN IN UMUAHIA NORTH, NIGERIA**

By

**OPARA MONICA ONYINYECHI**

May 2017

**Chairman : Suhainizam Muhamad Saliluddin, MPH**  
**Faculty : Medicine and Health Sciences**

**Background:** Malaria is an infectious disease which infects millions of people worldwide every year. The disease is a global health problem, which affect mainly young children especially those less than five years of age and pregnant women.

**Objective:** The aim is to determine the level of knowledge and attitude of insecticide treated nets (ITNs) use in malaria prevention and its associated factors among pregnant women in Umuahia North, Nigeria.

**Methodology:** A cross-sectional study was carried out using simple random sampling to select two hospitals among 10 hospitals; afterwards, simple random sampling with proportionate to size was employed to select the number of participants from each of the hospitals using guided self-administered questionnaire distributed to the pregnant women who met the inclusion criteria and came for antenatal visit. Data was collected using a pre-tested and validated questionnaire consisting of 5 sections involving the socio-demographic characteristics, knowledge, attitude, perceived barriers and maternal factors. The knowledge was measured using “Yes”, “No” or I don’t know options; The attitude was measured on a 5-point likert scale “strongly disagree” [0], “disagree” [1], “unsure” [2], “agree” [3], “strongly agree” [4]; perceived barriers was measured on a 5-point likert scale “strongly disagree” [0], “disagree” [1], “unsure” [2], “agree” [3], “strongly agree” [4]; past history of malaria related complication was measured using “Yes” or “No” options; while the questions on maternal factors were also measured. Three level of analyses were conducted which were descriptive analysis, chi-square and logistic regression. The significance level was set at 0.05.

**Results:** A total of 426 respondents were involved in the study with 97.3% response rate. The overall mean knowledge score of the respondents was 6.85 ( $\pm$  0.503), with

90.7% of having high knowledge on insecticide treated nets (ITNs) in malaria prevention. However, 51.1% (mean = 40.09, SD  $\pm$  5.5237) of the respondents held positive attitude. Majority of the respondents among the age group of 25-34 years were 341 (77.5), 414 (94.1) were Igbos, 401 (91.1) were married. Majority of the respondents 339 (77.0) were currently living in Urban, 342 (77.7) held tertiary education, Most of the respondents earned 71,000 and above, and more than half 294 (66.8) of the respondents had no past history of malaria related complication.

There were significant association between knowledge regarding the use of insecticide treated nets and ethnicity (P= 0.001), monthly income (X<sup>2</sup>=11.957, P= 0.008), parity (X<sup>2</sup>=8.487, P= 0.014), and also perceived barriers (X<sup>2</sup>=5.812, P= 0.016). However, there was significant independent predictors of knowledge on insecticide treated nets (ITNs) use and ethnicity (AOR=4.891, p = 0.024, 95% CI=1.231-19.429), in which those with higher odds of having high knowledge. Monthly income (AOR=0.358, p = 0.015, 95% CI=0.157-0.820), and also level of education (AOR=3.715, p = 0.019, 95% CI=1.244-11.094). There were significant association between attitude towards the use of insecticide treated nets and age (X<sup>2</sup>=44.801, P= 0.001), marital status (P= 0.008), monthly income (X<sup>2</sup>=139.417, P= 0.001), educational status (X<sup>2</sup>=23.544, P= 0.001), past history of malaria related pregnancy complication (X<sup>2</sup>=70.113, P= 0.001), stages of pregnancy (X<sup>2</sup>=57.244, P= 0.001), gravidity (X<sup>2</sup>=38.881, P= 0.001), parity (X<sup>2</sup>=25.116, P= 0.001) and perceived barrier (X<sup>2</sup>=144.423, P= 0.001). Furthermore, there was significant independent predictors of attitude towards the use of insecticide treated nets (ITNs) and monthly income (AOR= 0.257, p = 0.001, 95% CI=0.124-0.531), in which those with lower odds of having positive attitude. Past history of malaria related complicated pregnancy (AOR=1.858, p = 0.043, 95% CI=1.019-3.386), and Perceived barriers (AOR=1.435, p = 0.001, 95% CI=1.284-1.605).

**Conclusion:** This study has identified that there is high level of knowledge, negative attitude among pregnant women in Umuahia North LGA, Abia State. However, predictors of knowledge and attitude were also determined.

**Keywords:** Knowledge, attitude, ITNs, Malaria, Pregnant women.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**PENGETAHUAN DAN SIKAP TERHADAP PENGGUNAAN NET TERAWAT INSEKTISID DALAM PENCEGAHAN MALARIA DAN FAKTOR BERKAITAN DALAM KALANGAN WANITA MENGANDUNG DI UTARA UMUAHIA, NIGERIA**

Oleh

**OPARA MONICA ONYINYECHI**

Mei 2017

**Pengerusi : Suhainizam Muhamad Saliluddin, MPH**  
**Fakulti : Perubatan dan Sains Kesihatan**

**Latar belakang:** Malaria merupakan penyakit berjangkit yang menjangkiti ribuan manusia sejagat pada setiap tahun. Penyakit ini merupakan masalah kesihatan global yang memberi kesan, kebanyakannya pada kanak-kanak, terutama mereka yang berusia kurang daripada lima tahun dan juga wanita mengandung.

**Objektif:** Tujuan kajian ini adalah untuk menentukan tahap pengetahuan dan sikap terhadap penggunaan net terawat insektisid (ITN) dalam pencegahan malaria dan faktor berkaitan dalam kalangan wanita mengandung di Utara Umuahia , Nigeria.

**Metodologi:** Kajian keratan rentas telah dijalankan menggunakan persampelan rawak mudah bagi memilih dua buah hospital antara 10 hospital; seterusnya, persampelan rawak mudah mengikut kadar dengan saiz telah digunakan untuk memilih bilangan peserta daripada setiap hospital menggunakan soal selidik swatadbir terbimbing yang diedarkan kepada wanita mengandung yang menepati kriteria terangkum dan yang hadir pada lawatan antenatal. Data telah dikumpul menggunakan soal selidik praujian dan yang telah divalidasi mengandung 5 bahagian, termasuk ciri sosiodemografi, pengetahuan, sikap, penghalang teranggap dan faktor maternal. Pengetahuan diukur menggunakan opsyen “Ya”, “Tidak” atau “ Saya tidak tahu”: Sikap diukur menggunakan skala likert 5 mata “sangat tidak setuju” [0], “tidak setuju” [1], “tidak pasti” [2], “setuju” [3], “sangat setuju” [4]; penghalang teranggap diukur menggunakan skala likert 5 mata “sangat tidak setuju” [0], “tidak setuju” [1], “tidak pasti” [2], “setuju” [3], “sangat setuju” [4]; sejarah lepas komplikasi berkaitan malaria diukur menggunakan opsyen “Ya” or “Tidak”; manakala soalan mengenai faktor maternal juga telah diukur. Tiga tahap analisis telah dilaksanakan, iaitu analisis deskriptif, khi kuasa dua dan regresi logistik. Tahap signifikan telah disetkan pada 0.05.

**Dapatan:** Sebanyak 426 responden telah terlibat dalam kajian ini dengan 97.3% kadar respon. Min keseluruhan skor pengetahuan responden ialah 6.85 ( $\pm$  0.503), dengan 90.7% mempunyai pengetahuan yang tinggi terhadap net terawat insektisid (ITN) dalam pencegahan malaria. Walau bagaimanapun, 51.1% (min = 40.09, SD  $\pm$  5.5237) responden memperlihatkan sikap yang positif. Kebanyakan responden dalam kalangan kumpulan umur 25-34 tahun, iaitu 341 (77.5), 414 (94.1) ialah Igbo, 401 (91.1) telah berkahwin. Majoriti responden 339 (77.0) kini tinggal di bandar, 342 (77.7) mempunyai pendidikan tertiar, ramai responden berpendapatan 71,000 dan ke atas, dan lebih daripada separuh 294 (66.8) responden tidak mempunyai sejarah lepas komplikasi berkaitan malaria.

Terdapat asosiasi yang signifikan antara pengetahuan berkaitan dengan penggunaan net terawat insektisid dan etnik ( $P= 0.001$ ), pendapatan bulanan ( $X^2=11.957$ ,  $P= 0.008$ ), pariti ( $X^2=8.487$ ,  $P= 0.014$ ), dan juga penghalang teranggap ( $X^2=5.812$ ,  $P= 0.016$ ). Walau bagaimanapun, terdapat prediktor independen pengetahuan yang signifikan terhadap penggunaan net terawat insektisid (ITN) dan etnik (AOR=4.891,  $p = 0.024$ , 95% CI=1.231-19.429), mereka dengan rencaman yang lebih tinggi mempunyai pengetahuan yang tinggi. Pendapatan bulanan (AOR=0.358,  $p = 0.015$ , 95% CI=0.157-0.820), dan juga tahap pendidikan (AOR=3.715,  $p = 0.019$ , 95% CI=1.244-11.094). Terdapat asosiasi yang signifikan antara sikap terhadap penggunaan net terawat insektisid dan umur ( $X^2=44.801$ ,  $P= 0.001$ ), status marital ( $P= 0.008$ ), pendapatan bulanan ( $X^2=139.417$ ,  $P= 0.001$ ), status pendidikan ( $X^2=23.544$ ,  $P= 0.001$ ), sejarah lepas malaria berkaitan dengan komplikasi kehamilan ( $X^2=70.113$ ,  $P= 0.001$ ), peringkat kehamilan ( $X^2=57.244$ ,  $P= 0.001$ ), graviditi ( $X^2=38.881$ ,  $P= 0.001$ ), pariti ( $X^2=25.116$ ,  $P= 0.001$ ) dan penghalang teranggap ( $X^2=144.423$ ,  $P= 0.001$ ). Tambahan pula, terdapat prediktor independen sikap yang signifikan terhadap penggunaan net terawat insektisid (ITN) dan pendapatan bulanan (AOR= 0.257,  $p = 0.001$ , 95% CI=0.124-0.531), mereka dengan rencaman yang lebih rendah mempunyai sikap yang positif. Sejarah lepas malaria berkaitan komplikasi kehamilan (AOR=1.858,  $p = 0.043$ , 95% CI=1.019-3.386), dan penghalang teranggap (AOR=1.435,  $p = 0.001$ , 95% CI=1.284-1.605).

**Kesimpulan:** Kajian ini telah mengenal pasti bahawa terdapat tahap pengetahuan yang tinggi, sikap yang negatif dalam kalangan wanita mengandung di Utara LGA Umuahia, Negeri Abia. Di samping itu, prediktor pengetahuan dan sikap juga telah dikenal pasti.

**Kata kunci:** Pengetahuan, sikap, ITN, Malaria, wanita mengandung.



## ACKNOWLEDGEMENTS

I thank the Almighty God for giving me the opportunity to carry out this work.

I give special thanks to my father Mr. Francis C. Opara, my wonderful siblings for their constant encouragement and support throughout this program.

This work was facilitated by the untiring efforts of my major supervisor Dr. Suhainizam Muhamad Saliluddin, whose constructive criticism and guidance made this work what it is. I feel highly indebted to other members of my supervisory committee; Dr. Suriani Binti Ismail and Dr. Ifechukwu E. Adieze who made it possible for me to undergo this program.

Special appreciation goes to the pregnant women who voluntarily participated in this study and also all staff of health care facilities used in this study.

I am very grateful to my friends and colleagues, Tochukwu Mgbeojedo, Mrs. Itse Jacdomni and Inimfon Essiet who helped directly or indirectly in making this study a success. I will forever remain grateful.



I certify that a Thesis Examination Committee has met on 26 May 2017 to conduct the final examination of Opara Monica Onyinyechi on her thesis entitled "Knowledge and Attitude of Insecticide-Treated Net Use in Malaria Prevention and its Associated Factors among Pregnant Women in Umuahia North, Nigeria" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

**Huda binti Zainuddin, PhD**

Senior Lecturer  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Halimatus Sakdiah binti Minhat, PhD**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

**Zaliha Ismail, PhD**

Senior Lecturer  
Universiti Teknologi MARA  
Malaysia  
(External Examiner)



---

**NOR AINI AB. SHUKOR, PhD**

Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 4 September 2017

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Suhainizam Muhamad Saliluddin MB, BCh, BAO, MPH**

Senior Lecturer (Medical)  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Suriani Binti Ismail M.D, MPH, PhD**

Senior Lecturer (Medical)  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

**Ifechukwu, Enyinnaya Adieze, PhD**

Senior Lecturer  
Faculty of Science  
Federal University of Technology, Owerri  
(Member)

---

**ROBIAH BINTI YUNUS, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

## Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice- Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name and Matric No: Opara Monica Onyinyechi, GS44931

## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- Supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

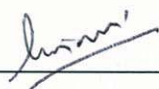
Signature: \_\_\_\_\_

Name of  
Chairman of  
Supervisory  
Committee:

Suhainizam Muhamad Saliluddin MB, BCh, BAO, MPH

Signature: \_\_\_\_\_

Name of  
Member of  
Supervisory  
Committee:



**Dr. SURIANI BT ISMAIL**  
MMC Full Registration No. 29362  
Public Health Medicine Specialist  
Department of Community Health  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
43400 UPM Serdang, Selangor.

Suriani Binti Ismail M.D, MPH, PhD

Signature: \_\_\_\_\_

Name of  
Member of  
Supervisory  
Committee:

Ifechukwu, Enyinnaya Adieze, PhD

## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	v
<b>APPROVAL</b>	vi
<b>DECLARATION</b>	viii
<b>LIST OF TABLES</b>	xii
<b>LIST OF FIGURES</b>	xiv
<b>LIST OF ABBREVIATIONS</b>	xv

### CHAPTER

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Background of the study	1
1.1.1	Factors influencing the use of insecticide treated nets	2
1.2	Problem statement	3
1.3	Significance of the study	6
1.4	Research questions	7
1.5	Research objectives:	7
1.5.1	General objective:	7
1.5.2	Specific objectives:	7
1.6	Research hypothesis:	8
<b>2</b>	<b>LITERATURE REVIEW</b>	<b>9</b>
2.1	History of malaria	9
2.1.1	Discovering the Malaria Parasite	11
2.2	Prevalence of malaria	12
2.2.1	Globally	12
2.2.2	In Nigeria	14
2.3	Malaria infection	17
2.3.1	Symptoms of malaria infection	17
2.3.2	Diagnose and treatment of malaria infection	17
2.3.3	Consequence of malaria infection	18
2.4	Preventive method globally	20
2.4.1	Intermittent preventive treatment (IPT)	20
2.4.2	Indoor residual spray (IRS)	21
2.4.3	Use of insecticide treated nets (ITNS)	22
2.4.4	Malaria preventive interventions in Nigeria	23
2.5	Socio-demographic determinants of the use of insecticide treated nets (ITNs)	26
2.5.1	Factors associated with knowledge and use of insecticide treated nets (ITNs)	26
2.5.2	Factors associated with attitude use of insecticide treated nets (ITNS)	28
2.6	Previous history of malaria infection as factors associated with knowledge and attitude use of insecticide treated nets (ITNs)	30

2.7	Conceptual Framework	31
<b>3</b>	<b>MATERIALS AND METHODS</b>	<b>32</b>
3.1	Study location	32
3.2	Study design	33
3.3	Study duration	33
3.4	Study population	33
3.5	Sample frame	33
3.6	Sampling unit	33
3.7	Selection criteria	34
	3.7.1 Inclusion criteria	34
	3.7.2 Exclusion criteria	34
3.8	Sampling and recruitment technique	34
	3.8.1 Sample size	34
	3.8.2 Sampling method	35
3.9	Study instrument	36
3.10	Components of the questionnaire	36
	3.10.1 Section A: socio-demography	36
	3.10.2 Section B: knowledge on malaria and ITNs use	36
	3.10.3 Section C: Attitude regarding Malaria and ITNs use	37
	3.10.4 Section D: perceived barriers to the use of ITNs and malaria	37
	3.10.5 Section E: Maternal factors	37
3.11	Quality control of study instrument	37
	3.11.1 Content validity	37
	3.11.2 Face validity	38
3.12	Internal consistency of the questionnaire	38
3.13	Ethical approval	38
3.14	Data collection	39
3.15	Data analysis	39
3.16	Study Variables	40
	3.16.1 Dependent variables	40
	3.16.2 Independent variables	40
3.17	Operational definition	40
<b>4</b>	<b>RESULTS</b>	<b>43</b>
4.1	Response rate	43
4.2	Test of Normality	43
4.3	Socio-Demographic Characteristics of the Respondents and Previous history of malaria/malaria-related pregnancy complications	43
4.4	Maternal factors	44
4.5	Respondents knowledge on ITNs use and Malaria	45
4.6	Level of Knowledge on ITNs use and Malaria among pregnant women	46
4.7	Respondents attitude on ITNs use and Malaria	47
4.8	Level of Attitude towards ITNs use and Malaria among pregnant women	49
4.9	Barriers regarding ITNs use among pregnant women	49



4.10	Association between Socio-Demography, Previous history of malaria/malaria-related pregnancy complications, Stages of pregnancy, Gravidity, Barriers and Knowledge Scores of the Respondents	50
4.11	Association between Socio-Demography, Previous history of malaria/malaria-related pregnancy complications, Stages of pregnancy, Gravidity, Parity, Barriers and Attitude Scores of the Respondents	52
4.12	Predictors of Knowledge	54
4.13	Predictors of Attitude	57
<b>5</b>	<b>DISCUSSION</b>	<b>60</b>
5.1	Introduction	60
5.2	Socio-Demographic Characteristics of the Respondents and Previous history of malaria/malaria-related pregnancy complications	60
5.3	Knowledge of pregnant women on insecticide treated nets (ITNs)	61
5.4	Factors Associated with Knowledge on ITNs use against malaria among pregnant women	62
5.5	Predictors of Knowledge on the use of insecticide treated nets among Umuahia North pregnant women	63
5.6	Attitude of pregnant women towards the use of insecticide treated nets	64
5.7	Factors Associated with Attitude of pregnant women towards the use of insecticide treated nets	64
5.8	Predictors of Attitude of use of insecticide treated nets among Umuahia North pregnant women	66
<b>6</b>	<b>SUMMARY, CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH</b>	<b>68</b>
6.1	Summary of the research	68
6.2	Conclusion	68
6.3	Strengths and Limitation of the Study	69
	6.3.1 Strength of the Study	69
	6.3.2 Limitations of the Study	69
6.4	Recommendations and Further Studies	69
	<b>REFERENCES</b>	<b>70</b>
	<b>APPENDICES</b>	<b>86</b>
	<b>BIODATA OF STUDENT</b>	<b>96</b>



## LIST OF TABLES

<b>Table</b>		<b>Page</b>
3.1	Variable used in sample size estimation	35
3.2	Internal consistency of the questionnaire	38
4.1	Socio-demographic characteristic of the respondents and previous history of malaria/malaria-related pregnancy complications	44
4.2	Respondents maternal factors	45
4.3	Respondents knowledge on ITNs use and malaria	46
4.4	Level of knowledge on ITNs use among pregnant women	46
4.5	Respondents attitude on ITNs use and malaria	48
4.6	Level of attitude on ITNs use among pregnant women	49
4.7	Barriers regarding the use of ITNs among pregnant women	50
4.8	Association between socio-demographic, previous history of malaria/malaria-related pregnancy complications, stages of pregnancy, gravidity, parity, barriers and knowledge scores on the respondents	51
4.9	Association between socio-demographic, previous history of malaria/malaria-related pregnancy complications, stages of pregnancy, gravidity, parity, barriers and attitude scores on the respondents	53
4.10	Simple logistic regression showing crude odd ratio (OR) of predictors of knowledge	55
4.11	Multiple logistic regression showing adjusted off ratio (OR) of predictors of knowledge	56
4.12	Simple logistic regression showing crude odd ratio (OR) of predictors of attitude	58
4.13	Multiple logistic regression showing adjusted odd (OR) of predictors of attitude	59

## LIST OF FIGURES

Figure		Page
2.1	Percentage distribution of Insecticide Treated nets in Nigeria	16
2.2	Map of Long-Lasting Insecticide Nets distribution coverage in Nigeria	25
2.3	Factors associated with knowledge and attitude of insecticide treated nets use among pregnant women in Umuahia North, Nigeria	31
3.1	Map of Umuahia North Abia State, Nigeria	33

## LIST OF ABBREVIATIONS

ACTS	Artemisinin-based Combination Therapies
AMNS	Any Mosquitoes Nets
ANC	Antenatal Care
DOT	Directly Observed Therapy
FMOH	Federal Ministry Of Health
GFATM	Global Fund To Fight Aids, Tuberculosis And Malaria
IRS	Residual-House Spray
IRS	Internal Revenue System
IUCN	International Union For Conservation Of Nature
IPTP	Intermittent Preventive Treatment Of Malaria In Pregnancy
IPT	Intermittent Presumptive Therapy
ITN	Insecticide Treated Nets
LLIN	Long-Lasting Insecticide Nets
NDHS	Nigeria Demographic And Health Survey
NGO	Non-Government Organization
NMCSP	National Malaria Control Strategies Plan
PAS	Protected Areas
PF	Plasmodium Falciparum
RBM	Roll Back Malaria
SMS	Short Message Service
SP	Sulphadoxine-Pyrimethamine
USAID	United States Agency For International Development
UNICEF	United Nations Children Fund
UN	United Nation
WHO	World Health Organization

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the study

Malaria is a transmittable disease that affects millions of people globally every year. It is a worldwide health issue that affect younger children especially mostly ones who are below five years of age and as well as pregnant women. However, those with low immunity are at risk of getting the disease. Malaria is caused by any of the human malaria parasites, examples include: *Plasmodium Falciparum*, *Plasmodium Malariae* and *Plasmodium Ovale*. The most common, dangerous, and dreaded malaria parasite is the *Plasmodium Falciparum* (WHO, 2006). *Plasmodium Falciparum* infections lead to a wide range of clinical diseases which include life threatening anemia and coma among children and also severe disease syndrome during pregnancy among first time pregnant women. Through the bite of female anopheles mosquitoes can transmit the disease (WHO, 2006).

Malaria endemic areas include Africa, Asia, Central and South America, Oceania, certain Caribbean Islands, Democratic Republic of the Congo, Burkina Faso, Mozambique, Ivory Coast, and Mali. Unpredictably, during the same period in sub-Saharan Africa, decrease in malaria morbidity and mortality patterns has been recorded (Eisele et al., 2009; Eisele et al., 2010; RBM, 2011; Komatsu et al., 2010), and illnesses associated with malaria in under-fives, such as episodes of fever, have reduced extensively (Lengeler, 2004). In Africa, approximately 174 million (representing 80.5%) of these cases and about 596,000 (90.1%) of these deaths have occurred, and 86% of the death weight is borne by children under 5 years of age. Six countries account for 60% (390,000) of the global problem of deaths which is caused by malaria.

In Africa, malaria is accountable for an annual loss of 35 million future life years from disability and prematurity. The malaria infection accounts for at least 1.3% reduction in Africa's financial growth yearly, with approximately US\$ 12 billion yearly losses both as direct and indirect cost of disease. The United Nations (UN) Inter-agency for Child Mortality in 2010 summarized the problem of malaria borne disease. The way of malaria transmission and disease differ decidedly between regions and even within individual countries. The results range from variations between malaria parasites and mosquito vectors.

Poverty and access to effective health care and prevention services are ecological conditions that affect malaria transmission. Socio-economic factors should be also considered. Malaria has been a fast growing health problem in Africa. Each year, more than 1 million people who die from malaria live in sub-Saharan Africa (Bryce et al., 2005). There are 60% of malaria cases worldwide, 75% of *Falciparum* malaria cases globally and more than 80% of malaria deaths that occur in Sub-Saharan Africa. In

common African countries, malaria will account for 25-35% of all outpatient visits, 20-45% of hospital admissions and 15-35% of hospital deaths that impose a bigger problem on previously delicate health-care systems (WHO, 2005). Africa having insufficient resources to bear the economic problem of the consequences and having to cope with the lack of proper infrastructure to successfully treat cases and been exposed to the most severe form of diseases which is mainly susceptible to malaria (WHO, 2006). In Sub-Saharan African, changes in the problem of malaria showed that, in the occurrence of malaria in Ibadan between the years 2000-2005 was on the increasing side (Wendy Prudhomme et al., 2010). They went a long way to provide nets to children and pregnant women through the maternal and child health clinics in 2004. Following a significant grant from Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), the massive distribution of free nets to all children younger than five years was organized in 2006. These measures have gone a long way to increase the use of Insecticide Treated Nets (ITNs) by children aged less than five years from 7.1% in 2004 to 67.3% in 2006 in selected regions. The aim to fight against pyrethroids by *Anopheles gambiae* and *Anopheles funestus* has been started in several African countries which include neighboring Burkina Faso (Yamamoto et al., 2009).

In Africa, the problem of malaria is worst but the prevention and treatment are reaching more to people globally, although it is too early to determine if these findings will have any influence on illness and death from the disease (World Health Organization 2005 report). For actual control of malaria, World Health Organization (WHO) endorsed fast diagnosis, concrete treatment and use of insecticide-treated bed nets. Insecticide-treated bed nets use has been shown to be the most cost-effective way of preventing malaria. Many studies which were conducted in East and West African countries stated the barriers that prevent pregnant women from using ITNs and Intermittent Presumptive Therapy (IPT) such as wrong perceptions, inequity in malaria treatment and low socio-economic status. (Aluko et al., 2012; Atieli et al., 2011; Auta, 2012; Baume & Arin, 2008; Belay & Deressa, 2008; Yassin, 2010). Previously, the use and ownership of protective commodities against malaria has been increased, (Public Health Epidemiology, 446 J.). In the year 2000, only a few household in most African countries owned nets, even fewer owned insecticide treated nets (ITNs). The reverse is the case now as a lot has changed concerning ownership of ITNs in many African countries. This great change can be endorsed to reduce the taxes and tariffs in many countries, such as in commercial market development, social marketing activities, demand creation and efforts to spread the most susceptible group of people with free or highly supported ITNs. From the above information, one will not be far from right if one starts a move to examine the assessment of the coverage and consistent use of ITNs in the prevention of malaria among pregnant women in some parts of the country. Malaria is the major public health problem in Nigeria.

### **1.1.1 Factors influencing the use of insecticide treated nets**

Several factors have been identified as contributing to its emergence and spread. These include environmental and socio-economic changes, deterioration of health care and food production systems, and the modification of microbial/vector adaptation (McMichael et al., 1998; Morse, 1995). In malaria endemic areas, factors such as poverty, poor socio-economic status, poor education, lack of enlightenment and poor



environmental sanitation have been attributed to availability of mosquito-friendly environment- conditions which allow for survival and proliferation of the vector and pathogenic parasite (McMichael et al., 1998). There is higher incidence among pregnant women and children under five years of age. Instead of many preventive interventions, incidence of malaria during pregnancy is still very high. More than 52% of pregnant women attending ante-natal care clinics are affected by malaria. Malaria during pregnancy has been reported to be associated with serious impacts on mothers, their fetus, and neonates in Nigeria. Anemia, spontaneous abortion, intrauterine growth retardation, stillbirth, premature and preterm labor, low birth-weight and maternal mortality often complicate the disease (NMCP, 2008).

Before the development of insecticide treated nets (ITNs) as a new technology in the mid-1980s, people in many countries were already using different types of nets, mainly to protect themselves against insects' bites and for other cultural reasons (MacCormack et al., 1989, Robert & Carnevale, 1991 & Aikins et al., 1994). It was only recently appreciated that a net treated with insecticide offers much greater protection against malaria; not only does the net act as a mechanical barrier to prevent mosquitoes come into contact and bite humans, but also the insecticide repels, inhibits, or kills any mosquitoes attracted to feed. By reducing the vector population, ITNs when used by the majority of the target population provides protection both to individuals sleeping under them and to the other community members who do not sleep under the nets. It can give protection of up to 90% and significantly reduces the incidence of malaria during pregnancy as well as its complications. The effect is so significant that the usage of ITNs is considered to be one of the most effective prevention measures for malaria (CDC, 2008 & Clifton, 2008). In addition to prevention of malaria when used by pregnant women, ITNs are also efficient in reducing maternal anaemia, placental infection, and low birth weight (Garner & Gulmezoglu, 2000).

Generally in Nigeria, the acceptance of ITNs and ownership of nets are low. Consistent use of these nets is very important in the prevention of malaria. The use of insecticide treated bed nets among exposed groups (such as children under-five years of age and pregnant women) and also the current strategy of the National Malaria Control Programme is always based on actual case management (Anto *et al.*, 2009). In spite of all these efforts, the rate of malaria infection increases by the day.

## 1.2 Problem statement

Malaria is a mosquito borne disease which, in humans, is caused by five protozoa: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, related sibling species of *Plasmodium ovale*, and *Plasmodium knowlesi*. *Plasmodium vivax* is the most cosmopolitan of the human malarias, reaching historical latitudinal extremes of 64° north and 32° south (Snow & Gilles, 2002). The public health burden posed by *P. vivax* is no longer regarded as benign, causing severe morbidity and death (Baird, 2013). Nevertheless, *plasmodium falciparum* remains the single most important threat to public health at a global scale, accounting for more than 90% of the world's malaria mortality.

Forty thousand years on, *Plasmodium falciparum* remains entrenched in Africa, largely as a result of optimal environmental conditions for the world's most efficient Anopheline mosquito vectors, amid sustained poverty. We remain unacceptably ignorant of the full extent of the public health burden posed by this parasite; however, it is clear that, over time, the mortality effects of *Plasmodium falciparum* have been significant, serving as a potent selective force on the human genome to confer red cell and hemoglobin genetic advantages against disease and death (Allison, 1954). It is reasonable to assume that Africa has contributed most to the global malaria burden for millennia.

There is evidence (Okiro et al., 2009; Roca-Feltrer et al., 2010; Snow & Marsh, 2002 & Noor et al., 2014) to suggest that despite a changing pathogenesis and age pattern of disease, the overall rate of severe, life-threatening disease in childhood remains stable for a large part of the transmission curve and only when conditions within the meso-endemic range are reached do the rates of disease begin to significantly decline. As transmission declines further, the risk of infection becomes more directly related to the chances of becoming sick and developing severe complications until a state is reached where infection risks and disease outcomes are both rare. Lacking functional immunity, the consequences of any new infection for an individual become increasingly severe. These unstable conditions become very susceptible to even the smallest of perturbations in climate, ecology, population movement, and intervention efficacy (drug and insecticide resistance) or coverage. It is also estimated that about half of the population of adults in Nigeria suffer from at least one incidence of malaria annually, that children who are under five years have as many as three or four incidences every year, and closely 110 million cases of malaria are clinically examined yearly; from the record, 60% of outpatients pay visits while 30% are being hospitalized (Komatsu, 2010). Statistics on malaria cases in 2007 was 45%; 45% was also recorded as malaria cases in 2008 while in 2009 it then increased to 47%. These findings show that there was no change in the malaria cases between the year 2007 and 2008 but in 2009, there was an increase in malaria cases which was about 2% (Runsewe-Abiodun et al., 2012).

In malaria transmission areas, pregnant women in particular primigravidae are known to be susceptible to malaria and to have higher prevalence and densities of parasitaemia than are non-pregnant women from the same population (Desai et al., 2007). The size of the excess risk varies with the age of the pregnant woman, reflecting cumulative exposure to malaria over a lifetime, and with parity, as a result of pregnancy specific immunity acquired after exposure to malaria in previous pregnancies. The consequences of malaria infection during pregnancy will depend on maternal malaria immune status; however, infections are associated with maternal anaemia and fetal growth retardation, and can result in acute illness, pregnancy loss or preterm delivery, and even maternal mortality.

Currently in Nigeria, malaria Parasitaemia increased greatly among pregnant women in the geographic regions. Hospital-based prevalence percentages range from 5% in the north-western region which was reported by Isah et al (2011) and cited by Jayleen et al (2015), while a study by Uneke et al (2007) reported that there was 17% of the



disease in the south-western region as was cited by Jayleen et al (2015). The percentage was 95 in the south-eastern region where the study was carried out. This is to show that malaria is prevalent among pregnant women at the study location.

An estimated 75 000–200 000 infant deaths annually are associated with malaria infection during pregnancy (Steketee *et al.* 2001). In areas of low or unstable malaria transmission, the risk of developing severe malaria is very high due to little or no immunity to the disease (Menendez 1995). In these areas, malaria significantly contributes to the direct cause of maternal mortality or an indirect malaria-induced anaemia. Spontaneous abortion, neonatal death and low birth weight are the major adverse outcomes of malaria infection during pregnancy in these areas. Effective tools to prevent and control malaria during pregnancy have been a challenge (Steketee *et al.* 1996b).

Current global initiatives to control malaria include a combination of preventive and curative measures such as vector control, use of insecticide treated bed nets, mosquito repellants, intermittent preventive treatment (IPT), Sulfaoxune-pyrimethamine (SP), chemoprophylaxis, and effective case management (Bates & Herrington 2007). Insecticide treated nets are an effective and cost effective means of preventing malaria.

During the last decade, intermittent preventive treatment (IPT) of malaria infection with sulfadoxine–pyrimethamine (SP) during pregnancy has increasingly been used in sub-Saharan Africa (SSA), and is currently recommended for all pregnant women in areas of stable malaria transmission (WHO 2004). Consequently, many countries in sub-Saharan Africa (SSA) have progressively scaled up IPT implementation (Hill & Kazembe 2006) towards 60% of the Roll Back Malaria (RBM) targets by 2005 (WHO 2000).

However, the use of IPT during pregnancy in areas of unstable or seasonal malaria transmission has not been recommended (WHO 2004) and Ethiopia has not adopted the use of this intervention for the prevention of malaria among pregnant women (Newman *et al.* 2003). Moreover, resistance to sulfadoxine–pyrimethamine (SP) in many countries in sub-Saharan Africa (SSA) and its replacement with the more expensive artemisinin-based combination therapies has posed a major threat to IPT implementation for the prevention and control of malaria during pregnancy (WHO 2001 & Mutabingwa, 2005). Therefore, one of the most promising tools for malaria prevention and control during pregnancy is the use of insecticide treated nets (ITNs), which reduced the risk of malaria infection, maternal anaemia and low birth weight in many community-randomized trials (Dolan *et al.* 1993; D'Alessandro *et al.*, 1996; Ter Kuile *et al.*, 2003).

Previous studies also show that knowledge and awareness of the Insecticide Treated Nets (ITNs) in the western part of Nigeria are still low (18%) among pregnant women Globally Harmonized System, 2009 and also, a study conducted by Noland G.S *et al.*, (2014) stated that the number of nets per household was significantly low in Abia State; the household ownership of at least one bed net was 10.1% in Abia State. World

Health Organization and its subsidiary organization placed a prominence on the use of Insecticide Treated Nets (ITNs) and also called for a detail to determine the awareness and practices of use of the Insecticide Treated Nets (ITNs) in Abia state. In this District (Umuahia North), information which was gathered from the Region Health Directorate indicates that there has not been a study to determine the knowledge, awareness and practices of use of Insecticide Treated Nets (ITNs). Therefore, there is a need for a study in this area to obtain accurate and reliable baseline data to provide guidelines and awareness on Insecticide Treated Nets (ITNs) and its use among pregnant women in the region. If this is done, it will go a long way in reducing malaria infections among people in the district especially pregnant women.

### **1.3 Significance of the study**

This study could serve as additional information on the knowledge, attitude and practices of use Insecticide Treated Nets (ITNs) among pregnant women in Nigeria. Information gathered from the Umuahia North District of Abia State Health Directorate shows that there is no known study conducted on the knowledge, attitude and practices of use Insecticide Treated Nets (ITNs) among pregnant women in the Region.

The findings and recommendations of this study could inform policy makers at the district, regional and national levels in making pragmatic policies as far as malaria prevention and control programmes are concerned. The findings and recommendations of the study could also guide the Umuahia North Region Health Directorate to plan and implement effective ITN programmes to help increase Insecticide Treated Nets (ITNs) awareness and its practice and use in the region. Raising public awareness of Insecticide Treated Nets (ITNs) for malaria prevention intervention in Umuahia region is necessary to increase uptake and utilization of Insecticide Treated Nets (ITNs) and to reduce malaria among pregnant women.

The findings of this study could be also useful in reviewing the national malaria strategic plan to incorporate targeted reproductive women's education for malaria control in Umuahia. Education to help pregnant women has a positive influence on awareness and practice and use of insecticide treated nets in one way or another. In terms of programming, efforts are needed to expand community level distribution campaigns to intensify appropriate behavior change intervention that highlight the effectiveness of Insecticide Treated Nets (ITNs) in malaria prevention as the distribution of insecticide treated nets is still processing, so that the proportion of pregnant women using the insecticide treated nets will increase. Findings from this study could serve as a baseline for further intervention studies.

## **1.4 Research questions**

- i. What are the socio-demographic characteristics among pregnant women in Umuahia North Nigeria?
- ii. What is the level of knowledge and attitude on insecticide treated nets among pregnant women in Umuahia North Nigeria?
- iii. What is the prevalence of history of malaria complication among pregnant women in Umuahia North Nigeria?
- iv. What are the barriers to the use of insecticide treated nets among pregnant women in Umuahia North, Nigeria?
- v. What is the association between socio-demographic factors and knowledge, and attitude of insecticide treated nets among pregnant women in Umuahia North Nigeria?
- vi. What is the association between barriers, stages of pregnancy, gravidity, parity and knowledge and attitude of insecticide treated nets among pregnant women in Umuahia North Nigeria?
- vii. What are the predictors of knowledge and attitude of use of ITNs among pregnant women in Umuahia North Nigeria?

## **1.5 Research objectives:**

### **1.5.1 General objective:**

This study was aimed at determining the knowledge and attitude of insecticide treated nets use in malaria prevention and its associated factors among pregnant women in Umuahia North, Nigeria.

### **1.5.2 Specific objectives:**

- a. To determine the distribution of the respondents according to;
  - i. Socio-demographic characteristics (age, ethnicity, marital status, place of residence, monthly income and level of education)
  - ii. Levels of knowledge
  - iii. Levels of attitude
  - iv. Past history of malaria related complication
- b. To determine the associations between knowledge towards the use of insecticide treated nets among pregnant women and;
  - i. Socio-demographic characteristics (age, ethnicity, marital status, place of residence, monthly income and level of education)
  - ii. Perceived barriers
  - iii. Parity
  - iv. Gravidity
  - v. Stages of pregnancy

- c. To determine the predicting factors associated with the knowledge and attitude towards the use of insecticide treated nets (ITNs) among pregnant women in Umuahia North, Nigeria.

#### **1.6 Research hypothesis:**

- i. There is a significant association between socio-demographic factors and knowledge and attitude of insecticide treated nets among pregnant women in Umuahia North.
- ii. There is a significant association between previous history of malaria/malaria-related pregnancy complications and knowledge and attitude of insecticide treated nets among pregnant women in Umuahia North.
- iii. There is a significant association between perceived barriers, stages of pregnancy, gravidity, parity and knowledge and attitude of insecticide treated nets among pregnant women in Umuahia North.

## REFERENCES

- Abuja, N. (2008). National Population Commission and ICF Macro; 2009. National Population Commission (NPC) [Nigeria] and ICF Macro. *Nigeria Demographic and Health Survey*.
- Adefioye, O. A., Adeyeba, O. A., Hassan, W. O., & Oyeniran, O. A. (2007). Prevalence of malaria parasite infection among pregnant women in Osogbo, Southwest, Nigeria. *American-Eurasian Journal of Scientific Research*, 2(1), 43-45.
- Afolabi, B. M., Sofola, O. T., Fatunmbi, B. S., Komakech, W., Okoh, F., Saliu, O., & Jalingo, I. (2009). Household possession, use and non-use of treated or untreated mosquito nets in two ecologically diverse regions of Nigeria–Niger Delta and Sahel Savannah. *Malaria journal*, 8(1), 1.
- Afolabi, B. (1996). Knowledge, attitude and practice of malaria in an isolated community on the Atlantic coast of Lagos. *Malaria Infect Dis Afr*, 4, 6-13.
- Aikins, M. K., Pickering, H., Alonso, P. L., d'Alessandro, U., Lindsay, S. W., Todd, J., & Greenwood, B. M. (1993). A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa 4. Perceptions of the causes of malaria and of its treatment and prevention in the study area. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 87 (Supplement 2), 25-30.
- Ajiboye, J.K.T. (2010) Data/Information for Behavioral Change Communication Decision Making. In Nigeria Behavioural Change Communication (BCC) Workshop; 21–24.
- Akinleye, S. O., Falade, C. O., & Ajayi, I. O. (2009). Knowledge and utilization of intermittent preventive treatment for malaria among pregnant women attending antenatal clinics in primary health care centers in rural southwest, Nigeria: a cross-sectional study. *BMC pregnancy and childbirth*, 9(1), 1.
- Akinboro, R. A., Ojuronbe, O., Akindele, A. A., Adefioye, O. A., Bolaji, O. S., Olaniran, O., & Adeyeba, O. A. (2010). Plasmodium falciparum parasitemia in pregnancy in relation to maternal anaemia. *African Journal of Clinical and Experimental Microbiology*, 11(3).
- Alonso, P. L., Lindsay, S. W., Schellenberg, J. A., Keita, K., Gomez, P., Shenton, F. C., ... & Greenwood, B. M. (1993). A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa: 6. The impact of the interventions on mortality and morbidity from malaria. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 87, 37-44.



- 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 and childbirth*, 12(1), 1.
- Ambrose, E. E., Mazigo, H. D., Heukelbach, J., Gabone, O., & Mwizamholya, D. L. (2011). Knowledge, attitudes and practices regarding malaria and mosquito net use among women seeking antenatal care in Iringa, south-western Tanzania. *Tanzania Journal of Health Research*, 13(3), 188-195.
- Amajoh, C. (2011). National LLIN campaign in Nigeria. <http://www.allianceformalariaprevention.com/resources/Nigeria%20country%20update%20-%20Chioma%20Amojoh.pdf>.
- Ankomah, A., Adebayo, S. B., Arogundade, E. D., Anyanti, J., Nwokolo, E., Ladipo, O., & Meremikwu, M. M. (2012). Determinants of insecticide-treated net ownership and utilization among pregnant women in Nigeria. *BMC Public Health*, 12(1), 1.
- Atieli, H. E., Zhou, G., Afrane, Y., Lee, M. C., Mwanzo, I., Githeko, A. K., & Yan, G. (2011). Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. *Parasites & vectors*, 4(1), 1.
- Babalola, M. (2013). An Examination of the Association between Malaria Knowledge and Bed Net Use of Pregnant Women Receiving Antenatal Care at Federal Medical Centre, Abeokuta, Nigeria.
- Baird, J. K. (2013). Evidence and implications of mortality associated with acute *Plasmodium vivax* malaria. *Clinical microbiology reviews*, 26(1), 36-57.
- Baume, C. A., & Marin, M. C. (2007). Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia: are nets being used? Who in the household uses them? *The American journal of tropical medicine and hygiene*, 77(5), 963-971.
- Beer, N., Ali, A. S., de Savigny, D., Abdul-wahiyd, H., Ramsan, M., Abass, A. K., & Källander, K. (2010). System effectiveness of a targeted free mass distribution of long lasting insecticidal nets in Zanzibar, *Tanzania. Malaria journal*, 9(1), 1.
- Belay, M., & Deressa, W. (2008). Use of insecticide treated nets by pregnant women and associated factors in a pre-dominantly rural population in northern Ethiopia. *Tropical Medicine & International Health*, 13(10), 1303-1313.
- Binka, F. M., & Adongo, P. (1997). Acceptability and use of insecticide impregnated bednets in northern Ghana. *Tropical Medicine and International Health*, 2(5), 499-507.
- Binka, F. N., Kubaje, A., Adjuik, M., Williams, L. A., Lengeler, C., Maude, G. H., & Smith, P. G. (1996). Impact of permethrin impregnated bednets on child mortality in Kassena-Nankana District, Ghana: a randomized controlled trial. *Tropical Medicine & International Health*, 1(2), 147-154.

- Black, R. E., Cousens, S., Johnson, H. L., Lawn, J. E., Rudan, I., Bassani, D. G., ... & Eisele, T. (2010). Global, regional, and national causes of child mortality in 2008: a systematic analysis. *The Lancet*, 375(9730), 1969-1987.
- Bruce-Chwatt, L. J. (1988). History of malaria from prehistory to eradication. *Malaria: principles and practice of malariology*, 1, 1-59.
- Bryce, J., Boschi-Pinto, C., Shibuya, K., Black, R. E., & WHO Child Health Epidemiology Reference Group. (2005). WHO estimates of the causes of death in children. *The Lancet*, 365(9465), 1147-1152.
- Chape, S., Spalding, M., & Jenkins, M. (2008). *The world's protected areas: status, values and prospects in the 21st century*. Univ de Castilla La Mancha.
- Cheng, H., Yang, W., Kang, W., & Liu, C. (1995). Large-scale spraying of bednets to control mosquito vectors and malaria in Sichuan, China. *Bulletin of the World Health Organization*, 73(3), 321.
- Curtis, C., Maxwell, C., Lemnge, M., Kilama, W. L., Steketee, R. W., Hawley, W. A., & Ochola, S. (2003). Scaling-up coverage with insecticide-treated nets against malaria in Africa: who should pay?. *The Lancet infectious diseases*, 3(5), 304- 307.
- Chukwuocha, U. M., Dozie, I. N. S., Onwuliri, C. O. E., Ukaga, C. N., Nwoke, B. E. B., Nwankwo, B. O., & Iwuala, C. C. (2010). Perceptions on the use of insecticide treated nets in parts of the Imo River Basin, Nigeria: implications for preventing malaria in pregnancy. *African journal of reproductive health*, 14(1).
- Clarke, S. E., Bøgh, C., Brown, R. C., Pinder, M., Walraven, G. E., & Lindsay, S. W. (2001). Do untreated bednets protect against malaria?. *Transactions of the royal society of tropical medicine and hygiene*, 95(5), 457-462.
- Coulibaly, D., Travassos, M. A., Kone, A. K., Tolo, Y., Laurens, M. B., Traore, K., ... & Sissoko, M. (2014). Stable malaria incidence despite scaling up control strategies in a malaria vaccine-testing site in Mali. *Malaria journal*, 13(1), 374.
- Curtis, C. F., & Mnzava, A. E. (2000). Comparison of house spraying and insecticide-treated nets for malaria control. *Bulletin of the World Health Organization*, 78(12), 1389-1400.
- Curtis, C. F., Maxwell, C. A., Finch, R. J., & Njunwa, K. J. (1998). A comparison of use of a pyrethroid either for house spraying or for bednet treatment against malaria vectors. *Tropical Medicine & International Health*, 3(8), 619-631.
- Dellicour, S., Tatem, A. J., Guerra, C. A., Snow, R. W., & ter Kuile, F. O. (2010). Quantifying the number of pregnancies at risk of malaria in 2007: a demographic study. *PLoS Med*, 7(1), e1000221.



- Desai, M., ter Kuile, F. O., Nosten, F., McGready, R., Asamoah, K., Brabin, B., & Newman, R. D. (2007). Epidemiology and burden of malaria in pregnancy. *The Lancet infectious diseases*, 7(2), 93-104.
- Dhingra, N., Jha, P., Sharma, V. P., Cohen, A. A., Jotkar, R. M., Rodriguez, P. S., ... & Million Death Study Collaborators. (2010). Adult and child malaria mortality in India: a nationally representative mortality survey. *The Lancet*, 376(9754), 1768-1774.
- Dicko, A., Mantel, C., Thera, M. A., Doumbia, S., Diallo, M., Diakité, M., ... & Doumbo, O. K. (2003). Risk factors for malaria infection and anemia for pregnant women in the Sahel area of Bandiagara, Mali. *Acta tropica*, 89(1), 17-23.
- Dike, N., Onwujekwe, O., Ojukwu, J., Ikeme, A., Uzochukwu, B., & Shu, E. (2006). Influence of education and knowledge on perceptions and practices to control malaria in Southeast Nigeria. *Social science & medicine*, 63(1), 103-106..
- Enato, E. F., Okhamafe, A. O., & Okpere, E. E. (2007). A survey of knowledge, attitude and practice of malaria management among pregnant women from two health care facilities in Nigeria. *Acta obstetrica et gynecologica Scandinavica*, 86(1), 33-36.
- Eisele, T. P., Keating, J., Littrell, M., Larsen, D., & Macintyre, K. (2009). Assessment of insecticide-treated bednet use among children and pregnant women across 15 countries using standardized national surveys. *The American journal of tropical medicine and hygiene*, 80(2), 209-214.
- Eisele, T. P., Larsen, D., & Steketee, R. W. (2010). Protective efficacy of interventions for preventing malaria mortality in children in Plasmodium falciparum endemic areas. *International journal of epidemiology*, 39(suppl 1), i88-i101..
- Erhun, W. O., Agbani, E. O., & Adesanya, S. O. (2005). Malaria prevention: Knowledge, attitude and practice in a southwestern Nigerian community. *African Journal of Biomedical Research*, 8(1), 25-29..
- Ernst, K. C., Lindblade, K. A., Koech, D., Sumba, P. O., Kuwuor, D. O., John, C. C., & Wilson, M. L. (2009). Environmental, socio-demographic and behavioural determinants of malaria risk in the western Kenyan highlands: a case-control study. *Tropical Medicine & International Health*, 14(10), 1258-1265.
- Eze, U. I., Eferakeya, A. E., Oparah, A. C., & Enato, E. F. (2007). Assessment of prescription profile of pregnant women visiting antenatal clinics. *Pharmacy Practice (Internet)*, 5(3), 135-139.
- Ezeigbo, O. R., Osuagwu, M. C., Ibegbulem, Z. O., & Agomoh, N. G. (2015). Evaluation of the Knowledge, Attitude and Practice of the Use of Insecticide-Treated Nets (ITNs) in Aba, Nigeria. *British Journal of Medicine and Medical Research*, 5(1), 57.

- Ezire, O., Adebayo, S. B., Idogho, O., Bamgboye, E. A., & Nwokolo, E. (2015). Determinants of use of insecticide-treated nets among pregnant women in Nigeria. *International journal of women's health*, 7, 655.
- Falade, C. O., Dada-Adegbola, H. O., Ogunkunle, O. O., Oguike, M. C., Nash, O., & Ademowo, O. G. (2014). Evaluation of the comparative efficacy and safety of artemether-lumefantrine, artesunate-amodiaquine and artesunate-amodiaquine- chlorpheniramine (Artemoclo™) for the treatment of acute uncomplicated malaria in Nigerian children. *Medical Principles and Practice*, 23(3), 204-211.
- Fana, S. A., Bunza, M. D. A., Anka, S. A., Imam, A. U., & Nataala, S. U. (2015). Prevalence and risk factors associated with malaria infection among pregnant women in a semi-urban community of north-western Nigeria. *Infectious diseases of poverty*, 4(1), 1.
- Federal Ministry of Health and National Malaria Control Programme (2004): National anti-malaria treatment guidelines. Abuja: FMOH and NMCP.
- Federal Ministry of Health, National Malaria Control Programme Abuja, Nigeria (2008): Strategic Plan A Road Map for Malaria Control in Nigeria.
- Federal Ministry of Health. Malaria situation analysis document. Federal Ministry of Health, Nigeria. 2000, p 14.
- Federal Ministry of Health and National Malaria Control Programme (2005): National guidelines and strategies for malaria prevention and control during pregnancy. Abuja: FMOH and NMCP.
- Federal Ministry of Health (2014): Nigeria National Malaria Control Strategic Plan. Abuja: Federal Ministry of Health.
- Fleming, A. F. (1989). Tropical obstetrics and gynaecology. 1. Anaemia in pregnancy in tropical Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 83(4), 441-448.
- Fuge, T. G., Ayanto, S. Y., & Gurmamo, F. L. (2015). Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashogo District, Southern Ethiopia. *Malaria journal*, 14(1), 1.
- Fumiya, S., Chongsivatwong, V., Saburo, U., & Thammapalo, S. (2001). The feasibility of a bed net impregnation program to enhance control of Malayan filariasis along a swamp forest in southern Thailand.
- Gamble, C. L., Ekwaru, J. P., & ter Kuile, F. O. (2006). Insecticide - treated nets for preventing malaria in pregnancy. *The Cochrane Library*.

- Gething, P. W., Patil, A. P., Smith, D. L., Guerra, C. A., Elyazar, I. R., Johnston, G. L., & Hay, S. I. (2011). A new world malaria map: Plasmodium falciparum endemicity in 2010. *Malaria journal*, 10(1), 1.
- Gosoni, L., Msengwa, A., Lengeler, C., & Vounatsou, P. (2012). Spatially explicit burden estimates of malaria in Tanzania: Bayesian geostatistical modeling of the malaria indicator survey data. *PLoS One*, 7(5), e23966.
- Goodman, C. A., Mnzava, A. E. P., Dlamini, S. S., Sharp, B. L., Mthembu, D. J., & Gumede, J. K. (2001). Comparison of the cost and cost-effectiveness of insecticide-treated bednets and residual house-spraying in KwaZulu-Natal, South Africa. *Tropical Medicine & International Health*, 6(4), 280-295.
- Graves, P. M., Ngondi, J. M., Hwang, J., Getachew, A., Gebre, T., Mosher, A. W., & Reithinger, R. (2011). Factors associated with mosquito net use by individuals in households owning nets in Ethiopia. *Malaria journal*, 10(1), 1.
- Greenwood, B. M., Bradley, A. K., Greenwood, A. M., Byass, P., Jammeh, K., Marsh, K., & Hayes, R. (1987). Mortality and morbidity from malaria among children in a rural area of The Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 81(3), 478-486.
- Griffin, J. T., Hollingsworth, T. D., Okell, L. C., Churcher, T. S., White, M., Hinsley, W., ... & Ghani, A. C. (2010). Reducing Plasmodium falciparum malaria transmission in Africa: a model-based evaluation of intervention strategies. *PLoS Med*, 7(8), e1000324.
- Hamel, M. J., Adazu, K., Obor, D., Sewe, M., Vulule, J., Williamson, J. M., ... & Laserson, K. F. (2011). A reversal in reductions of child mortality in western Kenya, 2003–2009. *The American journal of tropical medicine and hygiene*, 85(4), 597-605.
- Hansen, A. J., & DeFries, R. (2007). Ecological mechanisms linking protected areas to surrounding lands. *Ecological Applications*, 17(4), 974-988.
- Haque, U., Sunahara, T., Hashizume, M., Shields, T., Yamamoto, T., Haque, R., & Glass, G. E. (2011). Malaria prevalence, risk factors and spatial distribution in a hilly forest area of Bangladesh. *PLoS One*, 6(4), e18908.
- Hay, S. I., Okiro, E. A., Gething, P. W., Patil, A. P., Tatem, A. J., Guerra, C. A., & Snow, R. W. (2010). Estimating the global clinical burden of Plasmodium falciparum malaria in 2007. *PLoS Med*, 7(6), e1000290.
- Hermsen, C. C., De Vlas, S. J., Van Gemert, G. J. A., Telgt, D. S., Verhage, D. F., & Sauerwein, R. W. (2004). Testing vaccines in human experimental malaria: statistical analysis of parasitemia measured by a quantitative real-time polymerase chain reaction. *The American journal of tropical medicine and hygiene*, 71(2), 196-201.

- Isah, A. Y., Amanabo, M. A., & Ekele, B. A. (2011). Prevalence of malaria parasitemia amongst asymptomatic pregnant women attending a Nigerian teaching hospital. *Annals of African medicine*, 10(2).
- IUCN, & UNEP. (2014). the world database on protected areas (WDPA). Retrieved July 6, 2014, from: [www.protectedplanet.net](http://www.protectedplanet.net).
- Jagannathan, P., Muhindo, M. K., Kakuru, A., Arinaitwe, E., Greenhouse, B., Tappero, J., ... & Dorsey, G. (2012). Increasing incidence of malaria in children despite insecticide-treated bed nets and prompt anti-malarial therapy in Tororo, Uganda. *Malaria journal*, 11(1), 435.
- Kagu, M. B., Kawuwa, M. B., & Gadzama, G. B. (2007). Anaemia in pregnancy: a cross-sectional study of pregnant women in a Sahelian tertiary hospital in Northeastern Nigeria. *Journal of Obstetrics and Gynaecology*, 27(7), 676-679.
- Kalu, K. M., Obasi, N. A., Nduka, F. O., & Oko, M. O. (2012). Prevalence of malaria parasitaemia in Umuchieze and Uturu communities of Abia State, Nigeria. *Asian Journal of Epidemiology*, 5(3), 95.
- Kamolratanakul, P., Butraporn, P., Prasittisuk, M., Prasittisuk, C., & Indaratna, K. (2001). Cost-effectiveness and sustainability of lambda-cyhalothrin-treated mosquito nets in comparison to DDT spraying for malaria control in western Thailand. *The American journal of tropical medicine and hygiene*, 65(4), 279-284.
- Killeen, G. F., Smith, T. A., Ferguson, H. M., Mshinda, H., Abdulla, S., Lengeler, C., & Kachur, S. P. (2007). Preventing childhood malaria in Africa by protecting adults from mosquitoes with insecticide-treated nets. *PLoS Med*, 4(7), e229.
- Kilian, A., Opawale, A., Zegers, de Beyl, C., Baba, E., Boulay, M. (2010) Evaluation of the integrated LLIN distribution and child health campaign.
- Komatsu, R., Korenromp, E. L., Low-Beer, D., Watt, C., Dye, C., Steketee, R. W., & Schwartländer, B. (2010). Lives saved by Global Fund-supported HIV/AIDS, tuberculosis and malaria programs: estimation approach and results between 2003 and end-2007. *BMC infectious diseases*, 10(1), 1.
- Krefis, A. C., Schwarz, N. G., Nkrumah, B., Acquah, S., Loag, W., Oldeland, J., ... & May, J. (2011). Spatial analysis of land cover determinants of malaria incidence in the Ashanti Region, Ghana. *PloS one*, 6(3), e17905.
- Lagerberg, R. E. (2008). Malaria in pregnancy: a literature review. *Journal of Midwifery & Women's Health*, 53(3), 209-215.
- Laurens, M. B., Duncan, C. J., Epstein, J. E., Hill, A. V., Komisar, J. L., Lyke, K. E., ... & Spring, M. D. (2012). A consultation on the optimization of controlled human malaria infection by mosquito bite for evaluation of candidate malaria vaccines. *Vaccine*, 30(36), 5302-5304.



- Lengeler, C. (2004). Insecticide-treated nets for malaria control: real gains. *Bulletin of the World Health Organization*, 82(2), 84-84.
- Lim, S. S., Fullman, N., Stokes, A., Ravishankar, N., Masiye, F., Murray, C. J., & Gakidou, E. (2011). Net benefits: a multicountry analysis of observational data examining associations between insecticide-treated mosquito nets and health outcomes. *Plos med*, 8(9), e1001091.
- Looareesuwan, S., White, N. J., Karbwang, J., Turner, R. C., Phillips, R. E., Kietinun, S., ... & Warrell, D. A. (1985). Quinine and severe falciparum malaria in late pregnancy. *The Lancet*, 326(8445), 4-8.
- Looareesuwan, S., Merry, A. H., Phillips, R. E., Pleehachinda, R., Wattanagoon, Y., Ho, M., ... & Weatherall, D. J. (1987). Reduced erythrocyte survival following clearance of malarial parasitaemia in Thai patients. *British journal of haematology*, 67(4), 473-478.
- Mabaso, M. L., Sharp, B., & Lengeler, C. (2004). Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying. *Tropical Medicine & International Health*, 9(8), 846-856.
- Macintyre, K., Keating, J., Okbaldt, Y. B., Zerom, M., Sosler, S., Ghebremeskel, T., & Eisele, T. P. (2006). Rolling out insecticide treated nets in Eritrea: examining the determinants of possession and use in malarious zones during the rainy season. *Tropical Medicine & International Health*, 11(6), 824-833.
- Mackinnon, M. J., Mwangi, T. W., Snow, R. W., Marsh, K., & Williams, T. N. (2005). Heritability of malaria in Africa. *PLoS Med*, 2(12), e340.
- Malaria, R. B. (2008). The global malaria action plan. The Roll Back Malaria Partnership; 2008.
- Matovu, F., Goodman, C., Wiseman, V., & Mwengee, W. (2009). How equitable is bed net ownership and utilisation in Tanzania? A practical application of the principles of horizontal and vertical equity. *Malaria Journal*, 8(1), 1.
- Mazigo, H. D., Obasy, E., Mauka, W., Manyiri, P., Zinga, M., Kweka, E. J., & Heukelbach, J. (2010). Knowledge, attitudes, and practices about malaria and its control in rural northwest Tanzania. *Malaria Research and Treatment*, 2010.
- Mbanugo, J. I., Ukibe, N. R., & Ikeakor, L. C. (2013). Level of awareness and use of insecticide treated bed nets among pregnant women attending antenatal clinics in Anambra State, South Eastern Nigeria. *Journal of public health and epidemiology*, 5(9), 391-396.
- McGready, R., Lee, S. J., Wiladphaingern, J., Ashley, E. A., Rijken, M. J., Boel, M., ... & Singhasivanon, P. (2012). Adverse effects of falciparum and vivax malaria and the safety of antimalarial treatment in early pregnancy: a population-based study. *The Lancet infectious diseases*, 12(5), 388-396.

- Mengistu, G., Diro, E., & Kassu, A. (2006). Outcomes of pregnancy in severe malaria with emphasis on neurological manifestations in Gondar Hospital northwest Ethiopia. *Ethiopian medical journal*, 44(4), 321-330.
- Mens, P. F., Scheelbeek, P. F., Al Atabbi, H., & Enato, E. F. (2011). Peer education: The effects on knowledge of pregnancy related malaria and preventive practices in women of reproductive age in Edo State, Nigeria. *BMC public health*, 11 (1), 1.
- Mermin, J., Ekwaru, J. P., Liechty, C. A., Were, W., Downing, R., Ransom, R., ... & Solberg, P. (2006). Effect of co-trimoxazole prophylaxis, antiretroviral therapy, and insecticide-treated bednets on the frequency of malaria in HIV-1-infected adults in Uganda: a prospective cohort study. *The Lancet*, 367(9518), 1256-1261.
- Miller, R. L., Ikram, S., Armelagos, G. J., Walker, R., Harer, W. B., Shiff, C. J., ... & Maret, S. M. (1994). Diagnosis of Plasmodium falciparum infections in mummies using the rapid manual ParaSight™-F test. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 88(1), 31-32.
- Miller, T. R., Minter, B. A., & Malan, L. C. (2011). The new conservation debate: the view from practical ethics. *Biological Conservation*, 144(3), 948-957.
- Mockenhaupt, F. P., Rong, B., Günther, M., Beck, S., Till, H., Kohne, E., & Bienzle, U. (2000). Anaemia in pregnant Ghanaian women: importance of malaria, iron deficiency, and haemoglobinopathies. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 94(5), 477-483.
- Mubyazi, G., Bloch, P., Kamugisha, M., Kitua, A., & Ijumba, J. (2005). Intermittent preventive treatment of malaria during pregnancy: a qualitative study of knowledge, attitudes and practices of district health managers, antenatal care staff and pregnant women in Korogwe District, North-Eastern Tanzania. *Malaria journal*, 4(1), 1.
- Mudenda, S. S., Kamocha, S., Mswia, R., Conkling, M., Sikanyiti, P., Potter, D., ... & Marx, M. A. (2011). Feasibility of using a World Health Organization-standard methodology for Sample Vital Registration with Verbal Autopsy (SAVVY) to report leading causes of death in Zambia: results of a pilot in four provinces, 2010. *Population health metrics*, 9(1), 40.
- Munga, S., Yakob, L., Mushinzimana, E., Zhou, G., Ouna, T., Minakawa, N., & Yan, G. (2009). Land use and land cover changes and spatiotemporal dynamics of anopheline larval habitats during a four-year period in a highland community of Africa. *The American journal of tropical medicine and hygiene*, 81(6), 1079-1084.
- Murray, C. J., Rosenfeld, L. C., Lim, S. S., Andrews, K. G., Foreman, K. J., Haring, D., ... & Lopez, A. D. (2012). Global malaria mortality between 1980 and 2010: a systematic analysis. *The Lancet*, 379(9814), 413-431.

- Namibia MoHSS. Namibia Malaria Indicator Survey. Windhoek, MoHSS-NDVCP DSP. 2009.
- National Population Commission. National Malaria Control Programme, ICF International (2012) Nigeria Malaria Indicator Survey 2010. *Abuja, Nigeria: NPC, NMCP and ICF International*. doi, 10.
- National Population Commission and the National Malaria Control Programme: (2010). *Nigeria Malaria Indicator Survey (MIS): Preliminary results*. Abuja: NPC and NMCP.
- National Population Commission, ICF International (2012.). *Nigeria National Malaria Indicator Survey*. Abuja: ICF Macro.
- National Population Commission. *Nigeria Demographic Health Survey*. Abuja: Macro; 2008.
- National Population Commission. *Nigeria National Demographic Survey*. Abuja: Macro; 2013.
- Negash, K., Jima, D., Nafo-Traore, F., Mukelabai, K., Banda, J., Medhin, A., & Collins, A. (2004). Ethiopia roll back malaria consultative mission: essential actions to support the attainment of the Abuja targets. *Ethiopia RBM Country Consultative Mission Final Report*, 39pp.
- Netmark (2004): A regional partnership for sustainable malaria prevention 2004 Survey on Insecticide-Treated Nets (ITNs) in Ghana.
- Nevill, C. G., Some, E. S., Mung'Ala, V. O., Muterni, W., New, L., Marsh, K., ... & Snow, R. W. (1996). Insecticide - treated bednets reduce mortality and severe morbidity from malaria among children on the Kenyan coast. *Tropical Medicine & International Health*, 1(2), 139-146.
- Nigeria, F. Y. (2011). Malaria Operational Plan.
- Njoroge, F. K., Kimani, V. M., Ongore, D., & Akwale, W. S. (2009). Use of insecticide treated bed nets among pregnant women in Kilifi District, Kenya. *East African medical journal*, 86(7).
- Noland, G.S., Patricia, M. G., Adamu, S., Abel, E., Emmanuel, E., Amy, E. P., Joseph, A., Iheanyichi, O., Oji, U. O., Mary, U., Alphonsus, K., James, D., Jeremiah, N., Masayo, O., Elizabeth, C., Josephine, O., Solomon, E., Chinyere, O., Renn, M., Olusola, O., Emmanuel, M., Paul, M. E and Frank, O R (2014): Malaria prevalence, anemia and baseline intervention coverage prior to mass net distributions in Abia and Plateau States, Nigeria; *BMC Infectious Diseases*, 14:168.



- Noor, A. M., Omumbo, J. A., Amin, A. A., Zurovac, D., & Snow, R. W. (2006). Wealth, mother's education and physical access as determinants of retail sector net use in rural Kenya. *Malaria Journal*, 5(1), 1.
- Noor, A. M., Kinyoki, D. K., Mundia, C. W., Kabaria, C. W., Mutua, J. W., Alegana, V. A., ... & Snow, R. W. (2014). The changing risk of Plasmodium falciparum malaria infection in Africa: 2000–10: a spatial and temporal analysis of transmission intensity. *The Lancet*, 383(9930), 1739-1747.
- Noor, A. M., Amin, A. A., Akhwale, W. S., & Snow, R. W. (2007). Increasing coverage and decreasing inequity in insecticide-treated bed net use among rural Kenyan children. *PLoS Med*, 4(8), e255.
- Nosten, F. T. E. R., Ter Kuile, F., Maelankirri, L., Decludt, B., & White, N. J. (1991). Malaria during pregnancy in an area of unstable endemicity. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 85(4), 424-429.
- Obol, J. H., Ononge, S., & Orach, C. G. (2013). Utilisation of insecticide treated nets among pregnant women in Gulu: a post conflict district in northern Uganda. *African health sciences*, 13(4), 962-969.
- Okiro, E. A., Al-Taiar, A., Reyburn, H., Idro, R., Berkley, J. A., & Snow, R. W. (2009). Age patterns of severe paediatric malaria and their relationship to Plasmodium falciparum transmission intensity. *Malaria journal*, 8(1), 4.
- Okiro, E. A., Bitira, D., Mbabazi, G., Mpimbaza, A., Alegana, V. A., Talisuna, A. O., & Snow, R. W. (2011). Increasing malaria hospital admissions in Uganda between 1999 and 2009. *BMC medicine*, 9(1), 37.
- Okrah, J., Traoré, C., Palé, A., Sommerfeld, J., & Müller, O. (2002). Community factors associated with malaria prevention by mosquito nets: an exploratory study in rural Burkina Faso. *Tropical Medicine & International Health*, 7(3), 240-248.
- Okwa, O. O. (2003). The status of malaria among pregnant women: a study in Lagos, Nigeria. *African journal of reproductive health*, 77-83.
- O'Meara, W. P., Mangeni, J. N., Steketee, R., & Greenwood, B. (2010). Changes in the burden of malaria in sub-Saharan Africa. *The Lancet infectious diseases*, 10(8), 545-555.
- Onwujekwe, O. C., Soremekun, R. O., Uzochukwu, B., Shu, E., & Onwujekwe, O. (2012). Patterns of case management and chemoprevention for malaria-in-pregnancy by public and private sector health providers in Enugu state, Nigeria. *BMC research notes*, 5(1), 211.
- Oresanya, O. B., Hoshen, M., & Sofola, O. T. (2008). Utilization of insecticide-treated nets by under-five children in Nigeria: Assessing progress towards the Abuja targets. *Malaria Journal*, 7(1), 1.

- Osero, J. S. O., Otieno, M. F., & Orago, A. S. S. (2006). Mothers' knowledge on malaria and vector management strategies in Nyamira District, Kenya. *East African medical journal*, 83(9).
- Osondu, N. B., & Jerome, O. O. (2009). Effectiveness of insecticide-treated bednets (ITNs) in malaria prevention among children aged 6 months to 5 years in a rural community in Imo State, Nigeria. *Int J Trop Med*, 4(1), 41-49.
- Paaijmans, K. P., Read, A. F., & Thomas, M. B. (2009). Understanding the link between malaria risk and climate. *Proceedings of the National Academy of Sciences*, 106(33), 13844-13849.
- Patz, J. A., & Olson, S. H. (2006). Malaria risk and temperature: influences from global climate change and local land use practices. *Proceedings of the National Academy of Sciences*, 103(15), 5635-5636.
- Perlmann, P., & Troye-Blomberg, M. (2002). Malaria and the immune system in humans. In *Malaria Immunology* (Vol. 80, pp. 229-242). Karger Publishers.
- Pell, C., Straus, L., Andrew, E. V., Meñaca, A., & Pool, R. (2011). Social and cultural factors affecting uptake of interventions for malaria in pregnancy in Africa: a systematic review of the qualitative research. *PloS one*, 6(7), e22452.
- Phillips, R. E., Looareesuwan, S., Warrell, D. A., Lee, S. H., Karbwang, J., Warrell, M. J., ... & Weatherall, D. J. (1986). The importance of anaemia in cerebral and uncomplicated falciparum malaria: role of complications, dyserythropoiesis and iron sequestration. *QJM*, 58(3-4), 305-323.
- Plebanski, M., & Hill, A. V. (2000). The immunology of malaria infection. *Current opinion in immunology*, 12(4), 437-441.
- Pulford, J., Hetzel, M. W., Bryant, M., Siba, P. M., & Mueller, I. (2011). Reported reasons for not using a mosquito net when one is available: a review of the published literature. *Malaria journal*, 10(1), 1.
- Reyburn, H., Mbatia, R., Drakeley, C., Carneiro, I., Mwakasungula, E., Mwerinde, O., ... & Greenwood, B. M. (2004). Over diagnosis of malaria in patients with severe febrile illness in Tanzania: a prospective study. *Bmj*, 329(7476), 1212.
- Roca - Feltrer, A., Carneiro, I., & Armstrong Schellenberg, J. R. (2008). Estimates of the burden of malaria morbidity in Africa in children under the age of 5 years. *Tropical medicine & international health*, 13(6), 771-783.
- Roca-Feltrer, A., Kwizombe, C. J., Sanjoaquin, M. A., Sesay, S. S., Faragher, B., Harrison, J., ... & Chagomera, M. (2012). Lack of decline in childhood malaria, Malawi, 2001–2010. *Emerging infectious diseases*, 18(2), 272.
- Roca-Feltrer, A., Carneiro, I., Smith, L., Schellenberg, J. R. A., Greenwood, B., & Schellenberg, D. (2010). The age patterns of severe malaria syndromes in sub-

Saharan Africa across a range of transmission intensities and seasonality settings. *Malaria journal*, 9(1), 282.

Roestenberg, M., O'Hara, G. A., Duncan, C. J., Epstein, J. E., Edwards, N. J., Scholzen, A., ... & Sauerwein, R. W. (2012). Comparison of clinical and parasitological data from controlled human malaria infection trials. *PLoS One*, 7(6), e38434.

Roll Back Malaria: (2011): The global malaria action plan (GMAP). WHO2011:1-271.

Rosalind, E. H., Katherine, E. B., Kamini, N. M., David, L. S., Richard, E., Cibulskis, J., Kevin, B and Simon, I. H. (2016): Global Epidemiology of *Plasmodium vivax*. *The American Society of Tropical Medicine and Hygiene*, doi:10.4269/ajtmh.16-0141.

Runsewe-Abiodun, T. I., Iyaniwura, A. C., & Sotimehin, S. A. (2012). Awareness and knowledge about insecticide treated nets (ITNs) amongst pregnant mothers in Ogun State, Western-Nigeria: a descriptive cross-sectional study. *Educ Res J*, 2(5 Suppl), 138-45.

Runsewe-Abiodun, T. I., & Runsewe, O. (2013). Attitude and practice of pregnant women to use of insecticide treated nets in South-West Nigeria. *Afr J Pregnancy Childbirth*, 1, 1-9.

Sauerwein, R. W., Roestenberg, M., & Moorthy, V. S. (2011). Experimental human challenge infections can accelerate clinical malaria vaccine development. *Nature reviews Immunology*, 11(1), 57-64.

Sherman, I. W. (1998). A brief history of malaria and discovery of the parasite's life cycle. *Malaria: parasite biology, pathogenesis, and protection*, 3-10.

Shulman, C. E., Marshall, T., Dorman, E. K., Bulmer, J. N., Cutts, F., Peshu, N., & Marsh, K. (2001). Malaria in pregnancy: adverse effects on haemoglobin levels and birthweight in primigravidae and multigravidae. *Tropical Medicine & International Health*, 6(10), 770-778.

Singh, M., Brown, G., & Rogerson, S. J. (2013). Ownership and use of insecticide-treated nets during pregnancy in sub-Saharan Africa: a review. *Malaria journal*, 12(1), 1.

Sirima, S. B., Cotte, A. H., Konate, A., Moran, A. C., Asamoah, K., Bougouma, E. C., & Newman, R. D. (2006). Malaria prevention during pregnancy: assessing the disease burden one year after implementing a program of intermittent preventive treatment in Koupela District, Burkina Faso. *The American journal of tropical medicine and hygiene*, 75(2), 205-211.

Smith, D. L., Hay, S. I., Noor, A. M., & Snow, R. W. (2009). Predicting changing malaria risk after expanded insecticide-treated net coverage in Africa. *Trends in parasitology*, 25(11), 511-516.

- Snow, R. W., & Marsh, K. (2002). The consequences of reducing transmission of *Plasmodium falciparum* in Africa. *Advances in parasitology*, 52, 235-264.
- Snow, R. W., & Gilles, H. M. (2002). The epidemiology of malaria. *Essential malariology*, 4, 85-106.
- Snow, R. W., Winstanley, M. T., Marsh, V. M., Newton, C. R. J. C., Waruiru, C., Mwangi, I., ... & Armstrong, J. R. M. (1992). Childhood deaths in Africa: uses and limitations of verbal autopsies. *The Lancet*, 340(8815), 351-355.
- Steketee, R. W., Nahlen, B. L., Parise, M. E., & Menendez, C. (2001). The burden of malaria in pregnancy in malaria-endemic areas. *The American journal of tropical medicine and hygiene*, 64(1 suppl), 28-35.
- Stratton, L., O'Neill, M. S., Kruk, M. E., & Bell, M. L. (2008). The persistent problem of malaria: Addressing the fundamental causes of a global killer. *Social science & medicine*, 67(5), 854-862.
- Taylor, T. E., Fu, W. J., Carr, R. A., Whitten, R. O., Mueller, J. G., Fosiko, N. G., ... & Molyneux, M. E. (2004). Differentiating the pathologies of cerebral malaria by postmortem parasite counts. *Nature medicine*, 10(2), 143-145.
- Ter Kuile, F. O., Terlouw, D. J., Phillips-Howard, P. A., Hawley, W. A., Friedman, J. F., Kariuki, S. K., ... & Nahlen, B. L. (2003). Reduction of malaria during pregnancy by permethrin-treated bed nets in an area of intense perennial malaria transmission in western Kenya. *The American journal of tropical medicine and hygiene*, 68(4 suppl), 50-60.
- The U.S. Global Malaria Coordinator: Nigeria FY 2011 Malaria Operational Plan. [http://pmi.gov/countries/mops/fy11/nigeria\\_mop-fy11.pdf](http://pmi.gov/countries/mops/fy11/nigeria_mop-fy11.pdf).
- The World Bank: Malaria prevention programme in Nigeria aims at universal bed net coverage. <http://go.worldbank.org/LHEY74N900>.
- Thwing, J., Eisele, T. P., & Steketee, R. W. (2011). Protective efficacy of malaria case management and intermittent preventive treatment for preventing malaria mortality in children: a systematic review for the Lives Saved Tool. *BMC Public Health*, 11, 1-9.
- Tobin-West, C. I., & Alex-Hart, B. A. (2011). Insecticide-treated bednet ownership and utilization in Rivers State, Nigeria before a state-wide net distribution campaign. *Journal of vector borne diseases*, 48(3), 133.
- Udonwa, N. E., Gyuse, A. N., & Etokidem, A. J. (2010). Malaria: Knowledge and prevention practices among school adolescents in a coastal community in Calabar, Nigeria. *African journal of primary health care & family medicine*, 2(1).
- Ukibe, S. N., Ikeako, L. C., Mbanugo, J. I., Obi-Okaro, A. C., & Ukibe, N. R. (2014). Knowledge attitude and practices of pregnant women concerning use of



insecticide treated bed nets (ITNs) in Anambra State, South East Nigeria. *Journal of Applied Medical Sciences*, 3(1), 15-22.

Uko, E. K., Emeribe, A. O., & Ejezie, G. C. (1998). Malaria infection of the placenta and Neonatal Low Birth Weight in Calabar. *J Med Lab Sci*, 7, 7-20.

Uneke, C. J., Sunday-Adeoye, I., Iyare, F. E., Ugwuja, E. I., & Duhlińska, D. D. (2007). Impact of maternal Plasmodium falciparum malaria and haematological parameters on pregnancy and its outcome in southeastern Nigeria. *Journal of vector borne diseases*, 44(4), 285.

Uneke, C. J., Iyare, F. E., Oke, P., & Duhlińska, D. D. (2008). Assessment of malaria in pregnancy using rapid diagnostic tests and its association with HIV infection and hematologic parameters in South-Eastern Nigeria. *Haematologica*, 93(1), 143-144.

Valle, D., & Clark, J. (2013). Conservation efforts may increase malaria burden in the Brazilian Amazon. *PLoS One*, 8(3), e57519.

Verlé, P., Lieu, T. T. T., Kongs, A., Van Der Stuyft, P., & Coosemans, M. (1999). Control of malaria vectors: cost analysis in a province of northern Vietnam. *Tropical Medicine & International Health*, 4(2), 139-145.

Vittor, A. Y., Pan, W., Gilman, R. H., Tielsch, J., Glass, G., Shields, T., & Patz, J. A. (2009). linking deforestation to malaria in the Amazon: characterization of the breeding habitat of the principal malaria vector, Anopheles darlingi. *The American journal of tropical medicine and hygiene*, 81(1), 5-12.

Vittor, A. Y., Gilman, R. H., Tielsch, J., Glass, G., Shields, T. I. M., Lozano, W. S., & Patz, J. A. (2006). The effect of deforestation on the human-biting rate of Anopheles darlingi, the primary vector of falciparum malaria in the Peruvian Amazon. *The American Journal of Tropical Medicine and Hygiene*, 74(1), 3-11.

White, N. J., Dondorp, A. M., Faiz, A., Mishra, S., & Hien, T. T. (2012). New global estimates of malaria deaths. *The Lancet*, 380(9841), 559-560.

World Health Organization (2014): World malaria report 2014. Retrieved from: [http://www.who.int/malaria/publications/world\\_malaria\\_report\\_2014/en/](http://www.who.int/malaria/publications/world_malaria_report_2014/en/).

World Health Organization: Nigeria(2008): Update on Nigerian LLIN Campaigns. [http://www.rbm.who.int/countryaction/nigeria\\_roadmap.html](http://www.rbm.who.int/countryaction/nigeria_roadmap.html).

World Health Organization (2015): World Malaria Report 2015. Geneva, Switzerland: World Health Organization, 280.

World Health Organization. (2015). Global technical strategy for malaria 2016-2030. World Health Organization.

- World Health Organization (WHO). (2004). *A strategic framework for malaria prevention and control during pregnancy in the African region: report AFR. MAL/04/01*. Brazzaville, Democratic Republic of Congo: WHO Regional Office for Africa.
- World Health Organization. (2006). Regional Office for Africa. *The health of the people: the African regional health report*. World Health Organization.
- World Health Organization. (2010). *Global tuberculosis control: WHO report 2010*. World Health Organization.
- Malaria, R. B. (2005). World malaria report 2005. *World Health Organization and UNICEF*.
- Yamamoto, S. S., Louis, V. R., Sié, A., & Sauerborn, R. (2009). The effects of zooprophylaxis and other mosquito control measures against malaria in Nouna, Burkina Faso. *Malaria journal*, 8(1), 1.
- Yasin, M., Yadegarynia, D., Mojdehi, A. M., & Nabavi, M. (2014). Mixed infection of Plasmodium malariae and Plasmodium falciparum: a case report. *Archives of Clinical Infectious Diseases*, 9(1).
- Yassin, I. M., Rosnah, S., & Osman, M. (2010). Factors influencing the usage of insecticide treated mosquito nets among pregnant women. *International Journal of Health Research*, 3(3), 139-144.
- Yasuoka, J., & Levins, R. (2007). Impact of deforestation and agricultural development on anopheline ecology and malaria epidemiology. *The American journal of tropical medicine and hygiene*, 76(3), 450-460.
- Yusuf, O. B., Dada-Adegbola, H. O., Ajayi, I. O., & Falade, C. O. (2008). Malaria prevention practices among mothers delivering in an urban hospital in southwest Nigeria. *J Vector Borne Dis*, 45(3), 217-24.
- Zaki, S. A., & Shanbag, P. (2011). Atypical manifestations of malaria. *Res Rep TropMed*, 2, 9-22.
- Zimmerer, K. S., Galt, R. E., & Buck, M. V. (2004). Globalization and multi-spatial trends in the coverage of protected-area conservation (1980-2000). *Ambio: A Journal of the Human Environment*, 33(8), 520-529.