UTILIZATION OF LONG-LASTING INSECTICIDAL NET AND DETERMINANTS AMONG WOMEN ATTENDING ANTENATAL CLINIC IN SELECTED URBAN AND RURAL HEALTH FACILITY IN ENUGU, NIGERIA

BY

MMAMELU STANLEY (MBBS)

MATRIC NO: 180465

A DISSERTATION IN THE DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS SUBMITTED TO THE FACULTY OF PUBLIC HEALTH, COLLEGE OF MEDICINE IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF PUBLIC HEALTH (FIELD EPIDEMIOLOGY PRACTICE)

OF THE UNIVERSITY OF IBADAN

DECEMBER, 2016

ABSTRACT

Malaria remains one of the main causes of morbidity and mortality in Nigeria and in most Sub-Saharan African countries. Pregnant women and children are most at risk of malaria and its complications. Studies have demonstrated the efficacy of long lasting Insecticide-treated nets (LLIN) in protection against malaria, however, its use have remained relatively low. The reasons for the level of use of the LLINs vary from one setting to another. This study aims to identify the determinants of utilization of LLIN among women attending antenatal clinic in Enugu, Nigeria.

A cross-sectional study was carried out in Enugu State in 2016. Four hundred and eighty-six pregnant women were selected for the Study by multistage sampling technique. One urban and one rural local government area was purposively selected from the list of the 17 LGAs in the State. Two health facilities each were selected from the list of all the facilities in each of the selected LGAs. Pregnant women were then selected by systematic random sampling in each of the facilities on their antenatal clinic. Data were collected using pretested questionnaires. Data were collected on respondents' demographic characteristics, their clinical information, availability and access to LLINs, as well as ownership and utilization of the LLINs. Collected data were analyzed using descriptive statistics and Chi square at 5% level of significance.

Fifty percent of respondents lived in an urban LGA. Ninety one percent of them were between the age of 20 and 34 years. Eighty percent of them attained up to tertiary level of education. Ninety seven percent were married while ninety two percent were of the Igbo tribe. Forty three percent were unemployed while 50% earn a low monthly income. Fifty six percent of respondents owned a net while 31% use the nets. Sixty three percent of respondents in the rural LGA owned nets compared with 50% in the Urban ($P < 0.001$). An equal proportion, 31% of respondents in both the rural and urban LGAs used the nets ($P = 0.96$). Thirty five percent of those who knew how to hang a net used the nets compared with 8% of those who did not know ($P < 0.001$).Confidence to hang a net appeared to influence a patient to use LLINs. Training or instructions on how to hang the nets should therefore be included into the process of distributing of sale of LLINs to encourage its use.

Word Count: 397 Keywords: LLIN, Ownership, Use, Nigeria

CERTIFICATION

This dissertation has been submitted for exam as part of fulfillment for the award of degree of Master of Public Health in Field Epidemiology of the University of Ibadan with approval of supervisors.

Signature.....Date.....

Dr. IkeOluwapo Oyeneye Ajayi
MBBS, M.Cl.Sc. (Canada), MPH (Ibadan), Ph.D
FMCGP, FWACP, Cert. Field Epidemiology)
Reader, Department of Epidemiology and Medical Statistics
Faculty of Public Health
College of Medicine
University of Ibadan, Ibadan, Nigeria.

Signature.....Date.....

Dr. Babatunde Adedokun
MBBS, MSc (Ibadan), Ph.D
Lecturer 1
Department of Epidemiology and Medical Statistics
Faculty of Public Health
College of Medicine
University of Ibadan, Ibadan, Nigeria

ACKNOWLEDGEMENTS

This research work has been made possible due to the contributions of the following people I will like to acknowledge.

I acknowledge the moral and academic support, guidance, encouragement and stringent supervision of my supervisors, Dr. IkeOluwapo Oyeneye Ajayi and Dr. Babatunde Adedokun.

I appreciate Dr. Adebowale for his contribution towards the finalization of this study.

My gratitude also goes to the Resident Advisor for the Nigeria Field Epidemiology and Laboratory Training Program, Dr Patrick Nguku and all the staff of the program whose support and encouragement was instrumental to my success in the program.

I equally want to appreciate all my respondents for their cooperation and willingness to participate in my research.

I will also like to remember the visionary role of Dr P Ossai, the Director public Health Services. Ministry of Health (MoH), Enugu.

I salute the support from my colleagues in the programme who provided me with materials to actualize this dissertation.

My profound gratitude goes to my wife, Mrs. Paula Mmamelu and my two daughters Chimdalu and Olivia Mmamelu.

Finally, I am most grateful to God Almighty who enabled me to sail through all the rough roads during the programme. I now know that HE REIGNETH FOR EVER.

DEDICATION

This dissertation is dedicated to my Late Dad, Chief Fidelis Okereke Mmamelu and my mother, Mrs. Magdalene Nnenna Mmamelu.

TABLE OF CONTENTS

CHAPTER FIVE

LIST OF TABLES

LIST OF FIGURES

Pages

LIST OF FIGURES

Pages

ABBREVIATION

CDC:	Centre for diseases Control
CI:	Confidence Interval
DALY:	Disability Adjusted Life Years
DFID:	Department for International Development
ITN:	Insecticide Treated Nets
LLIN:	Long Lasting Insecticidal Net.
LLINs:	Long Lasting Insecticidal Nets
MDG:	Millenium Development Goals
MOH:	Ministry of Health
NDHS:	National Demographic and Health Survey
NGOs:	Non-Governmental Organisation
NMCP:	National Malaria Control Programme
NMCSP:	National Malaria control strategic plan
NPC:	National Population Commission
QALY:	Quality Adjusted life years
RBM:	Roll Back Malaria
SUNMAP:	Support for National Malaria Program in Nigeria
UNICEF:	United Nation's Children Fund
USAID:	United Nations Agency for International Development
WHA:	World Health Assembly
WHO:	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria is a leading cause of morbidity and mortality. The World Health Organization (WHO) estimated 3.2 billion people are at risk of malaria which represents a global burden of about 1.4 percent (WHO, 2013). The African continent bears over 90 percent of the global burden of about 2,7million deaths attributable to malaria, and houses over 300 million people who suffer from this disease yearly (Oresanya et al, 2008). It is primary cause of disease burden as measured by Disability Adjusted life years (DALY) loss of 10 percent. (WHO, 2003).

About 30 – 40 percent of all fevers seen in health centers in Africa are due to malaria with high seasonal variability between rainy and dry seasons. At the end of the dry season, it is less than 10 percent and more than 80 percent as the rainy season winds up. In Nigeria, malaria still remains the major cause of morbidity and mortality. About 63% of hospital attendance in Nigeria health care facilities is caused by malaria, 60 percent of out-patient visits, 30 percent of childhood death, 25 percent of children under one year and 11 percent of maternal deaths (NPC, 2008).

The risk of malaria is higher among pregnant women and children less than five years (Adogu and Ijemba, 2013).Anemia in pregnancy is one of the main maternal health problems globally affecting over fifty percent of pregnant women in sub-Saharan Africa including Nigeria. Although not always shown to have causal link, severe anemia contributes to malaria morbidity and poor pregnancy outcomes and infant survival.

In spite of many preventive interventions, the incidence of malaria during pregnancy is very high. Since the development of long lasting insecticidal nets (LLINs) as a new technology in the mid 1980's different studies have demonstrated the efficacy of the insecticide treated nets in protection against malaria (up to 90%).The evidence for the efficacy of ITNs in preventing malaria infectionand its consequences in pregnancy is strong, as reported in a Cochrane review in 2009.One of the most effective tools for malaria prevention is the

insecticide treated mosquito net (ITN).In Nigeria, the burden of malaria in pregnancy has over the years prompted the search for ways of reducing its effects to the barest minimum.A better understanding of the factors that determine thecoverage ofLLINs distribution among vulnerable group is essential to design more effective distribution strategies,and justifies a study of consumers' valuation and purchasedecisions for LLINs, together with factors that determine thelevel of access people have for the LLINs. The findings willprovide a basis for efforts to increase LLINs coverage andsupport the government's efforts to reduce the burden ofmalaria(Onwujekwe et al, 2001).

The strategies adopted were packaged in the Abuja Declaration of African Summit on Roll Back Malaria in April 2000 in which African regional leaders expressed commitment to ensuring that 60% of pregnant women in malaria endemic areas accessed effective malaria preventive services by the year 2005. These strategies included the use of insecticide treated nets (ITNs) amongst others.Consistent use of ITNs can reduce malaria transmission by up to 90 percent and as much as 44 percent of all-cause mortality among children under five.There is also evidence that if more than 80 percent of households in an area sleep under an ITN, malaria transmission is significantly reduced, which can benefit people who do not use an ITN themselves (CDC, 2008).

The National Malaria Control Strategic Plan (NMCSP) addresses national health and development priorities, including the Roll Back Malaria goals and the Millennium Development Goals. The NMCSP priority is increasing possession and use of ITNs and long-lasting insecticidal nets (LLINs), especially among children under 5 years and pregnant women. (FMOH, 2013)

1.2 Problem Statement

Malaria is a risk for 90 percent of the country's population. There are an estimated 100 million cases with over 300,000 deaths per year. Malaria contributes to estimated 11percent mortality. Malaria accounts for 60 percent outpatient visits and 30 percent hospitalizations among children under five years of age in Nigeria. Malaria is endemic in Nigeria and the population at highest risk includes children, pregnant women and the non-immune.

In the south east zone of Nigeria, the prevalence of malaria is 27.6 percent among children under five years. As a result of malaria, children spend days away from school and adults lose workdays. Along with malarial morbidity and mortality come economic losses. Social and economic consequences are directly related to the severity of the malaria's increased morbidity and mortality.

Despite the proven beneficial effects of insecticide treated bed nets in the prevention and control of malaria the ownership and utilization of these bed nets among the vulnerable group have remained low in Enugu. The Malaria Indicator Survey (MIS, 2010) reported an ownership rate of 32.2 percent for the South-East, Nigeria. A recent study in Enugu State South East, Nigeria the utilization rate for insecticide treated nets among studied pregnant women was 21.1 percent. (Ugwu et al, 2015).

Another study carried out in Enugu State, South East Nigeria equally reported a low utilization rate of 23 percent among studied pregnant women (Ukibe et al, 2013).Experts say malaria is a major contributor to the world's high rates of maternal mortality and accounts for 30 – 35% of the preventable low birth weight among new born infants. In endemic countries nearly Sixty percent miscarriages are attributed to malaria. (Abdul-Kara, 1999).

Several studies have demonstrated the delcterious effects of malaria in pregnancy. High among these is anemia. Maternal anemia has very grave consequences for the mother and child. Other complications for the mother include hypoglycemia, acute kidney injury, Liver failure, cerebral malaria and hypotension. Complications for the fetus include spontaneous abortion, low birth weight, stillbirth, disseminated intravascular coagulopathy, premature delivery, intrauterine growth retardation and intrauterine fetal death. (WHO, 2009).

Hence the need for further research to help elucidate some of the factors affecting the ownership and utilization of long lasting insecticidal nets by pregnant women and provide scientific basis for solutions/change of strategy to increase ownership rate and utilization with better health outcome.

1.3 Justification

Morbidity and mortality due to malaria exerts a significant health and economic burden. According to the statistics of the National Malaria Control Program, it is responsible for 60% of out-patient visits to health facilities, 30% of children deaths and 11% of maternal death and an estimated annual loss of 132 billion naira in the form of treatment and prevention costs and loss of man hours amongst other losses. (Tobin and Hart, 2011).

In Enugu State, Southeastern Nigeria, studies have demonstrated high malaria prevalence among pregnant women. A recent study reveals that 38 percent of pregnant women in the State show very high parasitaemia, while 99 percent of pregnant women show some level of malaria parasitaemia (Gunn et al, 2015).

Although an integrated Management approach is said to be the best for malaria control, the insecticide-treated net is however considered as the most efficacious of all the currently feasible interventions for malarial control in Africa.African Malaria report shows that many countries are quite far from reaching the target of 60 percent Insecticide Treated Nets coverage in Sub-Saharan African countries by the year 2015 which was set in Abuja by the AfricanHeads of State.This explains the current efforts at providing free Insecticide Treated Nets to vulnerable Groups,and the recognition by the Nigerian Government that access to Insecticide Treated Nets to all vulnerable Nigerians is important.

In Enugu State, the NPC and Macro in 2009 reported that only 9.7 percent of households surveyed had at least one net while only 3.9 percent of the pregnant women slept under a treated net (NPC, 2008). Another study in 2015 reported insecticide treated net utilization among pregnant women studied to be 22.1 percent (Ugwu et al, 2015).

Furthermore, more recent studies have demonstrated very low long-lasting insecticide treated net utilization among pregnant women in Enugu State (Adogu and Ijemba, 2013). However, few studies have been carried out to determine the difference in ownership and utilization among rural and urban pregnant women and the factors that stimulate or hinder it.

The finding from this study is considered to generate information that helps malaria control program to improve ITN policies and design interventions to prevent malaria. The result of

this study helps to identify differences in LLIN ownership and utilization between pregnant women residing in rural locality and their urban counterparts if any exist and to design appropriate information, education and communication (IEC) interventions towards improving its utilization.The result will also be useful to evaluate the progress towards achieving national target and to take immediate actions in planning and implementation of prevention and control strategies.

1.4 Research Question

i. What are the factors that determine ownership of insecticide treated nets in Enugu State?
ii. What are the factors that determine utilization of insecticide treated nets in Enugu State?
iii. Is there a difference in the factors between urban and rural communities in the state?

1.5 Aims/Objectives

1.5.1 General objective

The aim of this study is to identify determinants of long lasting insecticidal nets (LLINs) among pregnant women in Enugu North and Nsukka LGAs.

1.5.2 Specific Objective

i. To determine the proportion of pregnant women who have ITNs in rural and urban area.
ii. To estimate the proportion of pregnant women that use ITNs in both LGAs.
iii. To identify the factors associated with the use of ITNs in both LGAs.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Malaria is an infectious disease caused by a protozoan parasite of the genus plasmodium. Malaria is endemic in the poorest countries of the world and has often been labelled a disease of poverty. An estimated 30 million women living in malaria endemic areas of Africa become pregnant each year. Pregnant women are particularly vulnerable to malaria because pregnancy reduces immunity to malaria. Several studies in endemic areas suggest that pregnant women have higher frequency of malaria, and are more likely to develop severe malaria when compared to their non-pregnant counterparts.

2.2 Malaria and the Transmission

Five plasmodium species infect humans and they include: Plasmodium Falciparum, Plasmodium Vivax, Plasmodium Ovale, Plasmodium malaria andPlasmodiumknowlesi. Plasmodium falciparum is the most deadly, accounting for 80% of infection and 90% of deaths.

2.2 Life Cycle

When an infectious/infected female anopheles mosquito bites, inject sporozoites, which circulate and invade the liver cells (Hepatocytes). After asymptomatic hepatic infection lasting 1 to 2 weeks in the case of P. falciparum, merozoites are released from the hepatic cells and then invade the erythrocytes (red blood cells). The asexual erythrocytic stage of the infection is responsible for all clinical aspects of the disease.

In erythrocytes, parasites develop into ring forms, mature trophoziotes, and multinucleated schizonts, which rupture and release more meroziotes. Repeated cycles of erythrocyte invasion and rupture lead to chills, fever, headache, fatigue other non-specific symptoms and with severe malaria, signs of organ dysfunction. Some parasites develop into gametocytes, which may be taken up by mosquitos, in which sexual reproduction and further development of the parasites lead to the generation of a new set of infectious sporozoites. A key feature of the life cycle of Plasmodium falciparum iscytoadherence, whereby erythrocytes infected

with mature parasites adhere to endothelial cells in the microvasculature. This process is presumably of advantage to the parasite, since it prevents the passage of abnormal erythrocytes through the spleen. High concentration of Plasmodium falciparum infected erythrocytes in the microvasculature and a complex interplay of the host and parasite factors lead to the manifestation of severe malaria, including cerebral malaria, non-cardiogenic pulmonary edema, and renal failure. Because of the ability of mature P. falciparum organisms in the erythrocytic stage to adhere to endothelial cells, only ring forms circulate (except in very severe infections), and levels of peripheral parasitemia may be quite low despite substantial infection.

2.3 Burden of Malaria in Nigeria

Malaria is transmitted throughout the country with 97% of the population at risk. Transmission season decreases from year round transmission in the south to three months or less in the northern part of the country. The 3% of lower risk live in Jos, Plateau State above 1200 meters elevation. Major vectors in Nigeria are Anopheles gambiae Species and Anopheles funestus. Within the Anopheles gambiae complex, anopheles arabiensis predominates in the north, but is a less efficient vector.

Malaria still remains one of the main causes of mortality and morbidity in Nigeria and in most Sub-Saharan African countries. Malaria is endemic in Nigeria, with year-round transmission. In Nigeria, 98% of all cases of malaria are due to *Plasmodium falciparum*. This is the species that is responsible for the severe form of the disease that leads to death. It is transmitted from bites of an infected female *Anopheles* mosquito to man. Prior to 2010, available data were insufficient to clearly microstratify epidemiological profile of Nigeria's malaria. However, the 2010 Nigeria Malaria Indicator Survey revealed that malaria parasite prevalence is still high, with an average prevalence of 42% among children under the age of 5 years and zonal variations ranging from 28% in the South East to 50% in the South West. Malaria is responsible for mortality in almost one-third of children under 5 years and is associated with one-tenth of maternal deaths in Nigeria. About 63% of hospital attendance in Nigeria health care facilities is caused by malaria. Out of ten childhood deaths, malaria causes three. It is estimated that in every 30 seconds, a child dies of malaria. The burden is so much that approximately 300,000 children die of malaria annually and over 70% of

illness in children under 5 years is due to malaria; this leads to school absenteeism. Malaria causes abortion and low birth weight in pregnancy.

Malaria in pregnancy is still a major health issue in Nigeria. It accounts for approximately 33% of cause of maternal death. At the historic Malaria Summit hosted by Nigeria in 2000, African Heads of States made a declaration to halve the burden of malaria by the year 2010. One of the targets set for the first five years was to ensure that the vulnerable groups, children under five years of age and pregnant women, have access to and sleep under long lasting insecticidal nets.

2.4 Malaria in Pregnancy

Malaria in pregnancy is different to the disease in a non-pregnant state. The severity of malaria in pregnancy is thought to be due to general impaired immunity plus a diminution of acquired immunity to malaria in endemic areas. Placental malaria occurs where plasmodium falciparum-infected erythrocytes accumulate in the intervillous space of the placenta but may be rare or absent in the peripheral circulation.

Globally, 125 million women are at risk of malaria every year. In sub-Saharan Africa the area most burdened by malaria, the disease is thought to cause as many as 10,000 cases of malaria-related deaths in pregnancy mainly due to severe maternal anaemia. Between 75,000 and 200,000 infants (children under the age of 12 months) are estimated to die annually as a result of malaria infection during pregnancy. Approximately 11% (100,000) of neonatal deaths are due to low birth weight resulting from P. falciparum infection in pregnancy.

The use of long-lasting insecticidal nets combined with intermittent preventative treatment resulted in an estimated 94,000 newborn deaths averted between 2009 and 2012 in 25 African countries. If these interventions had been applied to 80% of the at-risk population, it is estimated that 300,000 deaths could have been prevented.

Preventing malaria in pregnant women reduces severe maternal anemia by 38%, reduces low birth weight by 43%, and perinatal mortality by 27%. Therefore, scaling up coverage and access to preventative measures is clearly the way forward.

2.4.1 Risk factors for Malaria in Pregnancy

Primigravidae and pregnant women with one previous birth are at highest risk of infection and serious complication. The effect of gravid status on complication risk is negated by concurrent HIV infection. Younger maternal age (particularly adolescence) carries a higher risk of infection and adverse effects. Equally the second trimester carries the highest risk of infection.

Some studies suggest the increased risk disperses quickly after delivery, others that the first two months post-partum continues to carry an increased risk of infection.

2.4.2 Complications of Malaria in Pregnancy

Maternal complications are mainly anemia because baseline immunity to malaria is decreased by pregnancy. This is frequently the case in endemic/high transmission areas for malaria.

An Indian study reported that pregnant women with malaria are at increased risk of hypoglycemia, cerebral malaria, acute kidney injury, hepatic failure and hypotension.Acute pulmonary edema occurs much more commonly in pregnant women and may be the presenting feature. It carries a high mortality and is typically seen in the second and third trimesters. Disseminated intravascular coagulation can occur and carries a high mortality risk.

In sub-Saharan Africa 23 million pregnant women are exposed to malaria infection annually and approximately 400,000 pregnant women develop moderate to severe anemia. Complications involving the fetus include spontaneous abortion, premature delivery, stillbirth, intrauterine growth retardation, low birth weight and intrauterine fetal death.

2.5 Malaria Prevention/Control

There are four key intervention strategies in the scale up for impact for the control of malaria. These strategies are. Long lasting insecticidal nets (LLINs), Indoor residual spraying, and intermittent preventive treatment in pregnancy, Case management.

2.5.1 Long Lasting Insecticidal Nets in Malaria Control

In spite of many prevention interventions the incidence of malaria during pregnancy is still very high. Since the development of long lasting insecticidal nets (LLINs) as a new

technology in the mid 1980's different studies has demonstrated the efficacy of the insecticidal nets in protection against malaria (up to 90%).Furthermore, insecticide treated nets have been shown to significantly reduce the incidence of malaria during pregnancy as well as its complications.

The evidence for the efficacy of ITNs in preventing malaria infection and its consequences in pregnancy is strong, as reported in a Cochrane review in 2009 and in a more recent meta-analysis which examined malaria prevention in pregnancy data sets from different African nations. The evidence showed a strong correlation between the use of insecticide treated nets and reduction in stillbirths, improvements in birth weights of babies and a reduction in the prevalence of parasitemia and anemia in pregnant women. A communal protective effect of the insecticidal nets and reduction in the overall vector density has also been observed in some settings(Nwokolo, 2015). Despite the known health benefits of using insecticide treated nets in pregnancy, the use is still very low (16% and 16.0% for insecticide treated nets and long lasting insecticidal nets respectively).

The evidence for the efficacy of LLINs in preventing malaria infection and its consequences in pregnancy is strong, as reported in a Cochrane review in 2009 and in a more recent meta-analysis, which examined malaria prevention in pregnancy datasets from different African nations. The evidence showed a strong correlation between the use of LLINs and reduction in stillbirths, improvements in birth weights of babies, and a reduction in the prevalence of parasitemia and anemia in pregnant women. A communal protective effect of LLINs and reduction in the overall vector density has also been observed in some settings. (Pulford et al., 2011)

Despite the known health benefits of using LLIN in pregnancy, the use is still very low (16.0%) with wide variation across geopolitical zones. Understanding the profile of users can provide very useful information in understanding the facilitators and/or inhibitors for the use of LLIN among pregnant women. (Ezire et al, 2015)

Between 1986 and 2002, at least 81 trials and over 30 descriptive studies carried out in every type of color and shape. A study showed that the time of the year during which the nets are delivered affects use. 99% of the net recipients were found to use the nets during rainy

season, while only 20% used it during the dry season. Demographic characteristics like age, education, size of household, and ethnicity also influence use of bed nets. Some studies show that children are less likely to use nets, particularly in rural areas, while others found no significant association between age and net use.(Oresanya, Hoshen, & Sofola, 2008) The President of Nigeria launched an LLIN Massive Promotion and Awareness Campaign (IMPAC) and made provision of free ITNs for the vulnerable groups a priority on commencement of implementation of the RBM program. With support from international donor agencies, LLINs (either re-treatable nets bundled with retreatment kits or long-lasting insecticidal nets) were procured and distributed. (Oresanya, et al., 2008)

LLINs were given at immunization posts to children completing their immunization schedule; during stand-alone LLIN campaigns in specific rural local government areas; and by means of the Expanded Program on Immunization, EPI-plus (giving measles vaccine plus LLIN) in tandem with supplemental immunization campaigns to saturate the population with the nets in line with WHO's recommendation. Several studies have proved the effectiveness of ITNs/LLINs in Malaria Control. Insecticide treated nets if properly used and maintained can provide a physical barrier to mosquitos and provide 46 percent protection against malaria (RBM, 2001).

ITNs/LLINs reduce malaria morbidity and mortality, but its use is limited. In a trial of untreated bed nets in the Gambia, nets were found to reduce the number of infective bites but not enough to reduce morbidity from malaria. Malaria decreases with the use of ITNs. The main reason for this is that mosquitoes are not only kept away from sleeping people, but would die when they come into contact with the insecticide.

In subsequent studies it was demonstrated further that use of ITNs/LLINs in pregnancy reduces maternal parasitemia, anaemia, and premature deliveries, increases mean birth weight and subsequently reduces neonatal and infant mortality. ITNs/LLINs have a mean protective efficacy against malaria episodes of approximately 50 percent in highly endemic areas of Africa. They have also been found to reduce overall mortality among children by 63 percent in villages using impregnated nets. (Adogu and Ejemba, 2013)

A study done in Kenya has shown that bed nets given to pregnant women have been found to be protective to women and their children against malaria in both high and low malaria transmission areas. (Komomo et al., 2016)

Knowledge on malaria prevention is low among the people. In a study carried out in Mali, most individuals could identify malaria as most common disease in their village (93 percent) recognize malaria based on clinical symptoms (98 percent) treatment methods (87 percent) however knowledge of prevention was more limited. Only 35 percent of individuals knew that malaria was transmitted by mosquitoes and less than 40 percent of people knew that one could prevent malaria. Only 17 percent of those individuals stated that using ITNs/LLINs was an important method of prevention. (Rhee et al., 2003)

2.6 LLINs Distribution in Nigeria

One of the targets of Roll Back Malaria (RBM) and the Millennium Development Goals (MDGs) is to scale up interventions for the prevention and control of malaria in pregnancy. In pursuit of this the Federal Government of Nigeria, in collaboration with several partners distributed 30 million bednets across the country between May 2009 and February 2011(Yusuf et al, 2016).

Insecticide treated bed nets is part of malaria control policy in Nigeria and the government wishes to scale-up its use.The mechanisms for distribution of ITNs/LLINs to ensure high coverage have generated much discussion. Free mass distribution of LLIN, is on-going in Nigeria.The National Malaria Control Strategic Plan (NMPCSP) distributed 63 million LLINs in 2010. (FMOH, 2009).

In Nigeria, Netmark in conjunction with TMOH, Ministry of Finance and Nigeria Customs Service had joint forces to ensure that taxes and tariffs issues as related to ITNs/LLINs and treatment kit imports are given priority in order not to discourage partner investment. Netmark partnered with community projects to conduct a targeted DPTs immunization of children by providing discount vouchers for ITNs/LLINs to families of immunized children. This was able to boost under-five ownership and usage of ITNs/LLINs within the seven local government areas in Nasarawa State. Netmark distributed 673,000 ITNs/LLINs

donated by USAID and Canadian government in 18 Local government areas in Cross River State during the integrated measles campaign in 2008. (Komomo, et al,. 2016).

In 2009, the USAID, World Bank Malaria Consortium Summit for National and Malaria Programme (SUNMAP), joined forces to provide Four million ITNs/LLINs to Kano State Government.In 2010 (3rd Quarter), the people of Japan provided 150,000 LLINs to Jere Community in Kaduna State so that all the under-five and pregnant women in its 124,000 households could sleep safe from mosquitoes. Abia, Delta, Edo, Imo, Kogi, Osun and Oyo were among the 34 States that received 48 million ITNs/LLINs distributed by NMCP in 2012. (Komomo et al, 2016).

Support to National Malaria programme in Nigeria (SuNMaP) in particular has provided technical assistance to Nigerian National Malaria Elimination Programme (NMEP) to scale up malaria control across ten states (Anambra, Kano, Lagos, Niger, Katsina, Ogun, Jigawa, Enugu, Kaduna and Yobe) from 2008 until 2015. They distributed 12 million long-lasting insecticide treated nets (LLINs) which increased the coverage in these states from 7percent in 2005 to 58 percent in 2014.

2.7 Perception, attitudes, Knowledge and Beliefs of Pregnancy Women to use of LLINs

Insecticide treated nets (ITN/LLIN) have been proven to be very efficacious in malaria prevention. As a vector control intervention, they are effective in preventing malaria morbidity and mortality. By reducing the density and preventing mosquito bite, they reduce overall transmission and protect all individuals within a community. Hence, several studies have demonstrated the efficacy of the insecticide treated net in malaria control.

Despite the established benefits of insecticide treated nets, studies carried out to determine the ownership and utilization of insecticide treated nets have reported low utilization, even in households and communities were coverage and possession are comparatively higher.

In a study carried out in Anambra State, South-East Nigeria (Ukibe et al, 2014) on the knowledge, attitude and practices of pregnant women concerning the use of insecticide

treated bednets, it was reported that even though the level of awareness of pregnant women on the use of ITN was very high at 93%, ownership and utilization were 60% and 23% respectively.

However, a number of the studied women attributed their reasons for non-use of insecticide treated nets to be the feeling of discomfort and heat, lack of adequate accommodation to hang the net, residential accommodation window already netted, and simple dislike of ITNs.

Furthermore, other studies have shown that more pregnant women and their household employ other preventive measures which may include improved sanitation around the compound, clearing of bushes, use of mosquito coils, indoor spraying, screening of windows and taking anti-malaria regularly.

Another study carried out in Nigeria in which 18 states were sampled (Ezire et al, 2015) also reported similar discrepancies between insecticides treated nets ownership and utilization among pregnant women. There were no significant difference between those who own one net and those who own more than one net in a household, thus implying that the number of nets owned by a household does not significantly determine the use.Therefore, even though it may be useful to own more than one net in a household, the real focus should be on promoting the right knowledge and building skills on how to use the net.In a resource-constrained environment like Nigeria and most Sub-Saharan African countries, funds should be spent in policies to achieve the greatest impact.

2.8 National Policies

Ownership and use of insecticide treated bed nets remain low among different socio-economic groups in Sub-Saharan Africa including Nigeria. Several strategies have been applied to improve ownership and use including free distribution campaigns.

The National Malaria Control Strategic Plan (NMCSP), the RBM and the MDGS set up priorities to reduce the morbidity and mortality caused by malaria. Ownership of insecticide treated Nets have increased from an average of 2.2% of at risk population in 1999 to 32.8% in 2008. 1.5% on average in 1999 for children under 5 years which increased to 26.6% in 2008.

Demography and Health Survey (NDHS 2008) reports that 17% of households in Nigeria own a mosquito net. The 8% of households own at least one LLIN, while 3% own more than one ITNs/ LLINs. The average number of ITNs/ LLINs per household is however less than one, meaning that high majority of Nigeria households are not effectively covered with the usage of ITNs/LLINs. The RBM African Summit held in Abuja Nigeria on April 25th, 60% of pregnant women use of ITNs/ LLINs was promoted.

2.9 Ownership and Utilization of LLINs by Pregnancy Women

Ezire et al in their publication "Determinants of Use of ITN among pregnant women in Nigeria", of which about 850 pregnant women were sampled from a 2011 state-specific HIV and AIDs, Reproductive and Child Health Survey (SARHS).This was a population-based study aimed at assessing and monitoring levels of and trends in, various indicators of maternal, sexual and reproductive health issues in 18 Nigerian States.

The eligible respondents for this survey were women aged between 15-49 years. This was a household survey in which individual respondents were selected within households in various enumeration areas (EAs). (Ezire et al., 2015)

Enumeration Area is a small area in a community composed of one or more neighbouring blocks. In Nigeria EAs were created by the National Population Commission for the 2006 census. EAs are the basic units of Enumeration. Within a State, all eligible persons, irrespective of their place of residence (rural or urban), where given an equal chance of being included in the final sample selection was through a stratified probability sampling technique based on locality. The results of this study show that ownership of at least one LLIN in a household was just 67%, while the use was a low as 19% among all women who were pregnant. Among women who owned at least one net in a household, the use was 29.9%.

Also awareness of net is very high among studied pregnant women (92%). Eight out of every ten pregnant woman was confident; they can use or hang a net, while four out of ten knew that the use of an LLIN can protect a pregnant woman from malaria. Previous studies have shown LLIN ownership rate to range between 19-58.5%, but these studies vary in

terms of the particular population studied either pregnant women or children below the age of five or both. The study area may equally determine the rate and also whether the study was community based (household survey) or health facility based study. (Ezire et al, 2015)

Ezims et al in the study Awareness Ownership and Utilization of LLINs among pregnant women attending ANC in Imo State University Teaching Hospital Orlu, Imo State. This was a descriptive cross sectional study and hospital based study. 375 pregnant women aged between 17 and 45 years were recruited for the study. Data was collected using a structured questionnaire administered to pregnant women attending the antenatal clinic.

Results from this study reveals that among the women who attended ANC at the hospital, 76% of them owned at least one LLIN in their household while 24% do not own a net. This implies that majority of these women owned nets in their household against those who do not own nets. Adebayo et al in a study conducted in 2013 on ownership and utilization of ITN among caregivers of under-five children and pregnant women in a rural community in Southwest Nigeria. This is a descriptive community based cross-sectional study which sampled female caregivers of under-five children and pregnant women in their reproductive age of between 15-49 years.

A multi-stage cluster sampling technique was used to select participants.631 respondents sampled. A semi-structured interviewer-administered questionnaire consisting of 5 sections were used to obtain information. The results from this study shows that 71.8% of respondents had (owned) a mosquito net. 15.5% of these respondents owned an ITN. Overall, 11.1% of the respondents had an ITN.78.6% of these respondents had ever slept under an ITN. Among this group only 49.1% slept under an ITN the previous night.

Tobin and Hart, in their study on insecticide-treated bednet ownership and utilization in Rivers State, Nigeria in which 811 household heads or their proxies were sampled in a multi-stage sampling technique. This was a community based descriptive Cross-sectional study design. The result shows that 68.1% of the households owned nets, but 44.4% of those who own nets have LLINs, while the rest 60.6% were in possession of untreated/ordinary nets and 25% with re-treatable nets. (Tobin and Hart, 2011).

This can be compared with those who slept under the net the night preceding the survey which is 37.2. This shows the number that use their nets are far less than those than own nets. Nwokeukwu et al in the 2014 study on the use of insecticide treated nets amongst public health physicians in Nigeria.

This descriptive cross-sectional study which sampled 174 physicians including Consultants, Registrars and Medical officers discovered that majority of the physicians had access to ITNs (73.6%). These were mainly the Consultant and the Registrars. This could be due to the fact that these are the highest ranked doctors in the hospital as such will be considered before other cadre for services or amenities.

Onwuka et al in a study household ownership and use of insecticide treated bednets among school children in Ibadan, Oyo State, Nigeria, June 2016.This was a school-based descriptive cross-sectional study in which 611 pupils were sampled in a multi-stage sampling method.

The result from this study show that 81.7% of the respondents reported owning at least one ITN in their household. 27.5% reported owning one ITN, 49.3% reported owning two, while 23.2% reported owning three or more ITNs in their households. This result is similar to most studies which have reported high ownership rate among respondents. Ukibe et al in another study in 2014 on the knowledge, attitude and practice of pregnant women concerning the use of insecticide treated bed nets in Anambra State, South East Nigeria.

Results from this study which sampled now volunteer pregnant women in a hospital-based descriptive cross-sectional study show an ownership of 60%. This result is similar to other studies that show a high awareness and ownership among the respondents but low utilization rate Johnson et al in a study done in 2015 on the Awareness, ownership and utilization of insecticide treated nets among households in Rural community in Southern Nigeria in which 269 respondents (representing households) were sampled using a multi-stage sampling method. This was a community-based descriptive survey.

The results show high awareness of ITN (94%) and ownership of (49%). This ownership is slightly less than that of other studies but it is worthy of not that it is still above the utilization rate of (43.2% found in this study. A low utilization rate compared to ownership

is the consistent finding in most studies done to determine the ownership and utilization of ITNs among vulnerable group. Ganiyu et al (2009), in a study carried out in Ilorin Northern Nigeria of which over Four hundred pregnant women were sampled/interviewed during antenatal clinic using semi-structured questionnaires.

These women were selected during antenatal clinic (ANC) at Primary Health Care (PHC) centre in all 16 Local Government Areas (LGAs) of the State. Six out of the 16 Local Government Areas were comprised of rural communities. These women were interviewed using pre-tested questionnaires that contained questions that elicited information on the awareness, use and acceptability of ITN by the respondents.

The results of this study shows that approximately one-third accounting for 35% of the respondents were aware of ITN/LLIN in malaria prevention, then less than a third accounting for 27% had ever used ITN/LLIN and only 19% were currently using ITN/LLIN. Qzims et al in the study on Awareness, Ownership and Utilization of LLINs among pregnant women attending ANC in Imo State Teaching Hospital. This descriptive cross sectional study and hospital based study sampled 375 pregnant women between the ages of 17 and 45 years. Results from this study shows that among women attending ANC who owns a net, 52.7% of them sleep under the net sometimes, 28% sleeps always while 19.3% of those that own a net have never slept under their net.

Adebayo et al in his study on ownership and utilization of ITN/LLIN among care givers of under five children and women in a rural community in South West, Nigeria in which 631 respondents were studied in a descriptive community based cross-sectional study reveals that 11.1% of studied population had ITN/LLIN and 78.6% of this population had ever slept under an ITN/LLIN and 49.1% slept under an ITN/LLIN the previous night.

Eyong et al in the Journal, Assessment of the Utilization of Insecticide Treated Nets (ITBs) in Calabar Metropolis, Cross River State Nigeria. This was a community (household) based Cross-sectional study in which 440 houses were sampled using a multi-stage sampling method. Results show that despite high rate of ownership of ITNs/LLINs, only 43% hanging above their sleeping space and 15% of the surveyed persons slept under an ITN/LLIN the previous night.

Tobin-West et al 9in the study insecticide treated bednet Ownership and Utilization in Rivers State Nigeria. This is a community based descriptive cross-sectional survey which sampled 811 households in a multi-stage sampling method from the LGAs in the communities and to the households. Respondents are the household heads, (male or female) or their proxies.

Results from this study show that only 37.2% of respondents slept under the net the night preceding the survey. This is the actual proportion that use their net among those sampled. This is consistent with other surveys showing low net utilization even among respondent who actually own at least one net. Nwoke et al in the study conducted in 2014 on the use of insecticide treated bed nets among public Health Physicians in Nigeria.

This study sampled 174 physicians made up of Consultants, Registrars and Medical officers present in an at the Association Conference held in Ilorin, Nigeria. This was a descriptive cross-sectional study where the structured questionnaires were given to all consenting physicians. The results show that only 33.6% of those physicians who had access to ITNs always use it. In other words, even though access to ITNs was high, the rate of utilization was very low. The reason for this as explained in the study was probably due to the fact that most of the participants to the conference were visitors who had travelled from their home states to the Conference venue and hence slept in hotels and had no access to ITNs.

This finding is in line with most studies that have equally documented low utilization of ITNs despite high access or high ownership. The result also indicate that most of the net users were within the reproductive age group which include men and women of child-bearing age which constituted the vulnerable group that were beneficiaries of net distribution campaigns.

Onwuka et al in this study conducted June, 2016 on the household ownership and use of insecticide-treated bednets among school children in Ibadan, Nigeria. This school-based descriptive cross sectional study sampled 611 pupils and results from this study report 66.7% of respondents who reported having at one net in the household slept under the ITNs the night before the survey.

Tobin-West et al 9in the study insecticide treated bednet Ownership and Utilization in Rivers State Nigeria. This is a community based descriptive cross-sectional survey which sampled 811 households in a multi-stage sampling method from the LGAs in the communities and to the households. Respondents are the household heads, (male or female) or their proxies.

Results from this study show that only 37.2% of respondents slept under the net the night preceding the survey. This is the actual proportion that use their net among those sampled. This is consistent with other surveys showing low net utilization even among respondent who actually own at least one net. Nwoke et al in the study conducted in 2014 on the use of insecticide treated bed nets among public Health Physicians in Nigeria.

This study sampled 174 physicians made up of Consultants, Registrars and Medical officers present in an at the Association Conference held in Ilorin, Nigeria. This was a descriptive cross-sectional study where the structured questionnaires were given to all consenting physicians. The results show that only 33.6% of those physicians who had access to ITNs always use it. In other words, even though access to ITNs was high, the rate of utilization was very low. The reason for this as explained in the study was probably due to the fact that most of the participants to the conference were visitors who had travelled from their home states to the Conference venue and hence slept in hotels and had no access to ITNs.

This finding is in line with most studies that have equally documented low utilization of ITNs despite high access or high ownership. The result also indicate that most of the net users were within the reproductive age group which include men and women of child-bearing age which constituted the vulnerable group that were beneficiaries of net distribution campaigns.

Onwuka et al in this study conducted June, 2016 on the household ownership and use of insecticide-treated bednets among school children in Ibadan, Nigeria. This school-based descriptive cross sectional study sampled 611 pupils and results from this study report 66.7% of respondents who reported having at one net in the household slept under the ITNs the night before the survey.

The results also showed that 57.6% of the respondents reported those there under-five brothers and sisters used ITNs. This result is similar to most studies which have always reported a lower utilization rate compared to ITN ownership within households. Ukibe et al in the study (2014) on knowledge, Attitude and practices of Pregnant women concerning the use of Insecticide Treated nets (ITNs) in Anambra State South-East, Nigeria.

This was a hospital-based descriptive cross-sectional survey which sampled 700 volunteer pregnant women aged between 17 and 45 years. These respondents were sampled from five different hospitals which were conveniently selected and all of them offer antenatal services within the state capital.

Results from this study show high awareness and ownership of ITNs but a utilization rate of only 23% (proportion slept under the net previous night). This is similar to other studies which show that utilization rate of ITNs always far lower than ownership.

Johnson et al in their 2015 study on Awareness, Ownership and Utilization of Insecticide treated nets among Households in Rural Community in Southern Nigeria in which 269 respondents (corresponding to households) were sampled. This was a community-based descriptive survey. Results indicate a utilization rate of 43.2% as compared to an ownership of 49.8%.

Even though the difference between the utilization and ownership is not much yet it is consistent with most other studies in which the utilization rate is less or lower than the ownership of insecticide treated bed nets, ITNs. It is also noteworthy that the utilization rate among pregnant women in this study was 33.3%, while the utilization rate among under-five children was 37.6%.

A recent study by Ugwu et al in 2015 on the Utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria in which 832 pregnant women were sampled from 3 hospitals offering antenatal services. This was a hospital-based descriptive cross-sectional study. The result shows a discrepancy between ownership and utilization. While the utilization rate for this study was 39.1% among studied pregnant women, the ownership rate was a little above this at 43.1% of women studied.

It was also noted that only a small proportion of studied women (28.4%) used the insecticide treated net simply, i.e. without another form of rector control mechanism. Several of the women studied used bednets in combination with mosquito coils, insecticide spray and window screen.

Adogu et al in a 201c3 study on the insecticide treated nets possession and utilization among pregnant women in Enugu Nigeria in which 290 pregnant women were sampled in a hospital-based descriptive survey. The results from this survey show that the overall utilization rate for insecticide treated bed nets among pregnant women was 20.7%.

2.10 Factors affecting Ownership and Utilization of LLINS

Ezire et al in the work done in 2015, discovered that location, educational status or attainment, ever heard as well as ownership, confidence to hang and use a net and knowledge that sleeping under an LLIN can protect pregnant women from malaria were significant variables. Marital status, maternal age, length of time a woman owns a net, and the average number of nets owned in a household were not significant. The relationship between the use of nets and education is positive, meaning that the higher the level of education the higher the level of use of an LLIN.

Pregnant women who know how to hang or use a net were found to be almost ten times more likely to use a net compared with pregnant women who do not know how to use or hang a net. Pregnant women who know that the use of an LLIN can protect a pregnant woman against malaria were found to be almost two times more likely to use a net compared with those who do not know that the use of an LLIN can protect a pregnant woman from malaria.

Ganiyu et al, in their study on the awareness and use of insecticide treated nets among women attending ante-natal clinic in a Northern State of Nigeria discovered that the age of the respondents (pregnant women), the educational level priority and source of information or awareness on ITN have no significant influence on ITN use among the respondents. This finding is also consistent with most other studies.

Also, a greater proportion of the respondents who used ITN had at least one household member using ITN as against their counterpart who did not use ITN. The frequency of the malaria attack among subjects using ITN was lower than those not using and this was significant. There is no significant difference in the frequency of malaria attack among household member using ITN and those who do not. (Omotosho et al, 2009).

Ozims et al in the study on Awareness, Ownership and Utilization of LLINs among pregnant women attending ANC in Imo State University Teaching Hospital. The results show that there is no significant relationship between maternal age and awareness, ownership and utilization of net. (Ozims, et al, 2014)

Respondent's age and educational level have no significant influence on LLIN awareness, ownership and utilization. Adebayo et al in the study on ownership and utilization of ITN among care givers of under-five children and women in a rural community in Southwest, Nigeria which 631 respondents were studied shows that significantly higher proportion (75%) of respondents with low level of education utilized ITN compared with 35.9% with high level. (Ozims, et al, 2014)

There was in significant association between utilization of ITN and age group, marital status, family types, occupation, average income, total number of children. The knowledge of cause of malaria was statistically significant with utilization of ITN Higher proportion (63%) of respondents with good knowledge of cause of malaria used ITN last night compared with 32.1% with poor knowledge. Higher proportion of those with good knowledge of ITN in malaria prevention also used ITN compared to respondents with poor knowledge.

Eyong et al, in their publication Assessment of the utilization of insecticide treated nets (ITNs) in Calabar Metropolis in which 440 household, were sampled in a multistage sampling technique discovered that the factors affecting the utilization of ITNs among respondents to include, liability to access ITNs (4.55%), not comfortable using ITNs (4.77%).Tobin et al in the Journal insecticide treated by net ownership and utilization in River State, Nigeria in which 811 respondents were sampled in multistage sampling techniques.

This is a community based descriptive cross –sectional survey in which the results show that factors affecting the utilization of LLINs to include the complaints of excessive heat associated with the nets. Mukhopadhyat et al in the study Netting the malaria menace; Distribution and utilization of long-lasting insecticidal net in a malaria endemic area in Bankwa, West Bangal.

This is a community (household) based, descriptive cross-sectional survey in which 1300 households were sampled using the lots quality assurance sampling method. Results indicate that schooling for more than 6 years (higher educational level) of the highest educated member of the household, perceiving malaria as an important cause of morbidity and the role of net in controlling malaria were positively associated with ownership of LLINs. (Mukhopadhyat et al, 2016)

Considering malaria as an important cause of morbidity and mortality were also positively associated with utilization by members of the household. Ukibe et al in another study on knowledge, attitude and practice of pregnant women concerning the use of insecticide treated bet nets in Anambra State, South-East Nigeria. 700 volunteer pregnant women were sampled in this hospital-based descriptive cross-sectional study.

Results from this study show that factors or reasons responsible for non-use of insecticide treated bee nets include excessive heat (40.3%), unsuitable accommodation to hang the net (13.3%), window netting present on residential accommodation (11.7%). Some believed it was simply not effective (3.7%).Some respondents believed it causes itching (0.70%). A few of the women (1.7%) believe it could kill due to the dangerous chemicals used to treat the net. A reasonable number of the women (24%) had no specific reason while they refused to use the nets.

Johnson et al in the 2015 study on the Awareness, ownership and utilization of insecticide treated nets among households in a rural community in Southern Nigeria in which 269 respondents were sampled. Results from this study show that lack of money reported by 24% of respondents as the reason for non-use of the net.

Equally 24.7% of the respondents identified the feeling of heat as a serious contributing factor to non usage of insecticide treated net. Ugwu et al in their study (2015) on the

utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria in which 832 pregnant women were sampled in a hospital based descriptive cross-sectional study.

Results show that the reasons for non-use by 60.9% of the women studied include discomfort and excessive heat, chemicals in the net could harm their babies in the womb, nets are too expensive to buy while some say bednets were not accessible or unavailable. Adogu et al in a 2013 study on the insecticide treated net possession and utilization among pregnant women in Enugu, Nigeria in which 290 pregnant women were sampled in a hospital based descriptive study.

The results show that as the age of the subjects increased so did their knowledge of ITN while only 67.3% of the women aged between 15-24 years knew about ITN, 100% of those aged above 45 years knew about ITN. This demonstrates a significant association between age and awareness of ITN.

Similarly, whereas 54.5% of subjects with equal to or less than a primary education knew about ITNs, this knowledge level increased to 88.6% for those with Secondary education, to 93.7% for those with Tertiary education. Conversely, however, the use of ITN the night before the survey was only 12.7% for those with tertiary education but which significantly increased to 29.8% and 24% for those with Secondary and Primary education respectively.

Furthermore, this study shows that 32.7% of self-employed respondents used the ITN a night before the survey as opposed to 15.4% of their civil servant counterparts. The reasons for non-use of ITN among respondents include feeling of suffocation (18.5%) and heat (15.2%).

Yazoume et al in 2012 Journal on universal insecticide treated net campaigns achieve equity in coverage and use. A case of Northern Nigeria. This study sampled 4,638 individuals in 987 households in a community-based descriptive cross-sectional survey. Results show that among the covariates, education of the head of household, size of the household and household presence at the distribution points had a significant effect on household ITN ownership. Households with more than five members were less likely to own ITN compared to t hose with one member. (Yazoume et al, 2012).

Also results show that mosquito net ownership was concentrated among households with higher socio-economic status. This means that the wealthier households were more likely to own an ITN. The results also show no statistically significant differences in mosquito net use between different socio-economic groups. Furthermore, gender was observed to play a role as with higher odds observed among females. Age was found to play a role in ITN use with under-five children likely to use a net compared to older persons.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This research was conducted in Enugu State which is one of the States in Eastern part of Nigeria. In addition to the State owned ESUT Teaching Hospital, Parklane, there are seven district hospitals at Enugu-Urban Udi, Agbani, Awgu, Ikem, Enugu-Ezike and Nsukka. The predominantly urban population of Enugu North local Government area was used for this study. Enugu North is one of the three local government area that make up Enugu municipal area which is the capital of Enugu State.

Enugu North has an estimated land area of 106 square kilometers with an estimated population of about 244,852 (2006 census). Topographically, the area is hilly in nature with valleys and streams traversing it. This may serve as breeding site for mosquito. There are many health facilities located in the municipality, among them those owned by the federal state, local councils, Christian denominations, and private organization and individuals. There are 17 Local Government Area in Enugu State. These Local Government are further divided into 6 urban and 11 rural.

For the purpose of this study only public hospitals/clinics (owned by the federal, state or local council) was used. The predominantly rural population of Nsukka Local Government Area with an estimated land area of 1,810 square kilometers and a population of 309,633 (2006 census) was studied.

Nsukka Local Government Area is located in the northern part of the state and shares boundaries with Benue state to the north and Anambra State to the west. it has both public and private health facilities but only public health facilities was used for the study.

3.2 Study Design

This was a hospital-based descriptive cross-sectional comparative survey.

3.3 Study Population

The study population consists of pregnant women who are attending antenatal clinic in public health facilities in Enugu North and Nsukka Local Government Area.

3.3.1 Inclusion Criteria

All pregnant women of any gestational age who are resident in the Local Government Area attending antenatal clinic in public Health facilities in Enugu north and Nsukka Local Government Area.

3.3.2 Exclusion Criteria

i. Pregnant women who are not resident in the community but attend antenatal clinic in the facility.

3.4 Sample Size Estimation

The sample size for this survey will be calculated for both the urban population of pregnant women and for the rural population.

The formula for the calculation of sample size is as follows:

$$n = \frac{\{Z_{1-\alpha}\sqrt{2p(1-p)} + Z_{1-\beta}\sqrt{p_1(1-p_1) + p_2(1-p_2)}\}^2}{(p_1 - p_2)^2}$$

$$p = \frac{p_1 + p_2}{2}$$

$p_1 = proportion\ of\ pregnancy\ who\ use\ LLINs = 22\%\ (Ugwu\ et\ al, 2015)$

0.22

$p_2 = 0.12$

$$n = \left[\frac{1.96\sqrt{2\ x\ 0.17\ x\ 0.83}\ +\ (0.84)\sqrt{0.22\ x\ 0.78 + 0.12\ x\ 0.88}}{(0.22 - 0.12)}\right]$$

=219 respondents in each LGA

The calculated minimum sample size was 219 in each local government area. However 10% of the minimum sample size was added in order to adjust for non-response and missed data.

Adjusting for non-response rate

= 219/1 – 0.1

= minimum of 243 respondents required in each LGA

3.5 Sampling Technique

Two stage sampling technique was used:

Stage 1:

One urban and one rural local government area was purposively selected out of a total of 17 local government areas in the state. A comprehensive list of all the health facilities at all levels two local government areas were drawn, out of which two health facilities each were selected by simple random sampling.

Stage 2:

Systematic sampling was used to select respondents. The sampling frame was determined by obtaining the antenatal records to determine the average number of pregnant women that attended. For respondents in urban, the average daily attendance of 549 women was divided with a sample size of 243 to obtain an interval of 2.23 (k = 2). The respondents were then selected on the basis of this interval. For rural, the average daily attendance of 298 was divvied into sample size of 243 to obtain an interval of 1.2 (k =1). The respondents were then selected on the basis of this interval.

3.6 Data Collection

3.6.1 Description and design of study instruments

The data collection was done using an interviewer administered structured questionnaire adapted from the Malaria Indicator Survey (MIS) with a few modifications. The questionnaire was comprises four sections including socio-demographic characteristics, knowledge, availability, ownership and utilization long lasting insecticides among pregnancy women.

3.6.2 Training of research assistants

The research team comprises of six National youth service corps members who were trained for 3 days on how to administer the study questionnaire.

3.6.3 Pre-test of study instruments

The questionnaire was pre-tested in one health facility in each local government area not selected for the study.40 respondents were sampled and corrections were made before the training of the field team.

3.6.4 Field work

The survey was carried out from July 26, 2016 to August 23, 2016.

3.7 Data Analysis

Data entry and cleaning was done using Epi info version 7 and Statistical Software for Social Sciences (SPSS) version 16 software. Data was summarized using frequencies, and proportions. Chi-square test was done to compare proportions of categorical variables. Binary logistic regression was done to identify predictors of utilization of long lasting insecticide treated net amongst pregnant women. Level of statistical significance was set at $p< 0.05$.

3.7.1 Study Variables

Dependent variable:

Pregnant women's use of LLIN is the dependent variable in this study. For the purpose of this study, we use the number that reported sleeping under mosquito net the night before the study.

3.7.2 Independent variable

Independent variables used in the study include:

1. Place (locality) of residence: Place of residence was measured based on whether the respondent resided in an urban or rural area at the time of the study.
2. Age of the respondents: Age was included as a categorical variable in all models and subdivided into 15-19 years, 20-24years, 25-29 years, 30-34 years, 34-39years and ≥ 40years.
3. Educational attainment: Educational attainment was categorized into: primary, secondary, and tertiary.
4. Marital Status: Marital status was grouped into four categorical variables: Married, Single, Divorced and Widowed.
5. Ever heard of nets: Ever heard of mosquito net was measured as Yes or No.
6. Ownership of Net: Respondents were asked if they own a mosquito net or LLIN.
7. Average Number of nets owned per household: I attempted to find out the effect of number of nets owned on use.
8. Length of Time LLIN is owned.
9. Confidence can hang and use a net: Information on the ability and confidence to hang and use a net was solicited.
10. Knowledge that sleeping under a net protects pregnant women from malaria. Respondents were asked questions on the awareness of benefits of using a net.

3.8 Ethical Consideration

Approval to conduct the study was from the ethical review committee of the State Ministry of Health, Enugu, (Ref No: MH/MSD/EC/022: Appendix III)

~~Consent:~~ Written informed consent was taken from individual respondent before administering questionnaire.

Confidentiality: Questionnaires were numbered with codes to maintain confidentiality. They were assured that their responses will be kept confidential. Information on the system was password-protected and accessible to the researcher only.

Beneficence: Respondents were educated on the importance of Malaria control in pregnancy used long lasting insecticide treated nets. Opportunity was given to respondents to ask questions and their questions were addressed.

Right of withdrawal: Participants had the right to withdraw from the study at any point in time she chose.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic Characteristic of Respondents

Four hundred and seventy five respondents were selected for the study group. A total number of 475 questionnaires were administered during the study. These were properly filled and analyzed.

Table 4.1 shows the socio-demographic characteristics of respondents. Three hundred and seven (64.3%) of respondents were in the age group 20-29 with mean age 27.2±5.5 years. 373 (80.2%) attained tertiary level of education. 453 (97%) were married. 430 (92.3%) were of the Igbo tribe 455 (972%) `were Christians. 202 (42.5%) of them were unemployed, 239 (50.3%) of the respondents had low income. Details about the socio-demographic characteristics are found table 4.1.

Table 4.1: Socio-demographic characteristics of respondents

Characteristics	Rural n (%)	Urban n (%)	Total n (%)
Age (years)			
15 - 19	9 (3.9)	1 (0.4)	10 (2.13)
20 - 24	61 (26.4)	41 (17.2)	102 (21.7)
25 - 29	90 (39.0)	115 (48.1)	205 (43.6)
30 - 34	59 (25.5)	60 (25.1)	119 (25.3)
35 - 39	10 (4.3)	16 (6.7)	26 (5.5)
≥ 40	2 (0.9)	6 (2.5)	8 (1.7)
Total	231 (100.0)	239 (100.0)	470 (100.0)
Level of Education			
Primary	4 (1.8)	2 (0.8)	6 (1.3)
Secondary	55 (24.2)	31 (13.0)	86 (18.5)
Tertiary	168 (74.0)	205 (86.1)	373 (80.2)
Total	227 (100.0)	238 (100.0)	465 (100.0)
Marital Status			
Divorced	1 (0.4)	0 (0.0)	1 (0.2)
Married	223 (97.4)	230 (96.4)	453 (97.0)
Single	5 (2.2)	5 (2.1)	10 (2.1)
Widowed	0 (0.0)	3 (1.3)	3 (0.6)
Total	229 (100.0)	238 (100.0)	467 (100.0)
Ethnicity			
Fulani	1 (0.4)	2 (0.8)	3 (0.6)
Hausa	0 (0.0)	6 (2.5)	6 (1.3)
Igbo	216 (95.2)	214 (89.5)	430 (92.3)
Yoruba	6 (2.7)	7 (2.9)	13 (2.8)
Others	4 (1.8)	10 (4.2)	14 (3.0)
Total	227 (100.0)	239 (100.0)	466 (100.0)
Religion			
Christian	227 (99.1)	228 (95.4)	455 (97.2)
Muslim	2 (0.9)	8 (3.4)	10 (2.1)
Traditional	0 (0.0)	1 (0.4)	1 (0.2)
Others	0 (0.0)	2 (0.8)	2 (0.4)
Total	229 (100.0)	239 (100.0)	468 (100.0)
Occupation			
Unemployed	86 (36.8)	116 (57.4)	202 (42.5)
Business	88 (37.6)	39 (16.2)	127 (26.7)
Civil Servant	60 (25.7)	86 (35.7)	146 (30.7)
Total	234 (100.0)	241 (100.0)	475 (100.0)
Income			
Low	140 (59.8)	99 (41.1)	239 (50.3)
High	94 (40.2)	142 (58.9)	236 (49.7)
Total	234 (100.0)	241(100.0)	475 (100.0)

In the table below, 143 (62.7%) of those living in rural areas own a long lasting insecticide treated net compared with 118 (49.4%) of those living in urban areas. However, 31% of respondent use the nets in both rural and urban setting.

Table 4.2: Ownership and Use of LLIN

Characteristics	Rural	Urban	Total	X^2	P Value
Own LLIN					
Yes	143 (62.7)	118 (49.4)	261 (55.9)		
No	80 (35.1)	87 (36.4)	167 (35.8)		
No Response	5 (2.2)	34 (14.2)	39 (8.3)	24.0	< 0.001
Use LLIN					
Yes	58 (31.0)	11 (31.4)	69 (31.1)		
No	129 (69.0)	24 (68.6)	153 (68.9)	< 0.001	0.96

Three hundred and Sixty six (75.5%) of the respondents had poor knowledge about malaria.

Table 4.3: Knowledge about LLIN

Knowledge about LLIN	Frequency	Percentage
Good	119	24.5
Poor	366	75.5.0
Total	485	100.0

In the table below, 65 of the 182 (35.7%) of the respondents who knew how to hang a net use LLINs compared with 3 out of 36 (8.3%) of those that did not know how to hang the net ($p = 0.001$).Other selected factors were not significantly associated with the use of LLINs.

Table 4.4: Factors associated with the use of LLIN

Characteristics	Does not use LLIN	Use LLIN	Total	X^2	P Value
Age (Years)					
15 – 19	5 (62.5)40 (70.2)	3 (37.5)	8 (3.5)		
20 – 24 `	68 (66.7)	17 (29.8)	57 (25.0)		
25 – 29	37 (72.5)	34 (33.3)	102 (44.7)		
30 – 34	7 (87.5)	14 (27.5)	51 (22.3)		
35 – 39	1 (50.0)	1 (12.5)	8 (3.5)		
≥ 40	158 (69.3)	1 (50.0)	2 (0.88)		
Total		70 (30.7)	228 (100.0)	8.88	0.180
Level of Education					
Primary/Secondary	46 (75.4)	15 (23.2)	61 (27.0)		
Tertiary	110 (66.7)	55 (33.3)	165 (73.0)		
Total	156 (69.0)	70 (30.1)	226 (100.0)	1.59	0.207
Income					
High	62 (64.6)	34 (35.4)	96 (42.7)		
Low	93 (72.1)	36 (27.9)	129 (57.3)		
Total	155 (68.9)	70 (31.1)	225 (100.0)	1.45	0.229
Knows that LLIN use can prevent malaria in pregnancy					
Yes	151 (69.0)	68 (31.1)	219 (97.3)		
No	4 (66.7)	2 (33.3)	6 (2.7)		
Total	155 (68.9)	70 (31.1)	225 (100.0)	0.01	0.905
Confidence to hang a net					
No	33 (91.7)	3 (8.3)	36 (16.5)		
Yes	117 (64.3)	65 (35.7)	182 (83.5)		
Total	150 (68.8)	31.2(31.2)	218 (100.0)	10.5	0.001
Length of time net is owned					
≤ 6 months	66 (54.1)	56 (45.9)	122 (88.4)		
>6 months	10 (62.5)	6 (37.5)	16 (11.6)		
Total	76 (55.1)	62 (44.9)	138 (100.0)	0.40	0.525
Number of nets owned					
1	39 (52.7)	35 (47.3)	74 (53.6)		
More than 1	35 (54.7)	29 (45.3)	64 (46.4)		
Total	74 (53.6)	64 (46.4)	138 (100.0)	0.05	0.816
Knowledge					
Poor	83 (66.9)	41 (31.1)	124 (54.9)		
Good	72 (70.6)	30 (29.4)	102 (45.1)		
Total	155 (58.6)	71 (31.4)	226 (100.0)	0.35	0.556

The table below shows factors associated with the use of long-lasting insecticide treated nets in the rural area.

Confidence to hand an LLIN is statistically significant (P-Value 0.003) 3 (9.1%) of pregnant women who did not have the skill to hand the net use LLIN compared to 53 (35.8%) who have confidence to hand the net. Other details can be found in the table.

Table 4.5: Factors Associated with Use of LLIN in Rural Area

Variables	Rural		Total	X^2	P-Value
	n(%) does not use	n(%) use			
Confidence to hang a net					
No	30 (90.9)	3(9.1)	33(18.2)	9.02	0.003
Yes	95 (64.2)	53(35.8)	148(81.8)		
No. Of net owned					
1	31 (52.3)	28 (47,5)	59 (52.7)		
>1	28 (52.8)	25 (47.1)	53 (47.3)	0.00	0.976
How long have you had the net					
≤ 6 months	54 (53.5)	47 (46.5)	101 (87.3)		
>6months	8 (57.1)	6 (42.9)	14 (12.2)	0.07	0.796
Aware of use					
Yes	126 (69.2)	56 (30.8)	182 (97.3)		
No	3 (60.0)	2 (40.0)	5 (27)	0.19	0.660
Income					
High	51 (65.4)	27 (34.6)	78 (41.1)		
Low	80 (71.4)	32 (28.6)	112 (58.9)	0.78	0.376

The Table below shows the factors associated with use of long-lasting insecticide treated net in the urban area. No respondent who had no skill to use the net used insecticide treated net in the Urban area compared to 11 (64.5%) who had confidence to hand a net. Other details can be found in the table.

Table 4.6: Factors Associated with Use of LLIN in Urban Area

Variables	Urban		Total	X^2	P-Value
	n(%) does not use	n(%) use			
Confidence to hang a net					
No	3 (100.0)	0 (0.0)	3 (8.8)		
Yes	20 (64.5)	11 (35.5)	31 (91.2)		
No. Of net owned					
1	8 (57.1)	6 (42.9)	14 (58.3)		
>1	6 (60.0)	4 (40.0)	10 (41.7)	0.02	0.880
How long have you had the net					
≤ 6 months	11 (57.9)	8 (42.1)	19 (90.5)		
>6months	2 (100.0)	0 (0.0)	2 (9.5)		
Aware of use					
Yes	23 (67.7)	11 (32.3)	34 (97.1)		
No	1 (100.0)	0 (0.0)	1 (2.9)		
Income					
High	11 (61.1)	7 (38.9)	8 (51.4)		
Low	13 (76.5)	4 (23.5)	17 (48.6)	0.96	0.328

The table below shows factors associated with ownership of long-lasting insecticide treated net in the rural area. 9 (25.7%) of respondents who did not have confidence to hand an LLIN owned an LLIN compared to 107 (65.2%) of the respondents who had confidence to hand the net. Other details can be found in the table.

Table 4.7: Factors Associated with ownership of LLIN in Rural Area

Variables	Rural		Total	X^2	P-Value
	n(%) does not own	n(%) own			
Confidence to hang a net					
No	26 (74.3)	9 (25.7)	35 (17.6)		
Yes	57 (34.8)	107 (65.2)	164 (82.4)	18.53	<0.001
No. Of net owned					
1	31 (52.5)	28 (47.5)	59 (52.7)		
>1	28 (52.8)	25 (47.2)	53 (47.3)	<0.001	0.976
How long have you had the net					
≤ 6 months	54 (53.5)	47 (46.5)	101 (87.8)		
>6months	8 (57.1)	6 (42.9)	14 (12.2)	0.07	0.796
Aware of use					
Yes	126 (69.2)	56 (30.8)	182 (97.3)		
No	3 (60.0)	2 (40.0)	5 (2.7)	0.19	0.650
Income					
High	43 (47.8)	47 (52.2)	90 (40.4)		
Low	61 (45.9)	72 (54.1)	133 (59.6)	0.08	0.779

The table below shows factors associated with the ownership of Long-lasting insecticide treated net in the Urban area. 2 (66.7%) of respondents who had no skills to hang a net own an LLIN compared to 23 (74.4%) of respondents who had confidence to hand a net. Details can be found in the table.

Table 4.8: Factors Associated with ownership of LLIN in Urban Area

Variables	Urban		Total	X^2	P-Value
	n(%) does not own	n(%) own			
Confidence to hang a net					
No	1 (33.3)	2 (66.7)	3 (8.8)		
Yes	8 (25.8)	23 (74.2)	31 (91.2)	0.08	0.778
No. Of net owned					
1	8 (57.1)	6 (42.9)	14 (58.3)		
>1	6 (60.0)	4 (40.0)	10 (41.7)	0.02	0.889
How long have you had the net					
≤ 6 months	11 (57.9	8 (42.1)	19 (90.5)		
>6months	2 (100.0)	0 (0.0)	2 (9.5)	1.36	0.243
Aware of use					
Yes	23 (67.7)	11 (32.4)	34 (97.1)		
No	1 (100.0)	0 (0.0)	1 (2.9)	0.47	0.492
Income					
High	8 (38.1)	13 (61.9)	21 (50.0)		
Low	9 (42.9)	12 (57.1)	21 (50.0)	0.10	0.753

In the table below, 102 (85.7%) of respondent in rural area got information about LLIN from the antenatal clinic compared to 17(14.3%) of their counterpart in the urban. 59(56.2%) of respondents from the rural area also heard about LLIN from television compared to 46(43.8%) of the counterpart in the urban. Other details can be found in the table.

Table 4.9: Source of Information about LLIN

Characteristics	Rural	Urban
Church/Mosque	4(66.7)	2(33.3)
Radio	59(56.2)	46(43.8)
Television	9(69.2)	4(30.8)
Community events	20(80.0)	5(20.0)
Town Announcers	3(42.9)	4(57.1)
Neighbours	5(50.0)	5(50.0)
ANC	102(85.7)	17(14.3)
Others	22(75.9)	7(24.1)

Table 4.9: Source of Information about LLIN

Characteristics	Rural	Urban
Church/Mosque	4(66.7)	2(33.3)
Radio	59(56.2)	46(43.8)
Television	9(69.2)	4(30.8)
Community events	20(80.0)	5(20.0)
Town Announcers	3(42.9)	4(57.1)
Neighbours	5(50.0)	5(50.0)
ANC	102(85.7)	17(14.3)
Others	22(75.9)	7(24.1)

Table 4.10 Sources of Information about Malaria

79(60.3%) of respondents in the urban area got information about malaria from the antenatal clinic compared to 52(39.7%) of their counterparts from the rural area 56(81.2%) of respondents from the rural area got information about malaria from the radio compared to 13(18.8%) of their counterparts in the urban area. Details can be found in the table.

Table 4.10: Sources of Information about Malaria

Characteristics	Rural	Urban
Church/Mosque	1(50.0)	1(50.0)
Radio	56(81.2)	13(18.8)
Television	11(29.0)	27(71.0)
Community events	7(50.0)	7(50.0)
Town Announcers	1(50.0)	1(50.0)
Neighbours	5(45.4)	6(54.6)
ANC	52(39.7)	79(60.3)
Others	22(75.9)	7(24.1)

In the table below, 213 (83.2%) of respondents in the rural area knew that malaria is caused by a bite from infected mosquito compared with 43 (16.8%) of respondents from the urban area. Details from the table.

Table 4.7: Respondents Knowledge of what causes Malaria

Characteristics	Rural	Urban
Bad cold weather	5(83.3)	1(16.7)
Close contact with Malaria patient	1(50.0)	1(50.0)
Bite from mosquito infected with malaria	213(83.2)	43(16.8)
Through the air	1(50.0)	1(50.0)
Through contaminated water/food	9(75.0)	3(25.0)

In the table below, 213 (83.2%) of respondents in the rural area knew that malaria is caused by a bite from infected mosquito compared with 43 (16.8%) of respondents from the urban area. Details from the table.

Table 4.7: Respondents Knowledge of what causes Malaria

Characteristics	Rural	Urban
Bad cold weather	5(83.3)	1(16.7)
Close contact with Malaria patient	1(50.0)	1(50.0)
Bite from mosquito infected with malaria	213(83.2)	43(16.8)
Through the air	1(50.0)	1(50.0)
Through contaminated water/food	9(75.0)	3(25.0)

In the table below, 23(59%) of children in the rural area use LLINs compared to 16(41.0%) of children in urban area. Details can be found in the table.

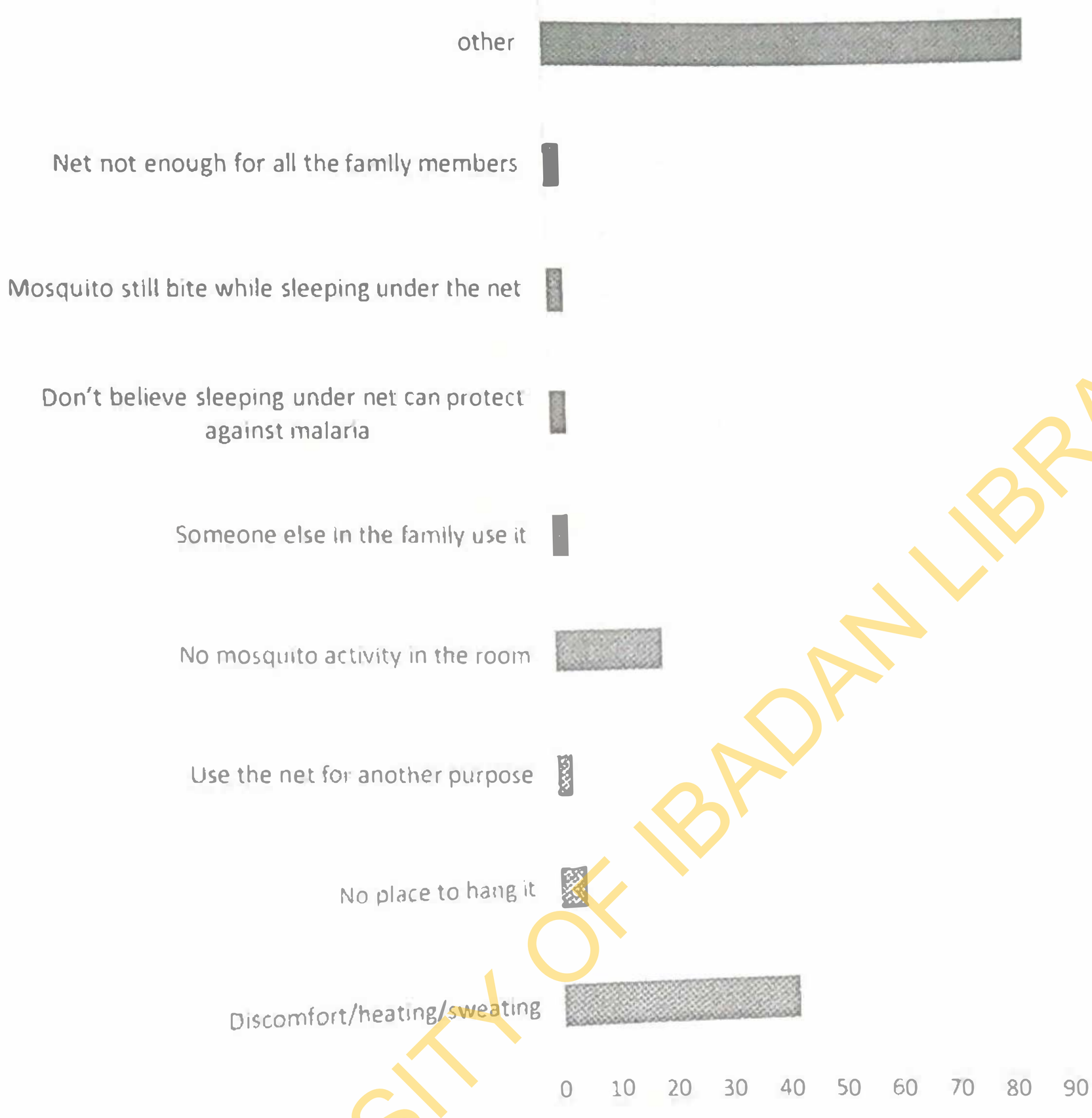
Table 4.8: Other Members of Household that Use LLIN

Characteristics	Rural	Urban
Husband	19(35.8)	34(64.2)
Children	23(59.0)	16(41.0)
Inland	6(50.0)	6(50.0)

In the table below, 17(74.0%) of children in the rural area have come down with fever compared to 6(26.0%) of children from the urban area. Details from the table.

Table 4.9: Household Members with Fever

Characteristics	Rural	Urban
Husband	20(69.0)	9(31.0)
Children	17(74.0)	6(26.0)
Inland	7(58.3)	5(41.7)



The above figure show the reasons for non-use of insecticide treated nets among sampled pregnant women. Discomfort/heat 42%, no mosquito activity in the room 19%, no place to hang 5%.

CHAPTER FIVE

DISCUSSION

This study set out to determine the ownership and utilization rate of long-lasting insecticide treated nets among pregnant women attending antenatal clinic in selected urban and rural health facilities in Enugu.The results from this study revealed that the ownership of insecticide treated nets among the respondents was 55.9%. However, the disaggregated ownership rate for rural and urban area are 62.7% and 49.4% respectively. The ownership rate in the rural is noticeably higher than that of the Urban.

The higher ownership rate in the rural compared to the urban may be due to a higher incidence of malaria in the rural area as a result of a possible higher parasite load in the rural because of preponderance of breeding sties including the bushes and stagnant collection of pools.

Furthermore, the net distribution campaigns of State, local government and the implantation partners are usually targeted towards the rural areas and this may be responsible for the higher ownership of long-lasting insecticide treated nets among studied rural pregnant women.

Though most studies have not really tried to compare the ownership and utilization rate between a purely rural area with a predominantly urban setting, however, those studies including community-based studies which were conducted in a most rural community show a slightly higher ownership rate when compared to those studies that sampled respondent from urban areas including facility-based surveys.

This result in slightly higher than a similar study done in Enugu. South-East Nigeria which discovered an ownership of 43.1% among studied pregnant women (Ugwu et al., 2015). The reason for the higher ownership in this study may be that even though both studies were carried out in the same state, this study sampled women from a locality which harbours a tertiary institutions and many of the respondents where attained a higher level of education.

However, this study has a lower ownership rate when compared to another study carried out in Anambra State, South-East Nigeria which reported an ownership of 60% (Ukibe et al.,

2015). These figures are higher than the 17% ownership reported in the 2008 National Demographic Health Survey in Nigeria (NDHS, 2008).

The reason for this increase in ownership may be due to an overall increase in awareness of the benefits of insecticide treated nets in protecting the pregnant woman and her baby against malaria and its complications or better LLIN coverage due to distribution campaigns especially during antenatal visits.

Furthermore, the results show that a higher proportion of pregnant women in the rural area own insecticide treated nets compared to their counterparts that reside in the urban area. This higher ownership rate is similar to studies carried out in the Northern part of Nigeria which reported higher ownership rate this part of the country is made of rural communities (Ankomah et al, 2012). Higher ownership rate observed in the rural area compared to the urban may be attributable to the activities of Support to National malaria programme in Nigeria (SuNMaP) and other NGOs who have demonstrated widespread insecticide-treated net distribution (community campaigns) especially in the rural areas of the state.

Support to National Malaria Programme in Nigeria (SuNMaP) has provided technical assistance to Nigeria National Malaria Elimination programme (NMEP) to scale up malaria control across ten states of the federation (Anambra, Kano, Lagos, Niger, Katsina, Ogun, Jigawa, Enugu, Kaduna and Yobe) from 2008 until 2015. Another reason for a higher ownership rate observed among rural respondents may be because the prices of items are generally lower in the areas compared to urban such that those pregnant women who purchased their nets in the rural area must have done so at a cheaper rate.

In addition, the rural area is expected to have heavy vegetation with bushes which are ideal breeding sites for the mosquitos. A high vector load will likely necessitate the need among pregnant women who reside here to protect against mosquito bites and consequently acquire more nets.

The result from the study also shows that one-third of the respondents use the net. The utilization rate was found to be the same between urban and rural pregnant women. This result is expected and could also be due to the fact the both locations has at least one tertiary institution such that the level of educational attainment is high in both urban and rural area.

This finding is higher than a similar study in Enugu, South East Nigeria which reported are utilization rate of 20.7% (Adogu and Ijemba, 2013). Another study in 2015 which sampled pregnant women in 18 states of Nigeria reported a slightly lower utilization rate (Ezire et al., 2015).

Also a higher proportion of pregnant women with tertiary education use insecticide treated nets compared to those with lower level of educational attainment. A higher proportion of pregnant women with a lower income appear to use insecticide treated nets compared to those with a higher income. However, this was not statically significant. The reason may be that pregnant women with a higher income can afford other methods of malaria control and can access anti malarial treatment when ill.

Overall, we can deduce that even though a greater proportion of pregnant women owned insecticide treated nets in both localities, only a fraction of these women actually slept under the net the previous night before the survey. This finding is consistent with another study carried out in Ilorin, North West Nigeria (Onwuka et al., 2016).

This study also discovered the facilitator of use of insecticide treated nets. Pregnant women who had skills on how to hang the net where found to use the LLIN compared to those who do not know how to hang the net. This was statistically significant.

This finding is consistent with that from another study (Ezire et al., 2015). Therefore policies geared towards improvement in utilization of insecticide treated nets among pregnant women should include education on the skills of hanging the net.

A greater proportion of those that owned the net for less than 6 months were found to use the net compared to those who have had the net for more than 6 months. The reason may be that these pregnant women who had had the nets for less than 6 months have benefitted from recent distribution campaign or attended antenatal clinic were nets were distributed and were equally educated on the benefits of using insecticide treated nets. There was no difference in use among pregnant women who own one net and those who own more than one net. Therefore, the number of nets owned did not predict utilization in both localities. The results from this study also show that pregnant women who did not use nets gave reasons for such as discomfort and feeling heat, the nets contain harmful chemicals, and mosquitos still bite

despite sleeping under the net, no space to hang the net, use the net for other purpose, other members of the family use it and the net is not enough for all the family members.

The Result from the study, show that a greater proportion of the respondents in the rural area got information on the benefits of long-lasting insecticide treated nets from Antenatal clinic compared to their counterpart in the urban. This could mean that a greater number of pregnant women in the rural area attend ante-natal clinic compared to pregnant women residing in the urban.

However, as explained earlier, the rural locality also harbours a tertiary institution so the level of awareness and educational attainment of the rural pregnant women is comparable or equal to that of the urban pregnant women.

Similarly, a slightly greater number of rural respondents got information on the benefits of long-lasting insecticide treated net from the media (Television). The reason may be same as stated above. The result also show that a higher proportion of children use the long-lasting insecticide treated nets compared to urban children. Of course, it stands to reason that since their mothers use the net that the children will equally use long-lasting insecticide treated nets.

It is worthy of note, however, that despite the higher ownership rate among rural pregnant women and their children, more children among the rural dwellers have come down with fever compared to those children residing in the urban. The reason for this may also be as a result of a higher parasite load as deduced earlier.

We did not observe respondents actually hanging or using nets, and we depended on their responses of either yes or no to the question "how confident are you to hang or use a net" with yes I am confident and no I am not as possible responses.

Conclusion

This study shows that majority of pregnant women own LLINs. Increase in coverage and ownership of long-lasting insecticide treated nets have been reported in most studies. This is probably due to the success of distribution campaigns especially during antenatal visits. However, only one-third of the pregnant women who own a net actually use it. Several

studies have reported that net ownership does not necessarily translate to improvement in utilization. Knowledge and skills to hang the net were an important stimulator to use of LLIN by pregnant women. Therefore policies to improve insecticide treated net utilization should include education and skills on how to hang the net.

Recommendation

Skills should be built on the use of net as these may contribute to improve LLIN use among pregnant women in Enugu State, Nigeria. Pregnant women should be educated on the benefits of using an LLIN.

REFERENCES

Abdul-Kareem, H.A., 1999. Promotion of the use of insecticide treated nets, paper presented to the National Consensus Meeting on RBM Programme by Primary Health Care and Diseases Control, Federal Ministry of Health, Abuja.

Adebayo, A.M., Akinyemi, O.O., Cadmus, O.E., 2013.Ownership and utilisation of insecticide-treated mosquito nets among caregivers of under-five children and pregnant women in a rural community in Southwest Nigeria. *Journal of Preventive Medicine and Hygiene*. Vol. 54, 58 – 64

Adebowale, A.S, Yusuf, O.B, Fagbamigbe, A.F. 2012. Survival Probability and Predictors for Woman Experience Childhood Death in Nigeria: "Analysis of North-South Differentials". BMC Public Health Vol. 12. No. 1, 430-442.

Adebowale, A.S., Fagbamigbe, A.F., Okareh, O.T., Lawal, G.O. 2012. Survival Analysis of Timing of First Marriage among Women of Reproductive age in Nigeria: Regional Differences. *African Journal of Reproductive Health* Vol. 16. No. 4, 95-107.

Adogu, P.O., Ijemba. C., 2013. Insecticide Treated Nets Possession and Utilization among Pregnant Women in Enugu Nigeria: A Descriptive Cross-sectional Study. *Journal of Natural Sciences Research*.Vol.3, No. 15.

Ankomah A., Adebayo S. B., Arogundade E.D., Anyanti J et al; Determinants of Insecticide treated net ownership and Utilization among pregnant women in Nigeria. BMC Publ. Health 2012, 12: 105.

Bashinyora, J.B., 2010. Utilisation of Insecticide Treated Nets in households with Children Under 5 Years in Muhorro Sub County, Kibaale District, Uganda. *A research Dissertation submitted to the postgraduate school in Makerere University, Kampala*

Baume, C.A., Marin, M.C., Gains in awareness, 2008, Ownership and use of insecticide-treated nets in Nigeria, Senegal, Uganda and Zambia. *Malaria Journal*, Vol.7, 153

Centers for Disease Control and Prevention.2014.Ebola Virus Disease (Ebola) Pre-Departure/Exit Screening at Points of Departure in Affected Countries. Available at.http://wwwnc.cdc.gov/travel/pdf/ebola-exit-screening.pdf.

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 Womens Health*, Vol. 7, 655–661.

Federal Ministry of Health. *Nigeria National Malaria Control Strategic Plan*. Abuja: Federal Ministry of Health; 2014.

Gemade, E.I., Earland, J., 2013.Long Lasting Insecticidal Nets (LLINs) Ownership and Use: A qualitative study to explore why people in Kuje Area Council of Federal Capital Territory of Nigeria are not sleeping under the LLINs for Malaria prevention. *The Journal of MacroTrends in Applied Science.* Vol.1, No1.

Johnson, O.E., Inyang, A.C., Etuknwa, U.I., Ekanem,U.D., Udo, U.O., Ubom, I.,Tommy, D.P., Ichah, M.E., Okeke, O.J.,Ntukidem, U.B., 2015, Awareness, Ownership and Utilization of Insecticide Treated Nets among Households in a Rural Community in Southern Nigeria. *Scholars Journal of Applied Medical Sciences*Vol. 3. No.2A. 608-613.

Komomo, E.A., Egena, R., Irene, C., Ayorinde, A.O., Agada, P.O., 2016. Assessment of the Utilization of Insecticide Treated nets (ITNs) in Calabar Metropolis, Cross River State, Nigeria. *Journal of Heal tMedicine a Nursing*. Vol. 26.

Lencha, B., Wakgari, D., 2014. Insecticide Treated bed Net Utilization among Under Five Children and Household bed Net Ownership in Adami Tulu District, Oromia Regional State, Ethiopia.*A Thesis Submitted To The School of Graduate Studies of Addis AbabaUniversity.*

Mukhopadhyay, D.K., Basau, S.S., Roy, D., Das, N., Akbar, F., Sakar, G.N., 2016. Netting the malaria menace: Distribution and utilization of long-lastinginsecticidal net in a malaria endemic area in Bankura, West Bengal.*Journal of Vector Borne Diseases.* Vol. 53. 23-29

National Population Commission (NPC) [Nigeria] and ICF Macro 2009. Nigeria Demographic and Health Survey 2008.NPC and ICF Macro; Abuja, 2009.

National Population Commission Nigeria and KF Macro Nigeria: DHS, 2008 – Final Report (English) Calverton: Macro International; 2009, p. 29.

Nwana, T.B., 2011. Knowledge and Utilization of Insecticide Treated Nets to prevent malaria in Cameroon(A Case Of The Mount Fako Region). Thesis Presented to the Higher Degree Committee of Ritsumeikan Asia Pacific University.

Nwokcukwu, H.I., , Emma-Ukaeghu, U. C., Inya-Agha, D., Iwuoha, E.C., 2014. Use of Insecticide treated bed nets amongst Public Health Physicians in Nigeria.*Journal of Dental and Medical Sciences.* Vol. 13, No. 1., 73 -77

Nwokolo, E. (2015). Determiantns of Use of insecticide-treated nets among pregnant women in Nigeria, 655-661.

Omotosho, I. M., Ganiyu, A. S., Rabiu, O. J., 2009. Awareness and Use of Insecticide Treated Nets among Women attending antenatal clinic in a Northern State of Nigeria. Vol. 59, No. 6

Onwujekwe, O., Chima, R., Shu, E., Nwagbo, D., Okonkwo, P., 2001. Hypothetical and actual willingness to pay for insecticide-treated nets in five Nigerian communities, Tropical Medicine and International Health. Vol.6, No.7, 545-553.

Onwujekwe, O., Hanson, K., Fox-Rushby, J., 2004. Inequalities in purchase of mosquito nets and willingness to pay for insecticide-treated nets in Nigeria: Challenges for malaria control interventions. Malaria Journal Vol. 3, 6.

Onwuka, J.U., Akinyemi, J.O., Ajayi, I.O, 2016. Household ownership and use of insecticide-treated bednets among school children in Ibadan, Oyo State, Nigeria. Malaria World Journal 2016, 7,9

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,* Vol. 7,145

Ozims, S.J., Eberendu, I.F. 2014. Awareness, Ownership And Utilization Of Long Lasting Insecticide - Treated Net (LLIN) Among Pregnant Women attending Antenatal Clinic in Imo State University Teaching Hospital, Orlu, Imo State. *International Journal of Research In Medical and Health Sciences.* Vol.4, No. 8.

Pulford, J. Hetzel., M. N., Bryant, M., Siba, P.M., Maeller, I., 2011. Reported reasons for not using a mosquito net when one is available. A review of the Published Literature of Malaria. Vol. 10, 83

Rhee, M., Sissoko, M. Perry, S., McFerland, J., Doumbo, O., 2005. Use of Insecticide Treated Nets following a malaria education intervention in Piron, Mali: A Control Trial with Systematic allocation of households.

Salaudeen, G.A., Jimoh R.O., Musa,.O.I.,2009. Awareness and use of Insecticide Treated Nets among women attending ante-natal clinic in a Northern state of Nigeria. *Journal of Parkistan Medical Association.*

Support to National Malaria Programme in Nigeria (SuNMaP). Malaria Control in Nigeria 2016 www.malariaconsortium.org/SuNMap.

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,* Vol. 48, 133 –137 43

Ugwu, E.O, Ezechukwu, P.C, Obi, S.N., Ugwu, A.O., Okeke, T.C., 2015. Utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria. *Original article*. Available athttp://www.njcponline.com

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 the use of Insecticide Treated Bed Nets (ITNs) in Anambra State, South-east Nigeria. *Journal of Applied Medical Sciences*, Vol. , No. 1, 15-22

World Health Organisation, 2009. Preventing Malaria during pregnancy.

World Health Organisation. 2015. World Malaria Report 2015. Available at: www.who.int/malaria/publications/world-malaria-report-2015/report/en/

Ye, Y., Patton. E., Kilian, A., Dovey, S., Eckert, E., 2012.Can universal insecticide-treated net campaigns achieve equity in coverage and use?The case of northern Nigeria. Malaria Journal. Vol.11:3.

Yusuf, O. B., Akinyemi, J. O., Fagbamigbe, A. F., Ajayi, I. O., Bamgboye, E. A., Ngige, E., Issa, K., Abatta, E., Ezire, O., Amida, P., Bashorun, A. 2016: Controlling malaria in pregnancy: how far from the Abuja Targets Vol. 7, No. 7.

Zuradam, S.F., 2012. Factors Associated With Use And Non-Use of Mosquito Nets for Children less than 5 Years of Age in the Mfantseman Municipality, Ghana. *Master's Thesis Public Health School of Medicine Faculty of Health Sciences University of Eastern Finland*

Ugwu, E.O, Ezechukwu, P.C, Obi, S.N., Ugwu, A.O., Okeke, T.C., 2015. Utilization of insecticide treated nets among pregnant women in Enugu, South Eastern Nigeria. *Original article*. Available athttp://www.njcponline.com

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 the use of Insecticide Treated Bed Nets (ITNs) in Anambra State, South-east Nigeria. *Journal of Applied Medical Sciences*, Vol. , No. 1, 15-22

World Health Organisation, 2009. Preventing Malaria during pregnancy.

World Health Organisation. 2015. World Malaria Report 2015. Available at: www.who.int/malaria/publications/world-malaria-report-2015/report/en/

Ye, Y., Patton, E., Kilian, A., Dovey, S., Eckert, E., 2012.Can universal insecticide-treated net campaigns achieve equity in coverage and use?The case of northern Nigeria. Malaria Journal. Vol.11:3.

Yusuf, O. B., Akinyemi, J. O., Fagbamigbe, A. F., Ajayi, I. O., Bamgboye, E. A., Ngige, E., Issa, K., Abatta, E., Ezire, O., Amida, P., Bashorun, A. 2016: Controlling malaria in pregnancy: how far from the Abuja Targets Vol. 7, No. 7.

Zuradam, S.F., 2012. Factors Associated With Use And Non-Use of Mosquito Nets for Children less than 5 Years of Age in the Mfantseman Municipality, Ghana. *Master's Thesis Public Health School of Medicine Faculty of Health Sciences University of Eastern Finland*

APPENDIX I

QUESTIONNAIRE

Nigerian Field Epidemiology and Laboratory Training Program

Facility Survey Questionnaire on Determinants and Utilization of Insecticidal Nets among women attending Antenatal clinic in selected Urban and Rural Health Facilities in Enugu State

Introduction and Consent

Hello Ma, My name is _____ and I am working with _____. I am conducting a research study on the use of insecticidal nets and determinants by pregnant women attending antenatal Clinic in health facilities in the state. I will very much appreciate your participation in this survey. The information you provide will help the government to plan health services. The interview will take between 10 and 20 minutes to complete. Whatever information you provide will not be shown to other persons.

Participating in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However I, hope that you will participate in this survey since your views are important. Your responses will be analyzed with those of other participants and will be used to make recommendations to government policy makers to improve the health care delivery system

Do you agree to the interview? ☐ Yes ☐ No

Questionnaire Identification

Questionnaire ID _____

Signature of Interviewer _____

Date _____

Name of Facility _____

☐ Primary

☐ Secondary

☐ Tertiary

Section A: SOCIO DEMOGRAPHIC CHARACTERISTICS

1. CODE NO_____

2. AGE at last birthday (Years) _____

3. Marital Status ☐ M arried ☐ Divorced ☐ Widowed

4. Religion ☐ Christian ☐ Muslim ☐ Traditional ☐ Other

5. Ethnicity ☐ Hausa ☐ Fulani ☐ Igbo ☐ Yoruba ☐ Others Specify _____

6. Occupation _____

7. Location ☐ Urban ☐ Rural

8. Level of Education ☐ None ☐ Primary ☐ Secondary ☐ Tertiary ☐

9. Monthly Income _____

SECTION B: CLINICAL INFORMATION/KNOWLEDGE/PERCEPTION

10. How many pregnancies have you had?_____

11. How many children do you have? _____

12. Do you consider malaria fever a problem? ☐ Yes ☐ No

13. In the past 6 months, have you seen or heard any messages about malaria? ☐ Yes ☐ No

If No skip to Q 15.

If Yes what is the message _____

_____

_____

14. What is the source of malaria information? ☐ Radio ☐ Television ☐ Church/Mosque

☐ Community event ☐ Town Announcers ☐ Neighbors ☐ ANC ☐ Others Specify

_____

15. Do you know what causes malaria? ☐ Yes ☐ No If No skip to Q.17

If yes name _____

16. Malaria is transmitted to humans (Tick One) ☐ Through Contaminated water/foods

☐ Through the air ☐ Bad cold weather ☐ Bite of mosquito infected with malaria

☐ Close contact with a malaria patient ☐ Don't k ☐ Others Specify

_____

17. When do Mosquitoes feed? (Tick only one) ☐ Day time ☐ Night time ☐

Both day and night time ☐ Don't know ☐

18. How will you know that your fever is caused by malaria? ☐ By taking my temperature

☐ Testing blood with RDT ☐ Blood microscopy ☐ Symptoms ☐ Don't know ☐

Others Specify _____

19. What are the symptoms of malaria? ☐ Fever ☐ omiting ☐ eadache

Shivering/Rigor ☐ Convulsion ☐ Don't know

20. Do you think malaria can be controlled or eliminated ☐ Yes ☐ No

If Yes give reasons _____

_____

If No give reasons _____

_____

21. What can a pregnant woman do to prevent malaria? ☐ Sleep under LLIN ☐ ake SP given

at ANC ☐ Take Chloroquine ☐ Take Daraprim ☐ Don't know ☐ Others specify

_____

22. What can you do to prevent malaria ☐ Sleep under LLIN ☐ Sleep under mosquito net

Use insecticide spray ☐ Mosquito coils ☐ Clean environment ☐ Don't know ☐

Others, specify _____

23. In the last month, did you hear any message about LLINs? Yes ☐ No ☐

If No skip to Q25

If yes what was the message _____

24. What is the source of the Message? Radio ☐ Television ☐ Church/Mosqu ☐

Community events ☐ Town Announce ☐ Neighbors ☐ ANC ☐

Others, specify _____

25. How long after fever starts would you seek treatment for Malaria?

☐ Within 24hrs ☐ Next day ☐ Others, specify _____

26. What do you use insecticide treated nets for? Keep flies away ☐ Keep rats away ☐

Fishing ☐ Prevents mosquito ☐ Useful in malaria prevention ☐ l mosquito ☐

27. Did you have malaria during your last pregnancy? Yes ☐ No ☐

28. Do you know LLIN can be used in pregnancy? Aware of use ☐ Not aware of use ☐

SECTION C: AVALIABILITY AND ACCESS

29. Do you have a mosquito net that can be used while sleeping? Yes ☐ No ☐

30. If No what are your reasons for not using

	Yes	No
No Net distribution		
Culture barrier		
Cost of buying		
Religious barrier		
Someone shut in		
Feel suffocated		
Skin irritation		
Chemical harmful		
Feeling heat		
Causes nose irritation		
Using other methods to prevent mosquitoe bites		
Others		

25. How long after fever starts would you seek treatment for Malaria?

☐ Within 24hrs ☐ Next day ☐ Others, specify _____

26. What do you use insecticide treated nets for? Keep flies away ☐ Keep rats away ☐

Fishing ☐ Prevents mosquito ☐ Useful in malaria prevention ☐ I mosquito ☐

27. Did you have malaria during your last pregnancy? Yes ☐ No ☐

28. Do you know LLIN can be used in pregnancy? Aware of use ☐ Not aware of use ☐

SECTION C: AVALIABILITY AND ACCESS

29. Do you have a mosquito net that can be used while sleeping? Yes ☐ No ☐

30. If No what are your reasons for not using

	Yes	No
No Net distribution		
Culture barrier		
Cost of buying		
Religious barrier		
Someone shut in		
Feel suffocated		
Skin irritation		
Chemical harmful		
Feeling heat		
Causes nose irritation		
Using other methods to prevent mosquitoe bites		
Others		

31. If Yes, what is the source of your LLIN? Distribution campaigns ☐ Purchased it ☐

Health facilities/ANC ☐ Others Specify _____ ☐

32. What type of net do you have? Pretreated ☐ Untreated ☐

33. What is the cost of your LLIN? _____

34. What color of LLIN do you like? White ☐ Blue ☐ Green ☐ Multi-color ☐

Red ☐ Any color ☐

SECTION D: OWNERSHIP/UTILIZATION

35. How many mosquito nets do you have? _____

36. Do you know how to hang the net? Yes ☐ No ☐

37. How long have you had the net? _____

38. How often do you use LLIN? Always ☐ Sometimes ☐ Never ☐

39. Did you sleep under this mosquito net last night? Yes ☐ No If yes skip to Q.40 ☐

If No why (Do not read but tick the options as mentioned by respondent)

Discomfort(Heat/Sweating) ☐

No place to hang them ☐ Use the net for other purposes ☐ How or no mosquito activity in the room ☐ Some else in the family use the net ☐ Don't belief sleeping under the net protect from Malaria ☐ Mosquito still bite while sleeping under the net ☐ Net not enough for all the family members to use ☐ Others specify _____

40. How many times have the net been washed? _____

41. How is the net dried?

_____

42. How often do you change the LLIN? _____

43. Which other members of the Household use LLIN ☐ Husband ☐ Childre ☐ In-laws ☐

Others Specify _____

44. In the last one week, which other household members have come down with fever?

Husband ☐ Children ☐ In-law ☐ Others Specify _____

45. Are LLIN safe to use? Yes ☐ No ☐

APPENDIX II

LIST OF 17 LOCAL GOVERNMENT AREAS IN ENUGUS STATE GROUPED INTO RURAL AND URBAN WITH SAMPLED HEALTH FACILITIES

Urban	**Rural**
Enugu North	Aninri
Enugu East	Ezeagu
Enugu South	Igbo Etiti
Udi	Igbo Eze North
Awgu	Igbo Eze South
Oji River	Isi Uzo
	Nkanu East
	Nkanu West
	Usukka
	Udenu
	UzoUwani
Urban	Rural
1. ESUT Teaching Hospital, Parklane, Enugu	District Hospital Nsukka
2. Poly Clinic, Asata, Enugu	Bishop Shannahan Hospital, Nsukka

APPENDIX III

ETHICAL APPROVAL

RESEARCH ETHICS COMMITTEE

Ref. No: MH/MSD/EC/0222

Date: 26th July, 2016.

The Research
Dr.Mmamelu Stanley
Dept:Epidermiology & Biostatistics
Faculty:Public Health,
University College Hospital,
Ibadan,Nigeria.

Sir,

RE:-Use of Insecticidal nets and determinants by Pregnant Women Attending Antenatal Clinic in Selected Urban and Rural Health Facilities In Enugu.

I refer to your request for permission to carry out a study/research on the above health issue and to inform you that approval has been granted to you.

Ethical Guideline

1. You are to keep to the principles of informed consent by obtaining a signed/thumb printed informed consent of subjects, parents/legally accepted representative.
2. You are to deposit two (2) copies of the result of your study to the ethical committee of the State Ministry of Health.

Chairman, Research Ethics Committee