UTILIZATION OF LONG LASTING INSECTICIDAL NETS BY UNDER FIVE CHILDREN IN OSUN STATE

BY

ISRAEL, OLUWASEYI KIKELOMO
M.B.B.S (LAUTECH)
MATRIC NO: 176995

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

JANUARY, 2016

ABSTRACT

Malaria is one of the most severe public health problems worldwide. It occurs mostly in poor, tropical and subtropical areas of the world and it is a leading cause of death and disease in many developing countries especially sub-saharan Africa, where young children and pregnant women are the groups most affected. Utilization of long lasting insecticidal net (LLIN) has been associated with reduction of malaria incidence. Despite attaining high levels of Long Lasting Insecticidal net coverage in Nigeria many children under five years of age do not sleep under the net. This study assessed the level of knowledge, utilization and factors influencing the use of LLIN among under five children in Osun State.

A cross-sectional survey was conducted among 1,020 mothers/caregivers of under five children in selected households in Osun State using a multistage sampling technique. A pre-tested semi-structured interviewer administered questionnaire was used to collect data on socio-demographic characteristics, knowledge on LLIN, ownership of LLIN, utilization of LLIN by under five children and factors influencing utilization of LLIN. Six focus group discussions were conducted among mother/caregivers of under five children. Data was summarized using frequencies, means and proportions. Chi square test was done to compare proportions for categorical variables. Multivariate analysis using binary logistic regression was done to determine the predictors of knowledge on LLIN and its utilization. Level of statistical significance was set at p value<0.05.

Mean age of respondents was 30.0±6.3 years. All the mothers were aware of LLIN and 76.1% had good knowledge of LLIN. Their major sources of LLIN were during net distribution campaign 516 (51.0%) and from the health facilities 322 (32.0%). Eight hundred and thirty six (82.9%) respondents had at least one LLIN and 58.6% under five children slept under the net the night before the study. It was also reported that 41.2% of all the under five children surveyed

slept under the net every night. Factors influencing utilization of LLIN by under five children were; level of education (OR=aOR=1.44, 95%CI=1.01-2.07, p=0.04), knowledge (aOR=1.82, 95%CI=1.36-2.45, p=<0.001) and tribe (aOR=1.54, 95%CI=1.01-2.36, p=0.04) of respondents. The barriers to utilization of LLIN by under-five children were discomfort due to heat, reactions to chemical and unpleasant odour. Other barriers from the FGDs were the misconception of some mothers concerning the net that the distributed nets were more effective than the ones purchased and the mothers ignorant of the fact that the nets comes in different colours and sizes. Majority of the respondents had good knowledge on the use of LLIN. The level of utilization of LLIN among study respondents was slightly above average. Educative programmes on the use of LLIN should be given through the media by the government in other to capture mothers/caregivers with poor knowledge on LLIN. Also, health workers should educate mothers on proper handling of LLIN prior to its use in other to limit the side effects of the chemicals.

Keywords: LLIN, Knowledge, utilization and under-five children.

Word count: 477

ACKNOWLEDGEMENT

I warmly acknowledge the support, encouragement and understanding of my supervisors, Prof. (Mrs) O.I. Fawole and Dr. A.S. Adebowale for all the attention and guidance they gave during the course of carrying out this research. I also appreciate the contributions of my programme supervisors; Dr Gabriele Poggensee and Dr Aishat Abubbakar. My gratitude also goes to Dr (Mrs) Ajayi, Dr Akinyemi and other principal staff in the Epidemiology and Medical Statistics Department for their inputs.

My gratitude also goes to my dad, mum, siblings and other loved ones for their prayers and moral support given to me all through the entire programme. Finally to my wonderful and understanding husband, thank you for the all-round support and encouragement.

DEDICATION

This work is dedicated to the Almighty God, the giver of life and my ever present help in time of need. This work is dedicated to my lovely husband who has always been a source of encouragement.

CERTIFICATION

We hereby certify that this research, titled **"Utilization of Long Lasting Insecticidal Nets By Under Five Children in Osun State"** was carried out and completed by ISRAEL Oluwaseyi Kikelomo in the Department of Epidemiology and Medical Statistics, University of Ibadan under the supervision of Prof. (Mrs) O.I. Fawole and Dr. A.S. Adebowale

12/2/16

.....

Prof. (Mrs) Olufunmilayo Fawole
MBBS (Ib), M.Sc. (Epid & Biostat), FWACP, FMCPH, Cert. in Clinical Epidemiology (SA)
Head, Department of Epidemiology and Medical Statistics

Faculty of Public Health, College of Medicine

University of Ibadan, Ibadan, Nigeria

12/02/16

.....

Dr. A.S. Adebowale
B.Sc (Ado), P.G.D. (Lagos), M.Sc. (Lagos), M.Sc. (Ife), Ph.D. (Ife)
Senior Lecturer, Department of Epidemiology and Medical Statistics

Faculty of Public Health, College of Medicine

University of Ibadan, Ibadan, Nigeria

TABLE OF CONTENTS

CHAPTER THREE: METHODOLOGY

CHAPTER FOUR: RESULTS

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMMENDATION

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ACT	-	Artemisinin-based combination therapy
CHEW	-	Community Health Extension Worker
FBO	-	Faith Based Organization
FGD	-	Focus Group Discussion
IPT	-	Intermittent Preventive Treatment
IRS	-	Indoor Residual Spraying
ITN	-	Insecticide Treated Nets
LGA	-	Local Government Area.
LLIN	-	Long Lasting Insecticidal Nets
NGO	-	Non Governmental Organization
NDHS	-	Nigeria Demographic and Health Survey
WHO	-	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria is one of the most severe public health problems worldwide (CDC, 2014a). It occurs mostly in poor, tropical and subtropical areas of the world and it is a leading cause of death and disease in many developing countries especially sub-saharan Africa, where young children and pregnant women are the groups most affected (CDC, 2014b). Malaria is a febrile, mosquito-borne infection, classically characterized by periodic chills, rigors, and high fevers followed by profuse sweating, which occur at regular intervals of 48 to 72 hours (John Hopskin Malaria Research Institute, 2014). It is prevalent throughout most of the tropical world, producing a situation in which 40% of the world's population is at risk for acquiring this disease (Otsemobor et al., 2013). It affects 300 to 500 million people yearly and it is considered one of the most common infectious diseases and the most important of the parasitic diseases (Otsemobor et al., 2013).

The infections in humans are caused by four different species of the genus *Plasmodium*; *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium vivax*, and *Plasmodium ovale*. They are associated with different clinical presentations, progression, prevalence, and antimalarial resistance patterns (John Hopskin Malaria Research Institute, 2014). *P falciparum* infection results in the highest morbidity and mortality, accounting for almost all of the over 1 million deaths caused by malaria annually of which under five children and pregnant women are mostly affected (John Hopskin Malaria Research Institute, 2014).

The combination of tools and methods to combat malaria includes Long-Lasting insecticidal nets (LLIN) and artemisinin-based combination therapy (ACT), supported by indoor residual spraying of insecticide (IRS) and intermittent preventive treatment in pregnancy (IPT)

(WHO, 2008a). Utilization of LLIN has been associated with reduction of malaria incidence (CDC, 2014b; Ouattara et al., 2011). Long Lasting Insecticidal Net ownership and use is one of the proven interventions adopted by RBM partners to reduce malaria burden in Nigeria (Aderibigbe et al., 2014). It has proved to be an important means for the control of malaria and other vector –borne diseases (Tokponnon et al., 2014). A long-lasting insecticide-treated net (LLIN) is a net (usually a bed net), that has been treated with safe, residual insecticide for the purpose of killing and repelling mosquitoes (WHO, 2013a). It retains its biological activity without need for retreatment for a period of three years under field conditions (WHO, 2005). The multiplied effects of several LLINs killing and reducing the population of vector mosquitoes in the community provide protection for all the residents including persons who do not sleep under the nets (Obembe et al., 2014). It is estimated that less than 5% of children in sub-Saharan Africa currently sleep under any type of insecticide-treated net ("Net Distribution," 2011).

The use of treated nets reduces the numbers of infective mosquito bites by 70-90%, malaria morbidity by 50%, child mortality by 27%, incidence of the malaria parasite by 40% and malaria anaemia by nearly 50% (Obembe et al., 2014). Studies have shown that consistent and correct utilization of LLIN leads to a 90% decrease in malaria transmission rate (Baume and Marin, 2008; Bejon et al., 2009).. This intervention is generally considered to be among sthe most cost-effective ways to save lives(WHO, 2013a). In a previous study done in Osun state, malaria was found to be the commonest cause of morbidity and mortality among under five children (Egbewale et al., 2009). According to the Nigeria Demographic and health survey (NDHS) 2013, among all the states in south west, Osun State had the least proportion (5.7%) of under-five children who slept under LLIN the night before the survey (National Population Commission and ICF International, 2014).

1.2 Statement of Problem

Malaria has been a major threat in Africa, ravaging most of its population. According to recent figures from the World Health Organisation (WHO), about 3.4 billion people, half of the world's population are at risk of malaria (Obayendo, 2014). Malaria caused an estimated 655,000 deaths worldwide in 2010, more than 90% of these deaths occurred in the African region with 86% of them being children 5 years of age (Hmwe et al., 2013). It is the one of the leading cause of death in children under five years worldwide, after pneumonia and diarrheal disease accounting for almost 1 out of 5 deaths of children under 5 years in Africa (United States Embassy in NIGERIA, 2011). It accounts for 40% of public health expenditure, 30-50% of inpatient admissions, and up to 50% of outpatient visits in areas with high malaria transmission. Malaria also contributes to malnutrition in children, which indirectly causes the death of half of all children under the age of five throughout the world (Onwujekwe et al.. 2014). In addition to loss of life, malaria places an economic burden on African nations. It is estimated that malaria costs Africa $12 billion per year in direct costs and reduces GDP growth by 1.3 percent annually (WHO, 2013b). The burden is carried mostly by poor, rural families that have less access to current prevention and treatment services.

Nigeria has the greatest malaria burden among countries in the world, it contains nearly one-third of the cases in Africa with over 300,000 malarial deaths each year. most of them occurring in children under five years of age (Hmwe et al., 2013). In Nigeria. malaria is responsible for 30% of the under five mortality and 11% of maternal mortality rate (Adenbigbe et al., 2014). Deaths from malaria in Nigeria. as at 2010. were the highest recorded worldwide (Obayendo, 2014). Nearly all Nigerians (97%) are at risk of contracting the disease and half of the population will have at least one malaria attack per year

(Obayendo, 2014). Malaria is the highest contributor to the global Disability Adjusted Life Year (DALY). It causes anemia especially in under five children and pregnant women which may require blood transfusions, a procedure that increases the risk for HIV infection where universal blood screening is yet to be achieved (United States Embassy in NIGERIA, 2011). Malaria infection during pregnancy, particularly among new mothers, increases the risk of maternal mortality, neonatal mortality, and low birth weight (WHO, 2012a).

Malaria can cause an overwhelming acute infection in children, which frequently presents as seizures or coma (cerebral malaria), and may lead to death. An estimated 2% of children who recover from cerebral malaria suffer from learning impairments and disabilities due to brain damage, including epilepsy and spasticity (WHO, 2010). In addition, repeated malaria infections make young children more susceptible to other common childhood illnesses, such as diarrhoea and respiratory infections, and thus contributing indirectly to mortality. Children who survive malaria may suffer long-term consequences of the infection. Repeated episodes of fever and illness reduce appetite and restrict play, social interaction, and educational opportunities, thereby contributing to poor development (WHO, 2010).

Malaria negatively impacts the social and economic development of communities in Nigeria. It is the leading cause of clinic attendance, it is responsible for school absenteeism and low productivity at workplaces and on farms (Aderibigbe et al., 2014). It accounts for 60% of outpatient visits and 30% of hospitalizations among children under five years of age in Nigeria (United States Embassy in NIGERIA, 2011). It has the greatest prevalence of close to 50%, in children age 6-59 months in the South West, North Central, and North West regions of the country (United States Embassy in NIGERIA, 2011).

1.3 Justification of the Study

Children under five years of age, together with pregnant women, have been identified as a vulnerable group to malaria and its consequences in endemic countries like Nigeria (Nwaorgu, 2011). In Nigeria malaria is responsible for 30% of the under five mortality and 11% of maternal mortality rate (Aderibigbe et al., 2014). There has been a rapid scale-up of LLIN distribution in African countries in the recent years (Hmwe et al., 2013). Despite attaining high levels of Long Lasting Insecticidal net coverage in Nigeria, many children under five years of age do not sleep under the net (Federal Ministry of Health (FMoH) Nigeria, 2013).

The Nigeria Demographic and Health Survey 2013, revealed that in south west, Osun State had the least proportion (5.7%) of under-five children who slept under LLIN the night before the survey and also the second least throughout the country (National Population Commission and ICF International, 2014). This study is therefore necessary to improve understanding on ownership and use of LLIN and also the factors influencing the use of LLIN in this target population.

Many studies (Aderibigbe et al., 2014; Obembe et al., 2014; Otsemobor et al., 2013) have been done on utilization of LLIN but only a few have focused on the factors influencing the use of LLIN among under five children in Osun state. The information from this study will assist program managers and policy makers to explore ways of improving utilization of LLIN among children less than five years of age.

1.4 Research Questions

1. How knowledgeable are mothers/caregivers of under five children in Osun State concerning the use of LLIN?
2. What are the sources of LLIN among under five children in Osun State
3. What is the level of utilization of LLIN among under five children in Osun State?
4. What are the factors affecting the use of LLIN among under five children in Osun State?

1.5 Objectives

1.5.1 General objective

To assess the level of utilization of Long Lasting insecticidal nets and identify factors influencing use by under five children in Osun State.

1.5.2 Specific objectives:

1. To assess knowledge of LLIN among mothers/caregivers of under five children in Osun State.
2. To identify sources of LLIN used by under five children in Osun State
3. To determine the level of utilization of LLIN by under five children in Osun State
4. To identify factors influencing the use of LLIN by under five children in Osun State.

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of Malaria

The term malaria is derived from the Italian 'mal'aria', which means 'bad air', from the early association of the disease with marshy areas (Heinpelmann and Krafts, 2013). Malaria is a life-threatening parasitic disease caused by protozoan of the genus Plasmodium and is a major cause of mortality and morbidity worldwide (Tangpukdee et al., 2009). Over two billion people, representing more than 40% of the world's population, are at risk of contracting malaria, and the vast majority live in the world's poorest countries (Tangpukdee et al., 2009). The disease is found throughout the tropical and subtropical regions of the world and causes more than 300 million acute illnesses and at least one million deaths each year (Tujera, 2007). Ninety percent of these deaths occur among children under age five in sub-Saharan Africa and those who survive an episode of severe malaria may suffer from a range of physical and mental disabilities (Tangpukdee et al., 2009).

Malaria is transmitted through the bite of an infected female Anopheles mosquito. There are four species of Plasmodium parasite that can infect humans under natural condition; they are *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae* (Tujera, 2007). These four species differ morphologically, immunologically, in their geographical distribution, in their relapse patterns and in their drug responses and these parasites have a complex life cycle in their mosquito vector and vertebrate hosts (Tujera, 2007). *Plasmodium falciparum* is the main cause of severe clinical malaria and death throughout sub-Saharan Africa (Tangpukdee et al., 2009).

The symptoms of malaria include; fever and flu-like illness, including chills, headache, muscle aches, tiredness, nausea, vomiting and a general feeling of being unwell. Because the symptoms are so general, malaria is often misdiagnosed. If malaria is not promptly treated, it can lead to severe malaria or complicated malaria.

2.2 Malaria Prevention and Control Strategies

Malaria is a difficult disease to control largely due to the highly adaptable nature of the vector and parasites involved. Effective tools have been and will continue to be developed to combat malaria. The combination of tools and methods to combat malaria includes Long-Lasting insecticidal nets (LLIN) and artemisinin-based combination therapy (ACT), supported by indoor residual spraying of insecticide (IRS) and intermittent preventive treatment in pregnancy (IPT) (WHO, 2008a).

Long lasting Insecticidal nets protect people from malaria by preventing mosquitoes from biting them while they sleep, and they are now the mainstay of malaria prevention in endemic areas (Cochrane Editorial Unit, 2014). The use of treated nets has been known to reduce the numbers of infective mosquito bites by 70-90%, malaria morbidity by 50%, child mortality by 27%, incidence of the malaria parasite by 40% and malaria anaemia by nearly 50% (Obembe et al., 2014). Studies have shown that consistent and correct utilization of long lasting insecticidal nets leads to a 90% decrease in malaria transmission rate (Baume and Marin, 2008; Bejon et al., 2009). The use of long lasting insecticidal nets is strongly advocated for the high risk groups; under five children and pregnant women. Free distribution of long lasting insecticidal nets is currently being conducted through campaigns, public health facilities, faith-based organisations (FBO), and non- governmental organisations (NGOs) with the goal of achieving universal access for the at- risk population.

Indoor residual spraying for preventing malaria involves spraying the inner walls of houses with insecticide and this has been a mainstay of malaria prevention programmes for decades. It is thought to reduce malaria transmission by repelling mosquitoes from entering houses and by killing female mosquitoes that are resting inside houses after having bitten someone inside (Cochrane Editorial Unit, 2014). Use of Long Lasting Insecticide Nets (LLINs) and implementation of Indoor Residual Spraying (IRS) prevents mosquitoes transmitting malaria parasites between people and reduces re-infection of people that have been recently cured. In many cases, these methods are used together in the same households, especially to suppress transmission in holoendemic and epidemic situations (Okumu and Moore, 2011).

Malaria chemoprophylaxis is used to prevent malaria infection in high risk groups such as under five children, pregnant women, sickle cell disease patients and travellers to endemic areas (Anyanwu et al., 2010). In most endemic countries, millions of pregnant women are snow provided with prophylactic anti-malaria drugs as part of the Intermittent Preventive Treatment (IPT), during their second and third trimesters to prevent infections. The use of artemisinin-based combination therapy (ACT) is also advocated for treatment of malaria infection to prevent drug resistance.

2.3 Malaria and use of Long Lasting Insecticidal Nets in under five children

The World Health Organization's World Malaria Report 2009, showed that malaria is endemic in 109 countries or territories, spread throughout Africa , Asia-Pacific , Central and South America, the Middle East and Asia, representing 3.3 billion people at risk (WHO, 2009). Regions vary in the species of Plasmodium parasite transmitted, Anopheles vector, intensity of transmission, and the mortality and morbidity burden. A total of 74 countries experience relatively low transmission and burden of disease, with 37 in the elimination or pre-elimination phase. However, the remaining 35 countries (30 in Africa and 5 in Asia)

represent 98% of worldwide malaria deaths, and 96% of cases (WHO, 2009). It is estimated that approximately half of malaria deaths and cases in 2008 were in only five countries: Nigeria, the Democratic Republic of Congo, Ethiopia, Tanzania and Uganda, illustrating the continuing need to scale up malaria interventions in such countries to successfully control this epidemic (WHO, 2009).

The World Health Organization (WHO) recommends the use of insecticide treated nets (ITNs), particularly long-lasting insecticidal nets (LLINs), and indoor residual spraying (IRS) in endemic regions (Okumu and Moore, 2011). Additionally, in areas where mosquito breeding sites are few, fixed, and easily identified, LLINs and indoor residual spraying may be complemented by the use of larviciding and environmental management (Onwujekwe et al., 2014). In areas of moderate to high transmission of P.falciparum malaria, intermittent preventive treatment (IPT) for pregnant women is recommended (WHO, 2012b). ITNs have been shown to be a cost-effective vector control measure in endemic regions (Mueller et al., 2008). A Cochrane review of the effect of ITNs that included 14 trials reported a 50% reduction in malaria episodes in stable malaria transmission areas compared to no net use, and a 62% reduction in episodes in P.falciparum and a 52% reduction in P.vivax in unstable transmission areas (Lengeler, 2004). Five of the included trials assessed mortality, and together suggested that ITNs reduce all-cause under five mortality by 17% compared to no nets (Lengeler, 2004).

Insecticide treated nets provide a physical barrier, preventing biting by the malaria vector and as such offer personal protection to the individual sleeping under the net. As ITNs are treated with insecticides that provide toxic effects to the mosquito, ITNs also have a community effect, providing protection even for those who do not sleep under nets themselves, by reducing the vector population (Onyencho, 2013). A study on the impact of Artemisinin-

Based Combination Therapy and Insecticide-Treated Nets on Malaria Burden in Zanzibar revealed that during the 4years period of the study, the crude under-five, infant and child (aged 1--4 yrs) mortality decreased by 52%, 33%, and 71%, respectively. Similarly, malaria-related admissions, blood transfusions, and malaria-attributed mortality decreased significantly by 77%, 67% and 75%, respectively in children under five (Mail et al., 2007).

Hopes for controlling malaria and malarial anaemia have recently been revitalised by the demonstration that nets treated with insecticide can reduce morbidity and mortality. A summary of randomised controlled trials showed an average protective effect of about 50% on mild malaria episodes in areas where the rate of transmission of malaria was stable (Salim et al., 2001). Moreover, protective effects were shown on the prevalence of parasitaemia with a high level (>5000/μl) of trophozoites (31%) and on overall mortality (19%). A modest improvement in packed cell volume (a rise of 0.02 (2%)) and weight gain was also observed in children sleeping under treated nets (Salim et al., 2001). Large scale implementation of programmes to supply treated nets is under way in several African countries. Also, a study in Tanzania revealed that Bed nets treated with insecticide and distributed as part of a large scale social marketing programme can rapidly and substantially reduce the prevalence of malarial parasitaemia and anaemia in young children. Ownership of nets increased rapidly (treated or not treated nets: from 58% to 83%; treated nets: from 10% to 61%). The mean haemoglobin level rose from 80 g/l to 89 g/l in the study children in the successive surveys. Overall, the prevalence of anaemia in the study population decreased from 49% to 26% in the two years studied. Treated nets had a protective efficacy of 62% (95% confidence interval 38% to 77%) on the prevalence of parasitaemia and of 63% (27% to 82%) on anaemia (Salim et al., 2001). Five randomized controlled trials have provided strong evidence that the widespread use of Insecticide treated nets can reduce overall mortality by about a fifth in Africa. For every 1000 children protected, on average about 5.5 lives can be saved in children

aged 1 to 59months every year. In Africa, full ITN coverage could prevent 370,000 child deaths per year (Lengeler, 2004).

Malaria negatively impacts the social and economic development of communities in Nigeria. It is responsible for school absenteeism and low productivity at workplaces and on farms. The Federal Government policy on malaria control in Nigeria focuses on the following main interventions: management of cases, prevention of malaria with insecticide-treated nets (ITN), and use of intermittent preventive treatment (IPT) during pregnancy. Presently only 15.5% and 5.4% of rural and urban household in the country has ITN while only 23.2% of under-five children could commence antimalarial drugs immediately after onset of fever (Aderibigbe et al., 2014). LLIN ownership and use is one of the proven interventions adopted by RBM partners in the country (Aderibigbe et al., 2014). The target for LLIN coverage and utilisation as contained in the revised NMSP is 100% and 80% respectively i.e. universal coverage. According to the National Implementation Guide for LLIN Distribution, universal coverage translates to ownership of two LLINs per household and an assumption of five occupants per household.

2.4 Determinants of use of Long Lasting Insecticidal Nets among under five children

Children under five years of age, together with pregnant women, have been identified as the most vulnerable risk group for malaria, with 88% of all deaths in sub-Saharan Africa attributed to malaria occurring in children underfive (WHO, 2009). Insecticide-treated nets (ITN) have been widely shown to be effective in reducing childhood morbidity and mortality through reducing mosquito bites while sleeping (García-Basteiro et al., 2011). ITNs have been shown to be the most cost effective measure to reduce malaria transmission (WHO, 2008b). However, the target of 80% coverage of children sleeping under a net by 2010 set by RBM (Roll Back Malaria) Programme (WHO, 2008b) was ambitious for most countries.

As it has been previously reported, even when there are bed nets available in the household, children under five, the most vulnerable group, do not always have access to them (Korenromp et al., 2003). Although previous studies have investigated the determinants of bed net utilization and ownership (Afolabi et al., 2009; Baume et al., 2009), the results remain inconclusive. The following factors have been identified as determinants of use of LLIN by under five children based on previous studies:

2.4.1 Age: Bed net use was associated with age in a study conducted in five African countries (Baume and Marin, 2007). Among under-fives, there was a clear decline in use as the child grew older. The same decline in use is shown in children whose mothers sleep under a mosquito net in Uganda (Mugisha and Arinaitwe, 2003). Low use in children under five compared to individuals of other age groups was also found in the Western Kenya (Alaii et al., 2003). A study in Ethiopia found age and marital status of household heads to be significantly associated with the utilization of LLIN. As age of household heads increased, utilization of LLINs showed steady decline. Households with heads less than 30 years and those with household heads of 30 to 49 years reported to have used LLINs; respectively, more than three times and about twice as likely compared to those households with household heads of 60 years or older (Lelisa et al., 2013). Household heads who were married reported more than three times the use of LLINs compared to households whose heads were widowed, divorced or separated (Lelisa et al., 2013).

2.4.2 Residence: Residence has also been found to play a vital role in the utilization of LLINs among under five children. In Nigeria, according to the NDHS 2013, 17.3% of under five children in urban areas were found to have slept under LLIN the night before the survey as compared 15.4% of children in rural areas (National Population Commission and ICF International, 2014). A study in the Republic of Benin found out that another variable

associated positively with using a net were: living in an urban area compared to rural area (Diabaté et al., 2014).

Also a study in Cameroon aimed at assessing the socio-demographic factors influencing the ownership and utilization of ITNs among vulnerable groups showed that the use of insecticide treated nets in children under five was associated with being from an urban area (OR = 2.44, 95% CI: 1.44–4.13; P = 0.01) (Kimbi et al., 2014b).

2.4.3 Education: Education level and knowledge about malaria transmission were some of the significant reasons affecting ownership and usage of ITNs. When compared to household with no education, households with at least a member having primary or secondary education level had significant higher ($p < 0.05$) percentage ITN ownership (Atieli et al., 2011). Houses with non-educated parents or guardians had significantly lower ITN ownership, fewer ITNs, lower ITN usage, and significantly less knowledge about malaria prevention using ITNs (Atieli et al., 2011).

Utilisation of ITNs by under five children was found to be positively associated with knowledge of ITNs ($p = 0.024$) in a study on the use of insecticide treated nets among caregivers of children under five years in Kenya (Malusha et al., 2009). Another study in Ethiopia found out that those households who received information about ITN in the last 6 months prior to the survey were three times more likely to have used it than those who were not (AOR 3.25; 95% CI 1.5–7.10) (Sibhatu et al., 2012).

Also a study in China found that bed net use was closely related to the knowledge that the bed nets prevent malaria infection (OR: 5.04, 95% CI: 2.72, 9.35; P<0.0001), where those who knew bed nets preventing malaria were significantly more likely to use nets (Xu et al, 2014). A study in Cameroon also showed that household members with secondary education

had 1.4 increase chances of using net (OR=1.41, 95% CI: 1.11-1.80) compared to individuals with primary/no education (Tchinda et al., 2012).

2.4.4 Socio-economic status: Some studies found higher socio-economic status SES related to higher ownership and utilization of LLIN (García-Basteiro et al., 2011; Wiseman et al., 2007). Household relative wealth index was found to be an influential predictor of use of LLINs (Lelisa et al., 2013). A study in Ethiopia shows that wealthy households reported more use of LLINs. The wealthiest families were more than three times more likely to use LLINs than poor families (Lelisa et al., 2013). Also a study in china showed that economic status was strongly associated with bed net use. The three poorest categories were significantly less likely to use nets than those with more annual cash income (P<0.0001) (Xu et al., 2014).

2.4.5 Household size: Household size is an important factor that influence use of insecticide treated net among under five children. A study on Insecticide-treated nets ownership and utilization among under-five children in Burkina Faso revealed that ITN use to protect under five children was significantly higher in small households than large households (Diabaté et al., 2014). Also a study in Ethiopia reported that households with three or fewer members reported more use of LLINs than households with large families (Lelisa et al., 2013). Another study in Ethiopia found out that households whose family size was less than or equal to four were two times more likely to have used ITNs than those whose family size of greater than four (AOR 2.32; 95% CI 1.06–5.05) (Sibhatu et al., 2012).

To accelerate universal access to bed nets, routine distribution of ITNs is often reinforced by periodic mass donations of fixed numbers of nets. Campaigns are aimed at increasing coverage, the proportion of households owning ITNs and reducing social inequalities in bed net ownership and use (Thwing et al., 2008). However, due to the insufficient number of nets distributed, the needs of households, particularly large ones, are often not fulfilled. The

possession of at least one net for every two members of the household is seldom achieved in large households (Tokponnon et al., 2013).

2.5 Conceptual framework

The figure below is a conceptual framework that illustrates the relationship between the dependent variables and the independent variables. The respondents' age, religion, tribe, residence and education will influence their employment status and the number of under five in the household. These variables will in turn influence the knowledge of respondents on LLIN and its utilization. Utilization of LLINs is also influenced by knowledge of respondents on LLIN.

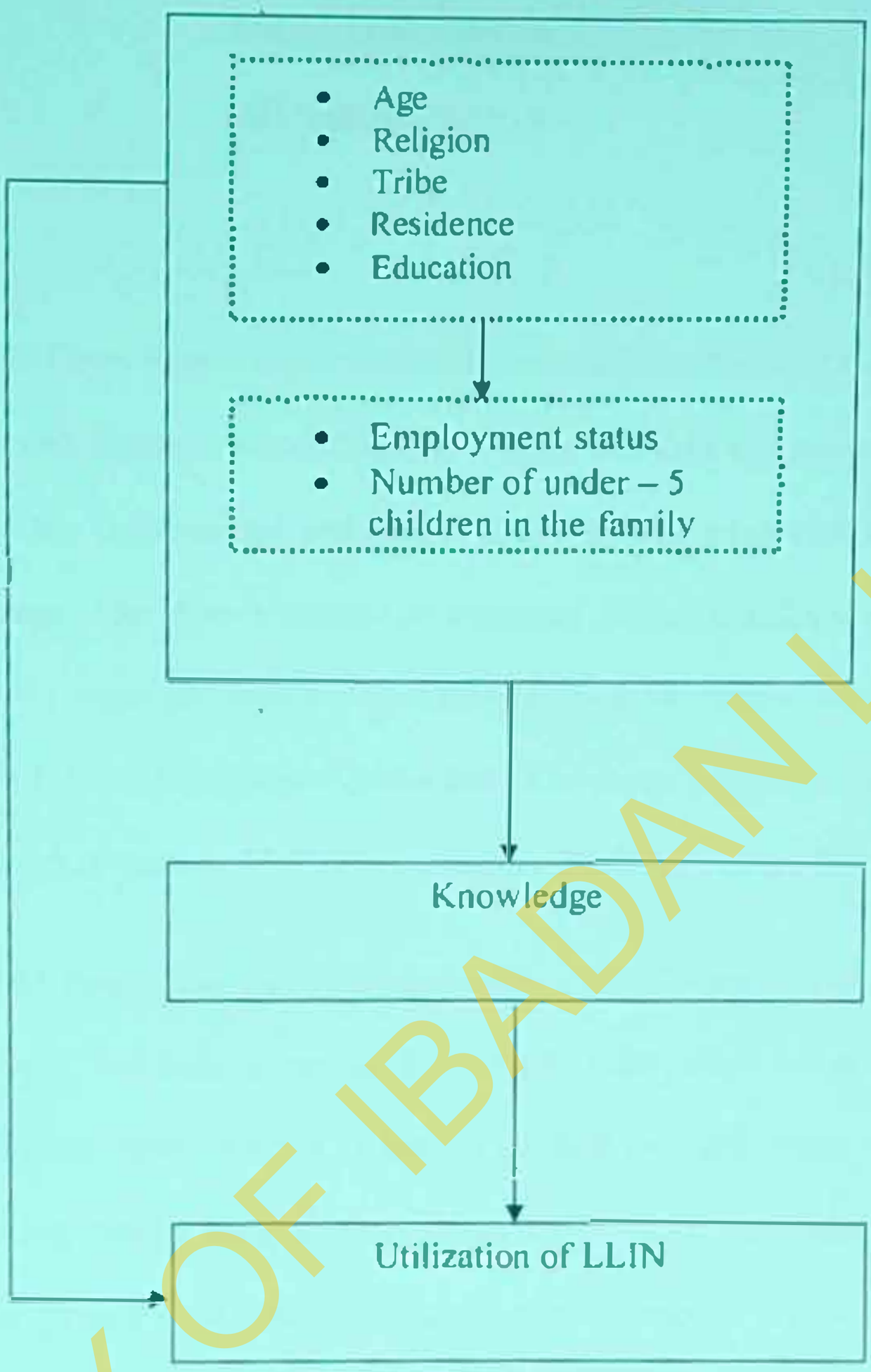


Figure 2.5.1: Conceptual framework showing factors influencing knowledge and utilization of LLIN

CHAPTER THREE

METHODOLOGY

3.1 Study area

The study location was Osun State. Osun state was created from the old Oyo State on 27th August, 1991 in the South Western part of Nigeria. It covers an area of approximately 14,875 square kilometres and lies between 300 and 600 m above the sea level with a largely gentle and undulating landscape. The state witnesses an abundant annual rainfall with annual rainy seasons, spanning up to eight (8) months. The average rainfall ranges from 1125 mm in derived savannah to 1475 mm in the rain forest belt. The mean annual temperature ranges from 27.2°C in the month of June to 39.0°C in December (Sofoluwe et al., 2011).

The state is divided into three senatorial districts namely, Osun Central, Osun East and Osun West, each comprising of ten local governments and one area office, located in Osun east senatorial district. Each of these districts is further divided into two zones. Osun West is made up of Ede and Iwo zones; Osun Central consists of Osogbo and Ikirun zones, while Osun East comprising Ife and Ilesa zones. The state has six zones all together and 30 Local Government Areas (LGAs). The projected population of Osun State for 2014 was 4,449,319 (UNFPA. 2014) and the estimated population of under-five in Osun state was 889,864.

The vegetation conditions of the state are suggestive of the rain forest belt and the soil types consist of loam, silt, sand and clay. The population consists mainly of farmers, traders and civil servants. The inhabitants of Osun State are of multi-ethnic groups such as the Yoruba, Hausa and Igbo. Most inhabitants in the urban areas of Osun state have access to portable water generated from Ede waterworks while rural dwellers of the state get their water from boreholes, rivers, springs and streams. There are 562 public health facilities, located in different parts of the State (512 at primary, 48 at secondary and two at tertiary levels)

(Federal Republic Of Nigeria, 2007). In addition there are 345 private and 10 missionary health institutions (Osun State Ministry of Information, 2006).

3.2 Study design

The study was a descriptive cross-sectional study among mothers/caregivers of under five children in Osun State.

3.3 Study population

The study population were mothers/caregivers of under five children in selected communities in Osun state.

3.3.1 *Inclusion criteria:*

Mothers/caregivers of under-five children, who were permanent residents in the study areas for at least 12 months.

3.4 Sample size determination

The minimum sample size required for the study was calculated using the formula for estimating a single proportion.

$$n = \frac{Z\alpha^2 pq}{d^2}$$ (Araoye, 2004)

Where n is the minimum sample size,

$Z\alpha$ is the standard normal deviate, set at 1.96 (for 95% confidence level)

d is the desired degree of accuracy (taken as 0.015)

p, is the proportion of children under five years of age who slept under LLIN the night before the survey = 5.7% (National Population Commission and ICF International, 2014).

q, is 1-p which is 1-0.057 = 0.943

$n = 1.96^2 \times 0.057 \times 0.943 / (0.015)^2 = 918$

n = 918

A non-response rate of 10% was added to give 1,020 (required sample size=N/1-f where f is 10%; 918/1-0.1= 1,020).

A total of 1,020 questionnaires were administered for the study.

3.5 Sampling technique

The respondents were selected using multistage sampling technique

First stage: One Local Government Area each was selected from the three senatorial districts in the state (Osun central, Osun west and Osun east) using a simple random sampling method by using table of random numbers. A total of three LGAs were selected.

Second stage: The list of all the wards in the 3 selected LGAs was obtained from Osun State Ministry of Local Government. Two wards were selected from each local government using simple random sampling technique by balloting. This yielded a total of 6 wards.

Third stage: The list of the enumeration areas in the selected wards was collected from each of the selected local government (National Population Commission Division) and simple random sampling technique by balloting was used to select two enumeration areas from each ward giving a total of twelve enumeration areas.

Fourth stage: From each of the selected enumeration areas, the total number of all the household was obtained. A proportional allocation was used to know the number of households to be interviewed in each of the enumeration areas which were 68, 72, 75, 80, 80, 82, 84, 85, 94, 94, 98 and 108. The first household was selected by simple random sampling and subsequent households were selected using systematic random sampling from which eligible respondents were chosen. All consenting mothers of the youngest under five child in each household who met the inclusion criteria were recruited into the study.

Table 3.5.1: Senatorial districts, selected LGAs, communities and wards

Selected senatorial district	Selected LGAs	Selected communities/wards
Osun Central	Olorunda LGA	Atelewo (4)
		Ilie (11)
Osun West	Egbedore LGA	Okinni (10)
		Ofa-tedo (8)
Osun East	Atakumosa West LGA	Osunjela (7)
		Osu (1)

3.6 Study instruments

Quantitative and Qualitative study instruments was used for data collection.

3.6.1 Quantitative method:

A pre-tested semi-structured questionnaire was used for data collection. The questionnaire was designed to seek information on the mother's socio-demographic characteristics, knowledge of LLIN, utilization of LLIN and factors influencing the use of LLIN by under five children. Seven research assistants were recruited and trained to help in the administration of the questionnaires. The research assistants were Community Health Extension Workers (CHEWS) in the Department of Community Medicine, Ladoke Akintola

University of Technology (LAUTECH) Teaching Hospital, Osogbo. The research assistants had a day training. They were taken through the questionnaire and the training lasted two hours. The questionnaires in English and Yoruba languages are in Appendices 1 and 2.

3.6.2 Qualitative method:

Six (6) Focus group discussions (FGD) were conducted. Each group is made up of eight participants from each of the selected wards. Each group was made up of mothers/caregivers of under five children and each sessions lasted about 45 minutes to 1hour. The sessions were moderated by the researcher using the FGD guide and one research assistant was trained as recorder for the FGDs. The FGDs were recorded on tape and notes were also taken by the recorder as back-up. The FGD guide in English and Yoruba languages are included in Appendices 3 and 4.

3.6.3 Pretesting of research instrument

The pre-testing of the questionnaires was conducted among fifty (50) mothers of under five children in ward 6 (sabo) which was not part of the study area. The trained research assistants were responsible for the administration of the questionnaires during the pretest. Necessary modifications and corrections were made before final administration of the questionnaires to the respondents.

3.7 Data collection methods

The questionnaire was adapted from Nigeria Malaria Indicator survey (2010). The research instruments (questionnaire and FGD guide) were translated to Yoruba, the predominant local language for ease of communication and to ensure proper understanding, it was back

translated to English to ensure that the original meaning was retained. The questionnaire was administered to eligible respondents in the selected wards.

The six (6) FGDs were mothers of under five children in each of the selected wards. The participants were purposively selected and each session lasted about 45 minutes to 1hour. FGDs were conducted in local language.

3.8 Data management

3.8.1 Study variables

Variables used in the study include:

Dependent variables: Knowledge on LLIN, Utilization of LLIN

Independent variables: Age, Religion, Tribe, Educational level, Employment status, Residence, Number of under five in the family.

3.8.2 Measurement of outcome variables

The questions on knowledge of respondents about LLIN were scored and categorized into good and poor knowledge. Seven (7) questions were asked on knowledge. Correct responses of questions were scored 1 point, while incorrect responses were scored zero. Respondents who scored below 5 were regarded as having poor knowledge while respondents who scored 5 and above were regarded as having good knowledge.

Utilization of Long Lasting Insecticidal Nets by under five children was the proportion of under five children who slept under Long Lasting Insecticidal Nets the night before the study.

3.8.3 Statistical Analyses

Data was entered and analyzed using Epi- Info version 3.5.1 statistical software. Univariate analyses was done to generate frequencies of key variables. Summary statistics was presented

using frequency tables, charts, means and proportions. The Chi-square test was used to determine the association between the dependent and independent variables. Fisher's exact test was used when cells had values less than five. Binary logistic regression was done to identify predictors of knowledge and utilization of LLIN. All analyses were done at the 95% significance level with the level of significant set at 5%.

Qualitative data analysis: Recordings at focus group discussions were transcribed verbatim and analyzed using themes and detailed content analysis. These are presented using the ZY index table. The ZY index table is a tabular representation of findings from qualitative data collection method, and it summarizes findings based on proportion (percentages) responding to particular questions as depicted by positive and negative signs; [- = None; + =Few (<25%); ++ = Some (50%); +++ =Majority (>75%); ++++ All (100%)] (Aransiola, 2013).

3.9 Ethical Considerations

Ethical clearance was obtained from the Ethical Review Committee of Ladoke Akintola University of Technology (LAUTECH) Teaching Hospital Osogbo (Appendix 6). Permission to conduct the study was obtained from the leaders of the selected communities. Written informed consent (Appendix 5) was obtained from each respondent before the questionnaire was administered.

Right of decline/withdraw from study: The respondents were informed participation was voluntary and they will not suffer any consequences if they chose not to participate.

Confidentiality of data: All information gathered was kept confidential. All the participants were identified using only serial number.

Beneficence to participants: Health education on the importance and use of Long Lasting Insecticidal Nets was given after the data collection (both questionnaire administration and

FGD) Opportunity was given to participants to ask questions and their questions were addressed.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of respondents

A total of 1,020 questionnaires were administered but 1,008 questionnaires were analyzed giving a response rate of 98.8%.

Table 4.1.1 below shows the socio-demographic characteristics of mothers/caregivers of under five children. Most of the respondents (33.2% and 25.1%) were within the age group of 25-29 and 30-34 years respectively and majority were from the Yoruba tribe (896, 88.9%). About half were Christians (524, 52.0%). Majority of the respondents had secondary education (43.8%) while 9.4% had tertiary education and 16.9% had no formal education. About 96.0% of the respondents were gainfully employed, half of the respondents live in the rural areas and 45.6% had 2 or more under-five children in their household.

Table 4.1.1: Socio-demographic characteristics of mothers/care givers of under five children

Variables	Frequencies (N= 1008)	Percentages(%)
Age group (yrs)		
≤24	169	16.8
25-29	335	33.2
30-34	253	25.1
35-39	151	15.0
≥40	100	9.9
Mean Age	30.0 ± 6.3	
Religion		
Christianity	524	52.0
Islam	481	47.7
Traditional	3	0.3
Tribe		
Yoruba	896	88.9
Others	112	11.1
Level of education		
No formal education	170	16.9
Primary	301	29.9
Secondary	442	43.8
Tertiary	95	9.4
Employment status		
Employed	964	95.6
Unemployed	44	4.4
Occupation		
Skilled workers	828	82.1
Unskilled workers	87	8.6
Professionals	49	4.9
Unemployed	44	4.4
Residence		
Rural	504	50.0
Urban	504	50.0
Number of under five children in the family		
1	548	54.4
≥ 2	460	45.6

4.2 Knowledge of respondents on LLIN

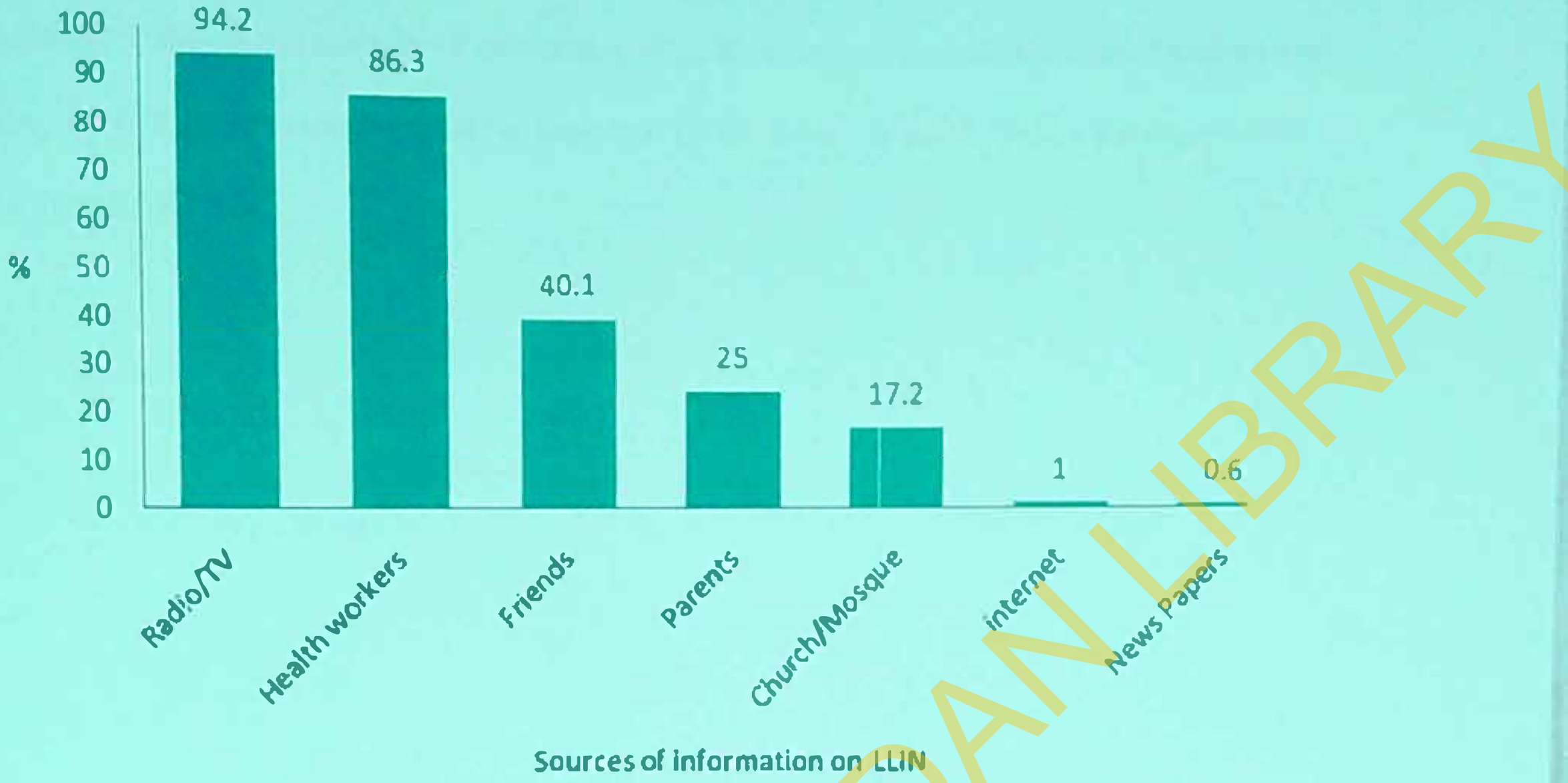
Table 4.2.1 shows the knowledge of mothers/caregivers of under five children on Long LLIN. All (1008, 100%) the respondents have heard about LLIN and they could state correctly what it was. The disadvantages mentioned by most of the respondents were that the net causes heat 943 (93.6%), itching of the body 628 (62.3%) and the chemical in it was much 476 (47.2%). Approximately 76% of the respondents had good knowledge on LLIN.

Table 4.2.1: Knowledge of mothers/caregivers of under five children on LLIN

Variables	Frequency (N=1008)	Percentage (%)
Ever heard about LLIN		
Yes	1008	100.0
No	0	0.0
What is LLIN		
Correct definition	1008	100.0
Incorrect definition	0	0.0
Advantages of LLIN*		
Protects against mosquito bite	1008	100.0
Protects against malaria infection	1002	99.4
Protects against other insect bites	1006	99.8
Disadvantages of LLIN*		
It causes heat	943	93.6
It causes itching of the body	628	62.3
Pepperish sensation of the body and eyes	322	31.9
Too much chemical	476	47.2
Unpleasant smell	229	22.7
Knowledge categories		
Good knowledge	767	76.1
Poor knowledge	241	23.9
Mean knowledge score	5.79±1.6	

* Multiple Responses

Figure 4.2.1 shows the sources of information on LLIN among respondents. Their major sources of information on LLIN were radio/television (950, 94.2%) and health workers (870, 86.3%), while very few reported that their sources of information on LLIN were internet (1.0%) and newspapers (0.6%).



* Multiple Responses

Figure 4.2.1: Sources of information on LLIN among mothers/care givers of under five children (N=1,008)

4.3 Household ownership of LLIN

Table 4.3.1 shows the household ownership of LLIN among respondents. Eight hundred and thirty six (82.9%) respondents had at least one LLIN. Most (802, 95.9%) of the respondent got their LLIN free.

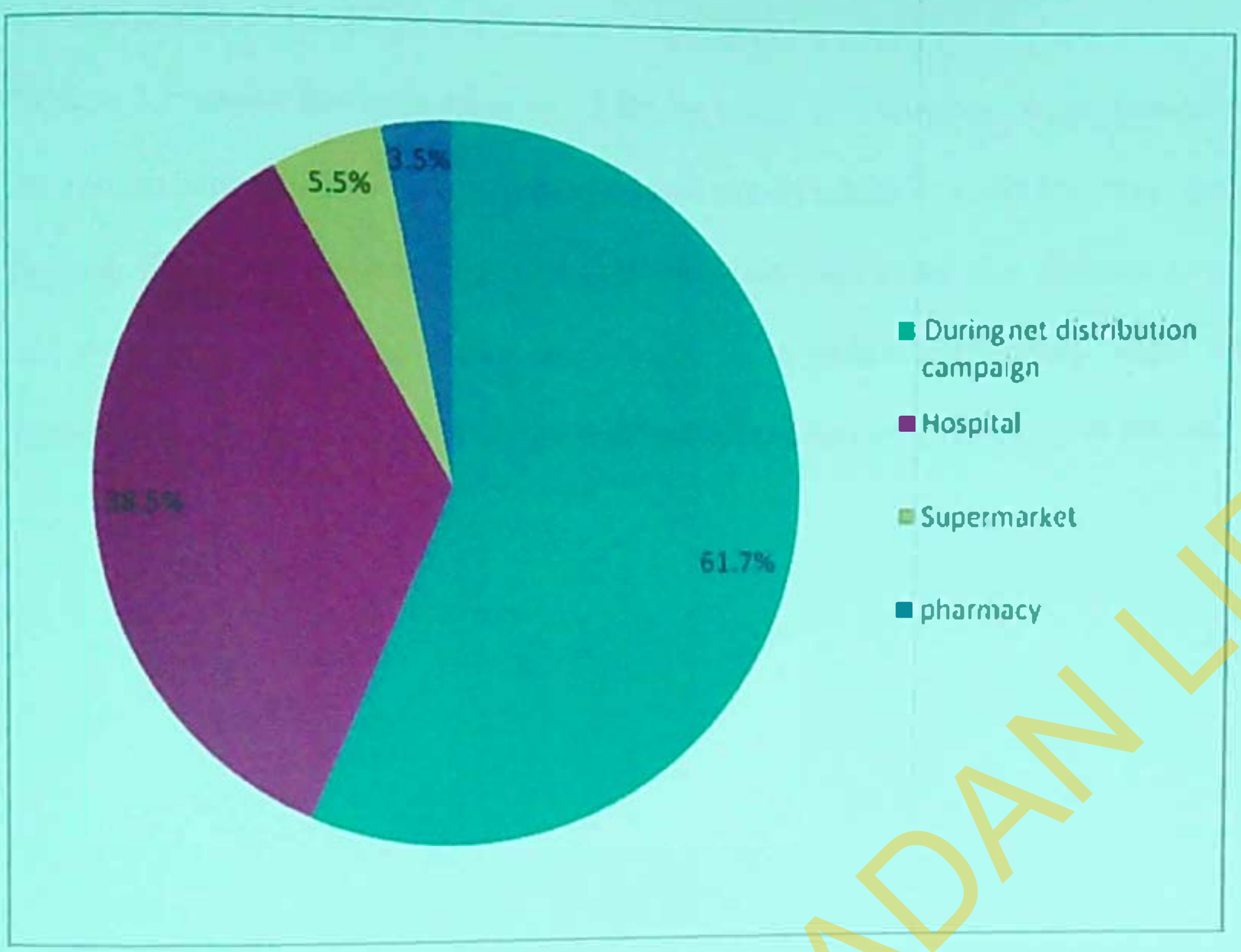
Table 4.3.1: Household ownership of LLIN among respondents

Variables	Frequency	Percentages (%)
Household ownership of LLIN (N=1008)		
Yes	836	82.9
No	172	17.1
Number of LLIN in the household (n=836)		
One	318	38.0
Two	460	55.0
Three	48	5.8
Four	10	1.2
Means of acquiring LLIN*(n=836)		
Free	802	95.9
Bought	81	9.7

*Multiple responses

4.4 Respondents sources of LLIN

Figure 4.4.1 below shows the source of acquiring LLIN by mothers of under five children. Five hundred and sixteen (61.7%) respondents obtained their nets during net distribution campaign, 322 (38.5%) got their nets from the hospital while 5.5% were from the supermarket and only 3.5% were from pharmaceuticals.



* Multiple Responses

Figure 4.4.1: Source of acquiring LLIN by mothers/caregivers of under five children (n=836)

4.5 Utilization of LLIN

Table 4.5.1 shows the utilization of LLIN by under five children. Approximately 82.0% of the respondents claimed their net was hanged, out of which 416 (60.6%) was observed to be hanged. Fifty nine percent of mothers reported that their under five children slept under the net the night before the study and 41.2% slept under LLIN every night while 7.5% mothers/caregivers said that their under-five children had never slept under the net.

Table 4.5.1: Utilization of LLIN by under five children

Variables	Frequency	Percentage (%)
Net claimed to be hanged (n=836)		
Yes	686	82.1
No	150	17.9
Net observed to be hanged (n=686)		
Yes	416	60.6
No	270	39.4
Child slept under LLIN the previous night (N= 1008)		
Yes	591	58.6
No	417	41.4
Frequency of child sleeping under net at night (n=836)		
Every night	344	41.2
Once a week	119	14.2
Twice a week	149	17.8
Three times in a week	77	9.2
Once in a while	84	10.1
Never	63	7.5
Ever use (N=1008)	773	76.7
Current use (N=1008)	591	58.6

4.6 Barriers to utilizing LLIN in under five children

Figure 4.6.1 shows barriers to utilizing LLIN in under five children. Heat (96.4%) was majorly reported as barrier to the use of LLIN for under-five children, while 315 (75.5%) mentioned reactions to chemical and 172 (41.3%) complained of unpleasant odour.

*** Multiple Responses**

Figure 4.6.1: Barriers to utilizing LLIN in under five children (n=417)

4.7 Bivariate Analysis

The association between some of the respondents' demographic characteristics and their knowledge on LLIN is shown in table 4.7.1. Respondents between the ages of 30-34 years, 211 (83.4%) significantly (p=0.04) had good knowledge of LLIN than those within other age groups. Respondents who were Christians, 436 (83.2%) significantly (p<0.001) had good knowledge of LLIN than those who were Islam 330 (68.6%). Respondents with formal education, 654 (78.0%) significantly (p=0.001) had good knowledge of LLIN than those with no formal education, 113 (66.5%). Respondents who were employed, 734 (86.1%) significantly (p= 0.02) had good knowledge of LLIN than those who were unemployed, 33 (75.0%). Respondents living in the urban areas, 430 (85.3%) significantly (p<0.001) had good knowledge of LLIN than those living in the rural areas 337 (66.9%). Also respondents who had 2 or more under-five children 385 (83.7%) significantly had good knowledge of LLIN than those with one under-five child 350 (63.9%).

Table 4.7.1: Association between selected variables of respondents and their knowledge on LLIN

Variables	Knowledge category			X^2	P-value
	Good N (%)	Poor N (%)	Total N		
Age (in years)					
≤24	123 (72.8)	46 (27.2)	169		
25-29	249 (74.3)	86 (25.7)	335		
30-34	211 (83.4)	42 (16.6)	253	10.10	*0.04
35-39	111 (73.5)	40 (26.5)	151		
≥40	73 (73.0)	27 (27.0)	100		
Tribe					
Yoruba	685 (76.5)	211 (23.5)	896	0.57	0.45
Others**	82 (73.2)	30 (26.8)	112		
Religion					
Christianity	436 (83.2)	88 (16.8)	524	29.49	*< 0.001
Islam	330 (68.6)	151 (31.4)	481		
Educational level					
Formal education	654 (78.0)	184 (22.0)	838	10.40	*0.001
No formal education	113 (66.5)	57 (33.5)	170		
Employment status					
Employed	734 (86.1)	230 (13.9)	964	5.55	*0.02
Unemployed	33 (75.0)	11 (25.0)	44		
Residence					
Urban	430 (85.3)	74 (14.7)	504	47.16	*< 0.001
Rural	337 (66.9)	167 (33.1)	504		
Number of under 5 children in the family					
1	350 (63.9)	198 (36.1)	548	23.97	*< 0.001
≥2	385 (83.7)	75 (16.3)	460		

*Statistically significant
**Igbo, Hausa/Fulani

The association between utilization of LLIN by under five children and some selected variables is shown in Table 4.7.2. Respondents from Yoruba tribe, 540 (60.3%) significantly (p=0.003) had their under-five children utilized LLIN more than those from other tribes, 51 (45.5%). Respondents with formal education, 507 (60.5%) significantly (p=0.01) had their under five children utilized LLIN more than those with no formal education, 84 (49.4%). Respondents with good knowledge of LLIN, 476 (62.1%) significantly (p< 0.001) had their under five children utilized LLIN more than those with poor knowledge of LLIN, 115 (47.7%).

Table 4.7.2: Association between utilization of LLIN and selected variables

Variables	Utilization of LLIN			X^2	P-value
	Yes N (%)	No N (%)	Total N		
Age (in years)					
≤24	103 (60.9)	66 (39.1)	169		
25-29	196 (58.5)	139 (41.5)	335		
30-34	150 (59.3)	103 (40.7)	253	1.31	0.86
35-39	88 (58.3)	63 (41.7)	151		
≥ 40	54 (54.0)	46 (46.0)	100		
Tribe					
Yoruba	540 (60.3)	356 (39.7)	896	8.91	*0.003
Others**	51 (45.5)	61 (54.5)	112		
Religion					
Christianity	295 (56.3)	229 (43.7)	524	2.84	0.09
Islam	296 (61.5)	185 (38.5)	481		
Educational level					
Formal education	507 (60.5)	331 (39.5)	838	7.17	*0.01
No formal education	84 (49.4)	86 (50.6)	170		
Knowledge					
Good knowledge	476 (62.1)	291 (37.9)	767	15.55	*<0.001
Poor knowledge	115 (47.7)	126 (52.3)	241		
Employment status					
Employed	565 (58.6)	399 (41.4)	964	0.004	0.95
Unemployed	26 (59.1)	18 (40.9)	44		
Residence					
Urban	297 (58.9)	207 (41.1)	504	0.04	0.85
Rural	294 (58.3)	210 (41.7)	504		
Number of under 5 children in the family					
1	313 (57.1)	235 (42.9)	548	1.14	0.29
≥2	278 (60.4)	182 (39.6)	460		

*Statistically significant
**Igbo, Hausa/Fulani

4.8 Multivariate Analysis

Table 4.8.1 shows the regression model of factors influencing knowledge of respondents on LLIN. Age, religion, educational level, employment status, residence and number of under-five children in the family were found to be significant predictors of good knowledge on LLIN. Respondents within the age group 30-34 yrs were 1.88 times more likely to have good knowledge on LLIN than respondents that were ≤ 24 years (OR=1.88, 95%CI=1.17-3.02, p= 0.01) and this remained statistically significant after adjusting for other variables (aOR=2.51, 95%CI=1.50-4.19, p< 0.001). Respondents who were Christians were 2.27 times more likely to have good knowledge on LLIN than those who were Islam (OR=2.27, 95%CI=1.68-3.06, p<0.001), this was not statistically significant after adjusting for other variables (aOR=2.49, 95%CI=0.81-3.43, p=0.05) Respondents with formal education were 1.79 times more likely to have good knowledge on LLIN than those with no formal education (OR=1.79, 95%CI=1.25-2.57, p= 0.001) and this remained statistically significant after adjusting for other variables (aOR=1.81, 95%CI=1.26-2.61, p=0.001). Respondents who were employed were 2.26 times more likely to have good knowledge than those that were not employed (OR=2.26, 95%CI= 1.15-4.21, p=0.03) and this remained statistically significant after adjusting for other variables (aOR=2.30, 95%CI=1.10-2.89, p=0.03). Respondents living in urban areas were 2.88 times more likely to have good knowledge than those living in rural areas (OR=2.88, 95%CI=2.12-3.92, p<0.001), this remained statistically significant after adjusting for other variables (aOR=3.15, 95%CI=2.26-4.39, p<0.001). Also, Respondents with 2 or more under-five children were 2.07 times more likely to have good knowledge than those with only one child and this remained statistically significant after adjusting for other variables (aOR=2.27, 95%CI=1.65-3.12, p<0.001)

Table 4.8.1: Predictors of good knowledge on LLIN among respondents

Variables	Unadjusted OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Age (yrs)						
≤24 (ref)	1.00					
25-29	1.08	0.71 - 1.65	0.71	1.54	0.97 - 2.43	0.07
30-34	1.88*	1.17 - 3.02	0.01	2.51*	1.50 – 4.19	<0.001
35-39	1.04	0.63 - 1.70	0.88	1.49	0.87 – 2.55	0.15
≥40	1.01	0.58 - 1.76	0.97	1.34	0.73 – 2.45	0.34
Tribe						
Yoruba	1.19	0.76 - 1.86	0.45			
Others** (ref)	1.00					
Religion						
Christianity	2.27*	1.68 - 3.06	< 0.001	2.49	0.81 – 3.43	0.05
Islam (ref)	1.00					
Educational level						
Formal education	1.79*	1.25 - 2.57	0.001*	1.81*	1.26 - 2.61	0.001
No formal education (ref)	1.00					
Employment status						
Employed	2.26*	1.15 - 4.21	0.03	2.30*	1.10 – 2.89	0.03
Unemployed(ref)	1.00					
Residence						
Urban	2.88*	2.12 - 3.92	< 0.001	3.15*	2.26 – 4.39	< 0.001
Rural (ref)	1.00					
Number of under 5 children in the family						
1 (ref)	1.00					
≥2	2.07*	1.54 - 2.78	< 0.001	2.27*	1.65 – 3.12	< 0.001

*Statistically significant
**Igbo, Hausa/Fulani

Table 4.8.2 shows the regression model of factors influencing utilization of LLIN by under five children. Tribe, educational level and knowledge of respondents on LLIN were found to be significant predictors of utilization of LLIN. Respondents from Yoruba tribe were 1.81 times more likely to utilize LLIN than those from other tribes (OR=1.81, 95%CI=1.22-2.69, P=0.003), this remained statistically significant after adjusting for other variables (aOR=1.54, 95%CI=1.01-2.36, p=0.04). Respondents with formal education were 1.57 times more likely to utilize LLIN than those with no formal education (OR=1.57, 95%CI=1.13-2.18, p=0.01) and this remained statistically significant after adjusting for other variables (aOR=1.44, 95%CI=1.01-2.07, p=0.04). Respondents with good knowledge of LLIN were almost two times more likely to have used LLIN than those with poor knowledge (OR=1.79, 95%CI=1.34-2.40, p<0.001). This remained statistically significant after adjusting for other variables (aOR=1.82, 95%CI=1.36-2.45, p=<0.001).

Table 4.8.2: Predictors of utilization of LLIN among respondents

Variables	Unadjusted OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Age (yrs)						
≤24 (ref)	1.00					
25-29	0.90	0.62 – 1.32	0.60			
30-34	0.93	0.63 – 1.39	0.73			
35-39	0.90	0.57 – 1.40	0.63			
≥ 40	0.75	0.46 – 1.24	0.27			
Tribe						
Yoruba	1.81*	1.22 – 2.69	0.003	1.54*	1.01 – 2.36	0.04
Others** (ref)	1.00					
Religion						
Christianity	0.81	0.63 – 1.04	0.09			
Islam (ref)	1.00					
Educational level						
Formal education	1.57*	1.13 – 2.18	0.01	1.44*	1.01 - 2.07	0.04
No formal education (ref)	1.00					
Employment status						
Employed	0.98	0.53 – 1.81	0.95			
Unemployed (ref)	1.00					
Knowledge						
Good knowledge	1.79*	1.34 – 2.40	<0.001	1.82*	1.36 - 2.45	<0.001
Poor knowledge (ref)	1.00					
Residence						
Urban	1.03	0.80 – 1.32	0.85			
Rural (ref)	1.00					
Number of under 5 children in the family						
1 (ref)	1.00					
≥ 2	1.15	0.89 – 1.48	0.29			

*Statistically significant
**Igbo, Hausa/Fulani

4.9 Focus Group Discussion

A focus group discussion (FGD) was held in each of the selected wards. Participants for each group were mothers/caregivers of under five children in the community.

4.9.1 Participants' knowledge on LLIN

In response to the questions on what do you know about LLIN, all the focus group respondents in the six wards knew what LLIN is. They could mention correctly its uses. Majority of the participants said LLIN protects against mosquito bites and malaria infection. They also added that the net protects against other insect bites. One of the participants said:

"LLIN protects against mosquito bites and malaria infection, it also keep my baby warm during harmathan".....FGD **Ofatedo.**

Their major sources of information on LLIN were radio/television, health workers (e.g nurses, doctors) and during net distribution campaigns.

4.9.2 Participants' knowledge on malaria prevention

When asked what are the ways by which malaria can be prevented, most of the participants said malaria can be prevented by the use of mosquito nets, indoor residual sprays and cleaning of the house environment. One of participant responded:

"We can prevent malaria infection by sleeping under mosquito net, using insecticide, and cutting of bushes around our houses".....FGD **Atelewo.**

Most of the participants also added that children, nursing mothers, pregnant women and the elderly are the most affected by malaria in the household.

4.9.3 Participants' sources of LLIN

In response to the question on where and how did you get your LLIN? Majority of the participants said they got their LLIN during net distribution campaign and also from the health centres. Only a few of them said they bought the net from the supermarket or pharmacy stores. All the participants claim the net is effective in preventing malaria infection in their children. One of the mothers said:

"The net works well for malaria, my one year old child have not had malaria since birth because he sleeps under the net every night".....FGD **Atelewo.**

Another participant said: "my *child of 2 years old has not had malaria in the last 6 months because he sleeps under the net every night".....FGD* **Osunjela.**

4.9.4 Barriers to use of LLIN among under five children

When asked, what are the reasons known to you why some children under 5 years do not sleep under LLIN? The common themes among participants were a dislike towards the unpleasant odour, heat and reported adverse reaction influencing usage of LLINs. One of the participants said:

"The net causes too much heat during the dry season that my children refuse to sleep under it".....FGD **Ilie.**

Another mother said: *"It causes body itching, rashes (uticaria), peprish sensation on the skin and eyes and some children sneeze excessively with difficulty in breathing when they sleep under it. Infact there is too much chemical in the net".....FGD* **Okinni.**

Another participant from Osu, a 38 year old mother said: *"some mothers believe that the free nets are more effective than those bought, so when they don't get the free net they refuse to buy"……FGD* **Osu.**

How to improve utilization of LLIN among under 5 children

In response to the question on what can be done to encourage mothers to ensure that their under five children sleep under the net? The suggestions include:

"Government should reduce the chemical in the net because of the reaction and they should produce different colors because the white nets get dirty easily and you have to wash it frequently"……FGD **Okinni.**

Another participant said *"the government should produce different sizes of the net because the one in the market cannot size my 71/2 bed"……FGD* **Ilic**

Summary of the FGD findings

Six (6) FGD sessions were conducted. All the respondents were aware of LLINs. Their major sources of information were radio/television and health workers. Most of the respondents got their net during net distribution campaign and also from the hospital/health centers. The barriers to use of LLIN among under five children mentioned by the participants are; the unpleasant odour from the net, production of unbearable heat and adverse reactions to the chemicals like itching of the body, rashes (uticaria rash), pepperish sensation on the skin and the eyes and excessive sneezing including difficulty in breathing. It was also discovered that some of the respondents had some misconceptions with regard to the net. Some of them believed that the free nets were more effective than those that were bought, this tend to discourage them from buying the net for their personal use except they get it free. Some of the mothers were not aware that the net comes in different colours and sizes.

Table 4.9: Participant responses on thematic areas during FGD in the selected wards

Themes	Responses	Atelewo	Ilie	Okinni	Ofa-tedo	Osunjela	Osu
Knowledge on LLIN	Correct	++++	++++	++++	++++	++++	++++
	Incorrect	-	-	-	-	-	-
Knowledge on malaria prevention	Use of bed net	+++	++++	++++	++++	++++	++++
	Indoor residual spray	+++	+++	+++	+++	+++	+++
	Clearing of bushes around the house	+++	+++	++++	++++	+++	+++
Sources of LLIN	During net distribution campaign	+++	+++	+++	+++	+++	+++
	Health facilities	+++	++	+++	+++	+++	++
	Supermarket/Pharmacy	+	+	+	+	+	+
Barriers to utilization of LLIN among under five children	Heat, unpleasant odour and adverse reactions to chemical	+++	+++	+++	+++	+++	+++

Key: - = None; + =Few (<25%); ++ = Some (50%); +++ =Majority (>75%); ++++All (100%).

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

Long Lasting Insecticidal Nets is an important means of controlling malaria and other vector-borne diseases (Tokponnon et al., 2014). Several studies in malaria endemic countries have shown the usefulness of LLINs in reducing man-vector contact,(Eisele et al., 2006; Thwing et al., 2008) thereby reducing the incidence of malaria infection (CDC, 2014b; Ouattara et al., 2011). Children under five years of age and pregnant women, have been identified as a vulnerable group to malaria and its consequences in endemic countries (Nwaorgu, 2011). This study revealed the level of knowledge of mothers/caregivers of under five children on the use of LLINs as well as the factors influencing its use by under five children in Osun State.

Socio-demographic Characteristics

Most of the respondents were within the age group of 25-34 years old. This finding is expected as this age range fall within the reproductive age group, and this is similar to findings in other studies in Nigeria (Edelu et al., 2010a; Envuladu et al., 2012). Half of the respondents were Christians and majority of them were from the Yoruba tribe. This was not surprising considering the area where the study was conducted. The distribution of respondents by their level of education showed that almost half of the respondents had secondary level of education this finding is similar to the findings of studies in Enugu and Osun States where most mothers of under five children that were studied had secondary education (Adeyemo et al., 2014; Edelu et al., 2010a). This finding is in contrast to the findings in other studies done in plateau state and Iran where majority of the respondents had

only primary education (Envuladu et al., 2012; Soleimani-Ahmadi et al., 2014b). Majority of the respondents were gainfully employed and most of them were skilled workers (e.g hair dresser, fashion designer etc), this is similar to a study done among mothers of under five children in Osun State where most of the respondents were artisan and traders (Adeyemo et al., 2014). This finding is also in contrast to the finding in a study carried out in Plateau State where majority (83.4%) of the mothers were unskilled workers(Envuladu et al., 2012) and in Iran where majority (92.7%) of the mothers were house wives (Soleimani-Ahmadi et al., 2014). These differences in the level of education and occupation of respondents may be due to the differences in the study areas. More than half of the respondents had at least one under five child in the household.

Knowledge on use of LLIN among mothers/caregivers of under five children

All respondents in this study have heard about LLINs and all of them could state correctly what it was. This outcome is slightly different from the findings in studies done in Enugu (80%) and Kenya (88.5%) where almost all the mothers were aware of the net (Edelu et al., 2010a; Malusha et al., 2009). This finding is also supported by what was found during the FGDs sessions where most of the participants could mention correctly the uses of the net. This could be as a result of the increase in publicity through mass media given to the use of LLINs as a means of preventing malaria infection. On the advantages of the net, majority of the respondents mentioned that the net protects against mosquito bites, malaria and other insect bites. This is similar to the reasons given for use of bed nets in a study done in Iran (Soleimani-Ahmadi et al., 2014). Also, a systematic review of randomized trials reported protective effects of the net on all-cause mortality in children less than five years of age and prevalence of malaria infection (Hmwe et al., 2013). The disadvantages mentioned by majority of the respondents were productions of heat, itching of the body and reactions to the

chemical. Distribution of respondents according to the knowledge categories of LLINs showed that most of the respondents had good knowledge on LLINs; this could be due to the high awareness about this net among respondents. The most common sources of information on LLINs among mothers/caregivers of under five children were radio/television and health workers. This is similar to what was reported in previous studies,(Kimbi et al., 2014a; Sarpei-Nunoo, 2011; Soleimani-Ahmadi et al., 2014b) and findings from the FGDs also affirmed this. This is encouraging as this finding illustrates that health workers are frequently in contact with mothers/caregivers. Also, it has been previously reported that access to health workers and mass media plays an important role in prevention and control of malaria (Soleimani-Ahmadi et al., 2014b).

Factors influencing the knowledge of LLIN among mothers/caregivers of under five children

Association between socio-demographic factors of respondents and level of knowledge on LLIN showed that there was a statistically significant difference between respondents' age, religion, educational level, employment status, residence, number of under-five children in the family and their knowledge on LLINs. Eight out of ten of respondents between the ages of 30-34 years had good knowledge on LLINs as compared to about 7 out of 10 respondents who fall within other age groups. This finding is expected as ages 30-34 years are still in their early reproductive years and they are more in contact with the health workers who are one of the major sources of information on LLINs. Most respondents with formal education had good knowledge on LLIN as compared to the respondents with no formal education. This is expected as formal education has been found to give access to information (Oheneba-Sakyi, 1995) About 9 out of 10 of the respondents who were working had good knowledge on LLIN as compared to 7 in 10 that were not working. This finding with regard to the

employment status could be because this category of people had access to information as a result of their interaction with people in their work place on daily basis. More than 8 in 10 0f the respondents living in the urban areas had good knowledge on LLIN as compared to two-third of those living in the rural areas. This may be because people living in the urban have access to information than those in the rural. Also, majority of mothers with 2 or more under-five children had good knowledge than those with only one under-five child, this is because mothers with 2 or more under-five children are likely to be more exposed to information because of their frequent contact with the health workers which is one of their major sources of information. Findings from this study were however in contrast to what was found in a previous study in Imo state, where there was no statistically significant association between age, level of education and the knowledge on LLINs (Ozims and Eberendu, 2014). Respondent's age, educational level, employment status, residence and number of under-five in the family were found to be predictors of good knowledge on LLIN in this study. Respondents between the age group of 30-34 years were two and half times more likely to have good knowledge as compared to those less than or equal to 24 years. Respondents with formal education were almost two times more likely to have good knowledge than those without formal education. Respondents who were employed were 2.3 times more likely to have good knowledge than those who were unemployed. Respondents living in urban areas were three times more likely to have good knowledge than those living in rural areas and respondents with two or more under-five children were 2.3 times more likely to have good knowledge than those with one under-five child.

Household ownership and sources of LLINs

Household ownership of LLIN among respondents showed that 4 out of 5 respondents had at least one net in the house as compared to 1 out of 5 respondents who does not have net. This

is similar to the findings in studies done in Imo state (76%) and Burkina Faso (90%) where majority of the households owned bed nets (Diabaté et al., 2014; Ozims and Eberendu, 2014). This is in contrast to the finding in a study done in Ogun state where only 23.6% of respondents owned LLINs (Adeneye et al., 2014). Most of those that had LLINs acquired the net free. This finding could be as a result of the frequent net distribution campaign that had taken place in the country. This is also confirmed by about half of the respondents whose source of LLINs was during net distribution campaign. This is similar to the findings in other studies where their main source of the net was during net distribution campaign (Ozims and Eberendu, 2014; Tokponnon et al., 2014). Hospital was also found to be another major source of LLINs among respondents in this study, as about one third of the respondents got their nets from there. Eight out of ten of the respondents that had LLINs claimed the net was hanged and only 6 out of 10 of them were observed to be hanged.

Utilization of LLIN by under five children

More than half of children under five years slept under net the night before the study, this is similar to the findings in previous studies done in malaria endemic countries such as Burkina Faso (70%) and Kenya (52.2%) (Diabaté et al., 2014; Malusha et al., 2009), lower use rate was found among under five children in Ghana (43%) (Zuradam, 2012). Of all the under five children sampled only two fifth of them sleep under the net every night. This is not encouraging as regular use of the net is necessary to reduce the incidence of malaria among under five children.

Factors influencing the use of LLIN among under five children

Association between utilization of LLINs and some selected variables showed that Tribe, level of education and knowledge of respondents on LLIN were significantly associated with utilization of LLINs. Three-fifth of the respondents from the Yoruba tribe utilized the net as

compared to almost half of those from the other tribes. This may be because majority of the respondents in the study areas were from Yoruba tribe. Also, three out of five of the respondents with formal education utilized the net as compared to two out of five of those with no formal education. This further confirmed the positive effect of education on knowledge of LLINs which directly affects its utilization. It was also found that more than 6 out of 10 respondents with good knowledge of LLINs used the net for their children as compared to 4 out of 10 of those with poor knowledge. This is similar to what was found in a study in Kenya, where utilisation of Long LLINs by under five children was found to be positively associated with knowledge ($p = 0.024$) (Malusha et al., 2009). Several reports confirmed that regular use of insecticide-treated nets increased when individuals received information about bed nets(Adongo et al., 2005; Hill et al., 2006) In as recent study conducted in a malaria endemic area of Iran, regular use of LLINs increased from 58.3% to 92.5% following educational intervention(Soleimani-Ahmadi et al., 2012a). Therefore, effective educational programmes may increase use of LLINs in the studied population. Respondents' tribe, educational level and knowledge on LLIN were found to be predictors of utilization of LLIN. Respondents from the Yoruba tribe were one and half times more likely to utilize LLIN for their under-five children than those that were none Yoruba's. Respondents with formal education were 1.4 times more likely to utilize LLIN for their under-five children than those without formal education and respondents with good knowledge were about two times more likely to utilize LLIN for their under-five children than those with poor knowledge.

Barriers to use of LLINs among under five children in this study were that it causes discomfort due to heat, reactions to chemical and the unpleasant odour. This is similar to the findings in other studies (Edelu et al, 2010b; Ozims and Eberendu, 2014). Also during the FGDs, most mothers complained of unbearable heat, adverse reactions to the chemical like

itching of the body, rashes (uticaria rash), pepperish sensation on the skin and the eyes and excessive sneezing including difficulty in breathing. Another barrier to use of the net mentioned by mothers was the misconception about the net. Some mothers believed that the free nets were more effective than those bought, so they refused to buy one and use when they don't get it free. They also made mention of the fact that the colour of the net being white made it difficult to maintain and some complained that the net they have does not size their beds. This means some of these mothers were ignorant of the fact that the net comes in different colours and sizes.

Limitation of study

The limitation of this study was that the information obtained from this study was based on maternal recall which could not be verified and therefore could lead to recall bias. However, the researcher ensured that such errors were minimized as mothers were encouraged to say the truth and assured that the information obtained will be kept confidential.

5.2 CONCLUSION

The findings from this study showed that all the respondents were aware of LLIN. Majority of them had good knowledge on LLIN, while about a quarter of them still had poor knowledge. Their major sources of LLIN were during net distribution campaign and from the health facilities.

The level of utilization of LLIN among study respondents was slightly above average though only two fifth of them slept under the net every night. The barriers to utilization of LLIN by under-five children were discomfort due to heat, reactions to chemical and unpleasant odour. Other reported barriers were the misconception of some mothers concerning the net that the distributed nets were more effective than the ones purchased and the mothers ignorant of the fact that the nets comes in different colours and sizes.

Factors identified to influence LLIN utilization were respondents' tribe, level of education and knowledge of respondents on LLIN. The relevance of these findings lies in the reinforcement of the collaborative roles of mothers, health workers, and government in the fight against malaria.

5.3 RECOMMENDATIONS

To the State Government

1. Educative programmes on the use of LLIN should be intensified through the media in other to capture mothers/caregivers with poor knowledge on LLIN.

To the Health workers

1. Health workers should educate mothers/caregivers on the need to ensure that their under-five children sleep under the net on daily basis.
2. Health workers should educate mothers on proper handling of LLIN prior to its use in other to limit the reactions to the chemical.
3. Health workers should correct mothers/caregivers misconception about the efficacy of the net irrespective of the source.
4. Mothers should be made aware of the fact that the net comes in different colours and sizes.

REFERENCES

Adeneye, A. ., Jegede, A. ., Nwokocha, E. ., & Mafe, M. A. (2014). Perception and affordability of long-lasting insecticide-treated nets among pregnant women and mothers of children under five years in Ogun State, Nigeria. *J Infect Public Health*, *7*(6), 522–33.

Aderibigbe, S. A., Olatona, F. A., Sogunro, O., Alawode, G., Babatunde, O. A., Onipe, A. I. et al. (2014). Ownership and utilisation of long lasting insecticide treated nets following free distribution campaign in South West Nigeria. *Pan African Medical Journal*, *17*(8), 263.

Adeyemo, M. O. ., Oluwatosin, O. ., Amodu, O., & Taofeeq, Y. O. (2014). Home Management and Prevention of Malaria among Under-Five Children: Experiences of Mothers in a Nigerian Local Government Area. *Afr. J. Biomed*, *17*(2), 83–91.

Adongo, P. B., Kirkwood, B., & Kendall, C. (2005). How local community knowledge about malaria affects insecticide-treated net use in northern Ghana. *Trop Med Int Health*, *10*, 366–378.

Afolabi, B. M., Sofola, O. T., Fatunmbi, B. S., Komakech, W., Okoh, F., Saliu, O. et al. (2009). Household possession, use and non-use of treated or untreated mosquito nets in two ecologically diverse regions of Nigeria–Niger Delta and Sahel Savannah. *Malar J*, *8*(5), 30.

Alaii, J. A., Hawley, W. A., Kolczak, M. S., Kuile, F. O., Gimnig, J. E., Vulule, J. M. et al. (2003). Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya. *American J Trop Med Hyg*, *68*, 137–141.

Anyanwu, E. B., Mabiku, T. O., & Okperi, B. (2010). Patients' awareness and the issue of malaria chemoprophylaxis. *Continental J. Biomedical Sciences*, *4*(2), 1–5.

Aransiola, J., 2013. Providing sustainable support for street children in Nigeria: Stakeholders challenges and the policy options available. *Advances in applied sociology, 3(3), pp.172-77*

Araoye, M. O. (2004). *Research Methodology* (pp. 115–120).

Atieli, H. E., Zhou, G., Afrane, Y., Ming-Chieh, L., Mwanzo, I., Githeko, A. K. et al. (2011). Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. *Parasites & Vectors*, *4*, 113.

Baume, C. A., & Marin, M. C. (2007). Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia: are nets being used? Who in the household uses them? *American J Trop Med Hyg*, *77*, 963–971.

Baume, C. A., & Marin, M. C. (2008). Gains in awareness, ownership and use of insecticide-treated nets in Nigeria, Senegal, Uganda and Zambia. *Malaria Journal*, *7*(2), 153.

Baume, C. A., Reithinger, R., & Woldehanna, S. (2009). Factors associated with use and non-use of mosquito nets owned in Oromia and Amhara regional states, Ethiopia. *Malar J*, *8*(2), 264.

Bejon, P., Ogada, E., Peshu, N., & Marsh, K. (2009). Interactions between age and ITN use determine the risk of febrile malaria in children. *Plos One*, *4*(12), 8321.

CDC. (2014a). Impact of Malaria. Retrieved May 22, 2014, from http://www.cdc.gov/malaria/malaria_worldwide/impact.html

CDC. (2014b). Insecticide-Treated Bed Nets. *Malaria*. Retrieved July 13, 2015, from http://www.cdc.gov/malaria/malaria_worldwide/reduction/itn.html

Cochrane Editorial Unit. (2014). Malaria prevention and control. *Cochrane Library*. Retrieved November 28, 2014, from http://www.thecochranelibrary.com/details/collection/6117231/Malaria-prevention-and-control.html

Diabaté, S., Druetz, T., Bonnet, E., Kouanda, S., Valéry, R., & Haddad, S. (2014). Insecticide-treated nets ownership and utilization among under-five children following the 2010 mass distribution in Burkina Faso. *Malaria Journal*, *13*, 353.

Edelu, B. O., Ikefuna, A. N., Emodi, J. I., & Adimora, G. N. (2010b). Awareness and use of insecticide-treated bed nets among children attending outpatient clinic at UNTH, Enugu - the need for an effective mobilization process. *Afr Health Sci.*, *10*(2), 117–119.

Egbewale, B. E., Olajide, F. O., Odu, O. O., & Adebimpe, W. O. (2009). Morbidity Pattern among under Five Children and Preventive Practices of Mothers and Care Givers in Olorunda Local Government Area. *Afr J Med Sci.*, *4*(1-2), 19–26.

Eisele, T. P., Macintyre, K., Yukich, J., & Ghebremeskel, T. (2006). Interpreting household survey data intended to measure insecticide-treated bednet coverage: results from two surveys in Eritrea. *Malar J.*, *5*(5), 36.

Envuladu, E. ., Banwat, M. ., Lar, L. ., Miner, C. ., Agbo, H. ., & Zoakah, A. I. (2012). Effect of community based intervention on awareness and utilization of the long lastining insecticidal nets in a rural area of Barkin ladi LGA Plateau state Nigeria. *Journal of Medical Research*, *1*(3), 029-033.

Federal Ministry of Health (FMoH) Nigeria. (2013). *Nigeria Demographic and Health Survey* (pp. 201–220). Retrieved from http://www.population.gov.ng/images/ndhs_data/ndhs_2013/2013_ndhs_final_report.pdf

Federal Republic Of Nigeria. (2007). Official Gazette of the 2006 National population and Housing census: The Federal Government Printer Lagos, Nigeria FGP71/52007/2, 500(OL24)., *94*, 175–98.

García-Basteiro, A. L., Schwabe, C., Aragon, C., Baltazar, G., Rehman, A. M., Matias, A. et al. (2011). Determinants of bed net use in children under five and household bed net ownership on Bioko Island, Equatorial Guinea. *Malaria Journal, 10*(179).

Hempelmann, E., & Krafts, K. (2013). Bad air, amulets and mosquitoes: 2,000 years of changing perspectives on malaria. *Malaria Journal*, *13*(10), 232.

Hill, I J., Lines, J., & Rowland, M. (2006). Insecticide-treated nets. *Adv Parasitol*, *61*(2), 77–128.

Hmwe, H. K., Katholiki, G., Harry, S. S., & Michael, H. B. (2013). Evaluation of the association between long-lasting insecticidal nets mass distribution campaigns and child malaria in Nigeria. *Malaria Journal*, *14*(12), 1475–2875.

John Hopskin Malaria Research Institute. (2014). About Malaria. Retrieved July 09, 2014, from http://malaria.jhsph.edu/about_malaria/

Kimbi, H. K., Nkesa, S. . B., Ndamukong-Nyanga, J. L., Sumbele, I. N., Atashili, J., & Atanga, M. B. (2014a). Knowledge and perceptions towards malaria prevention among vulnerable groups in the Buea Health District, Cameroon. *BMC Public Health*, *14*, 883.

Kimbi, H. K., Nkesa, S. B., Ndamukong-Nyanga, J. L., Sumbele, I. N., Atashili, J., & Atanga, M. B. (2014b). Socio-demographic factors influencing the ownership and utilization of insecticide-treated bed nets among malaria vulnerable groups in the Buea Health District, Cameroon. *BMC Research Notes*, *7*, 624.

Korenromp, E. L., Miller, J., Cibulskis, R. E., Kabir, C. M., Alnwick, D., & Dye, C. (2003). Monitoring mosquito net coverage for malaria control in Africa: possession vs. use by children under 5 years. *Trop Med Int Health*, *8*(2), 693–703.

Lelisa, D. ., Wakgari, A. ., & Ahmed, A. . (2013). Predictors of long-lasting insecticide-treated bed net ownership and utilization: evidence from community-based cross-sectional comparative study, Southwest Ethiopia. *Malar J.*, *12*, 406.

Lengeler, C. (2004). Insecticide-treated bed nets and curtains for preventing malaria (Review). *The Cochrane Library*, *6*(2), 1–54.

Mail, A. ., Ali, A. ., Kachur, S. ., Mårtensson, A., Abbas, A. ., Khatib, R. et al. (2007). Impact of Artemisinin-Based Combination Therapy and Insecticide-Treated Nets on Malaria Burden in Zanzibar. *PLOS Medicine Pathogens Neglected Tropical Diseases*, *10*(2), 137.

Malusha, J. ., Mwanso, I., Yitambe, A., & Mbugi, J. . (2009). Use of insecticide treated nets among caregivers of children under five years in Makueni District, Kenya. *East African Medical Journal*, *86*(7), 308–13.

Mueller, D. H., Wiseman, V., Bakusa, D., Morgah, K., Dare, A., & Tchamdja, P. (2008). Cost-effectiveness analysis of insecticide-treated net distribution as part of the Togo Integrated Child Health Campaign. *Malar J.*, *7*, 73.

Mugisha, F., & Arinaitwe, J. (2003). Sleeping arrangements and mosquito net use among under-fives: results from the Uganda Demographic and Health Survey. *Malar J*, *2*, 40.

National Population Commission (NPC) [Nigeria] and ICF International. (2014). *Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International* (pp. 201–213).

Net Distribution. (2011). *NetsforLife*. Retrieved December 01, 2014, from http://www.netsforlifeafrica.org/what-we-do/net-distribution

Nwaorgu, O. C. (2011). Prevalence of Malaria among Children 1 – 10 Years Old in Communities in Awka North Local Government Area, Anambra State South East Nigeria. *International Multidisciplinary Journal, Ethiopia*, *5*(5), 264–281.

Obayendo, T. (2014). Taming malaria in Nigeria. *Pharmanews*, *36*(5), 6–8. Retrieved from http://www.pharmanewsonline.com/taming-malaria-in-nigeria/

Obembe, A., Anyaele, O. ., & Oduola, A. . (2014). Lessons from the implementation of LLIN distribution campaign in Ilorin Kwara State, Nigeria. *BMC Public Health*, *14*, 514.

Oheneba-Sakyi, Y. (1995). *Woman and African society*. (M. Singh Das & V. K. Gupta, Eds.) (p. 104). Retrieved from https://books.google.com.ng/books?id=XZSaID8uNrMC&pg=PA104&lpg=PA104&dq

Okumu, F. O., & Moore, S. . (2011). Combining indoor residual spraying and insecticide-treated nets for malaria control in Africa: a review of possible outcomes and an outline of suggestions for the future. *Malaria Journal*, *10*, 208.

Onwujekwe, O., Etiaba, E., Uguru, N., Uzochukwu, B., & Adjagba, A. (2014). Towards making efficient use of household resources for appropriate prevention of malaria: investigating households' ownership, use and expenditures on ITNs and other preventive tools in Southeast Nigeria. *BMC Public Health*, *14*, 315.

Onyeneho, N. G. (2013). Sleeping under insecticide-treated nets to prevent malaria in Nigeria: what do we know? *Journal of health, population, and nutrition*, *31*(2), 243–51. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3702346&tool=pmcentrez&rendertype=abstract

Osun State Ministry of Information. (2006). Osun State at a glance: In Osun State diary; The Osun State Ministry of Information and Women Affairs:. 5–12.

Otsemobor, O., Ajayi, O. ., Bamgboye, M. ., Ajayi, J. A., Turshak, L. G., Fatunmbi, B. et al. (2013). Determinants of long lasting insecticidal nets distribution, ownership and use in the Federal Capital Territory, Nigeria – implications for malaria programmes. *Journal of Public Health and Epidemiology*, *5*(11), 445–458.

Ouattara, A. ., Raso, G., Edi, V. A., Utzinger, J., Tanner, M., Dagnogo, M. et al. (2011). Malaria knowledge and long-lasting insecticidal net use in rural communities of central Côte d'Ivoire. *Malaria Journal*, *10*, 288.

Ozims, S. ., & Eberendu, I. . (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*, *4*(8), 2307–2083.

Salim, A., Schellenberg, J. A., Nathan, R., Oscar, M., Marchant, T., Smith, T. et al. (2001). Impact on malaria morbidity of a programme supplying insecticide treated nets in children aged under 2 years in Tanzania: community cross sectional study. *BMJ*, *322*(7281), 270–273.

Sarpei-Nunoo, H. (2011). The use of bed nets by mothers / carers of children under five years old in the paediatrics out-patients department (P.O.P.D) of the 37 military hospital in the prevention of malaria. Retrieved July 29, 2015, from http://ir.knust.edu.gh/bitstream/123456789/4004/1/Final.pdf

Sibhatu, B., Ayalu, R., & Haji, K. (2012). Determinants of Ownership and Utilization of Insecticide-Treated Bed Nets for Malaria Control in Eastern Ethiopia. *Journal of Tropical Medicine*, *2012*, 1–7.

Sofoluwe, N. A., Tijani, A. A., & Baruwa, O. . (2011). Farmers' perception and adaptation to climate change in Osun State, Nigeria. *African Journal of Agricultural Research*, *6*(20), 4789--4794.

Soleimani-Ahmadi. M., Vatandoost, H., Shaeghi, M., Raeisi, A., Abedi, F., Eshraghian, M.R. et al. (2012). Effects of educational intervention on long-lasting insecticidal nets use in a malarious area, southeast Iran. *Acta Med Iran*, *50*, 279–287.

Soleimani-Ahmadi, M., Vatandoost, H., Zare, M., Alizadeh, A., & Salehi, M. (2014). Community knowledge and practices regarding malaria and long-lasting insecticidal nets during malaria elimination programme in an endemic area in Iran. *Malaria Journal*, *13*, 511.

Tangpukdee, N., Duangdee, C., Wilairat, P., & Krudsood, S. (2009). Malaria Diagnosis: A Brief Review. *Korean Journal of Parasitology*, *47*(2), 93–102.

Tchinda, V. H.. Socpa, A., AubinKeundo, A. ., Zeukeng, F., Seumen, C. ., Leke, R. G. et al. (2012). Factors associated to bed net use in Cameroon: a retrospective study in Mfou health district in the Centre Region. *Pan African Medical Journal*, *12*, 112.

Thwing, J. I., Hochberg, N., Vanden, E. J., Issifi, S., Eliades, M. J., Minkoulou, E. et al. (2008). Insecticide-treated net ownership and usage in Niger after a nationwide integrated campaign. *Trop Med Int Health*, *13*(6), 827–34.

Tokponnon, F. T., Aholoukpe, B., Denon, E. Y., Gnanguenon, V., Bokossa, A., N'guessan, et al (2013). Evaluation of the coverage and effective use rate of long-lasting insecticidal nets after nation-wide scale up of their distribution in Benin. *Parasit Vectors*, *6*, 265.

Tokponnon, F. T., Sissinto, Y., Ogouyémi, A. ., Sovi, A., Gnanguenon, V., Adéothy, A. A., et al. (2014). Assessment of long-lasting insecticidal net coverage, use and physical

integrity one year after universal distribution campaign in Plateau department in South-East Benin. *Journal of Public Health and Epidemiology*, *6*(2), 76–84.

Tujera, R. (2007). Malaria - an overview. *FEBS Journal*, *274*(18), 4670–9.

UNFPA. (2014). Population projection. *UNFPA NIGERIA NEWS*. Retrieved July 11, 2014, from http://nigeria.unfpa.org/osun.html.

United States Embassy in NIGERIA. (2011). Nigeria Malaria Fact Sheet. Retrieved October 17, 2014, from http://photos.state.gov/libraries/nigeria/231771/Public/December-MalariaFactSheet2.pdf

WHO. (2005). *Guidelines for Laboratory and Field Testing of Long-Lasting Insecticidal Mosquito Nets. Geneva: World Health Organization* (pp. 4–8).

WHO. (2008a). *World Malaria Report* (pp. 1–183). Retrieved from http://www.who.int/malaria/publications/atoz/9789241563697/en/

WHO. (2008b). Insecticide-Treated Mosquito Nets: a WHO position statement. *Global Malaria Programme*. Retrieved December 11, 2014, from http://www.who.int/malaria/publications/atoz/itnspospaperfinal.pdf

WHO. (2009). World Malaria Report. *World Health Organization. Geneva.* Retrieved December 11, 2014, from http://whqlibdoc.who.int/publications/2009/9789241563901_eng.pdf

WHO. (2010). *Burden of Malaria in Africa* (pp. 17–23). Retrieved from http://www.againstmalaria.com/downloads/RBMBurdenMalariaAfrica.pdf

WHO. (2012a). *World Malaria Report* (pp. 78–110). Retrieved from http://www.who.int/malaria/world_malaria_report_2011/9789241564403_eng.pdf

WHO. (2012b). Intermittent Preventive Treatment of malaria in pregnancy using Sulfadoxine-Pyrimethamine. *South Sudan Medical Journal*. Retrieved December 13, 2014, from http://www.southsudanmedicaljoumal.com/archive/february-2013/intermittent-preventive-treatment-of-malaria-in-pregnancy-using-sulfadoxine-pyrimethamine.html

WHO. (2013a). Mass distribution of long-lasting insecticide-treated nets (LLINs). *Technical information: International aid charities*. Retrieved May 22, 2014, from http://www.givewell.org/international/technical/programs/insecticide-treated-nets

WHO. (2013b). *World Malaria Report Fact Sheet* (pp. 21–52). Retrieved from http://www.rbm.who.int/keyfacts.html

Wiseman, V., Scott, A., McElroy, B., Conteh, L., & Stevens, W. (2007). Determinants of bed net use in the Gambia: implications for malaria control. *American J Trop Med Hyg*, *76*, 830–836.

Xu, J. W., Liao, Y. M., Liu, H., Nie, R. ., & Havumaki, J. (2014). Use of Bed Nets and Factors That Influence Bed Net Use among Jinuo Ethnic Minority in Southern China. *PLoS ONE*, *9*(7), 14.

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*. Retrieved from http://epublications.uef.fi/pub/urn_nbn_fi_uef-20121116/urn_nbn_fi_uef-20121116.pdf

APPENDICES

APPENDIX 1

QUESTIONNAIRE ON UTILIZATION OF LONG LASTING INSECTICIDAL NET BY UNDER FIVE CHILDREN IN OSUN STATE

Dear Respondents,

This is a health survey questionnaire to study utilization of Long Lasting Insecticidal Net among under five children in Osun state. All information would be kept confidential. Kindly ensure that you answer all questions truthfully. Thanks for your cooperation.

Serial no: ..... LGA: ..... Ward .....

Question No	Questions	Choice of answers	Skip to Ques No
SECTION A: Socio-demographic characteristics of mothers/care givers of under five children			
1.	How old are you? (as at last birthday)	1.....years	
2.	What is your tribe?	1. Yoruba 2. Igbo 3. Hausa/Fulani 4. Others (specify).....	
3.	What is your religion?	1. Christianity 2. Islam 3. Traditional 4. Others (specify).....	
4.	What is your highest level of education?	1. No formal education 2. Primary 4. Tertiary 5. Others (specify)	
5.	Place of residence	1. Rural 2. Urban	
6.	What is your Profession?	.....	
7.	What is your work status?	1. Working 2. Not working	
8.	What type of work do you do?	.....	
9.	Number of children less than 5years in the family?	Specify	
SECTION B: Knowledge of mothers/care givers of under five children about LLIN			
10.	Have you ever heard about Long Lasting Insecticidal Nets (LLIN)?	1. Yes 2. No ——————→	21
11.	What is/are your source(s) of information? (multiple answers are allowed)	1. Radio/ Television 1. Yes [ ] 2. No [ ] 2. Newspapers 1. Yes [ ] 2. No [ ] 3. Parents 1. Yes [ ] 2. No [ ]	

		4. Friends 1. Yes [ ] 2. No [ ] 5. Health workers 1. Yes [ ] 2. No [ ] 6. Internet 1. Yes [ ] 2. No [ ] 7. Church/Mosque 1. Yes [ ] 2. No [ ] 8. Others (specify)	
12.	What is Long Lasting Insecticidal Net? (*Pls write as stated)*	....	
13.	What are the advantages of Long Lasting Insecticidal Nets that you know?	....	
14.	What are the disadvantages of Long Lasting Insecticidal Nets that you know? (*Pls write as stated)*	....	
15.	People who sleep under Long Lasting Insecticidal Nets are protected against mosquito bite, thereby prevent malaria infection in them.	1. Yes 2. No	
16.	Some people who sleep under a Long Lasting Insecticidal Nets can still have malaria.	1. Yes 2. No	
17.	Long Lasting Insecticidal Nets protect a person from malaria infection for several years.	1. Yes 2. No	
18.	Dead mosquitoes on the ground are a good way to tell that your bed net is still effective.	1. Yes 2. No	
19.	Long Lasting Insecticidal Nets only prevent mosquito bites when used with certain types of beds.	1. Yes 2. No	
20.	More expensive bed nets are more effective than less expensive or free bed nets.	1. Yes 2. No	

	SECTION C: Ownership and Utilization of LLIN by under five children		
21.	Does your household have any Long Lasting Insecticidal Net that can be used while sleeping?	1. Yes 2. No	23
22.	Why doesn't your household have Long Lasting Insecticidal Net? *(multiple answers allowed)*	1. I don't have one 2. We don't like to use mosquito nets 3. It is too expensive 4. No mosquitoes in the house 5. Others (Specify).....	

23.	How many Long Lasting Insecticidal Nets does your household have? *(Specify)*	.....	
24.	Did you buy the net(s) or was it given to you free?	1. Bought 2. Free	
25.	Where did you obtain your Long Lasting Insecticidal Net?	1. During net distribution campaign 2. Hospital 3. Pharmacy 4. Supermarket 5. Others (Specify)	
26.	Ask respondents to show you the nets	1. Observed, but has holes 2. Observed, does not have holes 3. Not observed	
27.	Ask if net is hanging	1. Yes ——→ 2. No	28
28.	Observe if net is hanging?	1. Observed 2. Not observed	
29.	Did your child (choose the youngest under 5yrs) sleep under the net last night?	1. Yes ——→ 2. No	31
30.	If No, why? (*state reasons*)	.....	
31.	How many of your children under 5yrs sleep under the same LLIN at night?	1. Specify	
32.	How often do your child (youngest under five) sleep under the net at night?	1. Every night 2. Once a week 3. Twice a week 4. Three times in a week 5.Others(Specify)	
33.	Does the child (youngest under five) have malaria in the last 2wks?	1. Yes 2. No ——→	35
34.	Where was the child treated?	1. Hospital 2. Home 3. Pharmacy/chemist shop 4.Others (Specify).....	

SECTION D: Factors influencing use of LLIN by under five children			
35.	What are the reasons known to you why under five children does not sleep under the LLIN?	1. Lack of LLIN 2. It is expensive 3. It is not adequate for the number of under five children in the house 4. It is not effective against malaria 5. Lack of accessibility/availability of LLIN 6. It is not convenient to sleep under it because of Heat/suffocation 7. I don't know about it. 8. Other reasons (specify)	

THANK YOU FOR YOUR TIME

APPENDIX 2

IWE IBEERE (EDE YORUBA)

IWE IBEERE LORI AMULO APO EFON LAARIN AWON OMODE TI O DIN NI ODUN MARUN NI IPINLE OSUN

Oludahun owon,

Eyi ni iwe ibeere eto ilera lati se iwadi lori amulo apo efon laarin awon omode ti o din ni odun marun ni ipinle Osun. Gbogbo idahun yi ni yoo wa ni pipamo gege bi asiri. Ejowo e dahun awon ibeere wonyi pelu otito. E see fun ifowosowopo yin.

Nomba..... Ijoba ibile ..... Woodu .....

Nomba ibeere	Awon ibeere	Yiyan idahun	Fo si nomba ibeere
	IPIN A: Abuda adamo/igbesi-aye awon iya omo ti o din ni odun marun		
1.	Omo odun melo ni o? (lo dun ti ope keyin)	1. Odun	
2.	Ki ni eya re?	1. Yoruba 2. Ibo 3. Hausa/Fulani 4. Omiran (so o).....	
3.	Ki ni esin re?	1. Kiristiani 2. Musulumi 3. ibilel 4. Omiran (so o).....	
4.	Iwe melo lo ka?	1. Mi o ka iwe 2. Alako bere 3. Sekondiri 4. Ile iwe giga 5. Omiran (so o)	
5.	Ibugbe	1. Igberiko 2. Ilu nla	
6.	Ki ni ise re?	.....	
7.	Ki ni ipo ise re?	1. Mo n sise 2. Mi o sise	
8.	Iru ise wo lo nse?	.....	
9.	Iye omode ti ko ipe odun marun melo ni eni ninu ebi?	So o	

IPIN B: Imo awon iya/alagbato awon omode ti o din ni odun marun lori apo efon			
10.	Nje oti gbo nipa apo efon rii?	1. Bee ni 2. Bee ko →	21
11.	Ki ni orisu imo re? *(o le yan idahun pupo)*	1. Redio/ Telifisan 1. Bee ni [ ] 2. Bee ko [ ] 2. Iwe iroyin 1. Bee ni [ ] 2. Bee ko [ ] 3. Awon obi 1. Bee ni [ ] 2. Bee ko [ ] 4. Awon ore 1. Bee ni [ ] 2. Bee ko [ ] 5. Awon eleto ilera 1. Bee ni [ ] 2. Bee ko [ ] 6. Wro ayelu jara 1. Bee ni [ ] 2. Bee ko [ ] 7. Soosi/Mosalasi 1. Bee ni [ ] 2. Bee ko [ ] 8. Omiran (so o)	
12.	Kini o mo ti apo efon je? (*Jowo koo sile bi o se soo)*	.....	
13.	Kini anfaani apo efon ti omo?	.....	
14.	Kini aleebu apo efon ti o mo? (*Jowo koo sile bi o se soo)*	.....	
15.	Awon ti won n sun labe apo efon ma nni idaabobo lowo efon, tori naa won kii ni aisan iba?	1. Bee ni 2. Bee ko	
16.	Awon ti won n sun labe apo efon tun le ni aisan iba?	1. Bee ni 2. Bee ko	
17.	Apo efon yii maa n daabobo eniyan lowo aisan iba fun odun pipe?	1. Bee ni 2. Bee ko	
18.	Awon oku efon ti o wa nile je aridaju pe apo efon re si n sise?	1. Bee ni 2. Bee ko	
19.	Apo efon yii maa n see lo pelu awon orisii ibusun kan?	1. Bee ni 2. Bee ko	
20.	Awon apo efon to won maa n sise daadaa ju awon eyi ti ko won tabi ti o je ofe?	1. Bee ni 2. Bee ko	

IPIN C: Nini ati lilo apo efon fun awon omode ti odin ni odun marun			
21.	Nje idile re ni apo efon ti e le lo nigba ti e ba fe sun?	1. Bee ni 2. Bee ko →	23
22.	Ki ni ode ti idile re ko fi mi	1. Ko si apo efon	

	apo efon? *(o le yan idahun pupo)*	2. Ako feran lati maa lo apo efon 3. O won lowo 4. Ko si efon ninu ile 5. Omiran (so o).....	
23.	Apo efon melo ni idile re ni? *(so o)*	.....	
24.	Se e ra won ni abi won fun yin lofe?	1. Rira 2. Ofe	
25.	Ibo ni eti ri/ra apo efon yin?	1. Lasiko ipolongo fifun ni ni apo efon 2. Ile-iwosan 3. Ile-itaja oogun 4. Ile-itaja igbalode 5. Omiran (so o)	
26.	So pe ki oludahun fi apo efon naa han o	1. Mo rii, oni iho lara 2. Mo rii, ko ni iho lara 3. Mi o rii	
27.	Beere bi oba fi apo efon naa ko?	1. Beeni →	28
		2. Beeko	
28.	Sakiyesi bi oba fi apo efon naa ko?	1. Mo rii 2. Mi o ri	
29.	Nje omo re *(yan omo ti o kere ju ninu awon ti o din ni odun marun)* sun si abe apo efon ni ale ana ?	1. Bee ni → 2. Bee ko	31
30.	Bi ko ba ri bee, kini idi re ? (*so idi*)	.....	
31.	Awon omo re ti o din ni odun maarun melo ni osun si abe apo efon kan naa lale ana?	1. So o	
32.	Ee melo lose ni omo re *(omo ti o kere ju ninu awon ti o din ni odun marun)* maa nsun si abe apo efon?	1. Alaale 2. Eekan lose 3. Eemeji lose 4. Eemeta lose 5. Omiran (so o)	
33.	Nje omo naa *(omo ti o kere ju ninu awon ti o din ni odun marun)* ni aisan iba ni ose meji seyin?	1. Bee ni 2. Bee ko →	35
34.	Ibo ni eti toju omo naa?	1. Ile-iwosan 2. Ile 3. Ile itaja oogun 4. Omiran (so o).....	
IPIN D: Awon nkan ti o n gbogun ti lilo apo efon laarin awon omode ti o din ni odun maarun			
35.	Kini idi ti o mo ti awon omode ti odin ni odun maarun kii fi sun sabe apo efon?	1. Awon miran ko ni apo efon 2. Owon lowo 3. Ko to fun awon omo ti odin ni odun marun ninu idile 4. Ko ki nsise daadaa fun idena iba	

		5. Ko si ni arowoto 6. Ko rorun lati su sabe re nitori oru 7. Mi o mo nipa re. 8. Awon idi miran (so o)	

E SE FUN ASIKO TI E FI SILE

APPENDIX 3

FOCUS GROUP DISCUSSION GUIDE

This is a focus group discussion guide.on utilization and factors affecting use of Long Lasting Insecticidal Net among under five children in Osun state.

1) Arrival and welcoming of discussants

2) Introduction of self

3) Introduction of project topic and briefly explaining the rationale for the study

4) Questions

I. What is/what do you know about Long Lasting Insecticidal Nets?

II. What are your sources of information about Long Lasting Insecticidal Nets?

III. What are the ways by which malaria can be prevented?

IV. Which people in the household arc mostly affected by malaria?

V. Where and how did you get the Long Lasting Insecticidal Net(s)?

VI. Do you normally have access to the nets when it is distributed free?

VII. How effective is the Long Lasting Insecticidal Nets in preventing malaria infection in young children?

VIII. What are the reasons known to you why some children under 5 years do not sleep under the net?

IX. What can be done to encourage mothers to ensure that their under 5 children sleep under the Long Lasting Insecticidal Nets?

5) Appreciation and departure of discussants

APPENDIX 4

FOCUS GROUP DISCUSSION GUIDE (YORUBA VERSION)

Ilana ibeere fun ajoso lori lilo apo efon fun awon omode to din ni odun marun ni ipinle Osun

1. Wiwole awon olusoro ati kiki won kaabo
2. Fifi ara eni han
3. Siso nipa iwadi ti an se ati idi fun
4. Awon ibere

I. Kini amo nipa apo efon?

II. Bawo ni ase gbo nipa apo efon?

III. Awon ona wo la mo ti ale gba dena aisan iba?

IV. Awon wo lamo ti aisan iba ma nmu ju ninu idile?

V. Ibo/bawo ni ase maa nri apo efon?

VI. Nigba ti won ban npin apo efon lofe se ama n ri gba?

VII. Awa gege bi iya lomo, kini iriri wa nipa iwulo apo efon lati dena arun iba ninu awon omo wewe wa?

VIII. Kini idi ti aro pe won omode ti o din ni odun marun miran ofi ki nsun si abe apo efon?

IX. Kini aro pe ale se lati se koriya fun awon iya lomo wa lori lilo apo efon fun awon omode ti o din ni odun marun?

5. Idupe lowo awon olusoro

APPENDIX 5

CONSENT FORM

This informed consent is for mothers/caregivers of children under 5 years participating in the research titled **"Utilization of Long Lasting Insecticidal Nets by under five children in Osun State"**

My name is Dr ISRAEL, Oluwaseyi Kikelomo, I am doing a research on the utilization of Long Lasting Insecticidal Nets by under five children in Osun State. The purpose of this study is to collect information on the knowledge of mothers/caregivers on Long Lasting Insecticidal Nets, utilization of this nets by their under five children and the factors affecting its utilization.

As mothers/caregiver you will be in the best position to give us information on this study based on your experience this will help to improve utilization of the nets by other mothers that have not been using it effectively for their under five children.

I assure you that all the information collected from you will be kept confidential. Information gotten from you will not be shared outside the research team. Your name is not required for this study, please be truthful in your responses. Participating in this study is voluntary. Kindly indicate below if you agree to participate in the research.

Thank you.

I have read the above information/ it has been read to me. I consent voluntarily to participate in this study.

Signature of mother/ caregivers _____ Date _____

OR

Thumb print

ETHICAL COMMITTEE

LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY TEACHING HOSPITA

OSOGBO, OSUN STATE, NIGERIA.

Address:
P.M.B 5000, Osogbo
039-200309,
e-mail :lautech.ethical.committee@gmail.com

DR. OLUWADIYA K.S. Chairman
MISS NDUKWE Y.U SECRETARY

Our Ref: LTH/REC/2015/03/

Your Ref:

Date: 16th March, 2015

CLEARANCE CERTIFICATE

PROTOCOL NUMBER	LTH/EC/2015/03/209
PROJECT TITLE:	*Utilization and Factors Affecting Use of Long Lasting Insecticidal Net Among Under Five Children In Osun State.*
INVESTIGATOR(S):	Dr. Israel Oluwaseyi Kikelomo.
DEPARTMENT / INSTITUTION:	Department Of Community Medicine, LAUTECH Teaching Hospital,Osogbo, Osun State.
SUBMISSION OF PROTOCOL:	DECEMBER, 2014.
FINAL CONSIDERATION:	MARCH, 2015.
DECISION OF THE COMMITTEE:	APPROVED
CHAIRMAN:	Prof. Oluwadiya K. S (FMCS)
SIGNATURE & DATE:	.....

NOTE: THE COMMITTEE IS EXEMPTED FROM LIABILTY OF THE PROPOSAL AND THIS CERTIFICATE WILL BE REVOKED IF PROTOCOLS STATED IN THE PROPOSAL IS DEVIATED FROM.

.....

DECLARATION BY INVESTIGATOR (S)

PROTOCOL NUMBER (Please quote in all enquiries): LTH/EC/2015/03/209

To be completed in four and three copies returned to the secretary, Ethics and Research Committee, Lad Akintola University of Technology Teaching Hospital, Osogbo, Osun State, Nigeria.

I/We fully understand the conditions under which I am/we are authorized to conduct the above – mentioned research and I/We will ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved, I/We undertake to resubmit the protocol to the Ethics and Research Committee.

Signature..... Date 16-03-15

MEMBERS

APPENDIX 7

Training of research assistants by the researcher

APPENDIX 8

Researcher conducting focus group discussion with mothers of Under 5 children

APPENDIX 9

Researcher conducting focus group discussion with mothers of Under 5 children