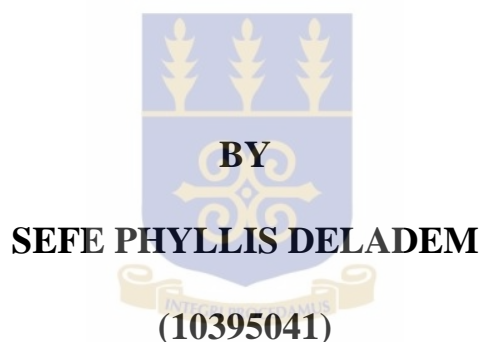


**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA, LEGON**

**USE OF LONG LASTING INSECTICIDE BED NET AMONG
PREGNANT WOMEN IN GA EAST MUNICIPALITY OF THE
GREATER ACCRA REGION**



**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF
GHANA, LEGON IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC
HEALTH (MPH) DEGREE**

JULY 2013

DECLARATION

CANDIDATE'S DECLARATION

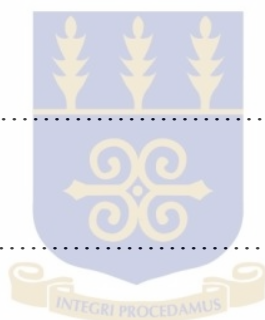
I, Sefe Phyllis Deladem declare that except for other people's Research work which have been duly acknowledged, this dissertation is the result of my own original research and that it has neither in whole nor in part been presented elsewhere concurrently or being submitted for any other degree.

CANDIDATE'S NAME: PHYLLIS DELADEM SEFE

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CANDIDATE'S SIGNATURE:

DATE:



ACADEMIC SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this project work was supervised in accordance with the guidelines on supervision of dissertation laid down by this University.

NAME OF SUPERVISOR: DR. AYAGA A. BAWAH

SIGNATURE:

DATE:

DEDICATION

I dedicate this work first to the Almighty God for giving me good health, knowledge and wisdom that enable me to complete this work successfully.

I also dedicate it to my parents, Mr. Christian Y. Sefe, Mrs. Selina Sefe, and my siblings for their prayers and ever ready support in my life. In addition, this project work is dedicated to my able supervisor, Dr. Ayaga A. Bawah for his guidance and support.



ACKNOWLEDGEMENT

First, I want to thank God for the grace, knowledge and wisdom given me to complete this work successfully.

Secondly, I wish to acknowledge the Dean Prof. Richard Adanu and his entire team of lectures at the School of Public Health and my Head of Department Dr Augustine Ankomah for their wonderful tuition, support and encouragement.

My special thanks go to my able supervisor Dr. Ayaga A. Bawah for his guidance and support that has gone a long way to shape this work.

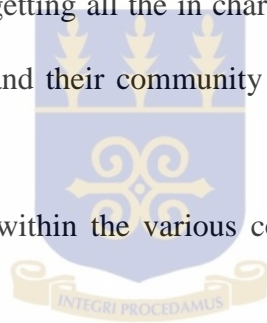
My appreciation also goes to the Management of Ga East Municipal Health Directorate of the Greater Accra Region especially Municipal Director and Mrs. Regina Bansah the Director in-charge of Nursing Services not forgetting all the in charges of the various Reproductive and Child Health Units of the district and their community health nurses for their co-operation and support.

I also thank the pregnant women within the various communities who participated in the study for their co-operation.

I am highly indebted to various writers from who references were made.

My heartfelt thanks also goes to my parents, brothers and sisters, my pastor and his wife for the needed assistance and encouragement to complete this work.

Finally, I would like to thank all other individuals not listed here who provided diverse support for me to complete this study.



ABSTRACT

Background: Use of Long Lasting Insecticide Bed Net (LLIN) is one of the recommended interventions by WHO to reduce the rate of malaria transmission especially among the vulnerable which include pregnant women and children. In Africa, out of 45 countries where ITNs form part of the national malaria control strategy, 36 had a representative household surveys that measured usage of nets and/or ITNs at some point between 1999 and 2004. According to available surveys, only Eritrea, in 2003 reached the Abuja target of 60% ITN usage. In later part of 2012 the Government of Ghana distributed LLIN to households in order to increase coverage extensively. The challenge is how to ensure consistent use of LLIN in Ghana to bring better outcome for pregnant mothers and their unborn babies. This study was to assess the use of Long Lasting Insecticide Bed Net (LLIN) among pregnant women and describe factors affecting its use in GA East Municipality.

Methods: The study employed cross sectional quantitative method. The data was captured using self-developed questionnaires. A two-staged sampling technique was adopted. At the first stage, we employed proportionate sampling procedure where sampled population is selected based on the size of the estimated number of pregnancies in each of the sub-municipalities. We later compiled a list of all pregnant women registered in each community from which we randomly select our sample. SPSS and Stata were used to analyze the data.

Results: Use of LLIN among pregnant women within the four communities of Ga East municipality was low. Most of them have high knowledge on LLIN and its appropriate use. Approximately half of the respondents had certain barriers on the use of LLIN. It was also realized that the use of LLIN was related to the educational level, occupation, age and marital status of the pregnant women.

Conclusion: Two main barriers to LLIN use in the municipality were cost and perceived harmful effect of LLIN on pregnancy. It is recommended that Community Health Nurses intensify Information, Education and Communication (IE&C) activities at outreach clinics and communities in the municipality

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ABBREVIATIONS

AdM:	Adenta Municipality
AM:	Accra Metropolitan
AOR:	Adjusted Odds Ratio
GDHS:	Ghana Demographic and Health Survey
GHS:	Ghana Health Service
GSS:	Ghana Statistical Service
GWM:	Ga West Municipality
IPT:	Intermittent Preventive Treatment
ITN:	Insecticide Treated Net
LLIN:	Long Lasting Insecticide Net
MDGs	Millennium Development Goals
MOH:	Ministry of Health
NMCP:	National Malaria Control program
RBM:	Roll Back Malaria
SPH:	School of Public Health
SPSS:	Statistical Package for Social Sciences
WHO:	World Health Organization

DEFINITION OF TERMS

Access:	The extent to which users can reach and obtain services.
Client:	User of a product or service.
Confidentiality:	Protection of information from persons who are not expected to have access to it.
Effectiveness:	The ability of a process to produce the anticipated desirable effects.
Impact:	The lasting effect of an activity.
Municipality:	A city or township that has its local government.
Programme:	A plan of action.
Questionnaire:	A list of items related to the topic, research questions and the objective of the study.
Standard:	Explicit statement of expected quality.
Use:	Pregnant women who slept under LLIN the previous night.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Malaria remains one of the major health challenges worldwide, despite considerable efforts made to contain it. It constitutes approximately 25% of the world's burden of diseases and there are approximately 300-600 million clinical episodes annually – approximately one death every 20 seconds – and about 1.5 to 2.7 million deaths caused by malaria throughout the world, and tropical Africa, south of the Sahara accounts for over 90% of the disease burden, the most affected being young children and pregnant women (Snow, Guerra, Noor, Myint, & Hay, 2005). Children and women, particularly pregnant women are the most vulnerable in terms of the burden of the disease Malaria in pregnancy is particularly threatening as it causes severe anaemia and reduces a woman's immunity, making her more susceptible to other illnesses, thus increasing the probability of death. On the part of the foetus, there is an increased risk of spontaneous abortion, stillbirth, premature delivery and low birth weight – a leading cause of approximately 200,000 newborn deaths each year (R.B. Malaria, 2002).

It is estimated that every year, over 30 million women in Africa become pregnant and their probability of getting malaria is very high since Africa is endemic with malaria. Pregnant women constitute the main adult risk group for malaria and 80% of deaths due to malaria in Africa occur in pregnant women and children below five years. In Africa, prenatal mortality due to malaria is more than 1500/day. In areas where malaria is endemic, more than 20-40% of all babies born have a low birth weight (Müller & Jahn, 2003).

In Ghana, Malaria is the number one public health problem, and accounts for the major cause of hospitalization, morbidity and mortality among the vulnerable. In the country, 9% of

deaths are attributed to the disease which accounts for 30% of outpatient visits and 9% of hospital admissions (Asenso-Okyere & Dzator, 1997) . Malaria is endemic throughout Ghana and continues to be a major public health concern. It is one of the leading causes of morbidity and mortality, especially among pregnant women. The Ministry of Health (MOH) estimates that over the past ten years, there have been 2-3 million cases of malaria each year, representing 40% of outpatient cases, while severe malaria accounts for 33-36% of in-patients (GSS, GHS & ICF Macro, 2009).

The Anopheles mosquito, which transmits the malaria parasite usually bites in the night mainly between 10.00 p.m. and 4.00 a.m. Therefore if people are made aware of the feeding habits of the Anopheles mosquito and the appropriate use of insecticide treated nets (ITN), the rate of malaria infection may be reduced to an appreciable level. The use of ITN among pregnant women has been associated with lower prevalence of malaria infection, and a resultant fewer premature births and significant reductions in all causes of maternal anaemia. However, only 4.1% of the total population of Ghanaians sleep in insecticide treated bed nets. Again, only 12.2% of households in Ghana, 9.1% of children under five years of age and 7.8% of pregnant women sleep under insecticide treated bed nets (Ter Kuile et al., 2003).

It is also clear that ITN re-treatment rate among Ghanaians is very low. Beyond governmental, state and institutional challenges, there could be lack of inadequate education, poverty, environmental, cultural and even religious hindering beliefs. As part of mitigating some of these challenges, some free distribution of bed nets had been promulgated, and in the later part of 2012, the Ministry of Health and the Ghana Health Services, in partnership with donor countries had decided to go from house to house to hang bed nets for people in the communities (WHO and GHS, 2003).

1.2 Statement of the Problem

Statistics available at the National Malaria Control Programme of Ghana indicate that about seven thousand pregnant women die of malaria annually in Ghana. Those pregnant women who survive may have various degrees of effects such as maternal anaemia, intra-uterine growth retardation, stillbirth among others. In Ghana, malaria is recognized as one of the top five major causes of morbidity and mortality especially among infants, young children less than five years of age and pregnant women (GSS & Macro, 2009).

The attempt to control malaria in Ghana began in the 1950s. It was aimed at reducing the malaria disease burden till it is no longer of public health significance. It was also recognized that malaria cannot be controlled by the health sector alone therefore multiple strategies were being pursued with other health related sectors. In view of this, interventions were put in place to help in the control of the disease. Some of the interventions applied at the time included residual insecticide application against adult mosquitoes, mass chemoprophylaxis with Sulphadoxine Pyrimethamine and improvement of drainage system (World Health Organization, 2005).

But malaria continued to be the leading cause of morbidity in the country. Ghana then committed itself to the Roll Back Malaria (RBM) initiative in 1999 and developed a strategic framework to guide its implementation. Overall, the Ghana RBM emphasizes the strengthening of health services through multi and inter-sectoral partnerships and making treatment and prevention strategies more widely available. The goal was to reduce malaria specific morbidity and mortality by 50% by the year 2010. In particular, RBM proposed to achieve 100% of households owning at least one ITN, 80% of the general population sleeping under ITNs and increasing the number of children under-five and pregnant women sleeping under treated net from current levels to 85% (WHO/GHS 2003).

In spite of the above, significant achievements have not been made over the period. In 2008 for instance, according to a survey conducted by Ghana Demographic and Health Survey, 19.9% of pregnant women slept under ITN the night before the survey. In effect, many programmes employed by the MOH and Ghana Health Service (GHS) including the famous Roll Back Malaria (RBM) has not made significant achievements (GSS, GHS and ICF Macro, 2009). The MOH in latter part of 2012 distributed and hanged LLIN in households in a hang up campaign” to help prevent the incidence of malaria especially among pregnant women and children. While coverage of LLIN seems to steadily increase, a growing number of studies report gaps between net ownership and use.

Therefore, a study into the use of long Lasting Insecticide Bed Net (LLIN) as a preventive measure of malaria among pregnant women especially on a local level is imperative.

1.3 Conceptual Framework

The conceptual framework below outlines the pathways through which use of LLIN could be understood. Thus use of LLIN is dependant on the sociodemographic characteristics of the woman (e.g. whether is educated or not, her socioeconomic status, etc), her knowledge of LLIN, barriers to use such as cost or accessibility, and of course the woman’s knowledge of the appropriate use of the net.

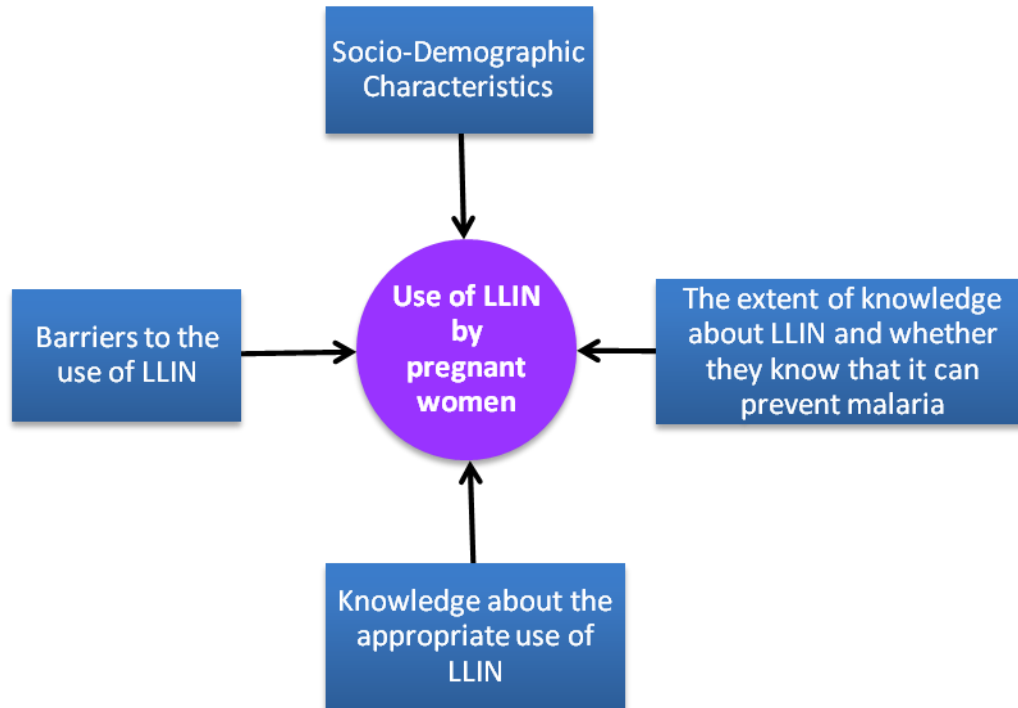


FIGURE 1.1: CONCEPTUAL FRAMEWORK OF THE STUDY

Source: Authors Own Construct (2013).

1.4 Research Questions

The study would attempt to address the following questions:

- i. To what extent pregnant women know about LLIN and do they know that it can help prevent malaria?
- ii. Do pregnant women have knowledge about the appropriate use of LLIN?
- iii. What are the barriers to the use of LLIN among pregnant women?

1.5 General Objective

- To assess the use of Long Lasting Insecticide Bed Net (LLIN) among pregnant women and describe factors affecting its use in Ga East Municipality.

1.6 Specific Objectives

- To determine the extent of pregnant women's knowledge about LLIN and whether they know LLIN can help prevent malaria.
- To assess whether they have knowledge about the appropriate use of LLIN.
- To identify the barriers to the use of LLIN among pregnant women.

1.7 Justification of the Study

Information gathered from the Ga East Municipal Health Directorate clearly shows that there is no study conducted on the use of LLIN among pregnant women in the Municipality. It is necessary to undertake this research to obtain accurate, up-to-date, reliable and valid data on the use of LLIN among pregnant women in the communities within the Ga East Municipality. It is hoped that findings and recommendations from this study will provide a way forward for policy makers at the district, regional and national levels in making pragmatic policies as far as malaria prevention and control programmes are concerned.

The findings and recommendations of the study will also guide the Ga East Municipality Health Directorate to plan and implement effective LLIN programmes to help increase LLIN coverage and its consistent use in the Municipality at large.

It would also serve as reference materials for other students who are pursuing programmes that are related to this area.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter focuses on literature review and the conceptual frame work that was used for the study. It covers the epidemiology of malaria, types of Long Lasting Insecticidal Nets (LLIN), ownership and use of LLIN, factors influencing use of LLIN by pregnant women, knowledge about LLIN among pregnant women, knowledge about cause and effect of malaria in pregnancy, appropriate use of LLIN among pregnant women and barriers to the use of LLIN, LLIN distribution strategies, financing LLIN in malaria control programme, Roll Back Malaria programme (RBM). Since LLIN has come to replace ITN, most literature done on this study area used ITN hence most literature reviewed were done on ITN.

2.1 Epidemiology of Malaria

Malaria is an infectious disease which infects millions of people on the globe annually. The disease is a global health problem, which affect mainly young children especially those less than five years of age and pregnant women. However, everybody especially the non-immune is at risk of getting the disease. Malaria is caused by any of the human malaria parasites including; plasmodium falciparum, plasmodium malarae plasmodium ovale and vivax. The most dangerous, common and dreaded malaria parasite is the plasmodium falciparum.

Infection with Plasmodium falciparum leads to a wide spectrum of clinical disease including life-threatening anaemia and coma in children and a severe disease syndrome during pregnancy in primigravida woman (Okrah, Traore, Palé, Sommerfeld, & Müller, 2002).

The female Anopheles mosquito through a bite transmits the disease (malaria current status, 2006). The main malaria endemic areas are Africa, Asia, Central and South America,

Oceania and certain Caribbean Islands. The burden of malaria is worst in Africa but prevention and treatment are reaching more people worldwide. However, it is too soon to say whether these findings will have an impact on illness and death from the disease (World Health Organization, 2005). Patterns of malaria transmission and disease vary markedly between regions and even within individual countries. This diversity results from variations between malaria parasites and mosquito vectors. Ecological conditions that affect malaria transmission and socio-economic factors such as poverty and access to effective health care and prevention services are also factors to consider.

In Africa, over 30 million women living in malaria-endemic areas become pregnant each year. For these women, malaria is a threat both to themselves and to their babies, with up to 200 000 newborn deaths each year as a result of malaria in pregnancy (GHS, 2005). Twenty-five million pregnant women are currently at risk for malaria, and according to the WHO, malaria accounts for over 10,000 maternal and 200,000 neonatal deaths per year (World Health Organization, 2010).

Pregnant women are particularly vulnerable to malaria as pregnancy reduces a woman's immunity to malaria, making her more susceptible to malaria infection and increasing the risk of illness, severe anaemia and death. For the unborn child, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery and low birth weight - a leading cause of child mortality. The problem has long been neglected, but new approaches and commitment offer hope for reducing the burden of malaria in pregnancy and improving the health of mothers and newborns. Based on available evidence, WHO recommends a three-pronged approach to the prevention and management of malaria during pregnancy:

- Insecticide-treated nets (ITNs)
- Intermittent preventive treatment (IPT)
- Effective case management of malarial illness.

Sleeping under ITNs remains an important strategy for protecting pregnant women and their newborns from the bite of mosquitoes especially the female anopheles. In addition, in areas of high and moderate transmission of *Plasmodium falciparum* malaria (the most prevalent type of malaria in Africa), intermittent treatment with an antimalarial drug is a cost-effective means of preventing malaria in pregnancy (WHO, 2005).

The current recommendation is to give at least two doses of a safe and effective antimalarial (currently, sulphadoxine-pyrimethamine) to all pregnant women living in these areas. In areas of low or unstable malaria transmission, pregnant women have low immunity to malaria and a two- to threefold higher risk of severe malarial illness than non-pregnant women. In these areas, use of ITNs and prompt case management of pregnant women with fever and malarial illness are the main strategies for malaria prevention and treatment (GHS/WHO, 2003).

Coverage is meant to reach $\geq 80\%$ in year 2010 with four key interventions: ITNs for people at risk, appropriate anti-malarial medicines for patients with probable or confirmed malaria, IRS for targeted households at risk and intermittent preventive treatment in pregnancy (in moderate-to-high transmission settings). The global impact targets are a reduction in the number of malaria cases and deaths per capita by 50% or more between 2000 and 2010, and by 75% or more between 2000 and 2015 (GHS / WHO 2003).

The RBM partnership added three additional targets as part of the Global Malaria Action Plan in September 2008. The first is to reduce the global number of malaria deaths to near-zero preventable deaths by 2015. This target is more aggressive than the previous although there is no global consensus on how to measure preventable deaths. The second is that malaria should be eliminated in 8–10 countries by 2015 and afterwards in all countries that are in the pre-elimination phase today (2008). The third goal is, in the long term, eradicate malaria worldwide by reducing the global incidence to zero through progressive elimination in countries (World Health Organisation, 2009).

According to Robert Newman, WHO Global Malaria Programme director, “In 2008, there were an estimated 232 million malaria cases and 841 000 malaria deaths, with close to 90% of those occurring in sub-Saharan Africa,” declaring: “we have an unfinished agenda.” (TDRnews, 2009; World Health Organisation, 2009)

The growing resistance of *Anopheles* mosquitoes to insecticides used in the impregnation of bed nets and in other vector control operations looms as another huge threat. Since 2001, the proportion of African households owning an Insecticide Treated bed Net (ITN) has increased by more than 30% across the continent. Most nets are impregnated with pyrethroids, a class of insecticides. Yet now, mosquito resistance to pyrethroid is a growing problem in parts of the developing world. “We have too many of our eggs in one basket” said Newman. “And we don’t have any alternatives in the pipeline for the near term” (TDRnews, 2009).

Apart from the heavy toll in human lives, the medical costs and number of workdays lost to malaria in many African countries are enormous.

The World Health Organization (WHO) estimates that malaria retards African economic growth by 1.3% points per year. The benefits of controlling the disease would, therefore, be great. According to the WHO, sub-Saharan Africa’s gross domestic product (GDP) in 2000 might have been 32% greater had malaria been eliminated 35 years ago, an estimated increase of \$100 billion in the region’s current GDP of \$300 billion (Bawah & Binka, 2007).

2.2 Types of Long-Lasting Insecticidal Nets (LLINs)

LLINs are treated materials that repel or kill mosquitoes that land on them. They are mostly cone or rectangular in shape.

According to the World Health Organization, (2005), LLINs are nets that are treated at factory level by a process that binds or incorporates insecticide into the fibres. They are designed to maintain their biological efficacy against vector mosquitoes for at least 3 years

under recommended conditions of use in the field, obviating the need for regular insecticide re-treatment. When tested in the laboratory, the insecticidal efficacy of the nets should persist through at least 20 WHO standard washes.

The following three types of LLINs are currently recommended by WHO:

1. **Permethrin-Incorporated Net** (WHO 2004) – LLIN made of high density polyethylene monofilament yarn blended with 2% (w/w) permethrin (see Fig. 1) – an active ingredient content of about 1000 mg/m². Only a small proportion (2–5%) of the insecticide is available at the surface of the yarn; when this is removed through normal use or by washing, it is progressively replaced by diffusion of permethrin from within the polymer. This migration of the active ingredient is essential for the efficacy of the net. The permethrin-incorporated LLIN is made of wide mesh (4 mm x 4 mm) and is available in different colours, shapes and sizes. Duration of protective efficacy is at least 5 years under recommended conditions of use.
2. **Deltamethrin-Coated Net** – LLIN made of multifilament polyester netting treated with deltamethrin (55 mg/m²). The deltamethrin is mixed in a resin that coats the netting fibres and releases the insecticide progressively, so that the net retains efficacy after repeated washings. Polyester netting is commonly made of flat or texturized multifilament yarn. In texturized yarn, filaments have a wavy shape that is effected mechanically just after extrusion. Flat and texturized yarns have similar physical characteristics, including strength. However, texturized yarn is softer than flat yarn and nets tend to absorb slightly more water (and insecticide) than those made of flat yarn. Deltamethrin-coated nets are available in different shapes, sizes and colours.
3. **Alphacypermethrin-Coated Net** according to World Health Organization, (2001) is an LLIN made of multifilament polyester netting treated with alphacypermethrin at a target dose of 200 mg/m² of fabric. It contains a textile auxiliary that binds

alphacypermethrin in a special coating to the fibres of the net. The net is available in different shapes, sizes and colours. The effective life of insecticide-coated polyester LLINs under field conditions is currently being assessed. The strength and duration of the netting material itself (e.g. 75 or 100 denier multifilament polyester) might be a limiting factor unless it can be further improved.

LLINs use comes with the following benefits;

- Keep you and your family healthier by reducing malaria (episodes) attacks.
- Save you the cost of malaria treatment and transport to/from clinic.
- Save you the cost of mosquito coils and spray.
- Allow you to sleep peacefully without mosquitoes disturbing you.
- It prevents severe effects in the malaria in the vulnerable- pregnant women and children under five years.

2.3 Ownership and Use of Long Lasting Insecticide Nets (LLIN)

One of the strongest weapons in the fight against malaria is the use of insecticide-treated mosquito nets (ITNs) while sleeping. Research has shown that malaria incidence rates fall dramatically with the use of ITNs. Bed net usage is highly influenced by region of residence, food security and beliefs about malaria. It is on record that more people living in Afram plains in Ghana sleep under bed net be it treated or non-treated due to high presence of mosquitoes and malaria in the area (Crookson et al, 2006).

A randomized control trial in Kasena-Nankana district in Ghana showed that out of 80% of women who had nets 70% of women used them frequently (Brown Maude & Binkah, 2001) and a study by Okra et al in 2002 showed that, 87% of respondents were interested in the future use of treated nets, mostly because they felt it would provide them with better protection against mosquitoes.

In Africa, it is more difficult to precisely describe the current level of ITN coverage or the progress in increasing ITN coverage. Out of the 45 African countries where ITNs form part of the national malaria control strategy, 36 had a representative household surveys that measured usage of nets and/or ITNs at some point between 1999 and 2004. According to available surveys, only Eritrea, in 2003 reached the Abuja target of 60% ITN usage (World Malaria Report, 2005).

In the 2008 GDHS, data were collected on whether or not households owned mosquito nets and if so, how many. Respondents were also asked a number of questions about each net they owned, including whether it had been treated with insecticide and if so, how many months ago it was most recently treated. Finally, household respondents were asked to report the specific people in the household who had slept under each net the night prior to the survey. Less than half (45 percent) of households report owning a mosquito net; about one-third (33 percent) of households have an insecticide-treated net. This is a marked increase from 3 percent of Households with an ITN reported. Although 41 percent of children under five and 32 percent of pregnant women were reported to have slept under a mosquito net, the night preceding the survey, only 28 percent of children and 20 percent of pregnant women slept under a treated bed net. Pregnant women who carry the malaria parasite may be at risk of serious problems that can jeopardize their own health, and that of the foetus, and that increase the likelihood of pregnancy complications that may result in stillbirth, spontaneous abortion, and low birth weight (GSS, GHS and ICF Macro, 2009).

Net ownership is quite encouraging but a lot needs to be done to increase coverage. It is on record that “net culture” is improving and expanding in many parts of Ghana. There is therefore the opportunity for stakeholders in ITN promotion to map up persuasive strategies to expand net ownership in Ghana. The focus now should be on availability and variety, on reducing the cost of ITN, on creating awareness of ITNs especially for vulnerable groups, on

using motivational strategies to convert non-owners to owners (Netmark, 2004). While coverage of Long Lasting Insecticide net (LLIN) seem to steadily increase, a growing number of studies report gaps between net ownership and use. (Grietens et al, 2007). A study done among pregnant women and children under five year old children by Bogale in 2007 has shown that majority (53.6%) of children's and 71.2% of pregnant women's bed nets were not in use in the area.

Furthermore, the direct observation of the households bed net has showed that, 107(21.7%) of household's bed nets were inspected totally unutilized (none compliance) with the evidence that no any attempt to use as bed nets were kept as they were packed by the manufacturer (Bogale, 2007).

A recent synthesis of data from national malaria control programmes has also shown that levels of utilization of ITN by pregnant women in many other sub-Saharan African countries remain far below national and global Strategic targets (Ankomah *et al*, 2012).

2.4 Factors Influencing the Use of LLIN by Pregnant Women

Drawing from existing literature, the researcher conceptualized that socio-demographic factors, knowledge about the appropriate use of LLIN as well as its effectiveness in preventing malaria and barriers to the use of LLIN would be contributing factors to the eventual use of LLIN among pregnant women In a similar vein, Otchere (2011) conducted a study to assess the coverage and consistent use of insecticide treated bed nets (ITNS) in the prevention of malaria among pregnant women in the Nkoranza South District in the Brong Ahafo region of Ghana. In his literature review, he classified factors such as affordability, ownership, socio-cultural beliefs, education on ITNs and acceptance of ITN as factors influencing the use of ITN by pregnant women.

Previous studies have shown that several factors influence LLIN use. At individual level, these include: knowledge, beliefs, risks perception about malaria and perceived benefits of ITNs (Binka & Adongo, 1997; Adongo, Kirkwood & Kendall, 2005), age, sex and educational level of individuals (Graves et al., 2010; Noor, Kirui, Brooker & Snow, 2009; Tsuang, Lines & Hanson, 2010). Household level factors include: net density (Graves et al., 2010; Macintyre et al., 2006), hanging status, paying for a net instead of obtaining free (Macintyre et al., 2011) household size, age, education and occupation of household head (Graves et al., 2010; Baume & Franka-Koh, 2011), structure, space, types of sleeping units and intra-household sleeping arrangements (Doannio et al., 2006) and household decision making processes (Okrah, 2002). In addition, net characteristics (age, shape, colour, condition, etc.) have also been associated with its use (Ngondi et al., 2011). Other factors include climate and temperature associated with increased net use in the rainy season or reduced use during excessive heat (Pulford et al., 2011; Alaii, Hawley & Kolscak, 2003), as well as socio-cultural and socio-economic activities which can temporary reduce net use even among regular net users (Pulford et al., 2011; Alaii et al., 2003).

2.5 Socio-Demographic Characteristics

Heggenhougen et al. (2003) examined the influence of wealth, access to healthcare services and education as important predictors of ITN possession and use. There is no doubt about a growing gap between the rich and the poor, the increase in marginalization, and the increasing numbers of people living below an absolute poverty line of \$1 per day which is the major cause of concern in as much as it is also recognized that malaria morbidity and mortality may lead to poverty. It is a fact that the health of a growing and flourishing population will not improve unless poverty and expanding inequality are reduced and this includes the effort to control malaria on a large scale. Greater issues of poverty and inequality

have to be addressed if the effort to tackle malaria was to be taken seriously, with a proposition to diversify and look at the problem in the socio-economic, political and cultural contexts (Heggenhougen et al., 2003).

Ethnicity, area of residence and gender have also been shown to be factors influencing ITN possession and use, all of which have been demonstrated in studies carried out in Gambia, a country characterized with many ethnic groups.

Thomson et al. (1996) examined the geographical perspective of bed net use and malaria transmission, prior to the introduction of impregnated nets in Gambia. They found that the villagers protected themselves with bed nets in areas of high mosquito bites, and where mosquito density was low; the prevalence rate was relatively high. They further correlated bed nets usage rates and mosquito prevalence to geographical determinants such as ethnic group, area, habitat, and distance from the River Gambia. The result showed that, “bed net usage was independently associated with area ($P < 0.001$), ethnic group ($P = 0.010$), habitat ($P = 0.006$) and distance from the river ($P = 0.013$)” while “Malaria prevalence was not independently associated with area, ethnic group, habitat or distance from the river”. In Kenya, Choonara (2012) explored the influence of socioeconomic factors in the usage of ITNs. The study made use of a cross-sectional study design. The study showed that more than 50 percent of pregnant women made use of an ITN. The critical predictors of ITN use were marital status, region of residence and the wealth index of respondents. The study concluded that campaigns that will lead to an increase in the use of ITNs must take into consideration the marital status, region of residence and the wealth index of pregnant women.

2.6 Knowledge about LLIN among Pregnant Women

Atieli et al (2011) examined the underlying factors associated with the usage of ITNs among households in the Western Highlands of Kenya. The level of education and knowledge of ITNs emerged as significant predictors of ITN use.

According to Otchere (2011), education and information are crucial elements of the efforts to increase ITN/LLIN coverage in malaria endemic areas such as sub-Saharan Africa yet some campaigners do not give the correct message about them. This situation creates difficulty for the public to comply with the message on use of LLINs that they receive. A study in Nigeria into households' perception on malaria and ITN revealed that majority of the respondents had good knowledge about malaria and use of ordinary mosquito nets to prevent malaria.

Adongo, Kirkwood and Kedall (2005) explored how local community knowledge about malaria acts as a barrier to the use of ITNs in three settings. They indicated people recognize the term 'malaria' but have limited biomedical knowledge of the disease, including its etiology, the role of the vector, and host response. Convulsions and anaemia are rarely linked to malaria. The people acknowledged a role for ITNs in nuisance reduction, but not for malaria prevention.

The behavioral theory posits that even with the highest degree of knowledge in that even after the acquisition of relevant knowledge and skills, other important intervening factors exist in the eventual use of LLINs.

In Cameroon, Nwana (2011) investigated knowledge and utilization of ITNs. The study was restricted to two main ecological zones (a highland area in the Buea district mountain vicinity and a lowland area in the Tiko district) within the Fako division, a sample of 10 communities, 5 from each zone were identified and a multistage cluster sampling technique was employed in an "on location" analysis. Caregivers within households were targeted as primary subjects and information was collected using a semi structured questionnaire in an interview process.

The method of cross sectional survey including descriptive and analytical statistics was employed for the analysis of the data. The results revealed that despite some variation in the knowledge of caregivers regarding individual malaria components, their general level of knowledge of malaria was dominantly good. Possession of ITN, perception and value of ITN, levels of knowledge of malaria and the principal sources of information for this knowledge, but not the demographic variables of marital status, educational levels, family size, occupation, income and housing type of the respondents, were significantly associated to the utilization patterns of ITN. Barriers associated with the possession and regular use of ITN, were that participants implicitly perceived ITNs as having toxic effects and associated with illnesses, not cost effective and inconvenient due to hot weather. According to this study, the determinant factors associated with a high incidence and prevalence of malaria within the studied communities involved a lack of environmental hygiene, and until there is proper understanding of the mode of transmission of the disease and the opportunities to disseminate malaria knowledge are met, widespread adherence to the regular practice of ITN utilization is difficult.

2.7 Knowledge on the Cause Effect of Malaria in Pregnancy

According to CDC (2010), pregnant women are more susceptible than the general population to malaria: they are more likely to become infected, suffer a recurrence, and develop severe complications and to die from the disease. Malaria contributes very significantly to maternal and fetal mortality - with at least 10,000 maternal deaths per annum attributable in sub-Saharan Africa.

Regardless of symptoms, the presence of plasmodial parasites in a pregnant woman's body will have a negative impact on her own health and that of her fetus. Restricting treatment to

symptomatic pregnant women is an inadequate strategy to reduce the morbidity and mortality associated with malaria. Nosten et al (2007) added that, subclinical infection is common in areas where natural immunity is high (e.g. sub-Saharan Africa), whereas symptomatic cases are more common in areas with low immunity (e.g. the Asia-Pacific region, and South Africa).

Takem et al (2013) noted that malaria in pregnancy is different to the disease in the non-pregnant state. The severity of malaria in pregnancy is thought to be due to general impaired immunity plus a diminution of acquired immunity to malaria in endemic areas. Placental malaria occurs where *Plasmodium falciparum*-infected erythrocytes accumulate in the intervillous space of the placenta but may be rare or absent in the peripheral circulation. Diagnosis by light microscopy of blood films is more difficult.

Treatment can be more difficult due to restrictions on anti-malarial agents. Many are unlicensed in pregnancy due to lack of clinical trials involving this important population, for fear of damaging the fetus. There is frequently a lack of good post-marketing surveillance where these drugs are routinely used in pregnancy. However, data support the safety of artemisinin-combined drugs (ACDs) and their advent has provided a useful therapeutic option. With regard to chemoprophylaxis, recent World Health Organization (WHO) recommendations and a large meta-analysis support the use of intermittent prophylactic treatment during the second and third trimester (Kayentao, 2013).

Various studies undertaken in most countries about the knowledge of women on the cause and effect of malaria though reveal some level of knowledge; various misconceptions among the pregnant women were also reported. In a study in Ethiopia, educational status was not significantly associated with basic awareness about the cause of malaria (Legesse et al., 2009). While mosquito was implicated as a cause of malaria, the aetiologic agent of malaria

was not mentioned as people usually incriminate mosquitoes as the causative agents of malaria. Other causes of malaria mentioned by pregnant women were cold food, playing in rain, cold weather, and eating mango. A study done in Kampala by Njama et al. indicated that 90% of the caregivers knew that mosquitoes cause malaria although they equally indicated other perceived causes such as drinking unboiled water and respiratory illnesses (Njama et al 2003).

Another study done in Uganda shows that malaria is believed to be caused by poor diet and exposure to bad environmental conditions. While in Ghana, it has been reported that malaria is presumed to be caused as a result of excessive heat and eating oily or starchy food (Ahorlu, Dunyo, Afari, Koram, and Nkrumah 2007; Agyepong and Manderson 2004). In Guatemala, malaria is thought to be caused by exposure to cold or wet conditions, weakness or poor general health, poor eating habits, and problems related to hygiene. Also, a study from coastal Kenya found that most mothers did not know the association between mosquitoes and malaria (Mwenesi, Harpham, and Snow 2005).

Misconceptions about malaria still exist among pregnant women. Therefore, there is need for awareness creation among pregnant women to know that mosquito is a vector for malaria parasite that causes malaria so that all these misconceptions are addressed. People's perceptions and understandings about the perceived cause and transmission of malaria have strong implications on the preventive measures such as the current scale-up ITNs implementation. Therefore, public health education interventions should always be designed to cover the existing knowledge and should be implemented for a sufficient length of time for it to be effective (Kroeger et al., 2006).

2.8 Knowledge of Pregnant Women about Appropriate Use of LLIN

Ensuring proper use of the LLIN continue to pose a challenge to the use of ITNs. It contributes to the low number of people sleeping under ITNs even though those owning ITNs are high. It is a known fact that possessing ITNs do not necessarily translate into appropriate usage. Yet “insufficient attention has been paid to designing and implementing locally appropriate communication strategies to accompany ITN distribution, to inform communities of the importance of ITNs and of how to hang, use and maintain them properly. As a result, many people who received ITNs did not sleep under them, re-sold them, reduced their efficacy through inappropriate washing practices, or failed to replace them when they became damaged or torn” (World Health Organization, 2005). Some even use the ITN for fishing. However, teaching beneficiaries on how to use the ITNs during distribution and monitoring them regularly to ensure that they are using the ITNs is central to reducing the burden of malaria.

2.9 Barriers to the Use of LLIN

Socio-cultural and behavioural practices go a long way to determine the extent to which people own, retain and use ITN including LLINs. Understanding the socio-cultural dimension and behavioural changes of a particular region or group of people is central to achieving effective use of the LLIN and building a strong and robust communication and advocacy system. In this context, “research into local perceptions of mosquitoes, malaria, LLINs and washing practices is needed to inform the choice of media, messages and advocacy strategies” (World Health Organization, 2005).

Despite the fact that several factors have direct or indirect influence on the correct knowledge and use of insecticide bed nets, the main challenge is how to subdue the negative influences,

foster positive factors and generally motivate the promotion of bed nets use, especially as a long term prevention tool for malaria.

Binka & Adongo (1997) conducted a districts wide study in Ghana to gauge community reaction to the introduction of net and to identify factors influencing the acceptance and use of insecticide-impregnated bed nets. They found out that the population accepted the use of long lasting bed nets (ITN) because they protect man from mosquito bites, but key factors such as seasonal variation, cost of the nets and the patterns of its use were likely to influence the distribution and effectiveness of the bed nets. It was shown that the use of bed nets was highly seasonal given that 99% of recipients used their nets in the rainy season which corresponds to the period when mosquito density is at the maximum and only 20% used them during the dry season of low mosquito density (Binka & Adongo, 1997).

2.10 LLIN Distribution Strategies

The epidemiological situation in a particular region determines the delivery method and the beneficiary group to target for the ITNs. The two main regions for distribution and target groups for ITNs include perennial transmission areas where vulnerable group such as pregnant women and children under 5 years of age are targeted and areas with unstable malaria and limited populations at high risk and the target group is the total population within particular geographical location (WHO 2005).

Households are the delivery target for the ITNS. The form of delivery can take the form of public, private or a mixture of public-private partnership arrangement. However, “delivery of LLINs through antenatal care services and immunization programmes allows advantage to be taken of existing health services to reach both pregnant women and children under the age of 1 year. Delivery of LLINs to pregnant women through antenatal care is practised or planned in many countries and can be done either by giving a free or subsidized LLIN (i.e. direct

product), or by giving a voucher or coupon that can be exchanged for an LLIN at a distribution point such as a commercial outlets” (WHO 2005).

Out of the two ways, the distribution of free or highly subsidized LLINs is the most effective way to rapidly scale up coverage of all people and target vulnerable group highly at risk such as young children and pregnant women. It breaks the barrier of cost and helps cover a large population and get to the target audience that rightly needs the ITNs.

According to WHO (2012), “a total of 89 countries distribute ITNs free of charge, including 39 of 43 countries with on-going *P. falciparum* transmission in the African Region. In 78 countries, ITNs are distributed to all age groups, and in 67 of those, ITNs are delivered to all age groups through mass campaigns. Of 40 countries in the African Region which distribute ITNs free of charge, 33 distribute them through antenatal clinics, reflecting policies where the effects of malaria in pregnancy are a particular concern. Globally, 27 countries distribute ITNs through EPI clinics” (WHO 2012).

Furthermore, WHO African Region report (2012) on national malaria control programmes (NMCPs) indicate that mass campaigns were the main channel for ITN distribution, accounting for 78% of all nets distributed. This was followed by antenatal care clinics (14%), immunization clinics (6%) and other channels (2%). NMCP reports outside Africa also revealed that 54 million ITNs were distributed globally during the 2009–2011 period. Of this number, 81% of ITNs were distributed through mass campaigns, 6% through immunization clinics, 1% through antenatal clinics and 12 % through other channels (WHO 2012). It can be seen that mass campaign constitutes the commonest means of distribution and reaching out to a wide audience of people.

2.11 Financing LLIN in Malaria Control Programme

Financing ITNs and other malaria control programme is expensive especially in situation where one is offering free and highly subsidised ITNs. WHO (2010) indicate that “global resource requirements for malaria control were estimated in the Global Malaria Action Plan to exceed US\$ 5 billion a year between 2010 and 2015 and US\$ 4.75 billion between 2020 and 2025” (WHO 2010). This called for a concerted global mobilisation of resources from both national and international community to meet the huge financial cost of fighting the burden of malaria.

The source of financing malaria control programme take three form namely funds from the international community, national government funds and out of pocket funds. WHO (2012) observed that “international disbursements to malaria-endemic countries increased every year from less than US\$ 100 million in 2000 to US\$ 1.71 billion in 2010 and were estimated to be US\$ 1.66 billion in 2011 and US\$ 1.84 billion in 2012. The Global Fund remains the largest source of funding for malaria control globally, accounting for 39 % of estimated disbursed funds in 2011 and 40 % in 2012” (WHO 2012).

Support from nation state in the form of domestic financing on malaria control programme is dependent on the economic strength and political will of a particular country. Available “data suggest that domestic financing for malaria increased in all WHO Regions between 2005 and 2011 except in the European Region. The Region of the Americas and the African Region report the greatest expenditure on malaria control. Total domestic spending was estimated to be US\$ 625 million in 2011” (WHO 2012).

Despite the impressive financial support on both domestic and international front towards the malaria prevention and treatment, available data reveal that total funding for malaria control will remain at less than US\$ 2.7 billion between 2013 and 2015 (WHO 2012). Other means of funding malaria control programme is through private out-of-pocket expenditure. Though

not much information and data are readily available on this form of funding, it nevertheless can form a substantial portion of funding for malaria preventive and treatment programme (WHO 2010).

2.12 The Roll Back Malaria Programme (RBM)

The use of insecticide-treated nets (ITNs) is one of the main malaria control strategies in most malaria endemic countries to reach the Roll Back Malaria (RBM) targets to reduce the malaria burden by 50% in 2010 compared to 2000 levels and at least 75% by 2015. Despite the large scale distribution of ITNs in many malaria endemic countries, there is a wide variation in the availability and use of ITNs/LLINs at the household level. The RBM global partnership programme is the prize of global community and collaborative work within malaria endemic regions to reduce the burden of malaria. It was formed in 1998 by global institutions such as WHO, UNICEF, UNDP and the World Bank who sought to work with over 500 partners including malaria endemic countries, their bilateral and multilateral development partners, the private sector, nongovernmental and community-based organizations, foundations, and research and academic institutions to provide a coordinated global response to the malaria disease by reducing human and socioeconomic cost. Its overall strategy aims to reduce malaria morbidity and mortality by reaching universal coverage and strengthening health systems.

The strength of RBM lies in mobilizing resources and forging consensus among various partners at both national and international level to scale up malaria-control efforts at country level, coordinating their activities to avoid duplication and fragmentation, and to ensure optimal use of resources (RBM, 2012). Scale up intervention to achieve coverage and meet the global target of reducing the burden of malaria by 2015 pillars includes integrated vector management such as the use of intermittent preventive treatment in pregnancy (IPT),

insecticide-treated nets (ITN), and case management of malaria illness with effective drugs. These multi-prong methods have become the major medium to combat the malaria menace (RBM WHO 2004).

The World Bank, (2005) indicate that “in each context, the priorities and appropriate combination of interventions will depend on factors such as the epidemiology of malaria, the type and behavior of the mosquito, local customs and preferences, the susceptibility of the malaria parasite to different drugs, feasibility of the logistics required, the quantity and quality of human resources for malaria control, and affordability” (The World Bank, 2005).

Crawley, Chu, Mtove, & Nosten, (2010) defined intermittent preventive treatment (IPT) as “the administration of a full therapeutic dose of an antimalarial drug (or a combination of drugs) at specified time points, whether or not parasites are present”(Crawley et al., 2010).

GHS/NMCP/JHPIEGO/MSH/GLOBAL FUND, (2005) suggest that in relation to pregnancy, “it is the administration of full, curative treatment doses of an effective anti-malarial drug at predefined intervals during pregnancy, beginning after 16 weeks or after quickening” (GHS/NMCP/JHPIEGO/MSH/GLOBAL FUND, 2005).

To make IPT fully preventive and not only presumptive, the drug(s) need to protect against recurrence of an existing infection and against new infections, ideally until the next dose is given. This requirement calls for slowly eliminated drugs to be given at the right dose and the right time. The most studied drug for IPT is sulfadoxine pyrimethamine (Crawley et al., 2010).

It provides a highly effective base for programmes through use of safe and effective anti-malarial drugs in treatment doses, which can be linked to antenatal clinic visits. The potential of IPT to attain high levels of programme coverage and its benefit in reducing maternal anaemia and Low Birth Weight (LBW) makes it a preferred strategy to the failed strategy of

weekly chloroquine chemoprophylaxis (GHS/NMCP/JHPIEGO/MSH/GLOBAL FUND, 2005).

WHO further recommend that “in areas targeted for malaria vector control, all persons at risk should be protected by ITNs or IRS. The choice of ITNs or IRS depends on a number of entomological, epidemiological, and operational factors including seasonality of transmission, vector survival and behaviour, and insecticide susceptibility of anopheles vectors” (World Health Organization, 2011).

Roll Back Malaria Programme – Ghana

The Global Roll Back Programme which was enrolled in 1998 and renewed with greater commitment at the turn of the century is continental based and nation specific. Ghana has become a partner to this programme and at the Abuja Declaration on the adoption of the African Summit on Roll Back Malaria (RBM) in April 2000, reiterated its commitment together with other regional leaders to achieve 60% coverage of malaria prevention in pregnancy over the next decade. The three-tier strategies to achieve this objectives includes the use of insecticides treated nets (ITN), intermittent preventive treatment (IPT) and case management of malaria illness (GHS/NMCP/JHPIEGO/MSH/GLOBAL FUND, 2005).

The Roll Back Malaria Programme (RBM) has become a major flagship for campaigning against malaria in Ghana. The Ghana Health Service (GHS) in collaboration with local government authorities and UNICEF distributed Insecticide Treated Nets (ITNs) to high risk group in the northern part of the country. The distribution achieved over 20 per cent coverage of children below 5 and pregnant women in the upper East, Upper West and Northern regions (UNICEF, 2007).

But while there have been considerably effort to extend coverage to all regions in the country, little documentation has been done in the literature on the use of the insecticide treated net in other regions like the GA East districts of Ghana. There is also the lack of effective and proper linkages between malaria control and antenatal care programmes during pregnancy (GHS/NMCP/JHPIEGO/MSH/GLOBAL FUND, 2005).

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.0 Introduction

The purpose of the study is to assess Long Lasting Insecticide Bed Net (LLIN) use among pregnant women within the communities in Ga East municipality. This chapter deals with the research procedures used. It starts with the type of study, description of the study area, variables to measure, study population, sampling procedures, and the technique for the collection of the data, description of the instrument used. These are followed by quality control, data processing and analysis, ethical consideration and pre-test.

3.1 Type of Study

This study employed a cross sectional quantitative method. Cross-sectional studies according to Creswell, (2003) may use questionnaires for data collection with the view of generalizing from a sample to a population. Survey research is one of the most important areas of measurement in applied social research. The broad area of survey research encompasses any measurement procedures that involve asking questions of respondents, survey is one of the most widely used methods in the social sciences. It is characterized by the selection of a random sample from large or small populations to obtain empirical knowledge commonly used to determine the present status of a given phenomenon by carefully following certain systematic procedures. This method has been credited for its flexibility in asking questions and its analysis of the responses. It provides for a comprehensive examination of people's attitudes towards specific issues. In addition, it allows a small sample of the population to be selected and then used to generalize the findings for the large group.

The study adopted a quantitative method because the researcher wants to make inferences on the findings of the study. The data was captured using a self-developed questionnaire and will be distributed to the pregnant women.

3.2 Study Location/Area

The research was carried out within Ga East Municipality between May and July 2013. The GA East Municipality is located at the northeast part of Greater Accra Region. It is one of the 10 municipalities/districts in the Greater Accra Region and covers a Land Area of 166 sq km. The municipality has Abokobi, as its capital and is boarded on the west by the Ga West Municipal (GWM), on the east by the Adenta Municipality (AdM), the south by Accra Metropolitan (AM) and on the north by the Akwapim South District. The district was established in 2004.

The estimated population as at the year 2010 was 173,215. The growth of the population is mainly due to the influence of migration inflows (Document on profile of Ga East Municipal Assembly) (gaeast.ghanadistricts.gov.gh).

3.3 Variables to Measure

Variables for this study were categorized into dependent and independent as shown below;

- **Dependent Variable:** The use of LLIN.
- **Independent Variable:** Socio-Demographic characteristics of the pregnant women, the extent of pregnant women knowledge about LLIN and whether they know it can help prevent malaria, knowledge about appropriate use of LLIN and barriers to the use of LLIN among pregnant women.

3.4 Study Population

The population for study will be pregnant women who reside within Ga East Municipality.

3.5 Sampling

3.5.1 Sample Size Determination

Yamane's formula (Israel, 2006) is used to determine the sample size in this study. Determination of sample size is based on the estimated population size ($N = 4785$) of expected pregnancies in the Ga East Municipality for the year 2013. The formula is stated below:

$$n = [N / 1 + N (e)^2],$$

Where:

n – The sample size

N – The population size

e – The desired level of precision or level of acceptable error = 0.05

$$\begin{aligned} \text{Total sample size (n)} &= [4785 / (1 + 4785 (0.05)^2)] = [4785 / (1 + 4785 \times .0025)] \\ &= [4785 / 1 + 11.9625] \\ &= [4785 / 12.9625] \\ &= 369.14 \end{aligned}$$

Below was the sample allocation:

Table 3.1: Sample Allocation to Communities in Ga East Municipality

Communities in Ga East Municipality	Total Population	Expected Pregnancy (4% of Total Population)	Proportions	Sample Size to Use	Non Response (10% of Sample Size to Use)	Allocated Sample
Abokobi	14077	394	0.082341	30	3	33
Dome	71,764	2009	0.419854	155	16	171
Haatso	23,890	604	0.126228	47	5	52
Taifa	63,484	1778	0.371578	137	14	151
Total	173,215	4785		369		407

The expected pregnancies are calculated based on WHO recommended standard of using 4% of any given population. An adjustment of 10% was made which yielded a final sample size of 407. We adjusted the sample size by increasing it by 10% because of possible non-responses or refusals. It is appropriate to do that so that if the proportion of non-responses is high, we will still be left with enough samples to have adequate power to estimate the outcomes without bias.

3.6 Sampling Technique

Since the study was based on the entire GA East municipality the population sampled for the study came from the four sub municipalities of the GA east municipality. A two-staged sampling technique was adopted. At the first stage, we employed proportionate sampling procedure where sampled population was selected based on the size of the estimated number of pregnancies in each of the municipalities. The estimated number of pregnant women for the year 2013 was collected from GA East Municipal Health Directorate based on 2010 census.

Sample proportions for the four communities were estimated based on their population. Since each of the four communities is a sub-municipality with public and community health nurses who help to provide antenatal care and have register of all pregnant women who receive antenatal care, we compiled a list of all pregnant women registered in each community from which we randomly selected our sample.

3.7 Data Gathering Techniques / Methods & Tools

The instrument for data collection was questionnaire, which was developed to collect data from the respondents on the various variables.

The first section (A): Collect information on socio-demographic characteristics of the pregnant women who have agreed to participate in this study. The second section (B): collected data on the extent of pregnant women knowledge about LLIN and whether they knew it could help prevent malaria. The third section (C): sought information about appropriate use of LLIN among pregnant women and the fourth section (D): collected information on the barriers to the use of LLIN among pregnant women. The research was conducted within a period of (20) days.

3.8 Quality Control

To ensure good outcome of the study the following were done:

- 1) The data collection tool (questionnaire) was critically analyzed with my supervisor in order to correct all errors and any ambiguity.
- 2) The data was collected and analyzed by the researcher, research assistant, trained data analyst and data entry personnel.
- 3) The data entry was done twice by two different data entry personnel
- 4) Data cleaning and analysis was done.

5) Each questionnaire after entry was separated and an indication made on it.

Interpreter was trained to ensure quality data collection

3.9 Data Processing and Analysis

The data was entered in SPSS and then exported to STATA for analysis. The data was also cleaned by running frequencies of all variables to check for incorrect coding. This helped double checked with the raw data and the needed corrections done. In the analysis, Frequency and proportions were used to describe the demographic information. A chi square test was used to determine the association between dependent and independent variables and also logistic regression model was fitted for some independent and dependent variables. Age has been categorized into 18-25, 26-33 and 34-41; knowledge on malaria transmission into 'Yes' for those who knew and 'No' for those who did not know; knowledge of effect of malaria on pregnant woman into 'Yes' for those who knew and 'No' and knowledge of effect of malaria on unborn baby into 'Yes' for those who knew and 'No' for those who did not know. The main questions under each objective were categorized using Likert scale. Under pregnant women's knowledge on LLIN, and appropriate use, 0-1 was indicated as low, 2-3 was represented by good, 4 and above denoted Very Good.

3.10 Ethical Consideration

Approval was sought from MOH/GHS Ethical Review Committee through the School of Public Health authorities. Initial consultations was done with the Municipal Director of Health Services, Municipal Chief Executive, chiefs and community leaders, assembly men of the selected communities. A letter from School of Public Health was sent to confirm the study. Participants were assured of privacy, anonymity and confidentiality. Each participant was been made to either sign or thumb print a consent form.

3.11 Pre-test or Pilot Study

Pretesting of the questionnaire was done at Madina with thirty questionnaires pretested. This was because the clients there also have the same characteristics as the study area. The aim was to help the researcher to reassess and restructure the questionnaire. It also helped in revealing the length of time appropriate for questioning the respondents.

CHAPTER FOUR

RESULTS

4.0 Introduction

This part of the study deals with the results of the responses from clients. The dependent variable in the study is LLIN use. A total of 407 respondents were used in the analysis. The response rate was hundred percent (100%). The data was collected from four sub-municipalities namely Abokobi, Haatso, Dome and Taifa. Respondents from Abokobi were 33 (8.1%), Haatso 52 (12.8%), Dome 171 (42.0%) and Taifa 151 (37.1%). It was realized that 273 (67.1%) of the pregnant women possessed the LLIN. In Abokobi sub-municipality 19 (57.6%) of the respondents possessed the net, 115 (67.3%) of the respondents in Dome possessed it. In Haatso, 27 (51.9%) of the pregnant women possessed the net while in Taifa 112 (74.2%) of the respondents possessed the LLIN. Figure 2 shows the level of usage of LLIN in the four sub-municipalities surveyed. It shows that out of the total number surveyed in Abokobi, 15.2% used the nets, in Dome 31% used the net, in Haatso 32.7% of the respondents used it and the usage in Taifa was 29.1% among the respondents.

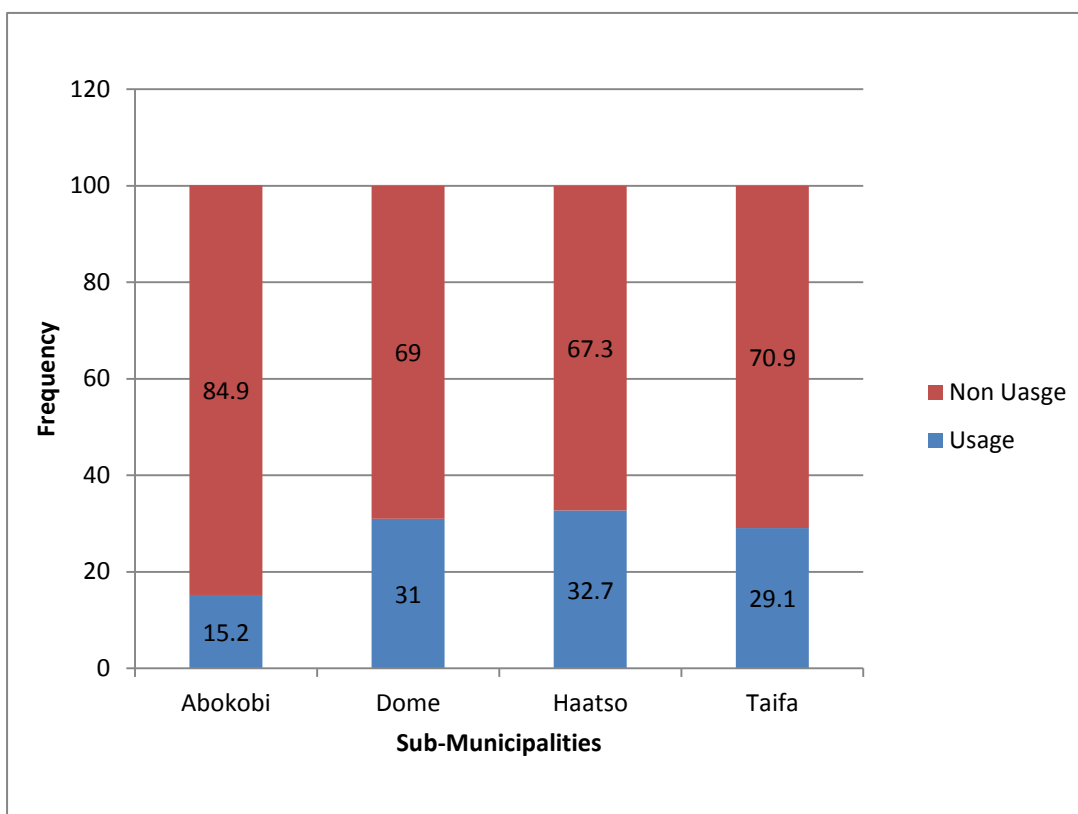


FIGURE 4.1: DISTRIBUTION OF USE AND NON-USE OF LLIN AMONG PREGNANT WOMEN WITHIN COMMUNITIES IN GA EAST MUNICIPALITY

4.1 Background Characteristic of the Respondents

Concerning background characteristic of client, majority (45.5%) of the clients were between the ages of twenty-six to thirty-three (26-33) years. Eighteen (18.2%) were more than thirty-three (33) years. Christians in the majority of (84.5%) and (76.9%) were also married. Majority of clients (79.4 %) were self-employed. 14.3% was not employed, 51.4% attended JSS, 18.2% attended SHS and 1.5% of clients had tertiary education.

Table 4. 1: Background Characteristic of the Respondents

Characteristics	Total Respondents = 407	
	Number	%
Age group		
18-25	148	36.4
26-33	185	45.5
34-41	74	18.2
Religion		
Christian	344	84.5
Moslem	48	11.8
Traditional	12	3.0
Others	3	0.7
Educational Level		
No education	29	7.1
Primary	61	15.0
Junior High	209	51.4
Senior High	74	18.2
Tertiary	28	6.9
Other	6	1.5
Occupation		
Unemployed	58	14.3
Civil servant	26	6.4
Self-employed	323	79.4
Marital Status		
Single	23	5.65
Married	313	76.9
Cohabiting	67	16.5
Separated	4	0.98
Ethnicity		
Akan	271	66.6
Ewe	77	18.9
Ga/Dangbe	27	6.6
Northerners	26	6.4
Other	6	5.9

4.2 Association between Socio Demographic Characteristics and Use of LLIN

Chi-squared test was conducted to check association between socio-demographic characteristics and LLIN usage. A P-value less than 0.05 is considered significant. The proportion of respondents aged 18–25 who used LLIN was 39 (26%). The usage among those aged 26-33 was 66 (35.7%) and 15 (20.3%) of those aged 34–41 used the LLIN (Table 4.2). Age is statistically significant with LLIN use ($\chi^2 = 7.13$; $P = 0.028$). Among the various religious groups usage of LLIN is higher 105 (31%) among Christians as compared to the

Muslims 12 (25%), traditionalist 3 (25%) and others zero (0). This difference is not statistically significant ($\chi^2 = 2.01$; $P = 0.570$).

Among pregnant women who had a form of formal education 116 (31.2%) of them use LLIN and while 4 (13.8%) of them who had no form of formal education used the LLIN. Those who had tertiary education, LLIN usage were higher among them 14 (50%) than those with lower level of education. Pregnant woman's level of education has statically significant association with usage of LLIN ($\chi^2 = 23.43$; $P = 0.001$).

The use of LLIN among pregnant women who were unemployed was 9 (16.1%) which was lower than those who were employed 111 (32%) this is an indication that employment status of a pregnant women as an association with the usage of LLIN $\chi^2 = 12.95$; $P = 0.024$ (Table 4.2). With regards to those who were married, and cohabiting the usage of LLIN among them was 109 (29%) which is lower compare to those who are not of any form of marital relationship 11 (41%). Marriage is significantly associated with LLIN use ($\chi^2 = 9.82$; $P = 0.020$) (Table 4.2).

The use of LLIN was high among pregnant women of northern tribes 11 (42%) as compare to the other ethnic groups but there is no statistical significant association between the ethnic group of pregnant women and the usage of LLIN ($\chi^2 = 6.47$; $P = 0.167$). Among the pregnant women whose partners have some form of formal education usage was reported to be 120 (30%) as compared to those who have no form of formal education. But usage of LLIN did not have any association with partner's educational level ($\chi^2 = 3.77$; $P = 0.438$). The use of LLIN by pregnant women whose husbands were employed was 116 (29%) which is lower than those whose husbands were not employed 4 (50%) but partners occupation did not have any association with the use of LLIN by pregnant women ($\chi^2 = 3.77$; $P = 0.438$). Usage of LLIN was high among pregnant women who have ever received antenatal care than those

who have never received antenatal care but it did not have association with use ($\chi^2 = 1.21$; $P = 0.271$).

Table 4.2: Socio-Demographic Characteristics of Respondents

Characteristics	Respondents	LLIN Use	Did not use	χ^2 ; P-Value
Age group				
18-25	148 (36.4)	39 (26.4)	109 (73.6)	$\chi^2 = 7.13$; $P = 0.028$
26-33	185 (45.5)	66 (35.7)	119 (64.3)	
34-41	74 (18.2)	15 (20.3)	59 (79.7)	
Religion				
Christian	344 (84.5)	105 (30.5)	239 (69.5)	$\chi^2 = 2.01$; $P = 0.570$
Moslem	48 (11.8)	12 (25.0)	36 (75.0)	
Traditional	12 (3.0)	3 (25.0)	9 (75.0)	
Others	3 (0.7)	0(0.0)	3 (100)	
Educational Level				
No education	29 (7.1)	4 (13.8)	25 (86.2)	$\chi^2 = 23.43$; $P = 0.001$
Primary	61 (15.0)	26 (42.6)	35 (57.4)	
Junior High	209 (51.4)	48 (23.0)	161 (77.0)	
Senior High	74 (18.2)	28 (37.8)	46 (62.2)	
Tertiary	28 (6.9)	14 (50.0)	14 (50.0)	
Other	6 (1.5)	0(0.0)	6 (100)	
Occupation				
Unemployed	58 (14.3)	9 (16.1)	47 (83.9)	$\chi^2 = 12.95$; $P = 0.024$
Civil servant	26 (6.4)	12 (46.2)	14 (56.8)	
Self-employed	323 (79.4)	99 (30.7)	224 (69.3)	
Marital Status				
Single	23 (5.65)	7 (30.4)	16 (69.6)	$\chi^2 = 9.82$; $P = 0.020$
Married	313 (76.9)	91 (29.1)	222 (70.9)	
Cohabiting	67 (16.46)	18 (26.9)	49 (73.1)	
Separated	4 (0.98)	4 (100)	0(0.0)	
Ethnicity				
Akan	271 (66.6)	79 (29.2)	192 (70.2)	$\chi^2 = 6.47$; $P = 0.167$
Ewe	77 (18.9)	25 (32.5)	52 (67.5)	
Ga/Damgbe	27 (6.6)	5 (18.5)	22 (81.5)	
Northners	26 (6.4)	11 (42.3)	15 (57.7)	
Other	6 (5.9)	0 (0.0)	6 (100)	

Table 4.2 continued

Partner Educational Level				
No education	2(0.5)	0(0.0)	2(100)	$\chi^2 = 3.77; P=0.438$
Primary	4 (1.0)	0(0.0)	4 (100)	
Junior High	153 (37.6)	47 (30.7)	106 (69.3)	
Senior High	175 (43.0)	48 (27.4)	127 (72.6)	
Tertiary	73 (17.9)	25 (34.3)	48 (65.8)	
Partner Occupation				
Unemployed	8 (2.0)	4 (50.0)	4 (50.0)	$\chi^2 = 3.77; P = 0.438$
Self-employed	329 (80.8)	92 (28.0)	237 (72.0)	
Civil servant	70 (17.2)	24 (34.3)	46 (65.7)	
Ever Received Antenatal Care for Pregnancy				
Yes	370 (90.9)	112 (30.3)	258 (69.7)	$\chi^2 = 1.21; P = 0.271$
No	37 (9.1)	8 (21.6)	29 (78.4)	

p<0.05 is considered significant

4.3 Pregnant Women's Knowledge about LLIN and Malaria Prevention

Out of the total of 407 pregnant women 394 of them have heard of LLIN. Among 394, 20 (5.1%) heard it from friends, 23 (5.8%) heard it from their family members, 34 (8.6%) heard it from community meetings. 366 (92.9%) heard it from the radio and 381 (96.7%) heard from television, then 20 (5.1%) read it from the newspapers and 23 (5.8%) heard it from the health facilities.

Concerning the best health messages 120 (31%) of them could remember that LLIN is safe to be used by the whole family, and (33%) could remember that the use of LLIN protect against malaria infection. Only (30%) could remember that, pregnant women must sleep under LLIN every day and (77%) of them could not remember anything about the LLIN health messages.

The use of LLIN among those who heard or seen LLIN was (30%) which is statistically significant with usage $\chi^2 = 5.6; P = 0.018$. From the study it was observed that all pregnant women have heard of malaria. Those who heard of it from friends were (14.0%), from family members (31%), (6%) heard it from community meetings, (88%) from the Radio, (91%)

heard it from the television and (41%) from posters, (13%) heard it from newspapers and (89%) heard it from the Health facility. The symptoms known by the pregnant women are bodily pains (88%), high temperature (92%), headache (85%) loss of appetite (96%), loss of energy (13%) and vomiting (100%). Surprisingly, (14%) believe waist pains and (3%) believe frequent stool is a sign of malaria. The use of LLIN among pregnant women who have heard of malaria was (29%) but this did not have association with the use of LLIN.

With regards to the knowledge of malaria transmission (81%) of them knows that mosquito bites can transmit malaria and among them (32%) use LLIN. The use of LLIN has statistical association with knowledge on transmission of malaria ($\chi^2 = 9.6; P = 0.04$).

132 (32.0%) did not know of any effect of malaria on pregnancy while (65%) knew of miscarriage, 26(8.9%) knew of anaemia and (6.3%) knew of premature birth as effect of malaria on pregnancy. Among those who knew of effect of malaria on pregnancy 9 (4%) of them use LLIN while those who did not know of effect of malaria on pregnancy (34%) of them also use LLIN. The use of LLIN has statistically significant association with the knowledge on effect of malaria on pregnancy ($\chi^2 = 19.6; P = 0.003$). Also (31%) of the women did not know that malaria can have effect on an unborn baby while (69%) have knowledge of effect of malaria to an unborn baby, (35%) of them use LLIN while those who did not have knowledge on effect of malaria to an unborn baby, (25%) of them use LLIN. The use of LLIN among pregnant women has statistically significant association with the knowledge of effect of malaria on unborn baby.

Knowledge on LLIN is statistically significant with usage of LLIN (Table 4.3).

TABLE 4.3: Knowledge of LLIN and Malaria Prevention

Characteristics	Total (N = 407)	Usage	Non Usage	P-Value
Ever heard or Seen LLIN	394(96.8)	119(30.2)	275(69.8)	0.018
Heard of malaria	407(100)	119(29.4)	288(70.8)	0.884
Knowledge on Transmission of Malaria				
Evil spirit	9(2.2)	1(11.1)	8(88.9)	0.053
Fatigue	5(1.2)	0(0)	5(100)	
Mosquito Bite	330(81.1)	107(32.4)	223(67.6)	
Prolong stay under the sun	14(11.3)	8(17.4)	38(82.6)	
Other	17(4.2)	3(17.7)	14(82.4)	
Knowledge on Effect of Malaria in Pregnancy				
Anaemia	26(8.9)	7(19.4)	29(80.6)	0.004
Premature birth	27(6.3)	4(14.8)	23(85.2)	
Miscarriage	126(31.0)	50(39.7)	76(60.3)	
Other	86(21.1)	29(33.6)	57(66.4)	
Don't know	132(32.4)	29(22.0)	103(78.0)	
Knowledge of Effect of Malaria on Unborn Baby				
Anaemia	11(2.7)	2(18.2)	9(81.8)	0.002
Growth retardation	20(4.9)	10(50)	10(50)	
Low birth weight	43(10.6)	17(39.5)	26(60.5)	
Prematurity	40(9.3)	15(37.5)	25(62.5)	
Still birth	129(31.7)	45(34.9)	84(65.1)	
Other	40(9.3)	20(16.1)	104(83.9)	
Don't know	124(30.5)	10(25)	30(75.0)	

4.4 Knowledge on LLIN and Knowledge on Appropriate Use of LLIN

From the analysis, 24 (5.9%) of the pregnant women with low knowledge on the LLIN used the net, 88 (27.4%) of those with good knowledge used it and among those with very good knowledge, 29 (46.8%) of them used it and this is statistically significant ($\chi^2 = 12.9$; $P = 0.002$).

With regards to appropriate use of LLIN, 192 (47%) of the pregnant women know how to use LLIN appropriately. Use of LLIN among them increases with increase in knowledge on appropriate use. Knowledge on the appropriate use of LLIN among pregnant women has a relationship with usage ($\chi^2 = 29.57$; $P < 0.001$) (Table 4.4).

Table 4.4: Pregnant Women's Knowledge on Usage of LLIN and Knowledge on Appropriate use of LLIN

Characteristic	All respondent	Used	Did not use	χ^2	P-value
Knowledge on LLIN				12.91	0.002
Low	24(5.90)	3(12.50)	21(87.50)		
Good	321(78.87)	88(27.41)	233(72.59)		
Very good	62(15.23)	29(46.77)	33(53.25);		
Knowledge on appropriate use of LLIN					
Low	91 (22.3)	6 (6.59)	45 (93.41)	29.57	0.000
Good	124 (30.5)	44 (35.48)	80 (64.52)		
Very good	192 (47.2)	70 (36.46)	122 (63.54)		

4.5 Association between Selected Barriers and the Use of LLIN Among Pregnant Women

Out of the 212 (52.1%) respondents who mentioned some barriers, 169 perceived LLIN as being expensive and 43 perceived it as being harmful to the pregnant woman. Majority 113 (66.9%) of those who perceived it as expensive did not use the net even though not significant ($\chi^2 = 2.122$; $P = 0.145$). Most 37 (86.0%) of the pregnant women who perceived the LLIN as harmful to the pregnant women did not use the net and this is statistically significant ($\chi^2 = 5.578$; $P = 0.018$).

Table 4.5: Barriers to the Use of LLIN among Pregnant Women

Characteristic	Total	Used	Did not use	χ^2	P-value
Perceived LLIN as expensive	169(41.5)	56(33.1)	113(66.9)	2.122	0.145
Perceived LLIN has harmful to pregnancy	43(10.6)	6(14.0)	37(86.0)	5.578	0.018

4.6 Logistic Regression on Significant Variables in Relation to LLIN Use

Logistic regression was done to determine the strength of association between knowledge on LLIN as well as knowledge on appropriate use of LLIN and LLIN use. It was realized that the odds of a pregnant woman with good knowledge on LLIN using the LLIN is 2.3 time that of a pregnant woman with low knowledge using the LLIN. Also, the odds of a pregnant woman with very good knowledge on LLIN using the net is 6.2 times that of a pregnant woman with low knowledge.

In the case of knowledge on appropriate use of LLIN, the odds of a pregnant woman with good knowledge on appropriate use of LLIN using the LLIN is 5.6 times that of a pregnant woman with low knowledge on appropriate use of the LLIN. Again, the odds of a pregnant woman with very good knowledge on appropriate use of LLIN using it is 5.1 times that of a pregnant woman with low knowledge (table 4.6).

After adjusting for all other variables that were significant, the odds of a pregnant woman with very good knowledge on LLIN using the LLIN is 5.7 time that of a pregnant woman having low knowledge and the odds of a pregnant woman with good and very good knowledge on appropriate use of LLIN is 5.7 and 4.5 respectively compared to a pregnant woman with low knowledge on appropriate use of LLIN.

The odds of a pregnant woman with knowledge on malaria transmission using LLIN is 2.3 time that of pregnant woman with no knowledge on malaria transmission. A pregnant woman who is self-employed has 2.6 (1.1, 6.6) times odds of using the LLIN than the one who is unemployed (table 4.6).

Table 4.6 Logistics regression on use of LLIN with Significant Variables

Characteristics	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	P-Value
Knowledge on LLIN			0.002
Low	1(ref)	1 (ref)	
Good	2.3 (1.3, 4.1)	2.2 (0.5, 9.5)	
Very Good	6.2 (1.7, 22.8)	5.7 (1.2, 26.4)	
Knowledge of Appropriate Use of LLIN			0.000
Low	1(ref)	1 (ref)	
Good	5.6 (2.1, 15.0)	5.7 (2.1, 15.3)	
Very Good	5.1 (2.0, 13.4)	4.5 (1.7, 11.8)	
Age			0.028
18-25	1 (ref)		
26-33	1.5 (1.0, 2.5)	1.5 (0.9, 2.7)	
34-41	0.7 (0.4, 1.4)	0.7 (0.3, 1.5)	
Marital status			0.020
Unmarried	1 (ref)	1 (ref)	
Married	0.6 (0.3, 1.3)	0.6 (0.2, 1.8)	
Occupation			0.024
Unemployed	1 (ref)	1 (ref)	
Civil Servant	4.6 (1.6, 13.3)	3.4 (0.9, 13.2)	
Self Employed	2.4 (1.1, 5.1)	2.6 (1.1, 6.6)	
Level of Education			0.001
No education	1 (ref)	1 (ref)	
Primary School	4.6 (1.4, 15.0)	2.2 (0.6, 8.3)	
Junior High	1.9 (0.6, 5.6)	0.9 (0.3, 3.0)	
Senior High	3.8 (1.2, 12.1)	1.8 (0.5, 6.6)	
Tertiary	4.4 (1.2, 15.4)	1.9 (0.4, 8.8)	
Knowledge on malaria transmission			0.043
No	1 (ref)	1 (ref)	
Yes	2.6 (1.4, 5.1)	2.3 (1.1, 5.0)	
Knowledge on Effect of Malaria on Pregnant woman			0.004
No	1 (ref)	1 (ref)	
Yes	1.7 (1.0, 2.7)	0.6 (0.3, 1.3)	
Knowledge of effect on Malaria on unborn baby			0.002
No	1 (ref)	1 (ref)	
Yes	2.6 (1.6, 4.5)	1.9 (0.8, 4.2)	
LLIN Harmful to pregnancy			0.018
No	1 (ref)	1 (ref)	
Yes	0.4 (0.1, 0.9)	0.4 (0.1, 1.0)	
LLIN Expensive			0.014
Yes	1 (ref)	1 (ref)	
No	1.4 (0.9, 2.2)	1.3 (0.8, 2.3)	

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter discusses the findings obtained from the data analysis and how they are related to other findings. Data was collected from 407 pregnant women in four sub-municipalities of Ga East Municipality. The Objectives of the study were to determine the pregnant women's knowledge about LLIN and whether they know LLIN can help prevent malaria, to assess whether they have knowledge about the appropriate use of LLIN and to identify the barriers to the use of LLIN among pregnant women.

Net possession among pregnant women in the Ga East Municipality was 67.1% but the usage was 29.5%.

5.1 Socio-Demographic Characteristics and Use of LLIN

The proportion of respondents aged 18–25 who used LLIN was 39 (26%). The usage among those aged 26–33 was 66 (35.7%) and 15 (20.3%) of those aged 34–41 used the LLIN. Age is statistically significant with LLIN use ($P = 0.028$). Pregnant women who had a form of formal education 116 (31.2%) use LLIN than 4 (13.8%) those with no formal education. Those who had tertiary education, LLIN usage were higher among them 14 (50%) than those with lower level of education and this is significant ($P = 0.001$). The findings confirm a study by Graves et al (2010) that age and educational level of the individuals can lead to eventual use of treated bed net. It also supports that of Atieli et al (2011) in the Western Highlands of Kenya that level of education emerged as one of the significant predictors of ITN use.

Religion did not show any association with the LLIN use among the religious groups ($P = 0.570$).

The use of LLIN among pregnant women who were unemployed was 9 (16.1%) and is lower than those who were employed 111 (32%). This is an indication that employment status of pregnant women has an association with the usage of LLIN ($P = 0.024$).

With regards to those who were married, and cohabiting the usage of LLIN among them was 109 (29%) which is lower than those who were not in any form of marital relationship 11 (41%) and this is statistically significant ($P = 0.020$). A similar finding occurred in Kenya, where marital status was identified as one of the critical predictors of ITN use (Choonara, 2012).

The use of LLIN was higher among pregnant women of northern tribes 11 (42%) as compared to the other ethnic groups but the difference is not statistically significant ($P=0.167$). This finding though not significant supports that of Thomson et al. (1996) in Gambia which indicated that ethnicity, area of residence and gender have shown to be factors influencing ITN possession and use.

Other factors looked at were pregnant women's partners (who are mostly households) education and occupation but none of them was significant (0.438 for both). The finding in this study did not support the finding that education and occupation of household head could influence net use (Graves et al., 2010; Baume & Franka-Koh, 2011).

Usage of LLIN was higher among pregnant women who have ever received antenatal care than those who have never received antenatal care but did not have statistically significant association ($\chi^2 = 1.21$; $P = 0.271$).

After adjusting for all other variables, occupation was the only socio-demographic characteristic that was significant with LLIN use.

5.2 Usage of LLIN

Overall LLIN usage among the pregnant women in the Ga East Municipality was low at 120 (29.5%). The net usage in Abokobi sub-municipality was 15.2%, Dome was 31%, that of Haatso was 32.7% and in Taifa the usage was 29.1%. This shows that the respondents in Haatso use the nets more than the rest of the three surroundings with Abokobi recording the least usage. The net usage in the municipality is far below the Abuja target of 60% by 2010. The low usage could be due to the fact that some pregnant women in the municipality perceive LLIN as expensive and harmful to the pregnant women as indicated by Otchere (2011) that affordability among other factors such as ownership, socio-cultural beliefs, education on ITNs and acceptance of ITN influence the use of ITN by pregnant women. The LLIN use even though below Abuja target, is higher than 20% usage of LLIN among pregnant women found by GSS, GHS and ICF Macro, (2009). The low usage is also similar to a finding from recent synthesis of data from national malaria control programmes that has shown that levels of utilization of ITN by pregnant women in many other sub-Saharan African countries remain far below national and global Strategic targets (Ankomah *et al*, 2012).

5.3 Knowledge on LLIN and How it Prevents Malaria

From the analysis, it was realized that 24 (5.9%) of pregnant women had low knowledge on LLIN, 321(78.9%) had good knowledge on LLIN and 62 (15.2%) had very good knowledge on LLIN. Among those who had low knowledge on LLIN, 3 (12.5%) of them used it. For those who had good knowledge, 88 (27.4%) used the net while among those who had very good knowledge on LLIN, 29 (46.8%) used it. This shows that use of LLIN among pregnant women increases with their knowledge on it and this is statistically significant ($P= 0.002$). A similar result was found by Atieli *et al* (2011) in Western Highlands of Kenya that knowledge

of ITNs emerged as significant predictors of ITN use. It also supports a study by Otchere (2011) in Nigeria that majority of their respondents had good knowledge about malaria and used mosquito nets to prevent malaria.

Majority 306 (75.7%) of the pregnant women knew that LLIN prevents the bite of mosquito, 86 (21.3%) knew it kills mosquitoes and 8 (2.0%) knew it drives mosquitoes away.

Majority (96.8%) of the respondents have heard of LLIN before but only 120 (30.5%) of them used the LLIN. Out of the total of 407 pregnant women 394 of them have heard of LLIN and the main sources of information on LLIN were television (96.7% of responses), radio (92.9% responses). Other sources which recorded less than 10% were friends, family members and community meetings.

Only 33 (8.1%) of the respondents knew that the effectiveness of the LLIN can last for twenty washes after which it can be packed. 193 (47.4%) knew that when holes develop in the net, it should be closed.

On health message on LLIN, 121 (29.7%) of the pregnant women said that it is safe for pregnant women to sleep under, 121 (29.7) said pregnant women must sleep under the LLIN always, 129 (31.7%) said use of LLIN protect against malaria and 36 (8.9%) could not mention anything. The response from the majority of the respondents is in line with what WHO, (2005) indicated that sleeping under ITNs remains an important strategy for protecting pregnant women and their newborns from the bite of mosquitoes especially the female anopheles to prevent malaria. It is also in line with WHO (2004) finding that LLINs use comes with some benefits which include prevention of severe effects of malaria in pregnant women and children under five years.

A pregnant woman with very good knowledge on LLIN is likely to use LLIN (AOR = 5.7, CI = 1.2, 26.4) than the one with low knowledge. This means when pregnant women have very good knowledge on LLIN, its usage will increase and malaria in pregnancy will reduce.

5.4. Knowledge on Appropriate use of LLIN

It was realized that knowledge on appropriate use increases with use of LLIN among pregnant women. 6 (6.6%) of the pregnant women who had low knowledge used the net, 44 (35.5%) of those with good knowledge used it and 70 (36.5%) of those with very knowledge on appropriate use also used the net and this is statistically significant ($P < 0.001$).

Seventy per cent (70.8%) of the respondents knew that one has to air the LLIN in the shade twenty-four hours before sleeping under it and 36.5% of them used the LLIN as against 12.6% usage among those who did not know ($P < 0.001$). One Hundred and Eight (31.7%) used the net among those who knew LLIN has to be low enough to touch the ground or tucked under the mattress used the net while 18.2% of those who did know used the net. This difference is statistically significant ($P = 0.028$). On washing of LLIN with bar soap, only Seventy-four (18.2%) of them knew this. Two Hundred and Sixty-Five (65.1%) knew appropriately that LLIN has to be dried under a shade after washing it.

For seasonal use of LLIN, Three Hundred and Forty-Three (84.3%) of the respondents said LLIN should be used always, Fifty (12.3%) said it should be used during the rainy season, Thirteen (3.2%) said when one sees mosquito and One (0.2%) said sometimes.

A pregnant woman with good knowledge on appropriate use of LLIN is (AOR = 5.7; CI = 2.1, 15.3) likely to use the LLIN than the one with low knowledge on appropriate use of LLIN.

5.5 Barriers to the Use of LLIN among Pregnant Women

Out of the 407 pregnant women interviewed, 204 (50.1%) had no barriers while 203 (49.9%) mentioned something as barrier. This implies that, approximately half of the pregnant women had some barriers preventing them from using LLIN. Two main barriers were identified by

the pregnant women. Some of them perceived LLIN as expensive, others perceived it to have harmful effect on pregnancy and some too perceived it as both expensive as well as having harmful effect to pregnancy. Among those (203) who identified the barriers, 194 (95.6%) said either the LLIN is expensive or it is harmful to the pregnancy and the rest 9 (4.4%) said it is both expensive as well as harmful to the pregnancy. If these barriers are not addressed, they may lead to non-use of LLIN. A study by Nwana (2011) in Cameroon also identified that people perceived ITNs as having toxic effects being one of the barriers but that study did not identified cost as a barrier. Macyntire et al., (2011) also identified that paying for a net instead of obtaining it free could be a barrier to net use.

5.5 Knowledge on Malaria

All the pregnant women heard of malaria and 119 (29.0%) of them used LLIN. Those who have heard of malaria use LLIN while 288 (70.8%) of those who have heard it do not use LLIN. Majority of them heard it from radio and health workers. This is in line with Binka & Adongo, (1997) and Adongo, Kirkwood & Kendall, (2005) which revealed that despite some variation in the knowledge of caregivers regarding individual malaria components, their general level of knowledge on malaria was dominantly good.

Out of the 407 pregnant women interviewed, 132 (32.4%) of the respondents said they do not know the effect of malaria on pregnancy, 26 (8.9%) said it causes anaemia in pregnant women, 27 (6.3%) said it causes premature birth, 126 (31.0%) said it causes miscarriage. Nine (2.2%) said they think the mode of transmission of malaria is by evil spirits, 5(1.2%) said it is as a result of fatigue, 330 (81.1%) said is by mosquito bite, 14(11.3%) said is by prolong stay under the sun while 17(4.2%) of them think is from other means such as dirt, taking too much carbohydrate diet and so on. Various studies undertaken in most countries on knowledge of women on the cause and effect of malaria revealed some level of knowledge;

various misconceptions among the pregnant women were also reported. Some mentioned eating of cold food, playing in rain, cold weather, and eating mango as cause of malaria (Legesse et al 2009). In Ghana, it has been reported that malaria is presumed to occur as a result of excessive heat and eating oily or starchy food (Ahorlu, Dunyo, Afari, Koram, and Nkrumah 2007; Agyepong and Manderson 2004).

When the respondents were asked on the effect of malaria to the unborn baby, 124 (30.5%) said they do not know it affects the child, 11 (2.7%) said it causes anaemia to the unborn baby, 20 (4.9%) said it leads to growth retardation for the child, 43 (10.6%) said it causes low birth weight, 40 (9.3%) said it causes low maturity and 129 (31.7%) said it causes still birth.

A pregnant woman with knowledge on malaria transmission is (AOR = 2.3; CI = 1.1, 5.0) likely to use LLIN than the one without knowledge on malaria transmission. This implies when pregnant women are educated on the mode of transmission of malaria, LLIN usage will increase and the effect of malaria on pregnant women and the unborn baby will decrease.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 INTRODUCTION

Use of Long Lasting Insecticide Bed Net by pregnant women within the communities in Ga East Municipality was investigated in order to determine pregnant women's knowledge on LLIN, its appropriate use and barriers to the use of LLIN by pregnant women in the municipality.

6.1 Conclusion

The socio-demographic characteristics identified to be influencing LLIN use in Ga East Municipality include age, educational level, occupation and marital status. It realized that majority of the pregnant women have good knowledge on LLIN and its appropriate use but usage was low. The two main sources of information on LLIN were radio and television. Information from health workers was low. Barriers identified were that LLIN is perceived to be expensive and also harmful to the pregnancy.

6.1 Recommendations

The following recommendations are made based on the conclusion

To the Municipal Health Directorate

1. The Municipal Health Directorate should make sure that Community Health Nurses intensify Information, Education and Communication (IE&C) activities at outreach clinics and communities in the municipality.
2. Public Health Nurses and Disease Control Officers should also carry out IE&C activities on local radio station on the importance of LLIN and also address the misconception about the LLIN.

To the Ministry of Health and national malaria control programme

There is the need to sustain the free LLIN distribution programme in order to increase access and use.

REFERENCES

- Adongo, B. P., Kirkwood, B., & Kendall, C. (2005). How Local Community Knowledge About Malaria Affects Insecticide-Treated Net Use in Northern Ghana. *Tropical Medicine and International Health*, 10 (4), 366-378.
- Alaii, J., Hawley, W., Kolczak, F., Gimnig, J., Vulule, J., Odhacha, A., et al. (2003). Factors Affecting Use Of Permethrin-Treated Bed Nets During A Randomized-Controlled Trial In Western Kenya. *American Journal of Tropical Medicine and Hygiene*, 68, *Supple. 4*.
- Ankomah, A., Adebayo, S., Arogundade, E., Anyanti, J., Nwokolo, E., Ladipo, O., et al. (2012). Determinants of Insecticide-Treated Net Ownership And Utilization Among Pregnant Women In Nigeria. *BMC Public Health*, 12(1), 105.
- Asenso-Okyere, W., & Dzator, J. (1997). Household Cost of Seeking Malaria Care; A Retrospective Study of Two Districts in Ghana. *Social Science & Medicine*, 45(5), 659-667.
- Atieli, H., Zhou, G., Afrane, Y., Lee, M., Mwanzo, I., Githeko, A., et al. (2011). Insecticide Treated Net (ITN), Ownership, Usage and Malaria Transmission in The Highlands of Kenya - Parasites and Vectors. *Tropical Medicine and International Health*, 16 (4), 480-488.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. New Jersey: Prentice-Hall.

- Baume, C., & Franca-Koh, A. (2011). Predictors of Mosquito Net Use In Ghana. *Malaria Journal*; 10, 265.
- Bawah, A., & Binka, F. (2007). How Many Years of Life Could Be Saved If Malaria Were Eliminated From A Hyperendemic Area of Northern Ghana? *The American Journal of Tropical Medicine And Hygiene*, 77, 145–152.
- Binka, N., & Adongo, P. (1997). Acceptability and Use Of Insecticide Impregnated Bed Nets In Northern Ghana. *Tropical Medicine and International Health Vol. 2*, 499-507.
- Bogale, F. (2007). *Assessment of Insecticide Treated Nets (ITNs) Utilization among Children Under Five Years of Age And Pregnant Women of Adama Woreda*. Oromia Regional State, Ethiopia.
- Carter, R., & Mendis, K. (2002). Evolutionary and Historical Aspects of the Burden of Malaria. *Clinical Microbiology Reviews*, 15(4), 564–594.
- CDC. (2013). *Fast Facts - The President's Malaria Initiative (PMI)*.
- CDC. (2013). *The President's Malaria Initiative: Seventh Annual Report to Congress*.
- Crawley, J., Chu, C., & G. Mtove, F. N. (2010). Malaria in Children. *The Lancet*, 375(9724), 1468–1481.
- Creswell, J. (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE.
- Cruz, N. D., Crookston, B., Dearden, K., Gray, B., Ivins, N., Alder, S., et al. (2006). Who Sleeps Under Bed Nets in Ghana? A Doer/Non-Doer Analysis Of Malaria Prevention Behaviours. *Malaria Journal*, 5(1), 61.

- Enato, E., Okhamafe, A., & Okpere, E. (2007). A Survey Of Knowledge, Attitude And Practice of Malaria Management Among Pregnant Women From Two Health Care Facilities in Nigeria. *Acta Obstet Gynecol Scand.* 86(1), 33-6.
- Falade, C., Mokuolu, O., & Okafor, H. (2007). Epidemiology of Congenital Malaria in Nigeria; A Multi-Centre Study. *Tropical Medicine and International Health*;12, 1279–87.
- Ga East Municipal Health Directorate. (2010-2012). *Ga East Municipal Annual Health Report*. Ghana.
- Ga East Municipality. (2012, November 13). *Ga East Municipality*. Retrieved April 8, 2013, from Profile of Ga East Municipal Website: <http://www.gaeast.ghanadistricts.gov.gh>
- Gerstl, S., Dunkley, S., Mukhtar, A., Maes, P., Smet, M. D., S. B., et al. (2010). Long-lasting Insecticide–Treated Net Usage in Eastern Sierra Leone – The Success of Free Distribution. *Tropical Medicine and International Health*, 15 (4), 480–488.
- GHS. (2005). *National Malaria Control Programme of Ghana*. Ghana.
- GHS/NMCP/JHPIEGO/MSH/GlobalFund. (2005). *Intermittent Preventive Treatment (IPT) of Malaria in Pregnancy Training Manual For Health Providers*.
- Goesh, J., Schwarz, N., Decker, M., Oyakhromé, S., Borchert, L., Kombina, U., et al. (2008). Socioeconomic Status is inversely related to Bed-Net use in Gabon. *Malaria Journal*, 7, 1-9.
- Graves, M., Ngondi, M., Hwang, J., Getachew, A., Gebre, T., Mosher, W., et al. (2010). Factors Associated With Mosquito Net Use By Individuals In Households Owning Nets in Ethiopia. *Malaria Journal*, 10:354.

- Grietens, K., Ribera, J., Soto, V., Tenorio, A., Hoibak, S., Aguirre, A., et al. (2013). Traditional Nets Interfere with the Uptake of Long-Lasting Insecticidal Nets in the Peruvian Amazon. *The Relevance of Net Preference for Achieving High Coverage and Use*.
- GSS, Macro, & I.C.F. (2009). *Ghana Demographic and Health Survey 2008*. Ghana Statistical Service, Ghana Health Service, and ICF Macro. Accra, Ghana.
- Guyatt, H., Noor, A., Ochola, S., & Snow, R. (2004). Use of Intermittent Prevention Treatment And Insecticide Treated Bednets By Pregnant Women In Four Kenyan Districts. *Tropical Medicine and International Health*, 9 (2) , 255-261.
- Heggenhougen, K., Hackethal, V., & Vivek, P. (2003). *The Behavioural and Social Aspects to Malaria and Its Control*. Geneva: UNDP/World Bank/WHO.
- Kitchen, A., & Chiodini, P. (2006). Malaria and Blood Transfusion. *Vox Sang*; 90, 77–84.
- Kuile, F., Terlouw, D., Phillips-Howard, P., & Hawley, W. (2003). Reduction of Malaria During Pregnancy by Permethrin-Treated Bed Nets in an Area of Intense Perennial Malaria Transmission in Western Kenya. *The American Journal of Tropical Medicine and Hygiene*, 64(4 suppl), 50-60.
- Malaria, R. (2002). *Scaling-Up Insecticide-Treated Netting Programmes in Africa Strategic Framework For Coordinated National Action*. Geneva, Switzerland: WHO.
- Müller, O., & Jahn, A. (2003). Editorial: Expanding Insecticide-Treated Mosquito Net Coverage In Africa: Tradeoffs Between Public And Commercial Strategies. *Tropical Medicine & International Health*, 8(10), 853–856.

- NetMark. (2004). *A Survey on Insecticide Treated Nets In Ghana. A Regional Partnership For Sustainable Malaria Prevention*. Washington DC.
- Okrah, J., Traore, C., Palé, A., Sommerfeld, J., & Müller, O. (2002). Community Factors Associated With Malaria Prevention By Mosquito Nets: An Exploratory Study In Rural Burkina Faso. *Tropical Medicine & International Health*, 7(3), 240–248.
- RBM. (2012). *Resource Mobilization Strategy for the 2012-2015 Phase of Implementation of the Global Malaria Action Plan*. Accra.
- Snow, R., Guerra, C., Noor, A., Myint, H., & Hay, S. (2005). The Global Distribution of Clinical Episodes of Plasmodium Falciparum Malaria. *Nature*, 434(7030), 214–217.
- TDRnews. (2009). Access to Treatment and Parasite Resistance. *Lead Agendas*, No. 84, 22-23.
- TheWorldBank. (2005). *Rolling Back Malaria; The World Bank Global Strategy & Booster Program*. The World Bank.
- UNICEF. (2007). *UNICEF Ghana Fact Sheet Malaria*.
- World Health Organisation. (2005). *Insecticide-Treated Mosquito Nets: A WHO Position Statement*. Geneva: WHO.
- World Health Organisation. (2009, September 12). *Global Malaria Programme*. Retrieved January 6, 2013, from Pregnant Women and Infants Web Site: <http://apps.who.int/malaria>
- World Health Organisation. (2012). *WHO Malaria Profile - Ghana*. WHO.
- World Health Organisation. (2012). *World Malaria Report*. WHO.

World Health Organization. (2001). *Report of the Fifth WHOPEs Working Group Meeting*. Geneva, Switzerland: World Health Organization.

World Health Organization. (2005). *World Malaria Report*. WHO.

World Health Organization. (2010). *Malaria Fact Sheet No. 94*. Geneva: WHO.

World Health Organization. (2011). *World Malaria Report*. World Health Organization.

APPENDICES

APPENDIX A: CONSENT FORM

Title: Use of Long Lasting Insecticide Bed Nets (LLIN) Among Pregnant Women in Ga East Municipality of Greater Accra Region.

Principal Investigator: Sefe Phyllis Deladem

Qualification: MPH Student

Address: Box LG 13, Department of Population, Family and Reproductive Health, School of Public Health, College of Health Sciences, University of Ghana, Legon. Tel. 0244535320;
Email: phyllidem@yahoo.co.uk.

General Information About Research

Use of LLIN among pregnant women is one of the strategies that will help to reduce malaria in pregnancy to an appreciable level and this will go a long way to reduce maternal morbidity and mortality at large, thereby meeting MDG 5. To implement effective LLIN programme, policy makers at all levels need data that will guide their decision. The study objective is to assess the use of LLIN among pregnant women and to describe factors affecting its use.

Possible Risks and Discomforts

Description of Risks / Discomfort

There are no risks associated with the interview. The study which is purely academic work involves answering questions from a questionnaire. It does not involve any invasive procedure on you for samples. A trained interviewer will administer a questionnaire in order to collect data. Time taken may pose minimum discomfort to you since it will take 30 minutes or less to complete.

Description of Level of Research Burden

As a study participant you will be asked to fill questionnaire which will take about 30 minutes to complete.

Description of Measures to Minimize Risks

The risks involved with study participation, mainly discomfort with the above mentioned topics, will be minimized by the researcher and interpreter, by explaining each item on the questionnaire to your understanding as a respondent. Also the questionnaire will be administered by the researcher and assistants.

Possible Benefits**Description of Potential Benefits**

There will be no material or financial benefit to you as respondents. The information obtained will inform the policy makers about use of LLIN among pregnant women in Ga East Municipality and this may guide their decision as far as implementing effective LLIN programmes are concerned and this will go a long way to improve maternal health.

Confidentiality

Please note that any information given to us will be kept strictly confidential and used for the purpose of the study only. Your responses will in no way lead to any adverse effect on you.

Data Security

All the questionnaires and informed consent forms will be stored in locked file cabinets in the offices of the Principal Investigator. Data will be entered in Statistical Package for Social Sciences (SPSS) and exported to STATA software for analysis by the researcher and the research assistant, and electronic files will be made accessible only to the research team.

Plans for Record Keeping

The person responsible for data storage will be the researcher (Sefe Phyllis Deladem) of the School of Public Health, University of Ghana, Legon. Tel: 0244535320

Compensation

There will be no compensation for you for participating in the study.

Voluntary Participation and Right to Leave the Research

Your participation in this study is entirely voluntary, and that declining to enter the study, declining to answer a questionnaire, will have no negative consequence or loss of any benefits. I therefore request you to assist with answering the questions included in this questionnaire. If you agree to this interview, I will proceed to ask you the questions but if you do not, you can let me know and I will not proceed with the interview.

Contacts for Additional Information about the study:

You can contact the following people when you have any further question concerning the study after the interview:

1. Phyllis Deladem Sefe – Principal Investigator - 0244535320
2. Miss Nana Abena Kwaa Addai-Donkor - Administrator, Ghana Health Service Ethical Review Committee - 0244712919

APPENDIX B – VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title (Use of Long Lasting Insecticide Bed Nets (LLIN) Among Pregnant Women in Ga East Municipality of Greater Accra Region) has been read and understood. I have been given an opportunity to have any questions about the research and answered to my satisfaction. I agree to participate as a volunteer and understand that I have the right to redraw from the study at any time without in any way affecting me.

.....

(Date)

.....

(Signature or mark of volunteer)

If volunteers cannot read the form themselves, a witness must sign here:

.....

I was present while the benefits, discomforts and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

.....

Date

.....

Signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

.....

Date

.....

Signature of Person Who Obtained Consent

APPENDIX C

University of Ghana
School of Public Health
Department of Population, Family and Reproductive Health

Questionnaire for Pregnant Women**Interviewer ID:****Community ID:****Date:**

Dear Respondent,

This questionnaire is designed to solicit your views about the use of Long Lasting Insecticide Bed Net (LLIN) in the Ga East Municipality, you have been identified and your assistance is being sought to participate in this exercise by completing this questionnaire as objectively as possible. Note that information obtain will contribute immensely to the purpose of the study. Your responses will be treated with utmost confidentiality. Thank you very much for your support and co-operation.

Instruction: Please tick (✓) where appropriate and provide your own answers where required in the spaces provided.

SECTION I: Socio-Demographic Characteristics**1. Place of residence:**Abokobi Dome Haatso Taifa **2. What is your age?****3. What is your religion?**a) Christian b) Moslem c) Traditional

d) Others, please specify.....

4. What is the highest level of school you attended?

- a) No education b) Primary School c) Junior High
d) Senior High e) Tertiary Education

Other (please specify).....

5. What is your main occupation?

- a) Civil servant b) Unemployed c) Farmer
d) House wife e) Trader f) Self employed

6. What is your marital status?

- a) Co-habiting b) Divorced c) Married
d) Separated e) Single f) Widowed

f) Others please specified:

7. What is the number of bed rooms in your household?**8. What is the total number of your children?****9. What is your husband's occupation?**

- a) Civil servants b) Farmer c) Self employed
d) Trader e) Retired f) Unemployed

10. What is your husband highest level of education?

- a) No education b) Primary c) Junior Secondary
d) Senior High e) Tertiary Education

11. What ethnic group do you belong to?

- a) Akan b) Dangme/Ga c) Ewe d) Northerner

Others please specify:.....

12. Have you ever receive Antenatal Care for this pregnancy?

Yes No

13. What type of dwellings/structures is there in your households? (Please tick where appropriate)

Type of Walls	Type of Roof
a) Fire bricks	a) Thatch
b) Mud house	b) Asbestos
c) Cement blocks	c) Aluminum sheet
d) Wood or Planks	d) Wood

SECTION II: THE EXTENT OF PREGNANT WOMEN'S KNOWLEDGE ABOUT LLIN AND WHETHER THEY KNOW IT CAN HELP PREVENT MALARIA

14. Have you ever heard of or seen LLIN?

a) Yes b) No

15. If yes to 14 above, where did you first hear or seen it?

- a) Friends b) Family members
- c) Community meetings d) Radio
- e) Television f) Posters
- g) Newspapers
- h) Health facility/Community Health Workers/Personnel from NMCP
- i) Any other (please specify).....

16. What do you remember best about LLIN health message?

- a. LLIN is safe to use for the whole family
- b. Pregnant women must sleep under LLIN everyday
- c. Use of LLIN protect against malaria infection
- d. I do not remember anything

17. Why is it necessary for pregnant women to always sleep under LLIN?

.....
.....

18. How does Long Lasting Insecticide Bed Net prevent malaria transmission?

.....
.....

19. Do you think you have enough information about LLIN?

Yes No

20. If no to question 30, what information would you like to get about LLIN?

- a. How to use it
b. Where to get it
c. Importance of using it
d. Any other (please specify).....

21. Where or how will you like this information communicated to you?

- a) Friends b) Family members
c) Community meetings d) Radio
e) Television f) Posters/pamphlets
g) Newspapers
h) Health facility/community health workers/personnel from NMCP
i) Others (specify):.....

22. Have you heard about malaria?

a) Yes b) No

23. If (Yes) to question 22 above, where or how did you hear about malaria? (Tick where appropriate)

- a) Friends b) Family members
c) Community meetings d) Radio
e) Television f) Posters/pamphlets
g) Newspapers
h) Health facility/community health workers/personnel from NMCP
i) Others (specify):.....

24. What do you remember best about malaria health message?

- a) Everybody is at risk of malaria
b) Malaria infection is dangerous for pregnant women
c) Pregnant women must sleep under LLIN
d) Pregnant women must take malaria prevention tablets in the presence of health worker
e) I don't remember anything
f) Any other (Please specify).....

25. What transmits malaria? (You may choose more than one response)

- a) Evil spirit b) Fatigue
c) Mosquito bite d) Prolong stay under the sun
d) Other (please specify).....

26. What does malaria do to a pregnant woman? (you may choose more than one response)

- a) Anaemia b) Premature birth c) Miscarriage
d) Don't know e) Others (specify).....

27. What does malaria do to the unborn baby? (you may choose more than one response)

- a) Anaemia b) Growth retardation
 c) Low birth weight d) Prematurity
 e) Still birth f) Don't know
 g) Others (specify).....

28. What do you think are the most common signs and symptoms in malaria infection in pregnancy? (you may choose more than one response)

- a) Bodily pains b) Frequent stools c) Headache and chill
 d) High temperature e) Loss of appetite f) Loss of energy
 g) Mental agitation h) vomiting i) Waist pains
 i) Other (specify).....

29. What information would you like to get about malaria that you don't know?

- a) Information on treatment b) Information on control
 c) Mode of transmission d) Signs and symptoms
 e) Any other (please specify).....

30. Where or how would you like this information communicated to you? (through what means of communication?)

- a) Friends b) Family members
 c) Community meetings d) Radio
 e) Television f) Posters
 g) Newspapers
 h) Health facility/Community Health Workers/Personnel from NMCP
 i) Any other (please specify).....

31. Who are at risk of malaria in your household? (you may choose more than one options)

- a) Adults b) Old age
 c) Pregnant women d) Under five

32. Who should be given priority in malaria prevention in the household? (you may choose more than one options)

- a) Under five b) Adult
c) Old age d) Pregnant women

33. Do you know that you have to wash your LLIN with only bar soap and it requires no re-treatment or dipping into insecticide solution after washing?

- a) Yes b) No

34. Do you know that effectiveness of Long Lasting Insecticide Bed Net (LLIN) can last for twenty washes after which it expires?

- a) Yes b) No

SECTION III: KNOWLEDGE ABOUT THE APPROPRIATE USE OF LLIN BY PREGNANT WOMEN

35. Have you ever used LLIN?

- a) Yes b) No

36. If yes to question 35, when did you start using LLIN?

.....

37. If no to question 35, would you consider using it every day if it is readily available?

- a) Yes b) No

38. Did you sleep under Long Lasting Insecticide Bed Net (LLIN) last night?

- a) Yes b) No

39. If no to the question 36 above, explain why.

.....
.....

40. Do you know that before you first use LLIN you have to air inside for twenty four hours before sleeping under it to reduce any side effect?
a) Yes b) No
41. Where do you normally dry long lasting insecticide bed net (LLIN) after washing?
a) Under the sun b) under a shade
c) Any other (please specify).....
42. What do you do to LLIN if holes develop in it?
a) Close holes by stitching b) Leave it as it is
c) Sleep under it with the holes d) Any other (please specify)
43. When should one use LLIN?
a) Always b) During rainy season
c) When one sees mosquitoes d) Sometimes
44. Do you make sure LLIN is low enough to touch the ground or is tucked under your mattress for maximum protection when sleeping under it?
a) Yes b) No

SECTION IV: BARRIERS TO THE USE OF LLIN AMONG PREGNANT WOMEN

45. Do you have LLIN?
a) Yes b) No
46. If yes to question 45 above how many LLINs do you have in your household?
a) One b) Two c) Three g) Four and above
47. If No to question 45 above, why don't you have one?
a) It is not necessary b) It is too expensive, I can't afford it.
c) I just haven't thought of it d) Others (specify).....

48. Do you consider LLIN expensive?

- a) Yes b) No

49. If yes, how much will you be willing to pay for it?

- a) less than Gh¢1 b) between Gh¢1 and Gh¢2
c) between Gh¢2 and Gh¢3 d) above Gh¢ 3
e) LLIN should be free

50. Do you know the difference between LLIN and a non treated net?

- a) Yes b) No

51. Where do you think you can obtain LLIN?

.....
.....

52. Where did you obtain the LLIN you are currently using or having in your household?

.....

53. How long do you have to travel to get LLIN?

.....

54. Do you perceive LLIN as harmful to a woman during pregnancy?

- a) Yes b) No

55. If yes to the question 54 above, what is/are the major perceived problem(s)?

- a) No Comfort b) Causes heat c) Air hunger
d) Any other (please specify).....

(Thank You Very Much For Your Time and Bye)