AN ASSESSMENT OF MALARIA CONTROL ACTIVITIES IN KASSENA-NANKANA DISTRICT

by

Abarry Tahir Mohammed B.Pharm (Hons.)

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DECLARATION

I hereby declare that this submission is my own work towards the MSc in Clinical Pharmacy and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgment has been made in the text.

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Abarry T. Mohammed/ PG6930703

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Student Name & ID	Signature	Date

Certified by:

……..	……	…….
Supervisor, Name	Signature	Date

Certified by:

……..	……	…….
Head of Department, Name	Signature	Date

DEDICATION

This work is dedicated to my wife; and children; for their contributions, patience and sacrifices during the period of the programme.

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By the grace of Allah, most merciful, most compassionate, this work has come to completion. A number of people have contributed in various ways to enable me go through the programme successfully. I express my gratitude to them. I would like to thank all my lecturers and staff of the department for being helpful to me in diverse ways during the period of the programme. I also want to say a big thank you to Pharmacists Raymond Tetteh and Ama Nkansah for the knowledge they imparted into me. I am particularly grateful to my academic supervisors, Prof. Mahama Duwiejua and Dr. Ohene Buabeng for their guidance, time and support during the course of the project in spite of their busy schedule.

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ABBREVIATIONS/ACRONYMS

ACT:	Artemisinin Combination Therapy
ANC:	Anti Natal Care
DDT:	Dichlodiphenyltrchloro
G6PD:	Glocose-6-Phosphate Dehydogenase
GHS:	Ghana Health Service
IMCI:	Integrated Management of Childhood Illnesses
IPT:	Intermittent Preventive Therapy
IVM:	Integrated Vector management
ITN:	Insecticide Treated Bed net
LBM:	Low Birth Weight
NID:	National Immunization Day
POP:	Persistent Organic Pollutants
RBM:	Roll back Malaria
RDT:	Rapid Diagnostic Test for malaria
SP:	Sulphadoxine-Pyrimethamine
WHO:	World Health Organization
ARI	Acute Respiratory tract Infection
RTA	Road Traffic Accident
URTI	Upper Respiratory Tract Infection

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ABSTRACT

Background

Malaria is the leading cause of morbidity and mortality in the Kassena-Nankana District of Ghana. The goal of Roll Back Malaria (RBM) is to reduce malaria morbidity and mortality by 50% by the year 2010 and thereafter until the disease is no more a threat to public health. To achieve this some preventive and therapeutic interventions have been put in place, such as the use of Insecticide Treated Nets (ITNs), Intermittent Preventive Treatment (IPT) in pregnant women and infants, under one year old, early identification and treatment of the disease. .

Objective

To find out the knowledge of the people studied on malaria, and if malaria control activities in the district are known and used by them. Also to assess how malaria is diagnosed in the district health facilities.

Method

Two methodological approaches were used.

1. In the first part, 200 respondents were interviewed using a structured questionnaire. This constituted 100 women who cared for children under 5 years and 100 women who were pregnant. Permission was sought to investigate if there was a mounted an ITN in the household.
2. In the second part, data was extracted from hospital and health facility registers and laboratory records for total cases of malaria seen as against the total laboratory tests to confirm the malaria cases for 2007 and 2008.

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Results

86% of respondents identified mosquito bites as the means of transmission of malaria disease. 85% could identify signs and symptoms of malaria in young children.

71% had ITNs in their homes; however, only 52% percent actually mounted them for use. 38% had nets but these were not in use. 10% did not permit search in their home. 89% of respondents were aware of IPT and 80% had been given SP for IPT during pregnancy.

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From the Health facility data 125,372 cases of malaria were recorded in 2007, of these, only 1% (n=1,391) were confirmed by laboratory results as malaria. The remaining 99% (n=123,981) were treated presumptively without laboratory confirmation. In 2008, out of 122,696 cases of malaria seen, 3% (n=3,585) were confirmed by laboratory test as malaria. The remaining 97% (n= 119,111) were treated presumptively.

Conclusion

There is awareness of malaria control activities in the district. The public could identify the mode of transmission of malaria. They could also identify the signs and symptoms of the disease. The public is also aware of the use of IPT to prevent malaria and are actually using it as a preventive measure. The use of ITN to prevent malaria was also well known.

Treatment of malaria was largely presumptive. Very few malaria cases were confirmed by lab before therapy in health facilities in district, though the situation was marginally better in 2008 compared to 2007.

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CHAPTER ONE

1. INTRODUCTION

1.1 Background

Malaria is a major cause of illness and death in Ghana, particularly among children and pregnant women. In 2006, malaria accounted for 38.6% of all outpatient illnesses and 36.9% of all admissions. Malaria prevalence per thousand population was 171 and there were 2,835 malaria-attributable deaths (all ages) representing 19% of all deaths recorded in Ghana (MOH, 2009). Infection rate is high in children peaking at more than 80% in those aged 5 – 9 years and falling to low levels in adults. Malaria infection during pregnancy causes maternal anaemia and placental parasitaemia both of which are responsible for miscarriages and low birth weight babies among pregnant women. As many as 13.7% of all admissions of pregnant women in 2006 was a result of malaria whilst 9.0% of them died from the disease. (MOH, 2009).

The picture is not different in the Kassena Nankana District. Data available over the past three years (2005-2007) indicate that malaria continues to be the leading cause of OPD attendance, in various health facilities and hospital admissions for all categories of clients including children less than five years of age, pregnant women, and among the general population. (DHA, 2007). (Appendix I &II).

1.2 Statement of the Problem

Malaria continuous to be the leading cause of OPD attendance, admissions, and even death in the District inspite of the interventions being actively pursued to combat the disease.

This work seeks to critically look at the IPT in pregnancy and the use of ITNs in pregnant women and children under five and to answer if the objectives of the interventions are being realized. If not what are the contributing factors and possibly what accounts for the ever increasing numbers of malaria cases.

1.3 Rationale of the Study

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Malaria not only remains a leading cause of morbidity and mortality, but it also impedes socioeconomic development, particularly in sub-Saharan Africa. Each year, there are approximately 515 million cases of malaria, killing between one and three million people, the majority of whom are young children (WHO, 2000). Malaria is commonly associated with poverty, but is also a cause of poverty and a major hindrance to economic development (Worrall, 2005).

Malaria imposes substantial costs to both individuals and governments. Costs to individuals and their families include: purchase of drugs for treating malaria at home; expenses for travel to, and treatment at, dispensaries and clinics; lost days of work; absence from school; expenses for preventive measures; expenses for burial in case of deaths. Costs to governments include: maintenance of health facilities; purchase of drugs and supplies; public health interventions against malaria, such as insecticide spraying or distribution of insecticide-treated bed nets; lost days of work with resulting loss of income; and lost opportunities for joint economic ventures and tourism. (RBM, 2005).

This study aims to show the level of awareness on malaria and the use of IPT and ITN in the prevention of malaria. It will also show if health workers in the district support their diagnosis of malaria with laboratory confirmation.

1.4. Research Questions

The major questions the study wants to find answers to are;

- The level of public awareness on malaria as a disease of public health importance
- Do the public know about the activities to combat malaria?
- Are the malaria control programmes accepted by the public?
- Are health workers properly diagnosing malaria?

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1.5 Aims and Objectives

The main aim of this study is to find out if the various interventions to combat malaria are known and whether or not they are being used. Then also the study wants to find out how malaria is diagnosed in the health facilities in the district.

1.5.1 Specific Objectives

- To determine if there is knowledge on cause of malaria
- To determine if interventions for malaria control are known
- To determine if the interventions for combating malaria are accepted and implemented
- To determine how malaria is diagnosed in the health facilities in the District.

1.6.0 Profile of Study Area

The Kassena-Nankana District of the Upper East Region lies between latitude $10^0$30' and $11^0$00' north of the equator and between longitudes $1^0$00' and $1^0$30' west of the zero

meridian and covers an area of 1,675 square kilometres along the Ghana Burkina Faso border. (Appendix V). The land is relatively flat and passing through it from Burkina Faso is the White Volta River which feeds into the lake Volta in the south of Ghana. It is bordered by the Sissala district in the west, Bongo and Bolga districts in the East and Northeast, Burkina Faso in the North. Located in the Guinea savannah belt, the district's ecology is typically sahelian (hot and dry) with the vegetation consisting mostly of semi arid grassland interspersed with short trees. There are two main climatic seasons, a short rainy season with an average rainfall of between 850-1000 mm, which lasts generally from June to September. It also has a dry season which lasts from October to May, with the harmatan winds peaking in January and February. The temperature ranges from 20^0C to 40^0C (DHA, 2007).

The district is largely rural with only 9.5% living in urban settings. The population consists of mainly two distinct ethno-linguistic groups. The Kassena form 49% while the Nankani constitute 46%. The Builsa and migrants belonging to other ethnic groups make up 5%. The main languages are Kassim and Nankani. Subsistence agriculture is the mainstay of the district's economy, complemented by retail trading. About 90% of the people are farmers.

The district has 1 hospital, 9 health centres, 1 private clinic, 24 CHPS compounds and a Health Research Centre. The major causes of morbidity in the district are malaria, gastro-enteritis and acute respiratory tract infections. (DHA, 2007).

1.7.0 Activities To Control Malaria In The District

The basic elements of malaria control are prevention and treatment. Malaria prevention includes vector control such as Indoor Residual Spraying of long acting Insecticides (IRS) and sleeping under Insecticide Treated Nets (ITN).

The district has seen the implementation of various strategies to control malaria such as the use of Insecticide-Treated Bed nets. These are given free of charge to children under five and pregnant women (Binka et al, 1997). The general population has been sensitized on the importance of ITNs in the fight against malaria, and are distributed free of charge to all women after delivery and to children under five years during National Immunization Days, (NID). The Navrongo Health Research Centre also distributes ITNs regularly to children under five years of age in their catchments areas.

Additionally, Intermittent Preventive Treatment of malaria using Sulfadoxine plus Pyrimetamine (SP) is widely implemented in all health centers and clinics where antenatal care services are provided. All women attending ANC clinic are given SP as DOT after quickening and are encouraged to take subsequent doses monthly.

Community health nurses, community volunteers have been sensitized on how to recognize signs and symptoms of malaria and other childhood illnesses and what do when they see them, all in a bid to bring down morbidity and mortality due to malaria.

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CHAPTER TWO

2 LITERATURE REVIEW

The Director General of the World Health Organization launched a global partnership on the Roll Back Malaria (RBM) initiative in 1998. The objective of RBM was to reduce malaria morbidity and mortality by half by the year 2010 (MOH, 2004 & 2007), with a further reduction in morbidity and mortality of 50% and 75%, respectively, by 2015 over the achievements in 2010, until malaria ceases to be a disease of public health importance. (MOH, 2004 & 2007).

Some initiatives were undertaken in Ghana after the launch of the RBM partnership. The Ghana partnership put emphasis on strengthening health services in general and making effective prevention and treatment strategies more accessible and prompt. (WHO, 2005). Progress was made in improving access to prompt and effective treatment, such as in the supply of insecticide-treated nets (ITNs) and using intermittent preventive treatment with sulphadoxine-pyrimethamine (SP) in pregnancy (IPT). Based on evidence from drug efficacy studies, Ghana changed from chloroquine to artesunate plus amodiaquine for the treatment of uncomplicated malaria, and added arthemeter plus lumefantrine and artemisinin plus piperaquine as alternatives for those who may not tolerate the former. (WHO, 2005).

Ghana committed itself to the Roll Back Malaria (RBM) Initiative of the World Health Organization (WHO), which builds on the Global Malaria Strategy with a focus on Africa and a goal to halve the world's malaria burden by 2010. Consequently the country drew up a 'Medium Term Strategic Plan for Malaria Control in Ghana' (1998-2002), which sought to improve the coverage of malaria control activities by adopting an

inter-sectoral approach involving and promoting partnership with the private sector and the community. It also committed itself to the Abuja Declaration on Roll Back Malaria in Africa, which it similarly seeks to achieve specific targets on malaria prevention and control. (WHO, 2005)

In November 2000, an informal Consultation on the use of anti-malaria drugs was convened by the World Health Organization (WHO) in Geneva. The meeting reviewed and updated recommendations on the use of anti-malaria drugs for chemoprophylaxis and treatment, based on the information available. The potential value of malaria therapy using combinations of drugs was identified as a strategic and viable option in improving efficacy and delaying development of resistant parasites. (MOH, 2004 & 2007).

In this regard, in 2002 Ghana initiated the process of using ACTs following WHO recommendations for all countries experiencing resistance to mono-therapies in the treatment of falciparum malaria. Based on evidence of efficacy, compliance, side effects, cost effectiveness, impact on local industry and key demographic variables such as the appropriateness for treating malaria in children under five and in pregnancy, Artesunate-Amodiaquine was selected as the first line drug for the treatment of uncomplicated malaria. (NMCP, 2009).

In 2004, Ghana changed its anti malaria drug policy selecting Artesunate -Amodiaquine combination as the first line drug for the management of uncomplicated malaria. The introduction was set for 1st January 2005 but roll out was later in that year. Systems were put in place to monitor the efficacy, quality, adverse drug reaction as well as G6PD status of pregnant women (with respect to the adoption of Sulphadoxine - Pyrimethamine for Intermittent Preventive Treatment (IPT) (NMCP, 2009).

The Case Management of malaria is also recognised as one of the main strategies for the control of malaria in the country. Treatment is generally presumptive and cases of fever are first treated as malaria with the recommended anti-malaria drug. However, the effectiveness of this intervention is highly dependent on anti-malarials, which should not only be safe and effective, but also available, affordable and acceptable to the population at risk. The rational use of an effective anti-malarial not only reduces the risk of severe disease and death and shortens the duration of the illness, but also contributes to slowing down the development of the parasite's resistance. (WHO, 2009).

The Anti Malaria interventions utilised in the Kassena-Nankana district include vector control by the distribution of insecticide treated mosquito nets to all children five years and below, and to all pregnant women who attend ante-natal clinic in any health facility within the district, the introduction and distribution of artesunate/amodiaquine tablets to all communities in the district at subsidised rates to ensure its availability in homes and in health facilities, the administration of IPT to all pregnant women attending ante natal clinic in all health facilities.

2.1 Diagnosis of Malaria

Early diagnosis and effective treatment of malaria will cure malaria and prevent complications (Breman et al, 2004). Since Charles Laveran first visualized the malaria parasite in blood in 1880 (Sutherland et al, 2009), the mainstay of malaria diagnosis has been the microscopic examination of blood.

Other life threatening febrile illnesses and sepsis are commonly misdiagnosed as severe malaria in Africa, leading to a failure to treat other life-threatening illnesses. In malaria-

endemic areas, parasitemia does not ensure a diagnosis of severe malaria, because parasitemia can be incidental to other concurrent disease. (Beare et al, 2005)

2.1.1 Symptomatic Diagnosis

Areas that cannot afford even simple laboratory diagnostic tests often use only a history of subjective fever as the indication to treat for malaria. Using Giemsa-stained blood smears from children in Malawi, one study showed that when clinical predictors (rectal temperature, nailbed pallor, and splenomegaly) were used as treatment indications, rather than using only a history of subjective fevers, a correct diagnosis increased from 21% to 41% of cases, and unnecessary treatment for malaria was significantly decreased. (Redd et al, 2006)

2.1.2 Microscopic Examination of Blood Films

The most economic, preferred, and reliable diagnosis of malaria is microscopic examination of blood films because each of the four major parasite species has distinguishing characteristics. Two sorts of blood film are traditionally used. Thin films are similar to usual blood films and allow species identification because the parasite's appearance is best preserved in this preparation. Thick films allow the microscopist to screen a larger volume of blood and are about eleven times more sensitive than the thin film, so picking up low levels of infection is easier on the thick film, but the appearance of the parasite is much more distorted and therefore distinguishing between the different

species can be much more difficult. With the pros and cons of both thick and thin smears taken into consideration, it is imperative to utilize both smears while attempting to make a definitive diagnosis. (Warhurst et al. 1996,)

2.1.3 Antigen Tests

For areas where microscopy is not available, or where laboratory staff are not experienced at malaria diagnosis, there are commercial antigen detection tests that require only a drop of blood. (Pattanasin et al, 2003). Immunochromatographic tests (also called: Malaria Rapid Diagnostic Tests, RDT, Antigen-Capture Assay or "Dipsticks") have been developed, distributed and field tested. These tests use finger-stick or venous blood, the complete test takes a total of 15–20 minutes, and the results are read visually as the presence or absence of colored stripes on the dipstick, so they are suitable for use in the field. One disadvantage is that dipstick tests are qualitative but not quantitative - they can determine if parasites are present in the blood, but not how many.

2.2.0 Malaria Control Techniques

Methods used to prevent the spread of disease, or to protect individuals in areas where malaria is endemic, include prophylactic drugs, mosquito eradication, and the prevention of mosquito bites. The continued existence of malaria in an area requires a combination of high human population density, high mosquito population density, and high rates of transmission from humans to mosquitoes and from mosquitoes to humans. If any of these is lowered sufficiently, the parasite will sooner or later disappear from that area, as happened in North America, Europe and much of Middle East (Andrew, 2004).

In 1992, the Global Strategy for Malaria Control was adopted in Amsterdam as a response to the increasing global malaria burden, The strategy was founded on four technical elements, which included early diagnosis and prompt treatment of malaria, planning and implementation of selective and sustainable preventive measures including vector control, early detection, containment or prevention of epidemics, strengthening of local capacities in basic and applied research. Implementation of this global strategy for malaria control began in Africa in 1993 with the development of national action plans as recommended by a WHO Study Group (WHO, 2000).

Since 2001 the World Health Organization has been promoting Integrated Vector Management (IVM) as the new strategic approach to vector control. IVM is defined as the targeted use of different vector control methods alone or in combination to prevent or reduce human-vector contact cost-effectively, while addressing sustainability issues. However despite the availability of highly subsidised ITNs and the awareness created for their use, there seems to be a wide gap between those who have them and number that use them.

2.2.1 Prophylactic Drugs

Several drugs, most of which are also used for treatment of malaria, can be taken preventively. Generally, these drugs are taken daily or weekly, at a lower dose than would be used for treatment of a person who had actually contracted the disease. Use of prophylactic drugs is seldom practical for full-time residents of malaria-endemic areas, because they have some degree of immunity against the parasites. Their use is usually restricted to short-term visitors and travelers to malarial regions, children under five

years and pregnant women. These people have little or no immunity to the malaria parasites and can easily develop complications of malaria.

Quinine was used starting in the seventeenth century as a prophylactic against malaria. The development of more effective alternatives such as quinacrine, chloroquine, and primaquine in the twentieth century reduced the reliance on quinine. Today, quinine is still used to treat chloroquine resistant *Plasmodium falciparum*, as well as severe and cerebral stages of malaria, but is not generally used for prophylaxis (Toovey, 2004)

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Modern drugs used preventively include mefloquine (Lariam) (Jacquerioz, 2009), and the combination of atovaquone and proguanil hydrochloride (Malarone). The choice of which drug to use depends on which drugs the parasites in the area are resistant to, as well as side-effects and other considerations. The prophylactic effect does not begin immediately upon starting taking the drugs, so people temporarily visiting malaria-endemic areas usually begin taking the drugs one to two weeks before arriving and must continue taking them for 4 weeks after leaving (with the exception of atovaquone proguanil that only needs be started 2 days prior and continued for 7 days afterwards) (Freedman, 2008).

2.2.2 Intermitent Preventive Treatment with Sulfadoxine + Pyrimethamine (IPT)

Malaria in pregnancy has been associated with a range of deleterious effects in women and their offspring. (Steketee, et al, 1996). Most malaria infections in pregnancy are asymptomatic and contribute to the development of severe anaemia in the mother, which is potentially fatal. Malaria infection of the placenta and maternal anaemia contributes to

low birth weight (LBW), which results in higher peri-natal mortality and impaired child development. (GHS, 2009).

Malaria in pregnancy has been recognized as a disease of public health priority since the beginning of the 1980s. It is estimated that each year more than 25 million women become pregnant in malaria endemic areas – mostly in sub-Saharan Africa – and 75,000 to 200,000 infant deaths are attributable to malaria infection in pregnancy (WHO, 2004), (Steketee et al 2001).

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In Africa, the first malaria preventive strategies were implemented in the 1950s (Valerie, 2007). They consisted in weekly or bi-monthly chemoprophylaxis with chloroquine (CQ) in West African countries and dapsone-pyrimethamine or sulfadoxine-pyrimethamine (SP) in East African countries. A large number of trials demonstrated the efficacy of such a chemoprophylaxis in preventing low birth weight, maternal anaemia and placental malaria infection (Garner et al, 2003). Unfortunately, because of the growing resistance of parasites to these drugs and the poor compliance of the women with the treatment the strategies finally showed a low efficacy. In 1998 it was proposed, then finally implemented in 2004, that chemoprophylaxis should no longer be recommended, but replaced by intermittent preventive treatment for all pregnant women living in areas of stable malaria transmission. (WHO, 2004).

Intermittent Preventive Treatment (IPT) of malaria during pregnancy is based on the assumption that every pregnant woman living in areas of high malaria transmission such as Ghana has malaria parasites in her blood or placenta, whether or not she has signs and symptoms of malaria. (GHS, 2005).

Sulphadoxine-pyrimethamine is the drug currently recommended by the WHO because of its safety and efficacy in pregnancy (WHO, 2004). WHO recommends that the first dose should be administered at the first ANC visit after quickening – which ensures that the woman is in the second trimester of pregnancy. Following IPT doses should be given at least one month apart. In the absence of ANC visits in the two first trimesters, it could still be worthwhile to administer IPT even only in the last month of pregnancy. The baby is still growing and has to be protected, and there is no major contraindication in using SP close to delivery.

Studies have shown the high efficacy of IPT with SP, compared to placebo or CQ prophylaxis on placental infection, low birth weight and or severe maternal anaemia (Van Eijk et al, 2004).

Ideal properties for an alternative drug are: (a) having a long-half life, as it has been suggested that IPT had a prophylactic rather than a treatment effect and that the duration of prophylaxis was the most important determinant of IPT efficacy; (b) being safe during pregnancy, and well-tolerated to ensure a high compliance with the treatment in women who are often asymptomatic when infected with malaria; (c) being easy to administer (ideally a single dose); and (d) at an affordable cost. (Valerie, 2007).

Artemisinin combination therapies (ACT) are also being evaluated for IPT. They have been shown to be highly efficacious and safe during pregnancy except when used in the first trimester. However, if the effect of IPT is mainly prophylactic (Valerie et al, 2007), then short-acting drugs would be expected to provide little benefit. Moreover, ACT is still very expensive and less easily deliverable as they require multiple treatment doses that could not be given as a directly-observed therapy in the ANC clinic.(White, 2005).

Because the treatment needs to be administered several times, compliance might be low. Other potential candidates, such as SP plus amodiaquine, SP plus azithromycine and chlorproguanil-dapsone are also being assessed for IPT. Piperaquine – used in combinations with other antimalarials rather than used alone – might be one of the most promising options for IPT. (Valerie et al, 2007).

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2.2.3 Indoor Residual Spraying

Indoor residual spraying (IRS) is the practice of spraying insecticides on the interior walls of homes in malaria affected areas. After feeding, many mosquito species rest on a nearby surface while digesting the blood meal, so if the walls of dwellings have been coated with insecticides, the resting mosquitoes will be killed before they can bite another victim, and thereby transferring the malaria parasite (Vanhauwer et al, 2007).

The World Health Organization (WHO) currently advises the use of 12 different insecticides in IRS operations. These include DDT and a series of alternative insecticides (such as the pyrethroids permethrin and deltamethrin) to both combat malaria in areas where mosquitoes are DDT-resistant, and to slow the evolution of resistance. This public health use of small amounts of DDT is permitted under the Stockholm Convention on Persistent Organic Pollutants (POPs), which prohibits the agricultural use of DDT. However, because of its legacy, many developed countries discourage DDT use even in small quantities. (WHO, 2006).

One problem with all forms of Indoor Residual Spraying is insecticide resistance via evolution of mosquitoes. According to a study published on Mosquito Behaviour and

Vector Control, mosquito breeds that are affected by IRS are endophilic species (Species which tend to rest and live indoors), and due to the irritation caused by spraying, their evolutionary descendants are tending towards becoming exophilic (Species which tend to rest and live out of doors), meaning that they are not as affected if affected at all by the IRS, rendering it somewhat useless as a defense mechanism. (Pates, et al 2005).

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2.2.4 Mosquito nets and bedclothes

Mosquito nets help keep mosquitoes away from people, and thus greatly reduce the infection and transmission of malaria. The nets are not a perfect barrier, so they are often treated with an insecticide designed to kill the mosquito before it has time to search for a way past the net. Insecticide-treated nets (ITN) are estimated to be twice as effective as untreated nets, (Binka et al, 1997) and offer greater than 70% protection compared with no net. Although ITNs are proven to be very effective against malaria, less than 2% of children in urban areas in Sub-Saharan Africa are protected by ITNs. Since the *Anopheles* mosquitoes feed at night, the preferred method is to hang a large "bed net" above the center of a bed such that it drapes down and covers the bed completely.

The distribution of mosquito nets impregnated with insecticide (often permethrin or deltamethrin) has been shown to be an extremely effective method of malaria prevention, and it is also one of the most cost-effective methods of prevention. (Binka et al, 1997)

2.2.5 Other Methods

2.2.6 Sterile Insect Technique

Sterile insect technique is emerging as a potential mosquito control method. Progress towards transgenic, or genetically modified, insects suggest that wild mosquito populations could be made malaria-resistant (Ito et at 2002).

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2.2.7 Vaccination

Vaccines for malaria are under development, with no completely effective vaccine yet available. The first promising studies demonstrating the potential for a malaria vaccine were carried out in 1967. Since the 1970s, there has been a considerable effort to develop similar vaccination strategies within humans. (Graves et al 2006).

METHODOLOGY

3.1 Study design

The design used in this study was cross-sectional. It was a community based survey that described what the community members knew about malaria and the various interventions put in place to combat the menace. It also describes activities of health workers and facilities towards diagnosing malaria.

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3.1.1 Study Population

The study population was pregnant women and women who cared for children under five (5) years old, and living within the Kassena Nankana District.

3.1.2 Data Collection

This was done in two parts: in the first part, 200 respondents, selected from 20 communities were interviewed using a structured questionnaire (Appendices III & IV). This was made up of 100 women who cared for children under the age of five (5) and 100 women who were pregnant. During the interview, permission was sought to see if there was a mounted ITN in the household. Pregnant women were identified by either physical signs of pregnancy or with the ANC card.

In the second part, Health facility registers and laboratory records were assessed for total reported cases of malaria and the number of tests done to confirm malaria (Appendix VI).

3.1.3 Study Site

Randomly selected communities within the Kasena Nankana district.

TABLE 1: Sampled communities in Kassena Nankana district visited in the study

Namolo	**Pinda**
Gurunia	**Wuru**
Kasulnia	**Gaani**
Gongnia	**Nania**
Yitonia	**Naaga**
Kungwania	**Kongongo**
Badayoro	**Chaaba**
Upper Talania	**Kasulnia**
Wusungu	**Akurugu Daboo**
Gia-Bangnia	**Manyoro**

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3.1.4 Data Collection Techniques and Tools.

This included administering structured questionnaires, observing for presence or absence of mounted ITNs in sleeping areas. And the second part of the work involved assessing Hospital and Health Centre records for total number of malaria cases recorded for the years 2007 and 2008 and the number that was confirmed by laboratory results as malaria. The War Memorial hospital, Chiana, Paga, Kasena Nankana East, and Kologo health centres were visited.

For those respondents who were illiterate, the questionnaire was read and translated to a language they could understand.

3.1.5 Sampling Techniques

A two-stage sampling design was adopted; the first stage was a random sampling among the Ninety five (95) communities to select twenty (20) communities for the survey; For the second stage, starting from a predetermined fixed point such as a CHPs compound, a bore hole, or school, the first house was excluded then every other house was selected until a total of 10 houses has been counted. If a house has no pregnant woman, or children under five years, as the case may be then the next house was selected. In each community, 5 pregnant women and 5 carers of children under 5 years old were interviewed.

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3.1.6 Sampling Size

The sampled population was 200; this was made up of the following;

100 pregnant women and 100 carers of children under 5 years. This size was adapted from a similar work done by Owusu-Agyei et al 2007.

3.1.7 Pre-Test

The questionnaire was preferred in wiaga, in the Builsa district by the principal investigator to identify potential problem areas. The pre-test showed that:

- Some respondents were unwilling to answer questions about ITNs in the household.
- Most landlords easily gave permission for interviewer to verify if they had mounted ITNs

- A good number of questions were well understood by the respondent
- The local dialect, English and Hausa were the main languages well understood by the interviewers and by the respondents

3.1.8 Selection and Training of Research Assistants

A total of 4 community health nurses; 2 male, 2 female, were recruited for the study and given one-day intensive training and then deployed to the communities.

3.1.9 Ethical Considerations

The Institutional Review Board (IRB) situated in the Navrongo Health Research Centre (NHRC) was informed for ethical clearance and support. Landlords and participants were also informed about the rational and objectives of the study in order to have their consent for the study. The questionnaire was confidential and anonymous. No information was passed on to anyone that could allow for the possibility of identifying persons completing the forms. As much as possible data and information were kept electronically.

Mutual respect, respect for the culture of the people, use of the language that the participant understood, were some core values employed in the study. All participants were treated fairly and equally. Health education was given after the interview when necessary and possible.

3.2.0 Data Collection Plan

Motor-bikes and fuel were arranged for use by field workers and small amount of cash provided to them each day to cover the day-to-day and any unexpected expenses. Completed questionnaires were returned to the principal investigator on a daily basis.

3.2.1 Quality Control

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Returned questionnaire were inspected daily with field workers in order to include only quality data that is reliable, complete, and accurate. The principal investigator was responsible for all aspects of the project and was available to supervise it throughout. Respondents were also made to understand the questions before giving their responses. Facilitative supervision was occasionally used to improve the quality of data collected.

3.2.2 Data Handling

Data collected was coded and entered into a computer as soon as possible.

The statistical Package for Social Sciences (SPSS) version 16 was used for storage and analysis of data. Descriptive data was presented as percentages and frequencies.

3.2.3 Limitations of the Study

Even though both male and females could be carers of children under five (5), this work was limited to carers of children who were female and as such only women were considered to participate in the study.

CHAPTER FOUR

4 DATA PRESENTATION, INTERPRETATION AND ANALYSIS OF RESULTS

4.1 Knowledge of Causes of Malaria

Of the 100 women that were interviewed for their views on the possible causes of malaria, 86% identified mosquito bites as the means of transmission of malaria disease. 41% thought sweet food could cause malaria. Other causes of malaria were attributed to dirty surroundings (32%), contaminated foods (27%), and weedy surroundings (22%). Oily foods, hereditary, unripe fruits and being in the sun for a long period were also mentioned. See Fig. 4.1

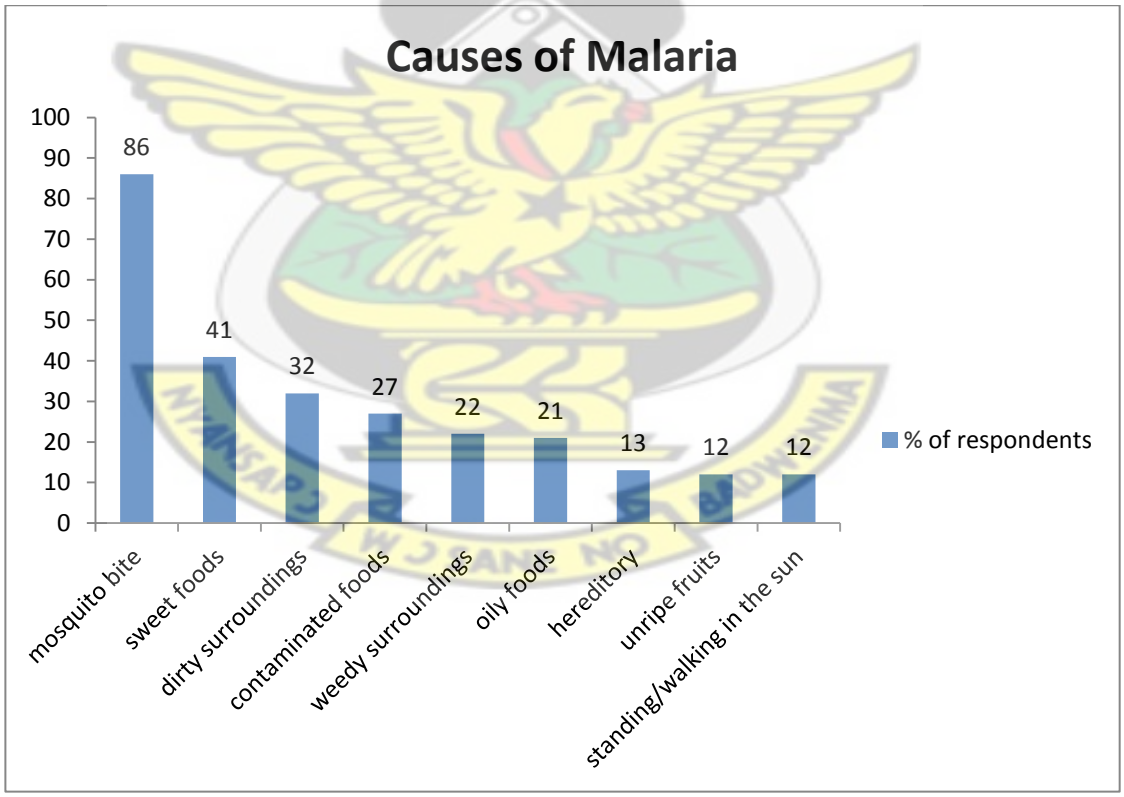

Fig 4.1: Knowledge of Causes of Malaria

4.2 knowledge of signs of Malaria

With regards to the signs and symptoms of malaria, 85% of respondents mentioned hot body or fever, 78% mentioned vomiting, and 43 mentioned diarrhoea. Body weakness, dizziness and headaches were also mentioned. Refer to fig. 4.2.

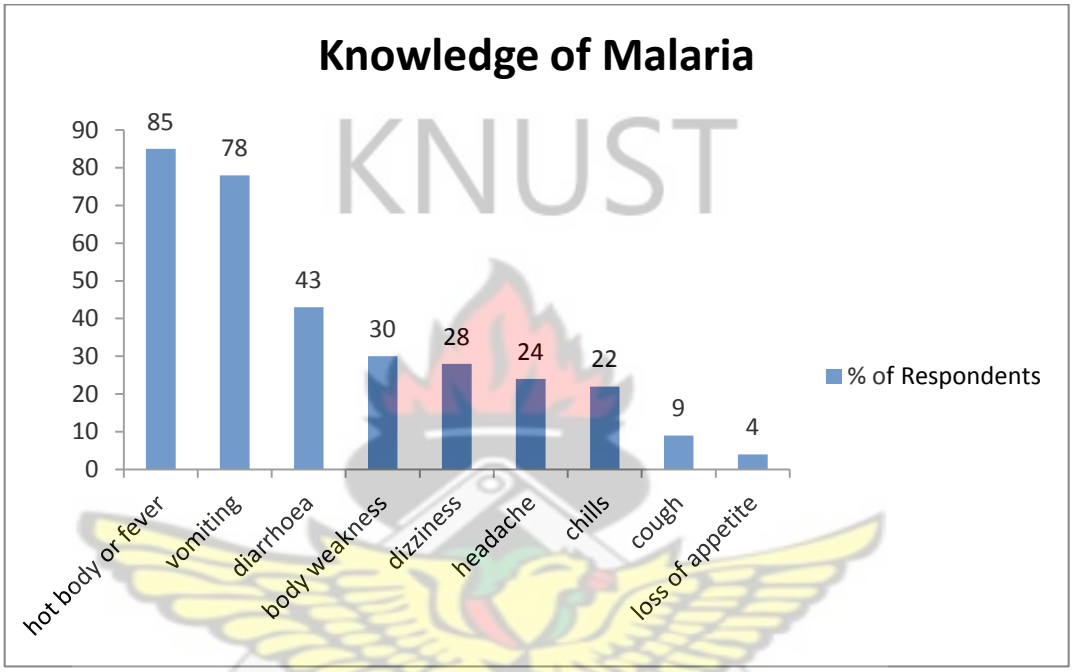

Fig 4.2: knowledge of signs of Malaria in children

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4.3 Possession of treated bed nets

When asked if they had a bed net in the house, 71responded that they had while 29 said they did not. See fig 4.3.

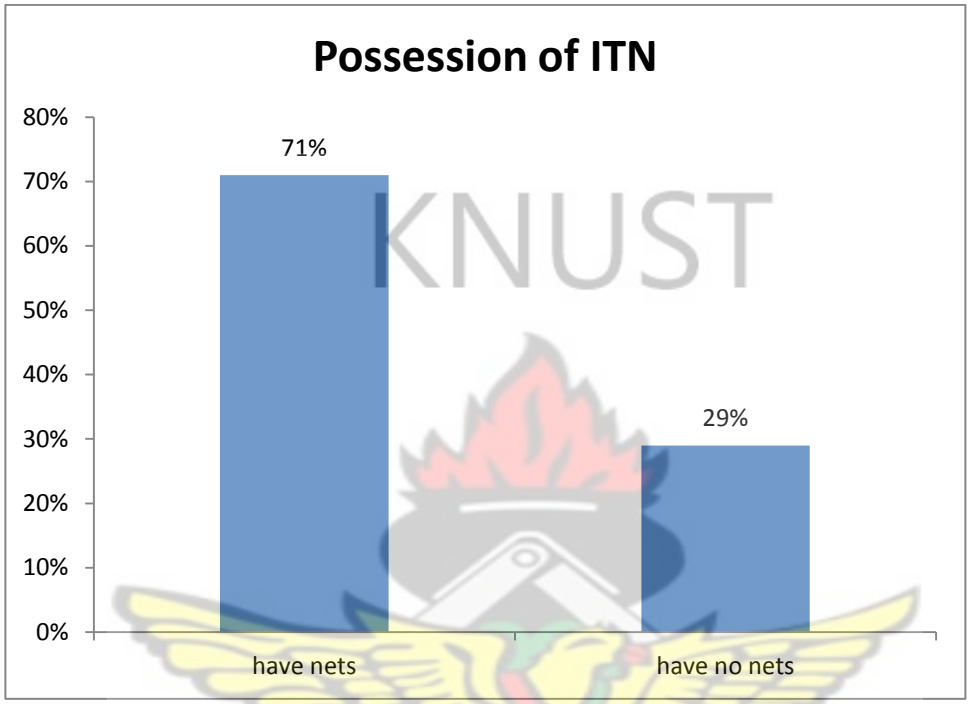

Fig 4.3. Possession of treated bed nets

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4.4 Mounted ITN in Household

A search for mounted ITN in households revealed that 56% had nets actually mounted, 33% had none and 11% did not allow inspection. See fig. 4.4

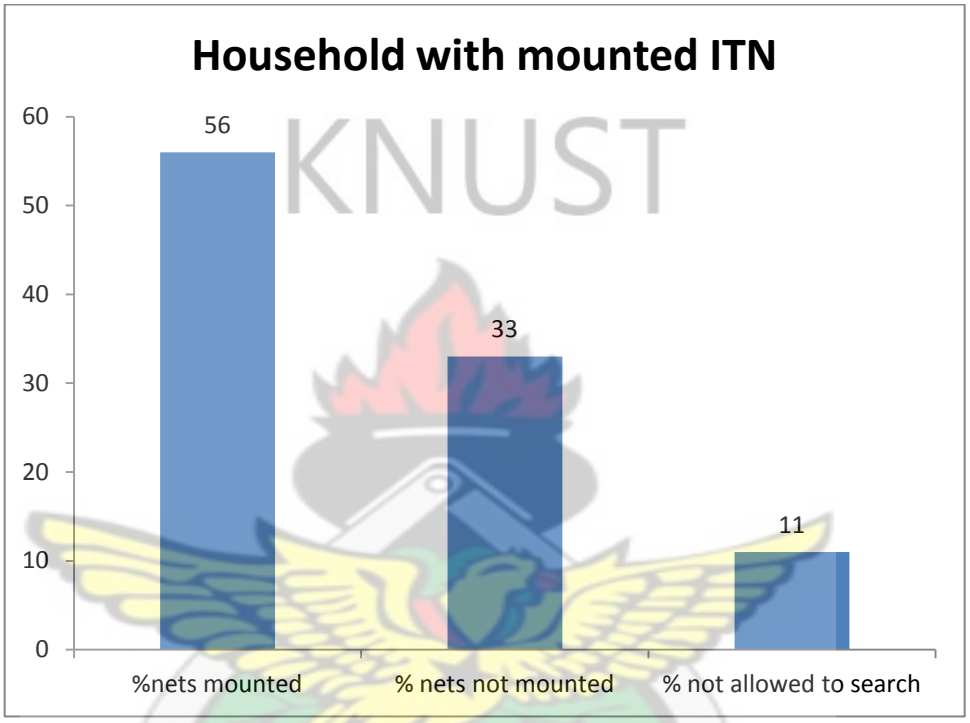

Fig 4.4 Mounted ITN in household

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4.5 IPT Awareness

It was revealed that 89% respondents were informed of IPT as a way to prevent malaria. 11% did not have this information And 11 had not. See fig. 4.5

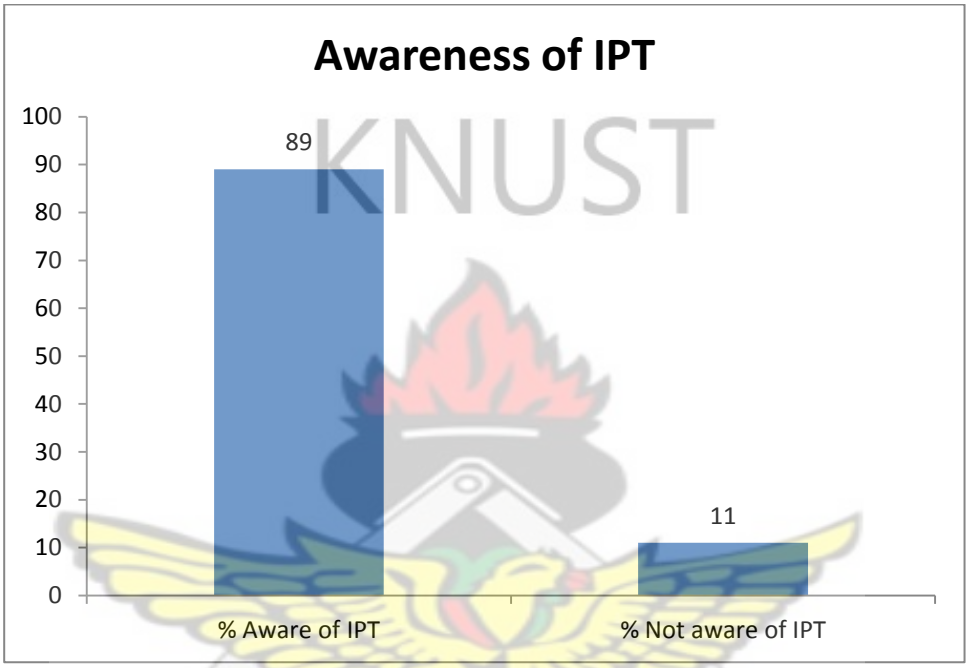

Fig 4.5 Aware of IPT

4.6 IPT taken during Pregnancy

Pregnant women whose gestation is more than 16 weeks were given IPT. It was explained to them that this was to prevent malaria in pregnancy. 80% of respondents had taken IPT, while 18% said they had not. 2% of them could not remember. See fig. 4.6

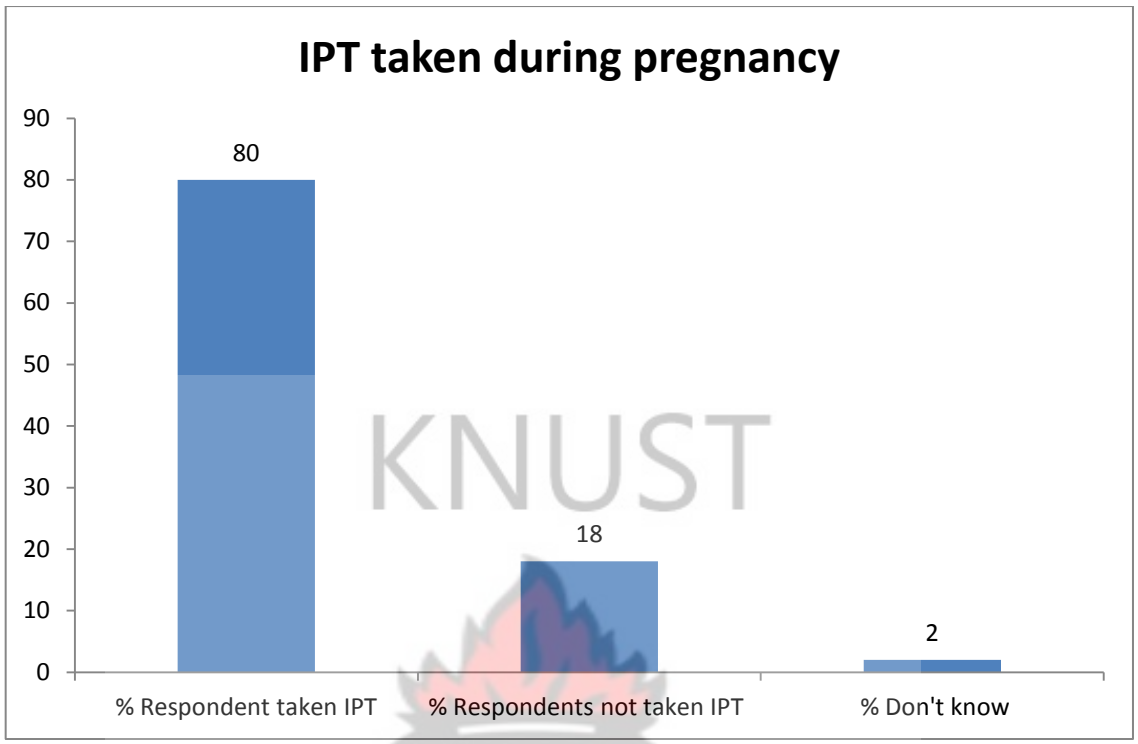

Fig. 4.6 Anti-malaria medicine taken for current or last Pregnancy

4.7 Medicine Given for IPT

It was shown that 82% of respondents knew that they were given SP for IPT. However, 9% did not know what medicine was given, and 6% and 3% said they were given quinine and Artesunate –amodiaquine respectively. See Fig. 4.7

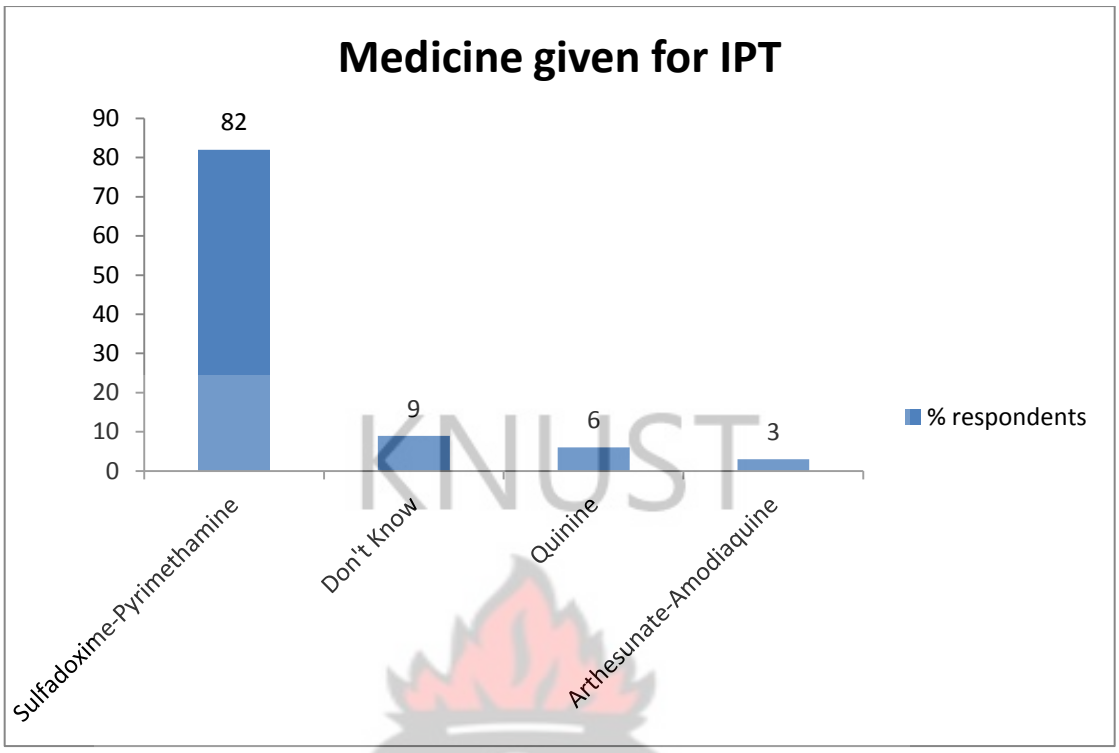

Fig. 4.7 Medicine Given for IPT

4.8 Hospital Admission during Pregnancy

It was also seen that 92% of respondents did not have any hospital admission during pregnancy. However, 8% did go on admission. See fig 4.8

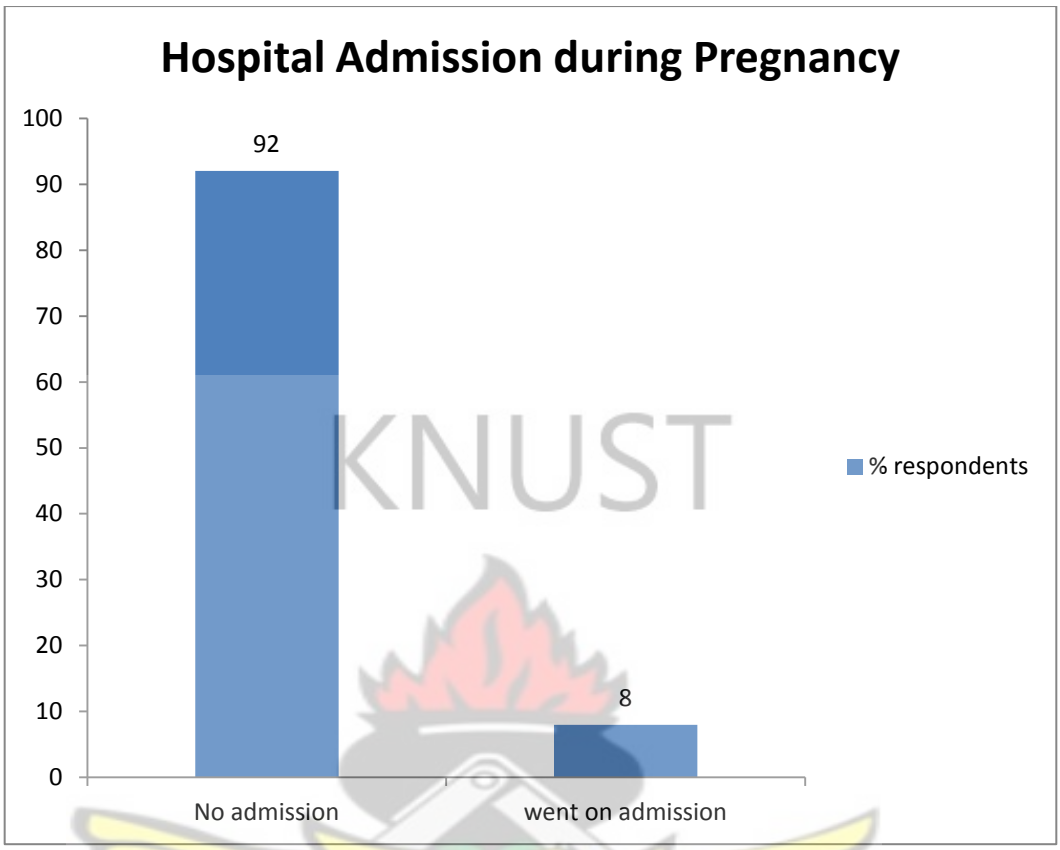

Fig. 4.8 Hospital Admission during Pregnancy

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4.9 Mode of Diagnosis of Malaria in Health Facilities

Data from health facility records showed that 125,372 cases of malaria were seen at OPD and treated for malaria in 2007. Of this, 1 %(1391) were confirmed by laboratory test as malaria while 99% (123,981) were not confirmed. In 2008, 122,696 cases of malaria were recorded at OPD, of these 3% (3,585) were confirmed by laboratory test whilst 97% (119,111) were not supported by laboratory tests. Refer table 4.1

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TABLE 2 Malaria confirmations, 2007 & 2008

YEAR	TOTAL OPD MALARIA	NO. LAB/RDT CONFIRMED	PERCENTAGE CONFIRMED
2007	125,372	1,391	1%
2008	122,696	3,585	3%

CHAPTER FIVE

5.0 DISCUSSIONS

5.1 KNOWLEDGE OF CAUSES, SIGNS AND SYMPTOMS OF MALARIA

It is of utmost importance that parents and guardians are able to recognise the causes of malaria as well as its signs and symptoms. The recognition of causes of malaria will place focus on ways to prevent contacting it. For instance the need to keep surroundings clean and clearing the immediate environment from stagnant waters and thus avoid breeding mosquitoes. Also, knowledge of causes of malaria would give a guide as to how to protect against mosquito bites, for instance use of ITNs, IRS, applying repellents to skin and use of screen doors among others.

Malaria is a very serious illness which is potentially fatal if not diagnosed and treated promptly, the knowledge of signs and symptoms of malaria is thus of paramount importance. As it affords the possibility of seeking for early treatment and thereby preventing the complications that may arise.

The Kassena Nankana District is rife with anti malaria activities and this has impacted greatly not only on the awareness of causes, signs and symptoms but also on the initial treatment. This is partly due to the presence of the Navrongo Health Research Centre which has carried out a number of projects relating to malaria in the area, and thus complementing the efforts of DHMT and the hospital. This probably accounted largely for the high awareness of causes, signs and symptoms of malaria as displayed by the study.

It has been shown that education in recognizing the signs and symptoms of malaria has indeed reduced the number of cases in some areas of the developing world by as much as 20%

(Barat, 2006). Recognizing the disease in the early stages, can also stop the disease from becoming a killer. (Lalloo et al, 2006).

5.2 POSSESSION OF BEDNETS

The usefulness of insecticide treated nets as an intervention against malaria cannot be overemphasised. It has been a major breakthrough in the fight against malaria, as it gives a high degree of protection against mosquitoes. And it has been shown that if it is properly utilised, it could reduce malaria transmission by at least 60% and child deaths by as much as 20% (Akande et al 2005).

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The district has seen a large scale distribution of ITN to virtually every household. It remains a challenge however that even though a majority of people were aware of the importance of ITN in combating malaria, and a good number of them do own nets however, not as many people actually slept under them. Sleeping under ITNs is probably the most effective method of preventing mosquito bites as mosquitoes bite at night when one is sleeping. The ITN prevents bites by either repelling or killing them if they land on the net. (GHS, 2005). Why then, is it that a good number of people did not use ITNs? The answer readily forwarded is that the nets generate heat and thus it was not comfortable sleeping under them. Others also claimed that they had skin irritations when their bodies come into contact with the treated nets. We probably have to weigh the benefits of being malaria free as against the irritations. The suggestion here is that a large size ITN should preferably be used in an airy room or environment.

5.3 AWARENESS OF IPT

The use of SP for IPT is widely practiced in all health facilities in the district. This service is provided to all pregnant women who attend the facilities for ante natal care. The high level of

awareness and acceptance of IPT shown in this study could be as a result of the health education given to pregnant women at the ANC clinics. It is of interest to note that only 8% of respondents were on hospital admission whilst pregnant. The vast majority remained healthy throughout pregnancy. The combination of IPT and ITNs could have contributed significantly to low incidence of malaria among the respondents.

Intermittent Preventive Treatment with SP as an intervention has been used successfully to control malaria in pregnant women and infants (Bardaji et al, 2012). Studies have also shown that IPT with SP did provide protection to pregnant women and their unborn children from malaria and thereby prevented premature births, low birth weights, and other complications (Garner et al, 2003, Verhoeff et al, 1998).

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5.4 FACILITY DIAGNOSIS OF MALARIA

The diagnosis of malaria was generally done clinically and not supported by a laboratory investigation for all categories of clients. This could arise due to several factors, foremost of which is the presumption that because we live in a malaria endemic area, any fever is most likely to be malaria and as such malaria is suspected for all cases presenting with fever. Thus the diagnosis of malaria may be wrongly assigned to any febrile condition and the client may not receive the appropriate medication. This will result in either a mistreatment or a delay in the in the treatment of other febrile illnesses, and thereby worsening the client's condition or leading to death. And which would be attributed to malaria. Secondly, practioners having so much confidence in their clinical acumens due to long practice and familiarity with malaria may want to make savings on laboratory reagents or RDTs by not requesting for laboratory investigations for perceived malaria.

Some studies have shown that clinical diagnosis of malaria has lead to a situation where most fevers have been inappropriately managed as malaria and millions of doses of ACT have been wasted (Perkins et al, 2008). It has also been shown that a high proportion of those who were given antimalarials did not in fact have malaria (Whitty et al, 2008).

The current malaria treatment guideline formulated by the World Health Organization (WHO) recommends a parasite-based diagnosis for older children and adults in all malaria settings in all areas of high transmission. (WHO, 2009).

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6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

There was much awareness on malaria and activities to combat malaria in the district. There was also a general acceptance by the respondents of the interventions employed to control malaria such as the use of IPT in pregnancy and sleeping under ITNs. However, this did not appear to translate significantly into reduction in malaria cases. Malaria diagnosis in the facilities assessed was largely clinical and mostly not backed by laboratory findings. Thus a diagnosis of malaria may be wrongly assigned to any febrile condition seen, and such clients may not receive the appropriate medication. The figures showing malaria as the leading cause of morbidity and mortality in the district may therefore not be very accurate.

6.2 RECOMMENDATIONS

- Education on the use of ITNs in households should be sustained. Those who have nets should be encouraged to use them.
- Though results obtained was encouraging, we should move towards 100% IPT uptake in pregnancy. Additionally, the search for an alternative to SP as prophylaxis for pregnant women must be intensified for the benefit of the few who may not tolerate SP or in case of parasite resistance to SP.
- All suspected malaria should be confirmed either by microscopy or RDT before treatment is given, except for children below the age of five where treatment may be initiated while awaiting test.

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APPENDIX I

Top ten causes of attendance

Conditions	2005			2006			2007		
	Rank	Cases	% total	Rank	Cases	% total	Rank	Cases	% total
Malaria	1	13,768	51.3	1	28,408	47.7	1	51,702	45.8
ARI	2	4,463	8.7	2	5,078	8.5	2	12,863	11.4
Skin diseases	3	2,729	5.3	3	3,773	6.3	3	7,105	6.3
Diarrhoeal diseases	4	1,938	3.8	4	2,256	3.8	4	4,871	4.3
Acute eye Injections	5	812	1.6	5	1,146	1.9	5	2,689	2.4
Rheumatism/Joint pains	-	-	-	-	-	-	6	2,297	2.0
Home/occupational Accidents	-	-	-	-	-	-	7	2,174	1.9
Typhoid fever	6	744	1.5	-	-	-	8	1,608	1.4
Hypertension	8	716	1.4	6	1,006	1.7	9	1,513	1.3
Intestinal worms	-	-		7	800	1.3	10	1,406	1.3
Gynaecological conditions	9	316	0.6	8	704	1.2	-	-	-
Anaemia	7	725	1.45	9	690	1.2	-	-	-
Pneumonia	10	267	0.5	10	569	1.0	-	-	-
Others	-	25,066	23.9	-	15,115	25.4	-	24,562	21.8
Total cases	-	77,544	100	-	59,545	100	-	112,790	100

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APPENDIX II

Top ten causes of admissions- 2005-2007

Conditions	2005			2006			2007		
	Cases	% total	rank	Cases	% total	Rank	cases	% total	Rank
Malaria	2579	34.8	1	2616	37.4	1	3371	42.8	1
Spontaneous deliveries	787	10.7	2	771	11.0	2	487	6.2	2
Anaemia	355	4.5	4	329	3.0	4	452	5.7	3
RTA	145	2.0	10	193	2.8	8	292	3.7	4
Pregnancy and related conditions	427	5.7	3	380	4.7	3	226	2.9	5
Pneumonia	279	3.8	5	209	3.0	5	206	2.6	6
URTI	201	2.7	7	208	3.0	6	202	2.6	7
Hernia	211	2.8	6	198	2.8	7	162	2.1	8
Gastro-enteritis	176	2.4	8	169	2.4	9	101	1.3	9
Cataract	-	-	-	-	-	-	100	1.3	10
Accidents/fractures/burn	-	-	-	115	1.6	10	-	-	-
Hypertention	148	2.0	9	-	-	-	-	-	-
Others	1810	-	-	1811	-	-	2276	28.9	-
Total cases	7120	-	-	6999	-	-	7875	-	-

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APPENDIX III

QUESTIONNAIRE FOR CARE GIVERS OF CHILDREN UNDER 5 YEARS

(Please interview only one child per care giver per household)

Serial number

SECTION A: INTRODUCTION

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I am ..... **working for the Ghana Health Service.**

Thank you for making time for this interview. The aim of this questionnaire is to find out if the strategies put in place to combat malaria in the district is making an impact. This work is to be submitted to the KNUST-Kumasi for the Award of Msc. in Clinical Pharmacy. Your cooperation in responding to these questions would also assist Ghana Health Service to improve upon the health promotion activities in the country. Please be candid and truthful in your responses and be assured that all your responses would be kept confidential.

Thank You.

Locality Name

Household Number **Interview Date**

Interviewer's Code **Interview's Name**

Supervisor's Code **Supervisor's Name**

SECTION B: BACKGROUND

---

1) Name of Household Head

2) Name of child **3) Age (Completed years)**

4) Sex

5) Name of caregiver

6) Age of Caregiver **7) Sex of Caregiver**

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8) Relationship of Caregiver to Child		RELCHILD
Mother	(1)	
Aunt	(2)	
Sister	(3)	
Brother	(4)	
Grand mother	(5)	
Father	(6)	
Uncle	(7)	☐
Other (Specify).....	(8)	

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9) How many children under 5 years are in this household? ☐☐

10) Educational background of caregiver		EDCCRA
None	(1)	
Primary	(2)	
Middle, school/JHS	(3)	
Technical, Commercial, Secondary School, SHS	(4)	
Postsecondary –Nursing training, teacher training, agric school	(5)	
Tertiary –university, polytechnic etc	(6)	
Other (specify)	(7)	☐☐
No response	(8)	

11) Occupation of caregiver		OCPCAR
Trader/artisan	(1)	
Traditional birth attendant (TBA)	(2)	
Civil/public servant	(3)	
Farmer	(4)	

Health worker	(5)	
Chemical seller	(6)	
Traditional healer	(7)	
Fisherman	(8)	
Fishmonger	(9)	☐☐
Others (Specify).....	(10)	

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12) Religion of caregiver		**RELCAR**
Christian	(1)	
Islam	(2)	
Traditional African religion	(3)	
Others (Specify).....	(4)	

SECTION C: KNOWLEDGE OF CAUSES AND TREATMENT OF MALARIA

13) Has your child (name) had a fever in the past 2 weeks?		**FEVER**
Yes	(1)	
No	(2)	☐

NB: If NO fill Not Applicable for the rest of questions section C and go to Section D

14) Was the child given treatment for malaria		**MALTRTM**
Yes	(1)	
No	(2)	
Don't know	(999)	☐☐☐
Not Applicable	(99)	

15) If YES to question 14, what type of medicine was given?		**MEDTYPE**
Sulfadoxine- pyrimethamine (fansidar)	(1)	
Chloroquine	(2)	
Amodiaquine-Artesunate	(3)	
Artesunate	(4)	
Herbal medicine	(5)	
Can't remember	(6)	
Don't know	(999)	☐☐☐
Not Applicable	(99)	

16 In what form was the given medicine?		**MEDFORM**
Liquid	(1)	
Table	(2)	
Capsule	(3)	☐☐
Not Applicable	(99)	

17) How many times did child take medicine each day? ☐☐ **FREQ**

18) How many table or tea spoonfuls did child (name) take each day? ☐☐ **MEDDOSE**

19) How many days did child take the medicine ☐☐ **MEDDAYS**

20) How long after the child (name) had fever did you start treatment?	**FVRDAYS**

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Same day	(1)	
One day after	(2)	
Two days after	(3)	
Others (Specify).....	(4)	☐☐
Not Applicable	(99)	

SECTION D: KNOWLEDGE ON CAUSES. SIGN/SYMPTOMS OF MALARIA

KNUST

21) What do you think is the causes of malaria?		**MALCAUS**
(Allow Multiple Responses by asking ‘’any other?’’		
Eating sweet foods	(1)	
Standing/working in the sun	(2)	
Eating contaminated foods	(3)	
Mosquito bites	(4)	
Hereditary	(5)	
Dirty surroundings	(6)	
Weedy Surroundings	(7)	
Eating oily foods	(8)	
Eating unripe fruits	(9)	☐☐
Other (Specify).....	(10)	

22) How would you know child has malaria?		**MALSIGN**
(Allow Multiple Responses by asking ‘’any other?’’)		
Hot body/fever	(1)	

Vomiting	(2)	
Diarrhoea	(3)	
Headache	(4)	
Hereditary	(5)	
Loss of appetite	(6)	
Bodily weakness	(7)	
Cough	(8)	
Dizziness	(9)	
Chills	(10)	
Other (Specify).....	(11)	

KNUST

23) When was the last time child had malaria? (in weeks)

☐☐ **LASTMAL**

24) How was the malaria treated? **Let caregiver narrate sequence of event related to the malaria episode treatment (List all actions take in order 1, 2, 3,.....etc.)** 1. Went to healthy facility 2. Consulted chemical seller/pharmacy 3. Consulted herbalist 4. Consulted a friend/relative 5. Used orthodox left over drug at home 6. Used tradition/herbal medicine- 7. Other (Specify).....	**TRTMAL** ☐ ☐ ☐ ☐ ☐ ☐ ☐

SECTION E INSECTICIDE TREATED NETS (ITN)

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25) How many bed nets do you have in this household ☐☐ **NUMNET**

26) How many of these bed nets are treated with insecticide? ☐☐ **TRTNET**

27) Did child (name) sleep in BED NET last night?	**SLEEPNET**
Yes (1)	☐
No (2)	

KNUST

28) if YES to Q 27, was the net TREATED with insecticide?	**SLEEPTRT**
Yes (1)	
No (2)	☐☐
Not Applicable (99)	

29) How long ago was the bed net that child (name) slept under treated with insecticide? (in weeks) **SLEEPDUR**

(If net was never treated enter ''00'')

---

30) If net was never treated, why has it never been treated with insecticide?

Not due for retreatment	(1)	**NEVTRTRE**
Permanently treated bed net	(2)	
No money to pay for treated	(3)	
Did not know it needed treatment	(4)	
Others (specify).....	(5)	

Not applicable (99) ☐☐

31) Is there a mounted ITN in the household? Please seek permission to verify

Yes (1)

No (2)

Not permitted (99) ☐☐

KNUST

THANK YOU

APPENDIX IV

QUESTIONNAIRE FOR PREGNANT WOMEN/WOMEN WHO HAVE DELIVERED IN THE LAST 12 MONTHS
(Interview only one woman per household)

Serial number

SECTION A: INTRODUCTION

KNUST

I am ..... **working for the Ghana Health Service.**

Thank you for making time for this interview. The aim of this questionnaire is to find out if the strategies put in place to combat malaria in the district is making an impact. This work is to be submitted to the KNUST-Kumasi for the Award of Msc. in Clinical Pharmacy. Your cooperation in responding to these questions would also assist Ghana Health Service to improve upon the health promotion activities in the country. Please be candid and truthful in your responses and be assured that all your responses would be kept confidential.

Thank You.

Region Code	**District Code**	**Round Code**	**EA Code**	**Rural/Urban Code**

Locality Name

Household Number **Interview Date**

Interviewer's Code **Interview's Name**

Supervisor's Code **Supervisor's Name**

SECTION B: BACKGROUND

1) Name of Household Head

2) Name of child (not applicable if not delivered **3) Age (Completed years)**

4) Name of mother **5) Age of mother in completed years**

6) If pregnant what is the duration in months

7) How long ago did deliver? (not applicable if not delivered)

8) Educational background of caregiver		**EDCCAR**
None	(1)	
Primary	(2)	
Middle schools/JHS- Standard seven	(3)	
Technical, commercial, secondary school, SHS	(4)	
Postsecondary – Nursing training, teacher training, agric school	(5)	
Tertiary – university, polytechnic etc.	(6)	
Others (Specify).....	(7)	
No response	(8)	

9) Occupation of caregiver (mother)		**OCPCAR**
Trader/artisan	(1)	
Traditional birth attendant (TBA)	(2)	
Civil/public servant	(3)	
Farmer	(4)	
Health worker	(5)	
Chemical seller	(6)	
Traditional healer	(7)	
Fisherman	(8)	
Fishmonger	(9)	

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Others (Specify)..... (10)	

10) Religion of caregiver (mother)	**RELCAR**
Christian (1)	
Islam (2)	
Traditional African religion (3)	
Others (Specify)..... (4)	

SECTION C: INSECTICIDE TREATED NETS (ITN)

11) Do you have a mosquito/bed net in this household?	**HOUSNET**
Yes (1)	
No (2)	☐

KNUST

12) If Yes, state how many (state number) ☐☐ **NUMBNET**

13) Where did you get the mosquito/bed net from? (Allow Multiple Responses by asking other)	**NETSOURCE**
Health Facility (1)	☐
Outreach Clinic (2)	☐
CBA/VHW (3)	☐
Private Shop (4)	☐
Market (5)	☐
Campaign (7)	☐
Gift (8)	☐
Other (Specify)	
Not applicable (99)	
14) How much did you pay for the mosquito/bed net?	**PAYNET**
Free (1)	
Cedis (state amount) GH¢..... (2)	☐
Not applicable (99)	

15) Is the net treated with insecticide?	**NETTRT**
Yes (1)	
No (2)	☐☐☐
Don't know (999)	
Not applicable (99)	

16) Did you sleep in a net last night?		**SLEEPNET**
Yes	(1)	
No	(2)	☐
Not applicable	(3)	

14) How long ago was the bed net you slept under treated with insecticide? (in months) ☐☐ **DURTRT**

15) When you started using the treated bed net, did you notice some insects eg, houseflies, cockroaches, mosquitoes dying/dead?		**NOTDEAD**
Yes	(1)	
No	(2)	
Don't Know	(999)	
Not taken notice	(9999)	
Not applicable	(99)	☐☐☐☐

16) If yes to question 15, are insects still dying/dead or being repelled from the room?		**STILDEAD**
Yes	(1)	
No	(2)	☐
Not applicable	(99)	

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SECTION D INTERMITENT PREVENTIVE TREATMENT (IPT)

17) Have you HEARD, SEEN or READ about intermittent preventive treatment (IPT)?		**HEARDIPT**
Yes	(1)	
No	(2)	☐

18) If yes to question to Q17, where did you HEAR, SEE or READ the message? (allow Multiple response)		**SOURCE**
Radio	(1)	
Newsprint	(2)	
Poster	(3)	
Health worker	(4)	
Community	(5)	
Meeting	(6)	
Friends/relatives	(7)	
Other (Specify)	(8)	
Don't know	(999)	☐☐☐
Not applicable	(99)	

19) How old was your pregnancy when you first visited ANC?		**GESTANC**
Never went to ANC	(1)	
Before 16 weeks	(2)	
16 – 23 weeks	(3)	
24 – 32 weeks	(4)	
32 weeks or more	(5)	☐☐☐
Don't know	(999)	

20) With this pregnancy or the last pregnancy, did you take any medicine to protect you from getting malaria?		**MEDPROT**
Yes	(1)	
No	(2)	☐
Can't remember	(3)	

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21) If YES to question 14, what type of medicine was given?		**MEDTYPE**
Sulfadoxine- pyrimethamine (Fansidar)	(1)	
Chloroquine	(2)	
Amodiaquine-Artesunate	(3)	
Artesunate	(4)	
Herbal medicine	(5)	
Can't remember	(6)	
Don't know	(999)	
Not Applicable	(99)	
22) Where were you given the medicine		**MEDSOURCE**
Health Facility	(1)	
Chemical shop/pharmacy	(2)	
Home	(3)	
Other (Specify)	(4)	
Not Applicable	(99)	
23) How many times have you taken this medicine?		**NUMTIMES**
Once	(1)	
Twice	(2)	
Thrice	(3)	
Other (specify).....	(4)	
Not Applicable	(99)	
24) How many of the malaria tablets (SP) were you given at each visit?		**NUMVISIT**
One	(1)	
Two	(2)	
Three	(3)	
Other (specify).....	(4)	
Not Applicable	(99)	
25) Was the medicine taken in front of a health worker?		**MEDHWK**

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Yes	(1)	
No	(2)	☐☐
Not Applicable	(99)	

26) Were you given water by the health worker to take the medicine?		**WATERMED**
Yes	(1)	
No	(2)	
I brought my own water	(3)	
Not Applicable	(99)	☐☐

27) Did you have any reaction?		**MEDRXN**
Yes	(1)	
No	(2)	☐☐
Not Applicable	(99)	

KNUST

28) If yes to question 27, specify type of reaction? **RXNTYPE**
(Allow Multiple Responses by prompting)

Rashes	1. Yes	2. No	999 DK
Dizziness	1. Yes	2. No	999 DK
Itching	1. Yes	2. No	999 DK
Sleeplessness	1. Yes	2. No	999 DK
Weakness	1. Yes	2. No	999 DK
Swelling	1. Yes	2. No	999 DK
Headache	1. Yes	2. No	999 DK
Nausea	1. Yes	2. No	999 DK
Vomiting	1. Yes	2. No	999 DK
Jaundice	1. Yes	2. No	999 DK
Coca cola urine	1. Yes	2. No	999 DK
Other (Specify)	1. Yes	2. No	999 DK
Not Applicable	1. Yes	2. No	99 NA

29) Where you admitted to hospital during pregnancy? **ADMPRG**

Yes (1)

No (2) ☐☐

Not Applicable (99)

30) If yes to Q29 what was the reason for the admission? **ADMREAS**

Malaria (1)

Other (specify) (2) ☐☐☐

Don't know (999)

Not Applicable (99)

31) At what month of pregnancy did you deliver? **DELMNTH**

At ----------Months ☐☐

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Not Applicable

32) Is there a mounted ITN in the household? Please request permission to verify

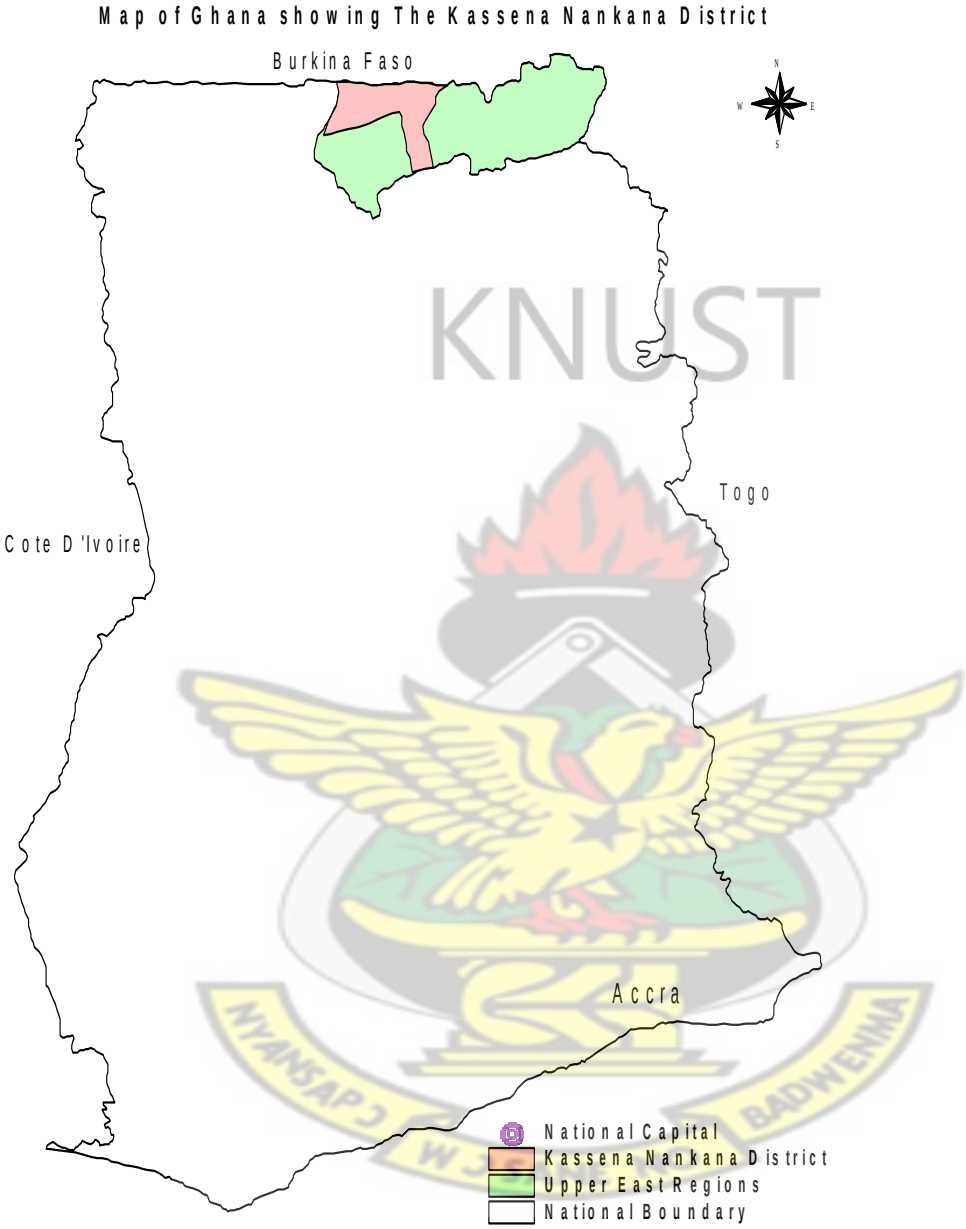
Yes	(1)	
No	(2)	
Not allowed to verify	(99)	

KNUST

THANK YOU.

APPENDIX V

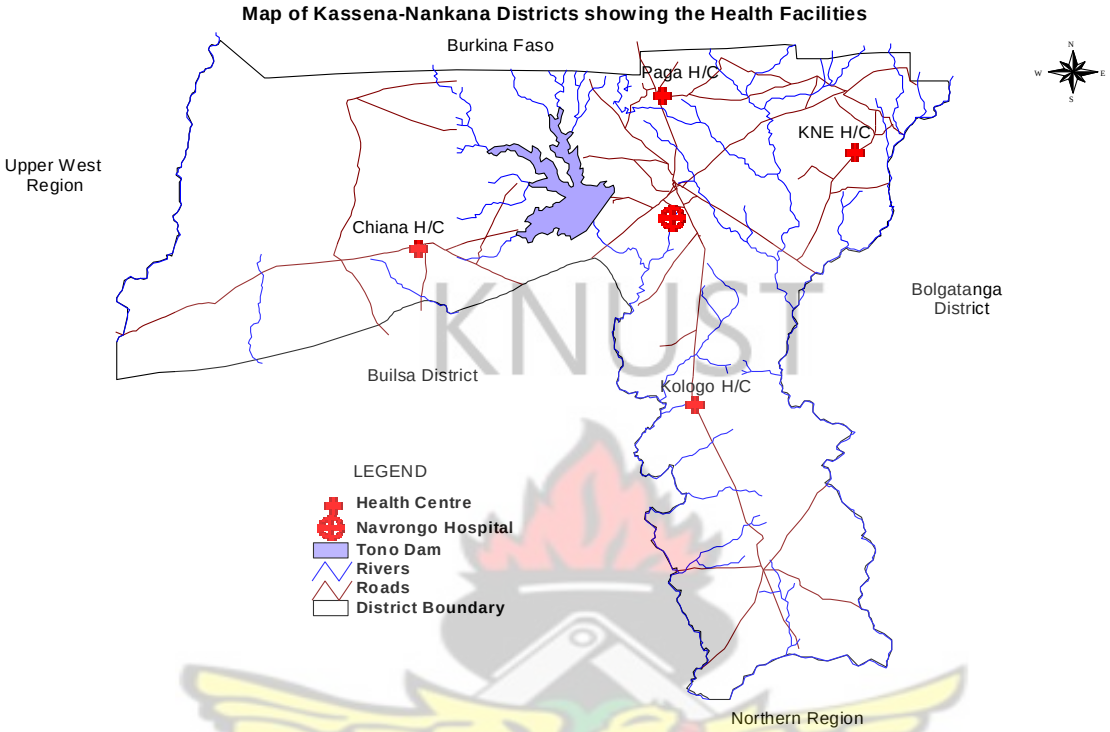
MAP OF GHANA SHOWING KASSENA NANKANA DISTRCT



KNUST

APPENDIX VI

MAP OF KASSENA NANKANA DISTRCT SHOWING THE HEALTH FACILITIES



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