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USE OF NON-PRESCRIBED ANTI-MALARIA DRUGS AMONG PEOPLE OF BOLGATANGA MUNICIPALITY OF GHANA

BY
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DECLARATION

I declare that except for references to other people's investigations which have been duly acknowledged, this dissertation is the result of my own research and that this dissertation either in whole or in part has not been presented for another degree elsewhere.

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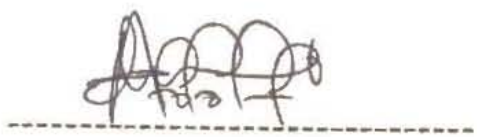

DR. PHILIP BABA ADONGO

DEDICATION

I dedicate this dissertation to my son, Emmanuel Kwaku Aborah.

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ABSTRACT

This study aimed at determining the prevalence of use of non-prescribed anti-malaria drugs in the Bolgatanga Municicpality of Ghana and also assessing the socio-cultural factors influencing that practice.

A random sample of 392 adults and primary caregivers of children who had experienced episodes of malaria in the last 4 weeks prior to the study were enrolled into a cross sectional survey. In addition, in-depth interviews were conducted with 21 chemical sellers in different chemical shops in the municipality.

The prevalence of use of non-prescribed anti-malaria drugs among the respondents was 16.8%. Among respondents who took non-prescribed anti-malaria drugs, 56% of them inappropriately took non-recommended drugs such as chloroquine, artemether, amodiaquine and sulphadoxine-pyrimethamine. The socio-cultural factors that influenced the use of non-prescribed anti-malaria drugs among the respondents from chi-square test were: persons being above 4 years of age (p-value = 0.0003); respondents' lack of knowledge about the right source of malaria treatment (p-value = 0.002) and respondents being influenced by other people to practice self medication (p-value = 0.004). The predictor of use of non-prescribed anti-malaria drugs among the respondents from multiple logistic regression analysis was: respondents who were influenced by other people to practice self medication were more likely to use non-prescribed anti-malaria drugs than those who were not influenced (odds ratio: 2.14; 95% CI: 1.01 – 4.53). Findings from the in-depth interview of the chemical sellers revealed that most of them

did not have adequate knowledge of treatment of malaria as they were selling both ACT and non-ACT anti-malaria drugs to their clients.

In concluding, the prevalence of use of non-prescribed anti-malaria drugs among respondents was 16.8%. Influence by other people on respondents to practice self medication and chemical sellers' lack of knowledge of malaria treatment influenced the use of non-prescribed anti-malaria drugs among the respondents.

It is recommended that the Ghana Health Service devise interventions to further reduce the prevalence of use of non-prescribed anti-malaria drugs in the Bolgatanga municipality, set up a regulatory body to partner with the Food and Drugs Board and Pharmacy Council to prevent the importation and sale of non-recommended anti-malaria drugs in chemical shops and also educate the chemical sellers about the new malaria treatment policy.

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LIST OF ABBREVIATIONS

ACT	Artemisinin Combination Therapy
CHPS	Community based Health Planning and Services
G-6-P-D	Glucose 6 Phosphate Dehydrogenase Deficiency
IPT	Intermittent Preventive Treatment
ITN	Insecticide Treated Nets
ITM	Insecticide Treated Materials
IRS	Indoor Residual Spraying
NGO	Non-governmental Organization
NMCP	National Malaria Control Programme
NMIMR	Noguchi Memorial Institute of Medical Research
RDT	Rapid Diagnostic Test
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Malaria remains a major cause of morbidity and mortality worldwide. In 2008, there were an estimated 243 million malaria cases worldwide, 85% of which occurred in Sub-Saharan Africa. There were an estimated 863000 malaria related deaths worldwide in 2008, of which 89% occurred in Africa. Malaria remains a threat to more than 40% of the world's population and pregnant and children under 5 years of age are at highest risk worldwide. Between 2000 and 2007, disbursement of funds by external agencies for malaria control in Africa has increased by a factor of 40 signifying continuing rising economic burden of the disease (WHO, 2009).

Ghana had an estimated number of 3.2 million malaria cases in 2008. There was no evidence of a reduction in the number of malaria cases between 2001 and 2007, and the numbers of inpatient cases and deaths have increased (WHO, 2009). Malaria is hyperendemic throughout Ghana and ranks first among the ten diseases most frequently seen in health facilities in the country.

The artemisinin based combination drugs are recommended by the World Health Organisation to treat uncomplicated malaria and parenteral quinine and artemisinin are recommended for the treatment of complicated malaria. Rectal artesunate is also recommended as a pre-referral treatment for complicated malaria. In Ghana, out of the 24% of febrile children who received anti-malaria treatment in 2008, only 12% were given artemisinin based combination therapy (WHO, 2009).

The issue of drug resistant malaria parasites has been a major drawback to successful control of malaria infection worldwide in the past and even recently there has been a report of the emergence of resistant malaria parasites against the artemisinin based combination therapy in Asia (WHO, 2009). Inappropriate use of anti-malaria drugs is the cause of the development of drug resistant malaria parasites against chloroquine and this has led to the change from the use of chloroquine for the treatment of malaria to artemisinin based combination therapy (Bell and Winstanley, 2004).

Several research studies done in Ghana and other countries have revealed that use of non-prescribed anti-malarial drugs is the most common initial action taken by most people in treating febrile illness (Buabeng et al, 2007; Abuya et al, 2007). Studies have also reported that the types of non-prescribed anti-malaria drugs used are chloroquine, sulphadoxine-pyremethamine, amodiaquine and the artemisinins which are purchased from chemical and pharmacy shops and drug sellers (Oue'draogo et al, 2008). Most people use non-prescribed anti-malaria drugs inappropriately for the treatment of malaria-like illness (Oguonu et al, 2005). Reasons given by people for using non-prescribed anti-malaria drugs initially for treating malaria include unavailability of health facilities in the community, inadequate number of skilled personnel in health facilities, long waiting time at health facilities, social distance of health workers and cost of treatment at health facility (Mwenesi, 2003). Some studies have identified socio-cultural factors influencing use of non-prescribed anti-malaria drugs. Socio-cultural factors such as high level of formal education, poor

access to health facilities, high socioeconomic status, treatment decision structures at home promote use of non-prescribed anti-malaria drugs (Ahorlu et al, 2005).

Research studies have also revealed that the knowledge and dispensing practices towards malaria by drug sellers are not satisfactory. The quality of malaria case management in the retail sector therefore is not satisfactory and this can lead to a higher malaria mortality rate and development of drug resistant malaria parasites (Manuel et al, 2008).

The identification of the pattern and socio-cultural factors influencing non-prescribed anti-malaria drug use in a community will help in designing appropriate educational strategies to improve upon malaria case management.

This research therefore aims at assessing use of non-prescribed anti-malarial drugs and identifying socio-cultural factors influencing their use in order to inform interventions aimed at improving malaria case management.

1.2 STATEMENT OF THE PROBLEM

There has been rising incidence of malaria case admissions and malaria related deaths in health facilities since 2007 in the Bolgatanga Municipality of northern Ghana.

There is relatively small number of health personnel especially prescribers in the Bolgatanga Municipality compared to other municipalities in the southern part of Ghana. There is therefore relatively longer waiting time for patients in health facilities in Bolgatanga Municipality and therefore a higher tendency for people to initially use non-prescribed anti-malarial drugs to treat febrile illness.

The non-prescribed anti-malaria drugs taken by people may not be the recommended treatment for malaria and this may contribute to higher incidence of severe malaria cases and malaria mortality. The inappropriate use of non-prescribed anti-malaria drugs also poses a threat to the development of drug resistant malaria parasites.

1.3 JUSTIFICATION OF THE STUDY

The Millennium Development Goal 6, target 8 aims at combating malaria by reducing by half in year 2015, the incidence of malaria and malaria deaths. This study will provide information to inform policy, programmes and interventions aimed at achieving this goal.

One of the malaria control interventions recommended by the World Health Organization is early diagnosis and prompt effective treatment with artemisinin based combination therapies for uncomplicated malaria and parenteral quinine or artemisinins for complicated malaria. This study will therefore provide information to assess the implementation of this treatment policy in the Bolgatanga Municipality.

Inappropriate use of non-prescribed anti-malaria drugs leads to unimproved malaria condition and promotes the development of drug resistant malaria parasites. People's choice of treatment is influenced by their socio-cultural context. This study will provide information on the socio-cultural factors influencing non-prescribed anti-malaria drug use and therefore help in improving malaria case management.

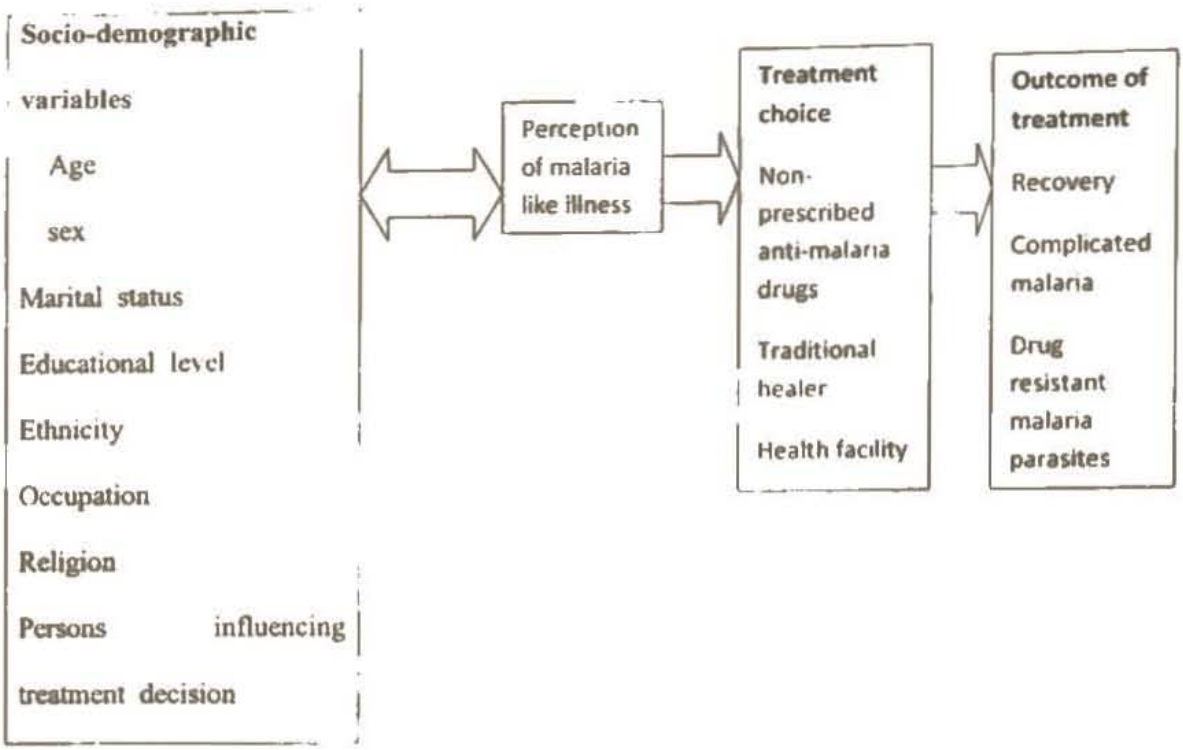
1.4 CONCEPTUAL FRAMEWORK

The conceptual framework which is the author's own construct is as follows:

When people experience malaria-like illness, they either initially take anti-malarial drugs bought from chemical or pharmacy shops or left over drugs from a previous visit to a health facility; go to a health facility or go to a traditional healer.

The choice of treatment is influenced by socio-cultural factors such as educational level, sex, age, ethnicity, marital status, occupation, perceptions/knowledge of malaria and other persons influencing an individual's decisions on treatment choice.

The non-prescribed anti-malaria drugs used may or may not be the recommended drugs for treating malaria. The dosage regimen of non-prescribed anti-malaria drugs may or may not be taken correctly. The use of non-prescribed anti-malaria drugs may lead to recovery, complicated malaria or drug resistant malaria parasites.



1.5 OBJECTIVES

1.5.1 Research Questions

Why are people using non-prescribed anti-malarial drugs to treat malaria?

Are non-prescribed anti-malarial drugs being used appropriately to treat malaria?

Is there any relationship between socio-cultural factors and use of non-prescribed anti-malarial drug?

1.5.2 General Objective:

To investigate the extent to which non-prescribed anti-malarial drugs are used for the treatment of malaria in the Bolgatanga Municipality.

1.5.3 Specific Objectives:

To determine the prevalence of the use of non-prescribed anti-malarial drugs in the community

To assess the people's perception on use of non-prescribed anti-malaria drugs

To assess socio-cultural factors influencing use of non-prescribed anti-malarial drugs

To assess drug sellers' knowledge and dispensing practices towards anti-malarial drugs

1.6 STUDY AREA

The study was conducted in the Bolgatanga Municipality which is located in the center of the Upper East Region, and is also the regional capital. It has a total land area of 729 sq km and is bordered to the north by the Bongo District, South and East by Talensi-Nabdam District and West by Kassena-Nankana District. It was established by LI 1797 (2004).

The climate is classified as tropical and has two distinct seasons which are a wet season that runs from May to October and a long dry season that stretches from October to April, with hardly any rains. Mean annual rainfall is 950mm maximum temperature is 45 degrees celsius in March and April with a minimum of 12 degrees celsius in December. The natural vegetation is that of guinea savannah woodland consisting of short deciduous trees widely spaced and a ground flora, which gets burnt by fire or scorched by the sun during the long dry season. The most common economic trees are the shea nut, dawadawa, baobab and acacia. The municipality has forest reserves which primarily protect most of the water bodies in the area. The municipality has gentle slopes ranging from 1% to 5% with some isolated rock outcrops and some uplands which have slopes over 10%. It falls within the Birimian Tarkwaian and Voltarian rocks of Ghana. There is ample evidence of the presence of minerals especially gold.

The population of the municipality is 152,658 with an annual growth rate of 1.7%. The population density is 141.2 persons per squared Kilometer. Persons below 15 years of age form 47.7% of the total population and those who are 15 years of age and above form 52.3% The sex composition of the population is 49% males and 51% females

Although the majority of the inhabitants in the Bolgatanga Municipality are from northern ethnic origins (Mole-Dagbon, Grusi, Mande-Busanga and Gurma), there are also other ethnic groups including the Akans, Ewes and Ga-Adangme. Most of these ethnic groupings are organized around chiefs and leaders, whilest others come together as social groupings.

There are 213 communities in the municipality and also nine sub-districts namely Bolga Central, Plaza, Sumbrungu, Sherigu, Gambibgo, Zuarungu Moshie, Zuarungu, Bolga North and Bolga South. Bolgatanga township has 3,932 houses with 10081 households and average household size is 4.5.

Agriculture accounts for as much as 57% of the labour force, trade and commerce 19%, manufacturing (mainly handicrafs) 11.92%, community/social services 7.4% and others are mining, construction and utility service.

Most of the modern buildings found in Bolgatanga are either residential or office accommodation for public servants with a few for private residential and commercial purposes. Generally, housing conditions are poor. Urban Bolgatanga has some buildings with sandcrete and plastered walls, well maintained and roofed with corrugated aluminium sheets. However, a large area of the township has dilapidated houses. Already several sections of downtown Bolgatanga have developed into slums (zongos) where the most vulnerable people live. These zongos lack drainage systems and toilet facilities and these have implications for mosquito breeding and malaria transmission.

The number of health facilities in the Municipality is 15. The Bolgatanga Regional Hospital and Afrikids Medical Centre are the only well equipped facilities. The rest that

are in most of the deprived parts of the municipality are poorly equipped. There are mobile clinics run by the Catholic and Presbyterian Churches. Some newly created community based health planning and services (CHPS) centres have been established at Aguusi, Kalbeo, Anateem and Yorogo to provide community based health services.

The health service providers comprise both public and private sectors that include Non-governmental organizations (NGOs) and traditional practitioners. Apart from some private clinics and the only hospital that have doctors all other health facilities are manned by medical assistants and nurses. The doctor-patient ratio is 1: 28000 while the nurse-patient ratio is 1:5000

Life expectancy in the municipality is 55 years. The high level of illiteracy and poverty as well as the limited access to safe drinking water and existence of poor sanitation and unhygienic practices have exposed many people to health hazards which contribute to the lowering of the living standards of the people. The prevalence of diseases like malaria, diarrhoea, anaemia, acute respiratory infections and gynaecological disorders as well as the outbreak of epidemics such as cholera, anthrax and cerebrospinal meningitis can be traced to the above factors. Other conditions such as malnutrition (mostly among children) are also prevalent in the municipality.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 THE EPIDEMIOLOGY OF MALARIA

Malaria is an internationally devastating disease producing nearly 600 million new infections and 3 million deaths worldwide each year. The burden of this disease falls heaviest among children below 5 years of age in Sub-Saharan Africa and nearly 30% of the annual mortality in this population is attributable to malaria. Malaria is caused by four species of Plasmodium namely Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae which are transmitted through the bite of the female anopheles mosquito. Of these species, Plasmodium falciparum accounts for the preponderance of morbidity and mortality globally, World Health Organization (WHO), 2001 report. The plasmodium is a multi-stage parasite and when a carrier female mosquito takes a blood meal, malaria sporozoites are released in to the bloodstream from the mosquito's salivary glands. From the bloodstream, the sporozoites enter liver parenchymal cells in less than 60 minutes. In the hepatocytes, the sporozoites undergo asexual amplification and during this period, no illness is induced by malaria. The liver schizont bursts, releasing the merozoites in to the bloodstream where the beginning of the erythrocytic phase begins. The merozoites are extracellular for only 1-2 minutes before they rapidly invade the erythrocytes. In the erythrocyte, the merozoites go through ring, trophozoite and schizonts stages. Again, asexual amplification occurs with as many as 36 merozoites being produced within one erythrocyte. When the erythrocyte schizont ruptures, the merozoites spill in to the blood once again and it is during this stage that

malaria-associated morbidity and mortality occurs. The merozoites continue in a repeated cycle of infecting erythrocytes, multiplying and bursting the erythrocytes. During this repeated cycle, some merozoites differentiate in to male and female gametocytes. It is in this form where they can be taken up by the mosquito vector during a blood meal. Inside the midgut of the mosquito, fertilization occurs, producing zygotes which develop in to ookinetes. The ookinetes form oocysts which then grow and divide and rupture to give rise to sporozoites which migrate to the salivary glands. Then the infectious cycle of malaria can repeat itself. Much of the morbidity and mortality associated with malaria is caused by the rupture of infected red blood cells during the asexual reproductive stages of the parasite. The clinical symptoms and signs associated with malaria occur within 9-14 days after being bitten by infected female anopheles mosquitoes for Plasmodium falciparum infection and more than 28days for the other Plasmodium species. The clinical symptoms and signs include intense fever, occurring in 24-72 hour intervals and accompanied by headache, nausea, muscular pain among other symptoms. The characteristic fever spike has been correlated with incremental rises in serum levels of TNF-alpha associated with erythrocytic rupture. Furthermore, a variety of potentially fatal symptoms, including liver failure, renal failure, and cerebral disease are associated with untreated Plasmodium falciparum. These symptoms are consequences of the unique ability of the parasite to bind to endothelial surfaces, inhibiting circulation, causing localized oxygen deprivation and sometimes haemorrhaging. The immune response to malaria is not well understood. The presence of serum antibodies in individuals living in regions where malaria is endemic indicates that the immune system mounts a humoral

response against the parasite. The immunity is strain specific and can be lost if the individual migrates to a region where malaria is not endemic (Clark and Cowden, 2003)).

2.1.1 The Management of Malaria

The management of malaria is comprised of prevention of malaria and the treatment of persons with the disease. The World Health Organization (WHO) therefore recommend as part of its' malaria control strategies early diagnosis and prompt treatment of malaria and prevention of malaria by mosquito control.

The WHO's recommendations for diagnosis and treatment of malaria include the following:

Prompt parasitologic confirmation by microscopy or alternatively by rapid diagnostic tests (RDTs) recommended in all patients suspected of malaria before treatment is started; treatment solely on the basis of clinical suspicion should only be considered when a parasitological diagnosis is not accessible; uncomplicated Plasmodium falciparum malaria should be treated with an artemisinin based combination therapy (ACT); vivax malaria should be treated with chloroquine where it is effective, or an appropriate ACT in areas where Plasmodium falciparum resistance to chloroquine has been documented. Both chloroquine and ACTs should be combined with primaquine for 14 days in the treatment of Plasmodium vivax malaria, for the prevention of relapses, subject to considering the risk of hemolysis in patients with G6PD-deficiency (WHO, 2009).

Five ACTs are currently recommended for use, artemether-lumefantrine, artesunate-amodiaquine, artesunate-mefloquine, artesunate-sulphadoxine/pyrimethamine, and

dihydroartemisinin piperaquine (WHO, 2009). The choice of the ACT should be based on the efficacy of the combination in the country or area of intended use.

Artemisinin derivatives should not be used as monotherapies for the treatment of uncomplicated malaria as this will promote the resistance to this critically important class of anti-malarials (WHO, 2009).

A single dose of primaquine to be added as an anti-gametocyte to ACT treatment of Plasmodium falciparum malaria, particularly as a component of pre-elimination or elimination programme, is recommended provided the risk of hemolysis in G6PD-deficients is considered (WHO, 2009).

Severe malaria should be treated with a parenteral artemisinin derivative or quinine to be followed by a complete course of an effective ACT as soon as the patient can take oral medications. When intravenous or intramuscular treatment is not feasible, example in peripheral health posts, patients should receive pre-referral treatment with an artemisinin suppository and be transferred to a health facility capable of providing definitive treatment with parenteral antimalarial medicines.

In settings with limited health facility access, diagnosis and treatment should be provided at community level through a programme of community case management (home-based management) of malaria (WHO, 2009).

The WHO's recommendation for prevention of malaria by vector control is intended to protect individuals against infective mosquito bites, and at the community level, to reduce the intensity of local malaria transmission. The two broadly applied interventions are use of insecticide treated nets (ITN) and indoor residual spraying (IRS). In some specific

settings and circumstances (if the breeding sites are few, fixed and easy to identify) these core interventions may be complemented by other methods such as larval control or environmental management (WHO, 2009).

2.1.2 Antimalaria Drug Use, Efficacy and Resistance

High resistance levels of Plasmodium falciparum to the most affordable drugs like chloroquine and sulphadoxine-pyrimethamine (SP) limits the choice of efficacious chemotherapy in the treatment of malaria and artemisinin based combination therapies (ACTs) are presently the recommended choice of treatment for malaria (Sirima and Gansane', 2007).

WHO (2001) recommends the use of artemisinin based combination therapies as first line treatment for uncomplicated malaria for countries experiencing resistance to monotherapy in the treatment of Plasmodium falciparum malaria.

Artemisinin based combination therapies (ACTs)

The combination therapy concept is based on the synergistic potential of two or more drugs to improve therapeutic efficacy and also delay the development of resistance to the individual components of the combination (Majori, 2004).

The key goal of combining artesunate with existing anti-malaria medicines is to improve cure rates, delay emergence of resistance to component drugs and reduce parasite clearance time (Barenness et al, 2004). Though ACTs are expensive, their advantages over monotherapy far outweigh the cost.

Artemisinin-based combination therapies have been documented also to consistently produce faster relief of clinical symptoms and parasite clearance in uncomplicated falciparum malaria than any other used antimalaria drug (Owusu- Adjei et al, 2005). However, the short half –lives of artemisinins result in frequent recrudescent infections when used alone and therefore much interest lies on the choice of the combination partner drug.

Amodiaquine still has efficacy against falciparum malaria in many countries. A study to assess the safety, treatment efficacy and effect of gametocyte carriage on amodiaquine and artesunate-amodiaquine in children 10 years and older in Kenya, Senegal and Gabon for uncomplicated malaria revealed a 91% cure rates on day 14 in the combination as against 74% in amodiaquine alone in Kenya; 93% versus 94% in Senegal and 98% versus 90% in Gabon (Adjuik et al 2002) and the corresponding rates for day 28 are respectfully for artesunate-amodiaquine versus amodiaquine alone; 68% versus 41% in Kenya, 82% versus 72% in Senegal and 85% versus 71% in Gabon. This implied that though amodiaquine alone is effective, the combination of artesunate and amodiaquine improved treatment efficacy in Gabon and Kenya and was equivalent in Senegal and thus artesunte-amodiaquine is a good combination for use in Africa

Efficacy of chloroquine

Chloroquine has lost its efficacy in the management of malaria (Koram et al, 2005). Several studies threw doubt on the efficacy of chloroqine in the management of malaria. In 1998, the Ghana National Malaria Control Programme (NMCP) in collaboration with Noguchi Memorial Institute for Medical Research (NMIMR) started a study centered at 6

district hospitals around the country to examine the responses of Plasmodium falciparum to chloroquine in the treatment of uncomplicated malaria and the results showed a resistance of the parasite to chloroquine. Treatment failure in this study using chloroquine of good quality was between 6% and 25% among the different demographic cohorts (Koram et al, 2005). This put Ghana's state between 'alert period' and 'change period' according to suggested WHO Global response to anti-malarial drug resistance four tier action framework. There was therefore a call for a review of the current policy to replace chloroquine as a first line drug for malaria treatment, introduce alternatives and review the treatment guidelines (Global Fund, 2004).

A task force of experts of various aspects of malaria control, set up by NMCP, reviewed the evidence on the efficacy of chloroquine in the treatment of malaria and chemoprophylaxis in pregnancy between October 2002 and January 2004 (cited by Global Fund, 2004).

2.2 THE NEW MALARIA TREATMENT POLICY ADOPTION IN GHANA

Ghana had to follow the WHO (2001) recommendation to use combination therapies containing artemisinin derivatives as a country experiencing resistance to monotherapies in the treatment of falciparum malaria (Koram et al, 2004). The choice of the combination is based on characteristics including efficacy levels, compliance, route of administration, side effects, cost effectiveness, impact on local industry and key demographic variables such as the appropriateness for treating malaria for children under 5 years and in pregnancy. Ghana adopted and later implemented a new anti-malaria treatment policy effective from January 2005 with the objective to treat all malaria cases

in all categories of the population in other to reduce morbidity and mortality in especially in children under 5 years and pregnant women. The new policy chose artesunate-amodiaquine for the treatment of uncomplicated malaria because it is an efficacious combination drug with low side effects, known worldwide for its high parasitic clearance and cure rate with adequate treatment duration. The combination is also safe for use in children and can also be used with caution in pregnancy, after the first trimester, comparatively less expensive to all other alternatives and compliance can be improved with unit dose co-packaging (Global Fund, 2004). Quinine was chosen for the treatment of complicated malaria. Recently other anti-malarial drugs have been adopted by the National Malaria Control Programme and they include artmether-lumefantrine and dihydroartemisin piperaquine combination drugs for the treatment of uncomplicated malaria. Sulphadoxine-pyrimethamine is used for the prevention of malaria in pregnancy.

The Treatment Policy Monitoring

As part of monitoring, focus was to be on availability and quality of ACTs, quinine and sulphadoxine-pyrimethamine drugs in health institutions, prescriber prescribing habits, and dispensing habits of medicine selling outlets. The NMCP was to liase with Pharmacovigilance Centre to develop procedure for adverse drug reaction reporting (ADR), (Global Fund, 2004).

Challenges of the New Treatment Policy

Implementation of the new malaria treatment policy has not been particularly smooth right from the onset. At the launch of the new treatment policy, some clients experienced severe adverse reactions that were publicized. This created doubts in many providers and

the general public about the combination. The policy might not therefore achieve the main objective for which it was adopted if the pattern remained (Yeboah, 2006).

Dosage Regimens of Anti-malaria Drugs

Effectiveness of medicines depends a lot on appropriate dosage regimens to avoid treatment failure or toxicity. The best way of dosing is to use milligram per kilogram body weights (mg/kg bw) of patients which means that, the weight of the patient in kilogram is multiplied by a specific factor usually in milligrams specified for each particular medicine in order to get a specific dose for each specific patient based on his or her weight. Weight based dosing in mg/kg body prevents the possibility of some children receiving drug doses below and above those recommended with attendant risks of treatment failure or toxicity (Taylor et al, 2006).

The Policy states the dose for combination as artesunate 4mg/kg body weight and amodiaquine, 10mg/kg body weight, administered concurrently daily for three consecutive days.

Patient adherence to prescribed anti-malarial drug is important to clear infections, reduce the chances of complicated malaria and slow down the rate of development of resistance and adherence is affected by form of drug, packaging, as well as cost (Agyepong, 2002).

2.3 SOCIO-CULTURAL FACTORS OF MALARIA AND DRUG USE

Socio-cultural practices and social structure organization play a significant role in the prevention and treatment of malaria. This recognition has significantly pushed the

malaria agenda forward in the last decade, albeit at a pace that is still not satisfactory. The socio-cultural factors include:

The processes underlying illness recognition;

Treatments of fevers at household and community levels;

Pathways to treatment /care seeking, adherence to treatment regimens;

Malaria prevention/control within the ambit of community participation/cooperation; and mechanisms underlying behaviour change.

Recognition and Perceptions of Malaria-like illness

A significant percentage of malaria-like illness is first recognized and defined at home. A number of studies conducted in the last decade (Brieger et al, 2001; Govere et al, 2000), especially on children aged less than 10 years have highlighted the fact that recognition/definition of malaria-like illness is based on a people's belief system, as it relates to the aetiology of illness. The belief system forms the basis of categorization of illness in to mild or severe which in turn determines the promptness with which care is sought or withheld; the type of care sought (home, traditional or modern) and the social network that will be involved in decision for treatment seeking (Mwenesi, 2003; Korte, 2004). People living in areas where malaria is endemic are able to recognize the symptoms of mild malaria which they see as everyday illness. However in most cases, people do not recognize that malaria can develop in severity as indicated by convulsions and severe anaemia which are still viewed in many communities as separate disease entities with no relationship to malaria.

Treatment-seeking behaviour for malaria-like illness

Treatment of malaria in both mild and severe forms in most cases commences at home and for the most part , continues outside of the formal health care sector. Treatment takes the form of self medication with anti-malarial and /or antipyretics (Adeniyi, 2000; Agyepong, 1994). The anti-malarial drugs and antipyretics consumed are obtained from "left overs" saved from previous episode (especially when drugs are obtained from health care facility), retail outlets and drug sellers and are frequently used irrationally or inappropriately (Ahorlu et al, 1997; Alilio et al, 1997). The many reasons postulated for the widespread self medication revolve around inadequacies of health care facilities and delivery of services, including accessibility of the health care facilities, cost, waiting time, lack of drugs and social distance of health workers (Worrall et al, 2002). Nevertheless people do seek care from formal health facilities and informal sources such as traditional healers, the choice being dependent on various factors including cost, distance and socioeconomic status (Marsh et al, 1999; Geissler et al, 2000). When illness persists or causation is redefined, people seek care from health care facilities often late in the episode of illness, with all attendant consequencies (Nyamongo, 2002).

Prevention and Control of Malaria

Intermittent Preventive Treatment

Current knowledge on malaria during pregnancy supports the use of directly observed intermittent preventive treatment (IPT) with sulphadoxine-pyrimethamine (SP). For this approach to be effective, pregnant women must be informed and empowered to change popularly held cultural beliefs on use of antenatal clinics, time during gestation at which

first contact is made with antenatal clinics, and most importantly educated to understand that fever is not a normal condition of pregnancy and that some medication, even if bitter tasting, is safe and will not lead to spontaneous abortion (Winch, 1994).

Vector control and environmental issues

Potential breeding sites, comprising small, temporary, freshwater pools (man-made or natural) that are exposed to sunlight, abound in countries in which malaria is endemic. More breeding sites are created by human manipulation of the environment (Colluzzi, 1999), mostly for necessary endeavors such as opening up land for agriculture and settlement, building dams for generation and irrigation. Local factors that have a direct impact on breeding sites include farming methods, house structure and rubbish disposal. Of these, intervention from communities could work at the level of improving house structures to decrease the number of mosquitoes entering.

Personal Protection with Insecticide-treated materials

It is an accepted fact that insecticide-treated materials (ITMs) including nets and curtains are effective in reducing morbidity and mortality caused by malaria, as demonstrated specifically in controlled trials (Lengeler, 1999; D'Alessandro, 2001).

2.4 PREVALENCE OF NON-PRESCRIBED ANTI-MALARIAL DRUG USE

Several research studies have revealed that more than 50% of the population in many communities initially use non-prescribed anti-malarial drugs to treat malaria (Abuya et al, 2007); Oguonu et al, 2005; Tumwesigire and Watson, 2002). A study done in Northern Ghana by Cowan (2006) however revealed that 42% of caregivers who

participated in the studies used non-prescribed anti-malarial drugs initially to treat their sick children who were perceived of suffering from malaria. Some studies done outside Ghana had also reported less than 50% of respondents initially using non-prescribed anti-malarial drugs to treat malaria (Wakgari, 2007; Sam-Wobo et al, 2008).

Types of Non-prescribed Antimalarial Drugs Used to Treat Malaria

The types of non-prescribed anti-malarial drugs commonly used to treat malaria include sulphadoxine-pyrimethamine, amodiaquine, chloroquine and the artemisinins (Goodman et al, 2007). However, non-prescribed anti-malaria drugs are used inappropriately in most cases (Pfeiffer et al, 2008; Oue'draogo et al, 2008).

Sources of Non-prescribed Anti-malarial Drugs used to treat Malaria

The non-prescribed anti-malarial drugs used to treat malaria are bought from pharmacy and chemical shops, drug vendors, petty traders or may be "left overs " from previous visit to a health facility (Oguonu et al, 2005; Abuya et al, 2007, Buabeng et al, 2009).

Reasons Given for Using Non-prescribed Anti-malarial Drugs

The reasons given for use of non-prescribed anti-malaria drugs by respondents in most research studies include lack of access to health facilities, cost of treatment at health facilities, long waiting time and lack of many skilled personnel in health facilities and social distance of health workers from patients (Kpaneke et al, 2009).

Drug Sellers' knowledge and Dispensing Practices Towards Malaria

Some research studies done to assess drug sellers' knowledge and dispensing practices towards malaria have revealed poor knowledge and poor dispensing behaviour among respondents (Okeke et al, 2006; Goodman et al, 2007). In some studies drug sellers were knowledgeable about malaria but quality of malaria case management was not satisfactory (Manuel et al, 2008; Okeke et al, 2006).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Type of Study

The study was a cross-sectional survey that used both quantitative and qualitative data collection methods

3.2 SAMPLING

3.2.1 Study Population

The study population was males and females of all ages living in Bolgatanga Municipality of Ghana.

3.3.2 Sample Size Determination

The sample size was calculated using Epi info StatCalc. The projected population of Bolgatanga Municipality was 152,658.The prevalence of non-prescribed anti-malarial drug use in previous research was 42% (Cowan, 2006). Assuming 5% worst acceptable prevalence of 47%, then at 95% confidence interval, a minimum sample size of 373 was determined and making allowance for losses it was rounded up to 400.

3.2.3 Sampling Method

Persons of all ages who had experienced malarial illness in the last 4 weeks prior to the study were eligible to be sampled in to the quantitative component of the study. A 3-stage multistage sampling technique was used to randomly select people in to the quantitative component of the study. The Bolgatanga Municipality is made up of nine sub-districts.

The nine sub-districts are made up of five rural and four urban sub-districts. The first stage of the multistage sampling involved the division of the municipality in to two strata namely rural and urban residence and the selection by simple random sampling method of three sub-districts from each of the rural and urban strata. The second stage involved the selection by simple random method of 6 or 7 communities within each selected sub-district making a total of 40 communities (20 rural and 20 urban) being used for the study. Within each community, a maximum number of 10 eligible persons were to be administered the questionnaire to make up the total sample size of 400. The third stage of the selection was the selection of the households within each selected community and it was done by the interviewer going to the center of the community and spinning a pen. The direction that the pen pointer pointed was then followed and the first house or household was entered and people in the household eligible for the study were interviewed after giving their consent. If no member of a household entered was eligible, the interviewer then went to the nearest house/household. This was continued till the maximum number of 10 respondents was obtained in each community. Adults (age 18 years and above) who were eligible within each household were interviewed directly. For children (age below 18 years who were under the care of their parents) eligible for the study, the parent or primary caregiver was interviewed on their behalf.

For the qualitative aspect of the research which was in-depth interview of chemical sellers, no sample size and probability sampling technique were used to select the respondents. Licensed or unlicensed chemical or pharmacy shops within the Bolgatanga Municipality were visited and one consenting chemical seller in each chemical shop was interviewed.

3.4 DATA COLLECTION TECHNIQUES AND TOOLS

For the quantitative aspect, the interviewer administered semi-structured questionnaires were administered to the selected participants to collect data on socio-demographic variables, respondents' knowledge about malaria, respondent's experience of malarial illness and their treatment practice, use of non-prescribed anti-malarial drugs and appropriateness of use of non-prescribed drugs.

For the qualitative aspect, in-depth interviews were conducted on drug sellers using the interviewer's guide to collect data on their knowledge and dispensing practices towards malaria illness. Interviews were audio-recorded and then transcribed.

3.5 VARIABLES

The main dependent variable was the percentage or prevalence of use of non-prescribed anti-malaria drugs among people who had experienced malaria in the last 4 weeks prior to the study. The term "non-prescribed anti-malaria drug" refers to an anti-malaria drug that is not prescribed by a qualified health professional in a health facility or community heath volunteer in the community. It includes anti-malaria drugs obtained from chemical or pharmacy shops, drug peddlers, relatives or friends without prior consultation with a qualified health professional or community health volunteer. It also includes "left over anti-malaria drugs" which were obtained from health facility in a previous visit.

The independent variables were

- age of eligible interviewed adults and primary caregiver's children
- sex of adult and primary caregivers' children

- religion of respondents
- marital status of respondents
- ethnicity of respondents
- occupation of respondents
- highest level of education attained by respondents
- Respondents' knowledge on symptoms, cause, mode of transmission, prevention and treatment of malaria
- perceived severity of malaria symptoms experienced by respondent,
- time to onset of first treatment for the malaria
- influence by other people on respondent's first treatment action against the malaria (decision making dynamics within households).

3.6 Quality Control

To enhance quality, 12 experienced field workers were taken and trained on how to appropriately collect the data. Two field workers were assigned to collect data in each selected sub-district. All filled questionnaires were examined by the principal investigator at the end of each of the 6 days of data collection for completeness and accuracy. Field workers were also given the telephone number of Principal Investigator to call when they encounter problems on the field. At the end of the data collection period, data were entered in to Epi info soft ware version 3.4.1 and cleaned.

For the qualitative data collection, quality of data was enhanced by the use of the same interviewer's guide for all the chemical sellers interviewed by the principal investigator. Also, interviews were recorded and then later transcribed.

3.7 DATA PROCESSING AND ANALYSIS

Quantitative Data Analysis

All quantitative data were analyzed using Epi info soft ware version 3.4.1. Descriptive statistics such as mean, median, minimum and maximum were calculated for continuous variables and percentages for categorical variables. Correlation analysis was done using Chi-square statistics to determine the association between use of non-prescribed anti-malarial drugs with age, sex, education, religion, marital status, ethnicity, occupation, knowledge on symptoms, cause, mode of transmission, prevention and treatment of malaria, perceived severity of malaria symptoms experienced, time to start of malaria treatment and influence by other people on respondent's choice of first treatment action against malaria. The logistic regression model was used to determine predictors of non-prescribed anti-malarial drug use in the presence of multiple factors.

Qualitative Data Analysis

Qualitative data were transcribed and analyzed using the synthesis of the grounded theory approach with the following steps:

Systematic coding of data and categories

Identification and refinement of the emerging categories

Relating the categories in some logical way

Finding the theoretical implications of the nature of the category relationships

Establishing a pattern from the theoretical properties of the categories

3.8 ETHICAL CONSIDERATION

Ethical clearance was sought from the Ghana Health Service Ethical Review Board before the study was done. Study participants were briefed on the research objectives, benefits, risks and their liberty to refuse participation. They were also assured of confidentiality and afterwards written informed consent was obtained before data were taken.

3.9 PILOT STUDY

A pilot study was initially conducted in six communities in the Bolgatanga Municipality which were not involved in the actual study to test the data collection tools. Some modifications were made to the questionnaires after the pilot study before the actual study began.

3.10 LIMITATIONS OF THE STUDY

Limitations encountered in the study were respondents' ability to accurately remember previously used non-prescribed anti-malarial drugs; respondents might have presented misleading responses and the study was limited to Bolgatanga Municipality and so findings might not be generalizable to the entire population of Ghana.

CHAPTER FOUR

4.0 RESULTS

In all a total of 392 randomly selected adults and parents or primary caregivers of children who had experienced malarial illness in the last 4 weeks prior to the interview participated in the questionnaire interview, and 21 chemical sellers from 21 different chemical and pharmacy shops spread across the Bolgatanga Municipality participated in the in-depth interviews.

4.1 Demographic Characteristics of Respondents

Out of the total 392 subjects who participated in the questionnaire interview, 194 were adults who had experienced malarial illness in the last 4 weeks prior to the interview and 198 were primary caregivers of children of age less than 18 years who had experienced malarial illness in the last 4 weeks prior to the interview. The age range for the adults and primary caregivers' children were from 0.17 years to 99 years with an average age of 18.8 years and median age of 17 years. Children below 5 years of age constituted 32.9% of the total 392. The majority (54.8%) of the interviewed adults and primary caregivers' children were female. The majority of the interviewed adults and primary caregivers were married (70.7%), Christians (63%) and Gurunses (87%). The main occupations of the interviewed subjects were farming and trading. Almost 19% of the interviewed subjects were unemployed and 40% had not had any formal education. Of the total 392 subjects interviewed, 50.3% were living in rural residence and 49.7% in urban residence. The baseline demographic characteristics of the interviewed subjects are summarized in tables 1 and 2.

For the qualitative component of the study, the chemical shops visited were all licensed chemical shops. The age range of the interviewed chemical sellers was 18 years to 55 years. The sex composition of the interviewed chemical sellers was 9 females and 12 males. Two of the interviewed chemical sellers were retired health professionals (a male nurse and a female medical assistant). There was also one dispensing technician among the interviewed chemical sellers. The other interviewed chemical sellers were non-health professionals. The highest level of education attained by the interviewed chemical sellers was from primary school level to tertiary school level. Eleven of the chemical sellers interviewed were owners the chemical shops whilst the rest were not owners of their chemical shops.

Table 1: Distribution of Demographic Characteristics of Respondents

Demographic characteristic	Total n (%)	Adult n (%)	parent of child n (%)
Marital status			
Co-habiting	6 (1.5)	3 (1.5)	3 (1.5)
Divorced	4 (1.0)	2 (1.0)	2 (1.0)
Married	277 (70.7)	121 (62.4)	156 (78.8)
Separated	3 (0.8)	2 (1.0)	1 (0.5)
Single	75 (19.1)	56 (28.9)	19 (9.6)
Widowed	27 (6.9)	10 (5.2)	17 (8.6)
Total	392 (100)	194 (100)	198 (100)
Religion			
Christian	247 (63.0)	113 (58.2)	134 (67.7)
Moslem	49 (12.5)	30 (15.5)	19 (9.6)
None	13 (3.3)	8 (4.1)	5 (2.5)
Traditionalist	83 (21.2)	43 (22.2)	40 (20.2)
Total	392 (100)	194 (100)	198 (100)
Ethnicity			
Akan	10 (2.6)	4 (2.1)	6 (3.0)
Builsa	5 (1.3)	3 (1.5)	2 (1.0)
Ewe	5 (1.3)	2 (1.0)	3 (1.5)
Gurunse	341 (87)	166 (85.6)	175 (88.4)
Kusasi	2 (0.5)	2 (1.0)	NA
Mande-Busanga	13 (3.3)	5 (2.6)	8 (4.0)
Namnam	7 (1.8)	6 (3.1)	1 (0.5)
Nankani	9 (2.3)	6 (3.1)	3 (1.5)
Total	392 (100)	194 (100)	198 (100)

Table 2: Distribution of Demographic Characteristics of Respondents

Demographic characteristic	Total	Adult	Parent of child
	n (%)	n (%)	n (%)
Occupation			
Auto-mechanic	9 (2.3)	8 (4.1)	1 (0.5)
Civil Servant	10 (2.6)	5 (2.6)	5 (2.5)
Farmer	137 (34.9)	63 (32.5)	74 (37.4)
Public Servant	36 (9.2)	22 (11.3)	14 (7.1)
Tailor	31 (7.9)	19 (9.8)	12 (6.1)
Trader	95 (24.2)	38 (19.6)	57 (28.8)
Unemployed	74 (18.9)	39 (20.1)	35 (17.7)
Total	392 (100)	194 (100)	198 (100)
Education			
None	156 (39.8)	60 (30.9)	96 (48.5)
Junior High School	81 (20.7)	44 (22.7%)	37 (18.7)
Polytechnic	25 (6.4)	17 (8.8)	8 (4.0)
Primary	56 (14.3)	27 (13.9)	29 (14.6)
Senior High School	52 (13.3)	37 (19.1)	15 (7.6)
Technical School	8 (2.0)	6 (3.1)	2 (1.0)
University	8 (2.0)	2 (1.0)	6 (3.0)
Vocational	6 (1.5)	1 (0.5)	5 (2.5)
Total	392 (100)	194 (100)	198 (100)
Residence			
Urban	195 (49.7)	100 (51.5)	95 (48)
Rural	197 (50.3)	94 (48.5)	103 (52)
Total	392 (100)	194 (100)	198 (100)

4.2 Respondents' Knowledge of Malaria

The majority of the 392 respondents had knowledge on malaria symptoms (96.9%), malaria cause (75%) and mode of transmission of malaria (93.1%). With regards to knowledge on malaria prevention, the majority of the respondents said malaria can be prevented by cleaning the surrounding (75.8%) and sleeping under a mosquito net (95.6). However, few respondents mentioned malaria prevention methods such as using mosquito coil, ingestion of herbs, ingestion of drugs, taking enough rest and also taking good nutrition. With regards to knowledge on the best treatment for malaria, the majority of the respondents (84.9%) said malaria is best treated when the sick goes to a health facility for treatment. A few respondents said malaria is best treated by practicing self medication using herbs (17.3%), antibiotics (0.5%), paracetamol (9.9%) and anti-malaria drugs (12%). One respondent said malaria is best treated by going to the traditional healer.

For the in-depth interview of the 21 chemical sellers, the majority (18) of the respondents had knowledge on the symptoms, mode of transmission, prevention and severity of malaria. However, with regards to malaria treatment, majority (19) of the interviewed chemical sellers mentioned both ACT and non-ACT drugs such as artemether, sulphadoxine-pyrimethamine and amodiaquine as recommended treatment for malaria. Two chemical sellers said the best source of treatment for malaria was for the sick person to go to the hospital for treatment.

4.3 Respondents' Experience OF Malarial Illness and Their Treatment Practice

All 392 respondents had experienced malarial illness in the last 4 weeks prior to the study. The majority (62.2%) of the respondents got to know of their diagnosis from a

medical doctor. However, some respondents got to know of their malarial status from self diagnosis (32.1%), relatives (4.1%) and friends (0.8%). The majority (64%) of the respondents perceived the malarial symptoms experienced to be severe. Also the majority of the respondents (61.5%) started their first treatment of the malarial illness within 24 hours of the onset of symptoms and the remainder (38.5%) started their malarial treatment after 24 hours of onset of symptoms.

With regards to respondents' first treatment action against the malarial illness, 56.6% of the total 392 respondents went to the health facility for treatment and 43.1% of respondents practiced self medication. Only one respondent went to the traditional healer as shown in Table 3. With regard to the type of self medicated drugs taken to treat the malarial illness, out of the 392 respondents, 16.8% took anti-malaria drugs, 24% took paracetamol, 14% took herbs and 1.8 % took antibiotics as shown in Table 3. For the respondents who took self medicated anti-malaria drugs, 43.9% took Artemisinin based combination therapy and 56.1% took non-artemisinin based combination therapy such as chloroquine, artemether, amodiaquine, quinine and sulphadoxine-pyrimethamine as shown in Table 3.

Table 3: Respondents' Experience of Malarial illness and their Treatment Practice

Respondent's Experience	Total n (%)	Adult n (%)	Primary caregivers' children n (%)
What action did you first take in treating the malarial illness?			
Took drugs or herbs as self medication	169 (43.1)	97 (50)	72 (36.4)
Went to Health Facility	222 (56.6)	96 (49.5)	126 (63.6)
Went to Traditional Healer	1 (0.3)	1 (0.5)	0
Total	392 (100)	194 (100)	198 (100)
Self Medicated drugs taken			
Antibiotics	7 (1.8)	4 (2.1)	3 (1.5)
Anti-malarial drugs	66 (16.8)	46 (23.7)	20 (10.1)
Paracetamol	96 (24.5)	45 (23.2)	51 (25.8)
Herbs	55 (14)	38 (19.6)	17 (8.6)
Type of Anti-malaria drugs taken on self medication basis			
ACT	29 (43.9)	23 (50)	6 (30.0)
Non- ACT	37 (56.1)	23 (50)	14 (70)
Total	66 (100)	46 (100)	20 (100)

For the urban respondents, out of the total 195 adults and children, 15.9% took non-prescribed anti-malaria drugs to treat their malarial episode. Out of the total 197 adult and children respondents living in rural residence, 17.8% took non-prescribed anti-malaria drugs to treat their malarial episode.

The self medicated drugs for the majority (62.3%) of the 392 respondents were from chemical and pharmacy shops. "Left over drugs" were the sources of self medicated drugs for 13.6% of the respondents. A few respondents got their self medicated drugs from neighbours (9.5%), friends (4.2%) and drug peddlers (4.7%). The main reasons why respondents did not go to a health facility first for treatment of their malarial illness were that some respondents (29.4%) had the perception that self medication was also effective treatment for malaria, some respondents (24.7%) also thought their malarial symptoms were mild and other respondents (28.2%) said they had no money to go to the health facility. The majority (74.1%) of the 392 respondents were not influenced by other people to practice self medication in treating their malarial illness. With regard to the dosage of the self medicated drugs taken by respondents, the majority (51.8%) of the 392 respondents said nobody told them the dosage whilst the minority said they got to know of the drug dosage from chemical sellers (20.6%), friends (6.5%), drug peddlers (2.9%), pharmacists (6.5%), relatives (7.6%) and spouses (4.1%).

From the in-depth interview of the chemical sellers, we found out that all the 21 chemical pharmacy shops spread across the Bolgatanga Municipality that were visited were selling suphadoxine-pyrimethamine drug to treat malaria, 18 chemical shops were selling artemisinin based combination therapy (ACT) drugs, 8 chemical shops were selling chloroquine to treat malaria and few chemical shops were selling artemether, amodiaquine, artesunate, halofantrine, metakelfin, quinine and sulphadoxine-pyrimethamine + artesunate drugs as shown in Table 4. The cost of the anti-malaria drugs that were being sold in the chemical shops visited were for suphadoxine-pyrimethamine, fifty Ghana pesewas, thirty Ghana pesewas for chloroquine, five to twelve Ghana cedis

for Artemether- lumefantrine (ACT), three Ghana cedis for artesunate- amodiquine (ACT) and the other non-ACT drugs. With regard to the dispensing practice of the chemical sellers interviewed, all respondents said clients who came to buy anti-malaria drugs with prescription were given drugs according to the prescription. Clients who came to buy anti-malaria drugs without prescription were given the drugs they requested to buy, provided the drugs were available in the shop. For clients who came to the shop to buy drugs without prescription, the majority of the chemical sellers interviewed said they asked the client their symptoms and if they thought the client had malaria, they sold to the client the anti-malaria drug he or she could afford. Few chemical sellers said they requested laboratory investigations for clients who went to buy drugs in their shop without prescription and complained of symptoms associated with malaria. Then when the laboratory results revealed the presence of malaria parasites in the clients' blood, they were sold anti-malaria drugs. With regard to the dosage of the anti-malaria drugs dispensed by the interviewed chemical sellers, all the respondents were giving the wrong dosage of sulpadoxine-pyrimethamine for treatment of malaria. Some chemical sellers were writing the dosage of the dispensed anti- malaria drugs whereas others were not writing the dosage.

A 25 year old female chemical seller said:

"if a client comes to buy drugs without prescription, I ask about the symptoms and if I suspect that the client has malaria, I tell the client the various anti-malaria drugs that are being sold and the one the client prefers I dispense it. For the dosage of the drug I dispense, sometimes I write it on the pack. Sometimes too, I don't write the dosage on the drug pack".

Table 4: Anti- malarial Drugs found in 21 Chemical/Pharmacy shops in the Bolgatanga Municipality obtained from in-depth interview of 21 Chemical sellers

Type of Anti-malarial drug	Number of Chemical/pharmacy Shops having the anti-malarial drug	Percentage
Chloroquine	8	38
Sulphadoxine-pyrimethamine	21	100
Artemisinin based Combination-Therapy	18	85.7
Artemether	5	23.8
Halofantrine	1	4.8
Amodiaquine	3	14.3
Metakelfin	2	9.5
Quinine	4	19
Artesunate + sulphadoxine-pyrimethamine	1	4.8
Artesunate	3	14.3
Injectable artemether	2	9.5

With regard to correct dosage of self medicated anti-malaria drugs taken by respondents, the majority (69.7%) of the 392 respondents did not take correct dosage. Also, majority (53%) of the respondents did not recover after taking the self medicated anti-malaria drug. For the Adult respondents, half did not recover after taking the self medicated anti-malaria drugs (Table 5). The issue of whether correct or incorrect dosage of non-

prescribed anti-malaria drug was taken by respondent was assessed by the interviewer asking the respondent the type and dosage of non-prescribed anti-malaria drug taken to treat the malarial episode and comparing the dosage taken to the recommended dosage for that particular drug. If the drug dosage taken did not correspond to the recommended dosage, then the respondent took incorrect dosage of the drug and vice versa.

Table 5: Respondents' experience of malarial illness and their Treatment Practice

Experience with taking Correct dosage	Total n (%)	Adult n (%)	child n (%)
Correct dosage	20 (30.3)	17 (37)	3 (15)
Incorrect dosage	46 (69.7)	29 (63)	17 (85)
Recovered fully	31 (47.0)	23 (50.0)	8 (40)
Did not recover	35 (53.0)	23 (50.0)	12 (60)
Total	66 (100)	46 (100)	20 (100)

Total = Both adults and primary caregivers' children

4.4 Socio-cultural Factors Influencing Use of non-prescribed Anti-malaria drugs among All Respondent Adults and Children

The choice of self medicated or use of non-prescribed anti-malaria drugs by all respondents as an initial treatment strategy against their malaria showed significant correlations (p-value < 0.05) using chi-square test with the following factors: Respondents who were above 4 years of age were more likely to use non-prescribed anti-malaria drugs than those who were below 5 years of age; respondents who were influenced by other people to practice self medication were more likely to use non-prescribed anti-malaria drugs than those who were not influenced; respondents who

perceived their malaria symptoms be severe were less likely to use non-prescribed anti-malaria drug than those who perceived their malaria symptoms to be mild; respondents who started treatment after 24 hours onset of symptoms were more likely to use non-prescribed anti-malaria drugs than those who started treatment within 24 hours of onset of symptoms; respondents who had knowledge of symptoms of malaria were less likely to use non-prescribed anti-malaria drugs than those who did not have that knowledge and respondents who had knowledge of cause of malaria were also less likely to use non-prescribed anti-malaria drugs than those who did not have the knowledge. Also respondents who had knowledge of source of treatment for malaria being to go health facility were less likely to use non-prescribed anti-malaria drugs then those who did not have the knowledge Tables 6 and 7. The results of the multiple logistic regression analysis revealed that the predictor of use of non-prescribed anti-malaria drugs among the 392 respondents was: influence of other persons on respondent to practice self medication. Respondents who were influenced by other persons to practice self medication were more likely to use non-prescribed anti-malaria drugs than those who were not influenced as the odds of such respondents using non-prescribed anti-malaria drugs was 2.14 (95% CI 1.008 - 4.533) times that of those who were not influenced (Table 8)

Table 6: Correlation of the dependent variable "Use of non-prescribed anti-malaria drug" with the independent variables for all respondents (chi-square test)

Respondents' knowledge/ Experience of malaria	use of non-prescribed anti-malaria drug		chi-square	p-value
	Used n (%)	Did not use n (%)		
Symptoms				
Has knowledge	60 (15.8)	320 (84.2)		
Does not have knowledge	6 (50)	6 (50)	9.72	0.002
Cause				
Has knowledge	42 (14.3)	252 (84.7)	5.47	0.019
Does not have knowledge	24 (24.5)	74 (75.5)		
Source of Treatment				
Has knowledge	48 (14.4)	285 (85.6)	9.3	0.002
Does not have knowledge	18 (30.5)	41 (69.50		
Age (years)				
<= 4	9 (7)	120 (93)	13.35	0.0003
>4	57 (21.7)	85 (67.5)		
Respondent was influenced By other people in taking Self medication				
Yes	25 (56.8)	19 (43.2)	8.09	0.004
No	41 (32.5)	85 (67.5)		

Table 7: Correlation of the dependent variable "Use of non-prescribed anti-malaria drug" with the independent variables for all respondents (chi-square test)

Respondent's experience	Use of non-prescribed anti-malaria drug		chi-square	p-value
	Used	Did not use		
Perceived severity of malaria symptoms experienced by respondent	n (%)	n (%)		
Yes	33 (13.1)	218 (86.9)	6.78	0.009
No	33 (23.4)	108 (76.6)		
How long did it take respondent to start treatment after onset of malaria symptoms?				
Within 24 hours	30 (12.4)	211 (87.6)	8.61	0.003
After 24 hours	36 (23.8)	115 (76.2)		

Table 8: Predictors of Use of non-prescribed Anti-malaria drugs among all respondents: A multiple logistic regression analysis results

Variable	Odds ratio	95% Confidence Interval	P-value
Age (Years) >4/ <=4	1.79	0.613 – 5.223	0.2968
Influence by other persons on respondent's treatment decision (Yes/ No)	2.14	1.008 – 4.533	0.0475
Respondents' knowledge about cause of malaria (Has knowledge/ does not have knowledge)	1.31	0.622 – 2.751	0.4787
Respondents' knowledge about symptoms of malaria (Has knowledge/ does not have knowledge	0.21	0.036 – 1.189	0.0774
Respondents' knowledge about source of malaria treatment (Has knowledge/ does not have knowledge)	0.58	0.277 – 1.196	0.1386
Perceived severity of malaria illness experienced by respondent (Severe/ mild)	0.88	0.437 – 1.786	0.7307
Status of respondent (child/ Adult)	0.71	0.298 – 1.683	0.434

Among the adult respondents, the use of non-prescribed anti-malaria drugs showed significant correlations using chi-square test with factors similar to that of all 392 respondents with the exception of age and influence by other persons on adult respondents to practice self medication. The predictors of use of non-prescribed anti-

malaria drugs among adult respondents from multiple logistic regression analysis were: adult respondents' knowledge of source of treatment of malaria and time period to start of treatment by adults. Adult respondents who had knowledge about the source of treatment of malaria being to go to health facility were less likely to use non-prescribed anti-malaria drugs than those who did not have that knowledge (odds ratio: 0.38; 95% CI: 0.163 – 0.892). Also adult respondents who started treatment after 24 hours of onset of symptoms were more likely to use non-prescribed anti-malaria drugs than those who started treatment within 24 hours of onset of symptoms (odds ratio: 2.1 95% CI 1.01 – 4.19) as shown in Table 9.

Table 9: Predictors of use of non-prescribed anti-malaria drugs among Adult respondents: A multiple logistic regression analysis result

Variable	Odds ratio	95% confidence interval	P-value
Respondents' knowledge about symptoms of malaria (Has knowledge/ does not have knowledge	0.25	0.052 – 1.175	0.079
Respondents' knowledge about cause of malaria (Has knowledge/ does not have knowledge)	0.60	0.274 – 1.325	0.208
Respondents' knowledge about source of malaria treatment (Has knowledge does not have knowledge)	0.38	0.163 – 0.892	0.026
Time period to start of treatment by respondent (>24 hours< 24 hours)	2.06	1.013 – 4.185	0.046

The use of non-prescribed anti-malaria drugs among all the children respondents showed significant correlations (p-value < 0.05) using chi-square test with factors similar to that of all 392 respondents except respondents' knowledge of symptoms of malaria, knowledge of cause of malaria and time to start of malaria treatment. The predictor of use of non-prescribed anti-malaria drugs among the children respondents from logistic regression analysis was: influence on primary caregivers by other persons to practice self medication. Primary caregivers who were influenced by other people to practice self medication were more likely to use non-prescribed anti-malaria drugs than those who were not influenced (odds ratio: 4.44; 95% CI: 1.220 – 16.103) as shown in Table 10.

Table 10: Predictor of use of non-prescribed anti-malaria drugs among the Children: A multiple logistic regression analysis results

Variable	Odds ratio	95% confidence interval	P-value
Age (Years) >4/ <=4	1.99	0.659 – 6.000	0.222
Influence by other persons on respondents' treatment decision (Yes/ No)	4.44	1.220 – 16.103	0.023
Perceived severity of malaria symptoms experienced by respondents (Severe/ mild)	0.60	0.198 - 1.824	0.368

Among the urban respondents, the predictors of use of non-prescribed anti-malaria drugs from multiple logistic regression analysis were: respondents who were above 4 years of age were more likely to use non-prescribed anti-malaria drugs than those who were below 5 years of age (odds ratio: 5.8; 95% CI: 1.38 – 24.53); respondents who were non-Gurunses were more likely to use non-prescribed anti-malaria drugs than those who were Gurunses (odds ratio: 2.93; 95% CI: 1.00 – 8.58) and respondents who had knowledge on the right source of treatment for malaria being to go the health facility were less likely to use non-prescribed anti-malaria drugs than those who did not have that knowledge (odds ratio:0.05; 95% CI: 0.009 – 0.236).

The predictors of use of non-prescribed anti-malaria drugs among the respondents living in rural residence were: respondents who were not influenced by other persons to practice self medication were less likely to use non-prescribed anti-malaria drugs than those who were influenced (odds ratio: 0.21; 95% CI: 0.06 – 0.71); respondents who had knowledge about the symptoms of malaria were less likely to use non-prescribed anti-malaria drugs than those who did not have that knowledge (odds ratio: 0.06; 95% CI: 0.004 – 0.876) and respondents who had knowledge on the right source of treatment for malaria were less likely to use non-prescribed anti-malaria drugs than those who did not have that knowledge (odds ratio: 0.06; 95% CI: 0.015 – 0.234).