MOTHERS' KNOWLEDGE, PERCEPTIONS AND USE OF ARTEMISININ BASED COMBINATION THERAPY FOR TREATING MALARIA AMONG UNDER-FIVES, IN IBARAPA CENTRAL LOCAL GOVERNMENT AREA, NIGERIA

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DEDICATION

I dedicate this work to my Saviour the Lord Jesus Christ who kept me alive during the course of this project.

ABSRACT

The promotion of Artemisinin – based Combination Therapy (ACT) in Nigeria involving use of Artemisinin – based drugs such as Coartem® is due to the increasing prevalence of Chloroquine resistant malaria. However, the knowledge, perceptions and use of the therapy among mothers of under-fives have not been well explored. This study therefore assessed the knowledge, perceptions and pattern of use of ACT among mothers of under-fives in Ibarapa Central Local Government Area, Oyo State, Nigeria.

The study was a cross-sectional survey of mothers of under-fives who consented to be involved in the study. Igboora and Idere, the two main communities in the LGA were purposively selected. A four- stage random sampling technique was used to select 720 participants from 360 households in the two communities. A validated questionnaire, which included a 36-point malaria and ACT knowledge scale was used for data collection. The data were analysed using descriptive statistics.

The mean age was 29±5.3 years and slightly more than half (50.7%) had primary education. Thirty percents had ever heard about ACT and the most common source of information was healthcare facilities (69.0%). The overall mean knowledge score on malaria and artemisinin-based combination drugs was 6.9±4.8 while the mean knowledge scores by level of education were: non-formal education (5.8±3.6); primary (6.8±4.6); secondary (7.9±5.5) and tertiary education (11.3±6.4). Only 27.0% had ever used Coartem®, the first-line artemisinin- based combination drug in Nigeria. Chloroquine was the first-line drug for treating children with malaria among 59.0% of current ACT users. The reasons adduced for the preference for Chloroquine included ready availability (30.2%), frequent prescription by health workers (27.8%) and low cost (12.4%). The level of formal education of current Coartem® users were: none (17.1%), primary (47.7%), secondary (22.5%) and tertiary education (10.7%). Respondents' pattern of treating children using ACT included doctors' prescription (17.6%); mild fever (4.6%); and onset of malaria symptoms (3.3%). Most current users of Coartem® (90.6%) obtained it from public health facilities. A majority (78.0%) of current ACT users correctly stated how it should be used while 80.0% were of the view that it was more effective compared with Chloroquine. Only 27.0% of participants perceived ACT to be more effective than

Chloroquine and 90.6% considered it affordable. Many (59.0%) of the current ACT users perceived artemisinin-based combination drugs to be readily available. Seventy-eight percent of the current ACT users reported more tolerable side effects of the drug compared with Chloroquine. The level of knowledge of Artemisinin – based Combination Therapy (ACT) was low and use of Coartem® as first-line drug for treating malaria in under-fives is not yet a common practice among nursing mothers in the study area. Advocacy, public enlightenment and social marketing strategies are necessary to address the situation.

Keywords: Mothers, Under–fives, Malaria, Artemisinin-based Combination Therapy.
Word Count: 445

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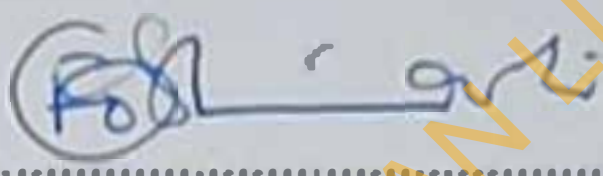
CERTIFICATION

I certify that this study was carried out by ADEKUNLE Oludayo Osuolale in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.



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ABBREVIATIONS

AA	Artesunate and Amodiaquine combination
ACT	Artemisinin-based combination Therapy
AFRO	WHO African region
AL	Artemether-lumefantrine combination
APPGM	All Party Parliamentarian Group on Malaria
CATMAT	Canadian Committee to Advice on Tropical Medicine and Travel
CDC	Centre for Disease Control
CQ	Chloroquine
DDT	Dichloro-diphenyl-trichloroethane
FMOH	Federal Ministry of Health
GFATM/GF	Global Fund to fight AIDs, Tuberculosis and Malaria
HIV	Human Immuno Virus
AIDS	Aquired Immuno Deficiency Syndrome
IPT	Intermittent Preventive Therapy
IRS	Indoor Residual Spray
ITN	Insecticide Treated Nets
LLIN	Long Lasting Insecticide Treated Nets
NMCP	National Malaria Control Programme
PAHO	WHO Region of the American (Pan American Health organization)
PMI	President's Malaria Initiative
RBM	Roll Back Malaria
RMM	Role Model Mothers
SEARO	WHO South East Asian Region
UNDP	United Nations Development Programme
UNICEF	United Nations Children Education Fund
USAID	United States Agency for International Development
WB	World Bank
WHO	World Health Organization

WHOPES	World Health Organization Pesticide Evaluation Scheme
WMR	World Malaria Report
WPRO	WHO Western pacific Region

CHAPTER ONE

INTRODUCTION

Background

Malaria is a life threatening parasitic disease characterized by fever and related symptoms such as headache, vomiting and others. It has been one of the most prevalent human diseases affecting the population of poor tropical climates in Africa, Asia and Latin America [(RBM/WHO 2006a), Hinton, Auwun, Pongua, Olive, Davis, Harin.Karunajeewa.John,Reeder,2007]. In 1880, scientists found that the real cause of malaria is a unicellular organism called *Plasmodium*. Later it was discovered that the parasite is transmitted from person to person through the bite of the female Anopheles mosquito, in the course of sucking blood to nurture her eggs [Centre for Disease and Control (CDC), 2004; Medical Encyclopedia, 2007; Kakkilaya, 2006].

The disease was once widespread worldwide but it was successfully eliminated from many temperate countries in the mid 20th century. Malaria has since re-emerged as a major disease burden in developing countries. Today, malaria is found throughout the tropical and sub-tropical regions of the world. It causes more than 300 million acute illnesses and at least one million deaths annually (UNICEF 2007a; RBM/WHO 2006a; Adeyemi, 2009). In Sub-Saharan Africa, deaths due to malaria declined dramatically over most of the 20th century, falling from 223 per 100 000 in 1900 to 107 per 100 000 in 1970. Since 1970 however, mortality rates have risen, accelerating to 165 per 100 000, roughly reversing in 30 years half of the gains achieved over the century (UNICEF 2007a; RBM/WHO, 2006b). One of the reasons for the increase in malaria mortality is genetic mutation of the malaria parasite, Plasmodium falciparum, thus enabling it to resist anti-malarial drugs (Meremikwu, Alaribe, Ejemot, Ekenjoku, Nwachukwu, Ordu, Ezedinachi, 2006; Adeyemi, 2009).

An estimated two billion people (over 40% of the World population) live in areas or countries that are at risk of malaria (RBM/WHO 2006b).It is estimated that malaria

causes 300 to 500 million clinical cases, and about two million deaths worldwide each year, with 80 to 90% of the clinical cases and one million deaths occurring in Africa alone (CDC, 2004). The global annual incidence is more than 300 million acute illnesses. According to World Malaria Report (WHO, 2008) there were an estimated 247 million malaria cases among 3.3 billion people at risk in 2006, causing nearly a million deaths, mostly of children under 5 years. The report also revealed that 109 countries were endemic for malaria in 2008, 45 within the WHO African region making it one of the world's leading killers (WHO, 2008).

Malaria remains a major public health problem in many endemic countries and is one of the major causes of morbidity and mortality in sub-Saharan Africa. It considerably affects the health of children, increasing susceptibility to other infections and hampering their development. Even non-fatal cases have severe consequences (Kakkilaya, 2008). Not only this, malaria contributes to child malnutrition, an underlying cause in more than half of deaths among children under age five globally. Although the precise causal links are unclear, nutritional status is affected by vomiting and appetite suppression during bouts of malaria and by malaria-related anaemia. (UNICEF, 2007).

In Nigeria malaria is one of the five leading causes of out- patient visits for children (FMOH, 2005). The other causes are malnutrition, diarrhea, acute respiratory infections and measles. Approximately, 70% of one year old children have malaria parasites in their blood (WHO, 2006c). The disease remains one of the leading causes of mortality and morbidity, and accounts for about 63% of all clinics attendances, which are potentially preventable (FMOH, 2005). It has been estimated that about 32% of children under 5 years old were found to have malaria parasite in their blood (Okogun and Amadi, 2005; FMOH, 2001). The true burden of the infection could be much higher because malaria often occurs in combination with other childhood diseases such as pneumonia and diarrhea (Howard, 1994).

In Nigeria, transmission of the disease is relatively stable as it turns high and continuous all the year round in many parts. The ecological conditions also favour reproduction and

longevity of the anopheles mosquito making the disease difficult to eradicate (FMOH. 1991 and Sickette, 1992).

With respect to prompt and effective treatment, Artemininisinin based Combination Therapy, (ACT) a new and highly effective treatment against *Plasmodium falciparum* has been introduced and it is expected to improve treatment outcome (WHO, 2006). The combination of tools and methods to combat malaria now includes long-lasting insecticidal nets (LLIN) and ACT, supported by indoor residual spraying of insecticide (IRS) and intermittent preventive treatment in pregnancy (IPT). Despite increases in the supply of mosquito nets, especially of LLINs in Africa, the number available in 2006 was still far below need in almost all countries. The procurement of antimalarial medicines through public health services has also increased sharply, but access to treatment, especially with ACT, is inadequate in many countries surveyed (WHO. 2008).

Early diagnosis and effective treatment constitute the corner stone of the current control strategies in the global fight against malaria (FMOH, 2005; Adeyemi. 2009; UNICEF, 2007). There is growing consensus that artemisinin- based combination therapies (ACTs) are the best treatment for uncomplicated falciparum malaria (WHO. 2001). They have proved to be highly efficacious, rapidly effective, and have few side effects in extensive clinical trials (Meremkwu, 2006; WHO. 2006). There have been more clinical trials on artemisinin and its derivatives, either alone or in combination, than with any other antimalarial drugs (Myint et al. 2004). Artemisinin- based combination therapies delay the emergence and spread of resistance and reduces the transmission of falciparum malaria in low transmission settings (Price et al. 1996; Brockman et al. 2000). Despite this, the majority of malaria affected countries still retain Chloroquine or Sulfadoxine-Pyrimethamine (SP) as their nationally recommended treatment, although there is abundant evidence that these drugs are ineffective (Mutabingwa et al. 2004; Sowunmi, Fehintola, Adedeji, Gbotosho, Tambo, Falcye, Happi, Oduola, 2005).

For Nigeria, in adapting and implementing combination therapy, WHO provides technical cooperation to Federal Ministry of Health (FMOH) on all aspects of national treatment policy changes. This is essentially to monitor the therapeutic efficacy of

medicines, updating, implementing and monitoring of ACT based treatment policies (WHO/RBM, 2006). The major treatment modality recommended by WHO and promoted by FMOH, Nigeria is the use of Artemether/lumerfaultrine, Coartem®. This is the only AL medicine prequalified by the World Health Organization and adopted by FMOH for the treatment of uncomplicated malaria but it is readily available in solid dosage forms (tablet) especially in the urban settings. This of course, may not be too acceptable to children especially the under-fives. It is also quite expensive and this makes it inaccessible to the poor (Meremikwu *et.al*, 2006). Where the tablet is compounded to liquid dosage form and is taken in correct dose, it has been proven to be very effective with minimal side effects for young children if taken in correct dosage (WHO/RBM, 2005).

In Africa, access to artemisinin-based combination medicines among children in need was only 3% (WHO, 2008). In an attempt to make ACT related medicines accessible to the mothers and other care givers at home level, the National Malaria Control Programme (NMCP) has to adopt the use of Role Model Mothers (RMM) as one of its intervention packages in the home management of malaria. This is to support community caregivers in the treatment of malaria and to enhance the availability of antimalarial medicines and commodities. Yet little or no attention has been paid to the mothers especially those that are still nursing the under-fives as regards their knowledge, perceptions and pattern of use of Artemisinin based Combination Therapy (ACT) in the treatment of malaria. This is in spite of the fact that perceptions and related concepts such as opinions, beliefs and attitudes, influence people's health seeking behaviours or practices (Green and Kreuters, 1999).

In the face of worsening antimalarial drug resistance and the need for countries to change to the implementation of effective treatment policies, there has been a renewed interest in patient adherence, drug effectiveness and increase in the number of ACT related studies. These studies have spanned across a range of disciplines, including social science investigations that seek to understand health beliefs and behaviours, biomedical studies documenting patient 'adherence' to treatment regimens, and operational research studies examining the effect of specific interventions (WHO.2001).

In this study, the focus is on mothers' knowledge, perceptions and use of ACT related medicines for treating malaria in under-fives in Ibarapa Central Local Government, Oyo state of Nigeria. These issues are important antecedent factors which have high potential for influencing the adoption of innovations including ACT.

Statement of the problem

Malaria accounts for one in five of all childhood deaths in Africa. (WHO, 2006). Anaemia, low birth weight, febrile convulsion and neurological problems, which are common complications of malaria, compromise the health and development of millions of children throughout the tropical world, including Nigeria (WHO/RBM, 2006). The National Survey conducted by the FMOH, in 2000, showed that home management of malaria in under-fives was very common in both rural and urban communities with or without health facilities. Home management tops the list of the actions taken during illness in under-fives. It was also confirmed by another study carried out in South Western Nigeria that home management of childhood malaria is very common (Brieger, Ramakrishna, Adeniyi, 1986).

The main factors contributing to the increasing malaria mortality and morbidity is the widespread resistance of *Plasmodium falciparum* to conventional anti-malaria drugs, such as chloroquine (CQ), sulphadoxine- pyrimethamine (SP) and amodiaquine (WHO/RBM, 2006). Drug-resistant malaria, thought to have originated in South-east Asia, has spread across Africa, Asia and South America over the past four decades. Its impact is greatest in Africa and in parts of Asia, especially where the deterioration of health infrastructure has exacerbated the effects of inadequate treatment (WHO, 2001). Experiences from South-east Asia show those malaria parasites are resistant to almost all antimalaria drugs, with the exception of drug combinations containing derivatives of artemisinin. Already, resistance to artesunate-mefloquine, ACT related medicine has been reported in Thailand-Cambodian borders (WHO, 2008).

The ACT drugs are being increasingly deployed on a large scale in the management of malaria. (WHO/RBM, 2006). They produce a very rapid therapeutic response and are very active against multidrug resistant *Plasmodium falciparum* with very high cure rate

similar to that of Chloroquine 30 years ago. (WHO/RBM. 2006; Malenga, 2006). However, cost is the primary problem with the use of ACT. The least expensive treatment courses currently cost more than US $1 which is several times more than the cost of chloroquine monotherapy (Yeung, Van Damme, Socheat, White, Mills, 2008; Melinga *et. al.*, 2006).

Advocacy interventions to government and non-governmental organizations are already being employed to reduce the cost of ACT so that it can be affordable and accessible to the poor (majority of whom are rural dwellers) with a view to saving the lives of children and other groups who are most vulnerable to the disease. There is however, dearth of information in the level of knowledge and perceptions of ACT related drugs among nursing mothers. Moreover, little is known about knowledge and pattern of use of the new drugs especially among mothers of under-fives in rural communities in Oyo state.

This study focuses on mothers' knowledge, perceptions and use of Artemisinin Based Combination Therapy for the treatment of malaria in the under-fives in Ibarapa Central Local Government Area, a largely rural setting in Oyo state.

Justification of the study

The study has been designed to extensively explore such factors that will facilitate or frustrate the relevance of ACT drugs in the treatment of malaria, especially among the under-fives. Such factors include the knowledge of the mothers themselves on malaria disease and the malaria medicines especially the ACT drugs; the pattern of application of these medicines in the treatment of malaria and their perceptions on the effectiveness and availability of the medicines. The findings of this study will therefore be very useful:

1. In the design of educational materials for the social marketing of the new antimalarial treatment policy and the artemisinin –based drugs.

2. In constituting useful baseline information for the design and implementation of other educational interventions aimed at promoting the use of ACT among under-five care givers in rural settings.

3. In determining effective package of incentives for the rural women in order to encourage and promote prompt treatment of malaria among children within 24 hours of the onset of the disease.

1.4 Broad objectives

To determine mothers' knowledge, perceptions and use of Artemisinin Based Combination therapy for treating malaria in under-fives in Ibarapa Central Local Government Area.

1.4.1 Specific objectives

The specific objectives were to:

Determine the level of knowledge of mothers about malaria and the use of ACT in the under-fives. Determine the types and sources of drugs used by mothers for the management of malaria in under-fives.

Document the pattern of use of ACT in managing under-5 children with malaria by mothers. Document the attitudes and beliefs of mothers regarding the use of ACT medicines for the treatment of malaria in their under-fives.

1.5 Research questions

1. What is the level of knowledge of mothers about malaria and anti-malaria medicines among mothers?
2. What are the types and sources of drugs used by mothers for the management of malaria in under-fives?
3. What is the pattern of use of ACT medicines in managing under-fives with malaria?
4. What are the attitudes and beliefs of mothers relating to the use of ACT medicines for the treatment of malaria in the under-fives?

CHAPTER TWO

LITERATURE REVIEW

2.1 Malaria- a historical overview, its control and prevention

Malaria is probably one of the oldest diseases known to mankind that has had profound impact on the history of the human race (Kakkilaya, 2006). According to Kakkilaya, man and malaria seem to have evolved together and it is believed that most, if not all of today's population of human malaria might have had its origin in West and Central Africa (*P.falciparum*) and West and Central Africa (*P.vivax*) on the basis of the presence of homozygous alleles for hemoglobin C and Red Blood Cells (RBC) Duffy negativity that confer protection against *Plasmodium falciparum* and *Plasmodium vivax* respectively. If not for malaria, the outcomes of many wars and destinies of many kings would have been different. It has been responsible for the decline of nations and crushing military defeats. The disease has often caused more casualties than the weapons of war Kakillaya, 2006). For centuries, malaria prevented economic developments in vast regions of the earth. It continues to be a huge social, economic and health problem, particularly in the tropical countries. The history of malarin and its terrible effects are as ancient as the history of civilization or the history of mankind itself (Kakilaya, 2006).

The symptoms of malaria were described in ancient Chinese medical writings. In 2700 BC, several characteristic symptoms of what were later associated with malaria were described in the *Nei Ching*, The Canon of Medicine. *Nei Ching* was edited by Emperor Huang Ti. Malarin became widely recognized in Greece by the 4th century BCE, and it was responsible for the decline of many of the city-state populations [Centre for Disease Control (CDC), 2004)]. Hippocrates noted the principal symptoms of malaria during his time. By the age of Pericles, there were extensive references to malaria in the literature and depopulation of rural areas as a result of malaria was recorded. In the *Susruta*, a Sanskrit medical treatise, the symptoms of malarial fever were described and attributed to the bites of certain insects (CDC, 2004).

Malaria was at a point linked with poisonous vapours of swamps or stagnant water on the ground (Kakkilaya, 2006; CDC, 2004). This probable relationship was so firmly established that it gave the two most frequently used names to the disease *mal'aria*, later shortened to one word *malaria*, and *paludisme*. The term malaria (from the Italian *mala* "bad" and *aria* "air") was used by the Italians to describe the cause of intermittent fevers associated with exposure to marsh air or miasma. The word was introduced to English by Horace Walpole, who wrote in 1740 about a "horrid thing called mal'aria that comes to Rome every summer and kills one." The term *malaria*, , evolved into the name of the disease only in the 20th century. Up to that point the various intermittent fevers had been called jungle fever, marsh fever, paludal fever, or swamp fever. (Kakkilaya, 2006).

Charles Louis Alphonse Laveran, a French army surgeon stationed in Constantine, Algeria, was the first to notice parasites in the blood of a patient suffering from malaria. This occurred on the 6th of November 1880. For his discovery, Laveran was awarded the Nobel Prize. However, the different species of malaria were identified and differentiated by Camillo Golgi, an Italian neurophysiologist, in 1886. He established that there were at least two forms of the disease, one with tertian periodicity (fever every other day) and one with quartan periodicity (fever every third day). He also observed that the different forms of these diseases were characterized by differing numbers of merozoites (new parasites) upon maturity and that fever coincided with the rupture and release of merozoites into the blood stream. He was awarded a Nobel Prize in Medicine for his discoveries in neurophysiology in 1906 (CDC, 2004).

Further work continued regarding the identification and the naming of the human malaria parasites up till 1922. (CDC, 2004). The Italian investigators Giovanni Batista Grassi and Raimondo Filetti first introduced the names *Plasmodium vivax* and *Plasmodium malariae* for two of the malaria parasites that affect humans in 1890. Laveran had believed that there was only one species, *Oscillaria malariae*. An American, William H. Welch, reviewed the subject and, in 1897, he named the malignant tertian malaria parasite, *Plasmodium. falciparum*. There were many arguments against the use of this name; however, the use was so extensive in the literature that a change back to the name given by Laveran was no longer thought possible (CDC, 2004). In 1922, John William

Watson Stephens described the fourth human malaria parasite, *Pasmodium ovale*. (CDC, 2004).

On August 20th, 1897, Ronald Ross, a British officer in the Indian Medical Service, was the first to demonstrate that malaria parasites could be transmitted from infected patients to mosquitoes (Kakkilaya, 2006). In his work with bird malaria, Ross showed that mosquitoes could transmit malaria parasites from bird to bird. This necessitated a sporogonic cycle (the time interval during which the parasite developed in the mosquito). Thus, the problem of malaria transmission was solved. For his discovery, Ross was awarded the Nobel Prize in 1902. It was between 1898 and 1899 that the transmission of the human parasites, *Plasmodium* was actually discovered. (CDC, 2004). A team of Italian investigators, led by Giovanni Batista Grassi which included Amico Bignami and Giuseppe Bastianelli, collected *Anopheles claviger* mosquitoes and fed them on malarial patients. The complete sporogonic cycle of *Plasmodium falciparum, Plasmodium vivax,* and *Plasmodium malariae* was demonstrated. In 1899, mosquitoes infected by feeding on a patient in Rome were sent to London where they fed on two volunteers, both of whom developed benign tertian malaria (CDC, 2006).

In the early part of the century, malaria probably accounted for 10% of global deaths and in India it probably accounted for over half. A list of some of the famous human beings who died or suffered from a health condition believed to be malaria at the time they occurred is presented in table 2.1

Table 2.1: Great personalities suspected to have been affected by malaria in history

S/N	Personalities	Period and circumstance of illness
1	Alexander the Great	died in 323BC, enroute to India beyond Mesopotamia
2.	St. Augustine the first Archibishop of Canterbury	died after a 10 day febrile illness
3.	Otto ii. King of the Germans and emperor of Rome	died of malaria on 7th Dec., 983.
4.	Heinrich, German king and Holy Roman Emperor	died of malaria in 1197
5.	Danta, an Italian Poet	died of malaria in 1321.
6	Byzanthine Emperor, Andronicus iii Palaologus	died of malaria in 1341
7	Minas, Ethiopian Emperor	died in 1563.
8	Oliver Cromwell, Lord protector	died of malaria in 1658
9	Lord Bryon	died in Greece in 1824.
10	Joseph Ressel, inventor of the propeller	died in 1857 of malaria
11.	Pope Leo x	died of malaria in 1521
12	Giambattista Castana was elected Pope Urban vii in 1590	died of malaria before his coronation

Source: Information compiled from Kakkilaya (2006) available at http://www.malariasite

2.2 History of Malaria Control

According to the Centre for Disease Control and Prevention of the United States of America (CDC,2006), the Qinghao plant (*Artemisia annua*) was first described in China by the medical treatise, *52Remedies*, during the second century BCE, found in the Mawangdui Tomb. In the United States, this plant is known as the annual or sweet wormwood. In 340 CE, the anti-fever properties of Qinghao were first described by Ge Hong of the East Yin Dynasty. The active ingredient of Qinghao was isolated by Chinese

scientists in 1971, known as Artemisinin, it is today a very potent and effective antimalarial drug, especially in combination with other medicines. This concept which is now globally refered to as Artemisinin-based Combination Therapy (ACT) is the current basic principle for the management of uncomplicated malaria cases in all malarious regions of the world.(WHO,2006; CDC 2004).

Before the advent of Artemisismn combination –related drugs, the control of malaria disease has evolved through diverse interventions and strategies. These predominantly included the discovery and application of insecticidal chemicals like Dichloro-diphenyl-trichloroethane (DDT) in 1939 and oral antimalarial medicines such as Quinine, Chloroquine, Sulphadoxine- pyrimethamine (sp), Amodiaquine, Halofantrine, Mefloquine, etc.

Quinine was discovered in the early 17th Century. Spanish Jesuit missionaries in South America learned of the medicinal bark from indigenous Indian tribes. With this bark, the Countess of Chinchón, the wife of the Viceroy of Peru, was cured of her fever. The bark from the tree was then called *Peruvian bark* and the tree was named Cinchona after the countess. The medicine from the bark is now known as, Quinine. Along with Artemisinin, Quinine is one of the most effective antimalarial drugs available today (CDC, 2006). In fact, it is the second line medicine adopted for the treatment of uncomplicated malaria in Nigeria today. (FMOH, 2005). Chloroquine was another anti-malaria drug that was discovered after Quinine. It was discovered by a German, Hans Andersag, in 1934 at Bayer I.G. Farbenindustrie A.G. laboratories in Eberfeld, Germany who named it *Resochin*. In the middle of all the lapses and confusion brought about during the Second World War, Chloroquine was finally recognized and established as an effective and safe antimalarial in 1946 by British and United State scientists (CDC, 2004). Chloroquine still remained first line drug of choice especially in Nigeria, until 2004, when its resistance by Plasmodium parasite was evidently confirmed. (FMOH, 2005; Park, 2009).

German chemistry student, Othmer Zeidler, synthesized DDT in 1874 for his thesis. The insecticidal property of DDT was not discovered until 1939 by Paul Müller in

Switzerland. Various militaries in World WarII (WWII) utilized the new insecticide initially for louse-borne typhus. The chemical was used for malaria control at the end of WWII after it had been proven to be effective against malaria-carrying mosquitoes by British, Italian. and American scientists. Müller won the Nobel Prize for Medicine in 1948. (CDC, 2004, Adeyemi, 2009).

House spray application of DDT among other interventions in the United States eventually resulted into a successful eradication of malaria between 1947 and1951. The National Malaria Eradication Program of United States, a cooperative undertaking by state and local health agencies of 13 Southeastern states and the CDC, originally proposed by Louis Laval Williams. commenced operations on July 1, 1947. By the end of 1949, over 4,650,000 house spray applications had been made. In 1947, 15,000 malaria cases were reported. By 1950, only 2,000 cases were reported. By 1951, malaria was considered eradicated from the United States (CDC, 2004).

Following the success of DDT. the advent of less toxic, more effective synthetic antimalarials, and the enthusiastic and urgent beliefthat time and money were of essence. the World Health Organization (WHO) submitted at the World Health Assembly in 1955 an ambitious proposal for the eradication of malaria worldwide. Eradication efforts began and focused on house spraying with residual insecticides, antimalarial drug treatment. and surveillance. These processes were carried out in four successive steps: preparation, attack. consolidation, and maintenance. Successes included eradication in nations with temperate climates and seasonal malaria transmission. Some countries such as India and Sri Lanka had sharp reductions in the number of cases, followed by increases to substantial levels after efforts ceased. Other nations had negligible progress (such as Indonesia. Afghanistan, Haiti, and Nicamgua CDC. 2004) Some nations were excluded completely from the eradication campaign (most of sub-Saharan Africa including Nigeria). The emergence of drug resistance, widespread resistance to available insecticides, wars and massive population movements, difficulties in obtaimng sustained funding from donor countries. and lack of community participation made the long-term maintenance of the effort untenable. (CDC 2004, Kakkilaya, 2006).

2.3 Geography, epidemiology and burden of malaria

2.3.1 The geography of Malaria

The geography of an area plays a key role in the epidemiology of a disease. Malaria is found in regions lying roughly between latitude 60^0 N and 40^0 S. It is still commonly found throughout most of Africa, the Middle East, South East Asia, the Western Pacific and South America. (Lucas and Gilles, 2003). Malaria is transmitted in tropical and subtropical areas, where: *Anopheles* mosquitoes can survive and multiply and where malaria parasites can complete their growth cycle in the mosquitoes ("extrinsic incubation period"). Temperature is particularly critical. For example, at temperatures below 20°C (68°F), *Plasmodium falciparum* cannot complete its growth cycle in the *Anopheles* mosquito, and thus cannot be transmitted.

According to CDC (2004) certain conditions hinder the transmission of malaria whether in the tropical or subtropical areas. These are high altitudes, cooler seasons and desert environments (excluding the oases). There are some islands in the Pacific Ocean, which have no local *Anopheles* species capable of transmitting malaria, and also some countries where transmission has been interrupted through successful eradication. Generally, in warmer regions closer to the equator, transmission of malaria will be more intense malaria will be transmitted year-round and *P. falciparum* predominates as causative agent of malaria.

The highest malaria transmission occurs in Africa, South of the Sahara. In cooler regions, transmission will be less intense and more seasonal. In these areas *P. vivax* might be more prevalent because it is more tolerant of lower ambient temperatures (Kakkilaya, 2006; CDC, 2004). In many temperate areas, such as Western Europe and the United States, economic development and public health measures have succeeded in eliminating malaria. However, most of these areas have *Anopheles* mosquitoes that can transmit malaria, and reintroduction of the disease is a constant risk or possibility (CDC 2004; Parks, 2009).

In Nigeria, malaria is a "stable" type where transmission is high and continuous all the year round (FMOH, 2005). The ecological conditions which favour the reproduction and longetivity of the life span of *anophelies* mosquito makes the eradication of the disease a challenging task. (FMOH, 1991; Stekette, 1992). Malaria is endemic in Nigeria throughout the whole country (FMOH, 2004). 50% of the population will have at least one attack yearly. The prevalence of the disease is highest during the raining season. This is as a result of availability of suitable breeding places provided in water logged holes and containers, blocked drainage pipes holding water, etc (FMOH,2005).

2.3.2 Epidemiology of Malaria

It is estimated that 3 billion people, almost half the world's population, live in areas where malaria transmission occurs. Malaria is endemic in 109 countries and territories in tropical and subtropical regions of the world, with sub-Saharan Africa being the region that is most affected. [(Depoortere, Guthmann, Sipilanyambe, Nkandu, Balkan and Legros, 2004); WHO, 2001; UNICEF, 2007)].

It has also been documented by the Roll Back Malaria unit of WHO that over 40% of the world's children live in malaria-endemic countries (WHO, 2006). Estimates show that 350 - 500 million cases of clinical malaria occur each year, leading to an estimated one million deaths. Nigeria topped the list of 19 African countries estimated to have 90% of malaria cases in the year 2006 (WHOa, 2008). It has been revealed that over 80 per cent of these deaths occur among African children under age five infected with Plasmodium falciparum.(Unicef,2007) Apart from sub-Saharan Africa, malaria transmission occurs in New Guinea; in large areas of Southern Asia; in parts of Southeast Asia, Oceania, Haiti, and Central and South America; and in limited areas of Mexico, the Dominican Republic, North Africa and the Middle East [Canadian Committee to Advise on Tropical Medicine and Travel (CATMAT), 2004].

According to WHO classification, the 109 countries and territories classified as endemic, or previously endemic with potential for re-emergence of malaria, fall into four groups. The four groups describe the transition from control to elimination. The countries fall into

the control, pre-elimination and elimination groups as well as group involved in prevention of re-introduction (WHO, 2008). Most sub- Saharan African countries including Nigeria are still at the level of control. In January 2007, the United Arab Emirates was the first formerly-endemic country since the 1980s to be certified malaria-free by WHO, bringing the total number of malaria-free countries/territories to 92 (WHO, 2008).

The rapid spread of resistance to antimalarial drugs, coupled with widespread poverty, weak health infrastructure and systems in many countries of Africa, civil unrest, means that mortality from malaria in Africa continues to rise. The tragedy of it all is that the vast majority of these deaths are preventable (WHO, 2006).

There are four identified species of this parasite causing human malaria, namely: *Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium ovale* and *Plasmodium vivax*. The most common species of Plasmodium are *P. vivax* and *P falciparum* while the latter is the most deadly type of malaria infection. Plasmodium falciparum malaria is also the most common in sub-Saharan Africa, South of the Sahara, accounting in large part for the extremely high mortality in this region. (Lucas and Gilles.2003; WHO, 2006). There are fears of the spread of *P. falciparum* malaria into regions of the world and its reappearance in areas where it had been eliminated. (CDC, 2004; WHO, 2006).

In Nigeria, 98% of all cases of malaria is due to *Plasmodium falciparum* and this is the specie that is responsible for the severe form of the disease that leads to death. (FMOH, 2005). The symptoms of the disease are non-specific, and usually diagnosis is not possible without a blood film. (CCAMAT, 2004). Clinically, on a general note, the disease is characterized by "flu-like" symptoms that appear 9-14 days after an infectious mosquito bites. Initial symptoms include fever, myalgias, headache, abdominal pain, and malaise. Vomiting, diarrhoea, rigors and chills often occur. Basically, malaria is classified into two: Uncomplicated and Severe malaria. Uncomplicated malaria is the type of malaria that has no life threatening manifestations. Its key symptoms include fever and "flu-like" symptoms such as headache, pain and malaise. Rigours and chills

also often occur. This kind of malaria would graduate into severe type when it is not diagnosed early enough and treated promptly (FMOH, 2005). It must be noted that the symptoms of a disease are the major complaints of the ill person or the observation of the care givers such as headache, bodypains and even high temperature whereas; signs of a disease are the clinical findings of the health workers after examining the ill person. The severe malaria type is the form of malaria which occurs when there is *P. falciparum* asexual parasitaemia and no other confirmed cause of their symptoms with the presence of life threatening clinical or laboratory features (FMOH, 2005). Cases of severe malaria are defined as children with parasitaemia confirmed by blood film microscopy and any of the WHO case definitions for severe malaria was documented (Orimadegun, Fawole, Okereke, Olukayode, Akinbami and Sodeinde, 2007). The common clinical characteristics of severe malaria include seizures, coma, renal and respiratory failure, and may lead to death, if it is not promptly treated (UNICEF, 2007). The poorest populations are most at risk, and the severe form of the disease most often strikes young children, women who lose their acquired immunity to malaria during pregnancy and people who lack any immunity to the disease, such as refugees and migrant workers moving into malaria-endemic zones from areas where there is little malaria (All Party Parliamentarian Group on Malaria (APPGM, 2006)). On a national scale, malaria is the most common cause of inpatient admissions and outpatient attendances in most African countries. In many rural areas of sub-Saharan Africa, malaria transmission is intense. Almost everyone is infected almost all of the time in these areas, and are constantly exposed to re-infection.

Many children get infected with malaria for the first time well before their first birthday, and they suffer repeated bouts of illness as they grow up. Left untreated, these bouts often become severe, and are too often fatal (APPGM, 2006; WHO, 2006). Children are highly vulnerable, with under-fives accounting for almost 90% of deaths due to malaria. Older children and adults in these high transmission areas acquire a partial immunity to malaria through repeated exposure to the parasite over a period of time, and develop only milder forms of the disease. Those who survive initial infections live to acquire partial immunity

later in childhood. In sub-Saharan Africa, one out of six infants will never reach his or her fifth birthday (APPGM, 2006).

Malaria accounts for almost one fifth of these deaths, and is often a greater killer of African children than diarrhoea, respiratory disease or HIV/AIDS (WHO, 2006). As well as causing sickness and death of children; is also thought to have a significant negative impact on intellectual development, with 50,000 new cases per year of direct neurological damage caused by cerebral malaria infection. Recent evidence suggests that some children who appear to have made a complete neurological recovery from cerebral malaria may develop significant cognitive problems (attention deficits, difficulty with planning and initiating tasks, speech and language problems), which can adversely affect school performance (WHO/RBM, 2006).

Another vulnerable group are pregnant women who, especially with their first child, lose their acquired partial immunity to malaria. The damage caused by malaria during pregnancy is thought to account for 200,000 deaths of infants and 35% of babies with preventable low- birth weight. Malaria also causes almost half a million episodes of severe anaemia in pregnancy, and an estimated 10,000 maternal deaths per year. (APPGM, 2006; WHO, 2006). In a study conducted in Ibarapa Local Government Area of Oyo state in 1986, malaria was one of the several common ailments in the community (Brieger, Ramakrishna and Adeniyi, 1986).

Given the varying epidemiological patterns of malaria transmission world wide, efforts to reduce the malaria burden need to be tailored to the local context (UNICEF/RBM, 2007). The epidemiology of malaria is known to be determined by four factors. These factors are related to environmental, vectorial, parasite and host factors characteristics. Their interplay determines the two polar epidemiological extremes of the disease -stable and unstable malaria.

The environmental factors include temperature, humidity, rainfall and altitude. All these affect the transmission of malaria. *Plasmodium falciparum* requires a minimum temperature of 20^{0} C to develop in the female mosquito, while the other species of human

malaria parasites can develop in temperatures as low as 16^0 C (Lucas & Gilles, 2003). A relatively high humidity is required for the survival of adult vectors while rainfall is essential to provide breeding sites. (Lucas & Gilles, 2003).

Vectorial factors are determined by the availability of female anopheles mosquitoes. Malaria is transmitted from man to man by the female anopheles mosquito, one of the most capable vectors of human disease, (Lucas and Gilles, 2003; Kakkilaya, 2006). Various species have been found to be the vectors in different parts of the world. *A. gambiae* complex is the chief vector in Africa and *A. freeborni* in N. America. Nearly 45 species of the mosquito have been found in India and *A. culicifacies, A. fluviatilis, A. minimus, A. philippinensis, A. stephensi, A. sundaicus, and A. leucosphyrus* have been implicated in the transmission of malaria. The areas of distribution are different for these mosquitoes: *A. fluviatil and A. minimus* are found in the foot-hill regions, *A. stephensi, A. sundaicus* are found in the coastal regions, *A. culicifacies* and *A. philippinensis* are found in the plains. Species like *A. stephensi* are highly adaptable and are found to be very potent vectors of human malaria, (Kakkilaya, 2006).

Thirty-seven (37) *Anopheles* species with varying behaviours have been documented in Nigeria (FMOH, 2005; UNPD, 2002). Some species are anthrophilic, while others are zoopbilic (prefer animal blood). Some *anopheles* species prefer to bite indoors (endophagy), and others outdoors (exophagy); some prefer to rest during the day indoors (endophily), while others prefer outdoors (exophily). *Anopheles* mosquitoes enter the house between 5 p.m. and 9.30 p.m. and again in early hours of morning. They start biting between dusk and dawn by late evening and the peak of biting activity is at midnight and early hours of morning (Kakkilaya, 2007). They generally choose well oxygenated water rather than stagnant polluted pools to lay their eggs. (Lucas & Gilles, 2003) Mosquitoes can fly up to several kilometers and they can reach far off places by taking shelter in motor vehicles, ships and aircraft. This explains why malaria is a key aspect of environmental health. The average life span of a mosquito is 2-3 weeks. It can be longer in ideal living conditions (Kakkilaya, 2007)

The parasite factors concerns mainly the species of *Plasmodium* that is implicated in the community and their effect on man. The pre-potency period (time from infection to appearance of parasitaemia) is shortest in *P. falciparum*, (6 – 25 days) and longest in *P. malariae*, (18 – 59 days). The time of appearance of gametocytes in the peripheral blood after the initial asexual parasitaemia occurs simultaneously in *P. vivax* but not until 8 – 15 days in *P. falciparum*. (Lucas & Gilles, 2003).

The main variables of the human element that have an influence on malaria epidemiology include the following: Age, Sex, Race, Pregnancy, Socio-economic development, habits, housing, population, and immunity (Lucas and Gilles, 2003; Parks, 2009). Malaria affects all ages. Newborn infants have considerable measure of immunity to infection with *P.falciparum*. This has been attributed to the high concentration of foetal haemoglobin during the first few months of life which suppresses the development of the parasite.

Individuals with AS haemoglobin (sickle cell trait) have milder illness with *falciparum* malaria than those with normal haemoglobin (AA). Persons whose red blood cells are 'Duffy negative' (a genetic trait) are resistant to *Plasmodium vivax* infection. Pregnancy increases the risk of malaria in women. Malaria during pregnancy may cause intra uterine death of the foetus. It may also cause premature labour or abortion. People migrate for one reason or another within the country or from one country to another. Labourers connected with various engineering: irrigation, agriculture and other projects and periodic immigration of nomads and other wandering tribes are outstanding examples.

Habits such as sleeping out of doors, nomadism, refusal to accept spraying of houses are few examples of behaviours that make people vulnerable to malaria. In endemic malarious countries, a state of collective immunity becomes established slowly, such that infants, young children, non- immune travelers from non endemic countries suffer most from the disease (Park, 2009).

2.3.3 The burden including consequences of malaria in children

The malaria burden on the country is not just on individuals and the health sector, it is on the entire infrastructure and systems of the country that has to deal with the disease. The

health sectors, given their limited resources, are essentially swamped by the disease. It has been confirmed that malaria reduces Africa's GDP by about 1.3 percent per year (Ridley, 2001). Malaria is confined to the tropics. The main disease burden is in Africa. Malaria burden has also been linked to poverty. The world map showing poverty striken nations especially in Africa almost exactly overlaps the map of the malaria index. Malaria is very prominent in the poverty stricken nations. It is not just that poverty causes malaria. Malaria also feeds back into poverty. The disease makes the population to be less productive, and the economy suffers, the wealth of the country is also adversely affected, so health and wealth are inextricably linked. The overall burden of the disease is directly on the people in Africa, mainly children, suffering from the disease (APPGM, 2006 and Ridley, 2001).

Malaria deaths are frequently the result of delays in the diagnosis and treatment of the infection (CCAMAT, 2004). .Multi-organ failure is common. Death in 6 months – 2 years: cerebral malaria in children 2 – 5 years; metabolic acidosis in either groups; or a combination of these severe manifestations could occur. (Lucas & Gilles, 2003).

The mortality and morbidity attributable to malaria is further enhanced by the fact that the vulnerable groups are largely unaware of the seriousness of the disease and what to do to protect themselves (including their under-five family members).

The burden of malaria is also exacerbated by lack of access to efficacious drugs and interventions to combat malaria and lack of affordability of the effective interventions (FMOH, 2005).

The Abuja summit on Roll Back Malaria in 2000 partially reappraised the burden of malaria as follows: (Okafor and Amzat, 2007).

- Nine out of ten cases of malaria worldwide occur in Africa South of the Sahara;
- Malaria costs Africa more than US $12 billion annually, and can be controlled for a small fraction of that amount;
- Those who suffer most are some of the continent's most impoverished and that malaria keeps them poor;

- A poor family living in malaria affected areas may spend up to 25 percent or more of its annual income in prevention and treatment;
- Malaria has slowed economic growth in African countries by 1.3 percent per year. As a result of the compounded effect of over 35 years, the GDP level for African countries is now up to 32 percent lower than it would have been in the absence of malaria; and
- Malaria can re-emerge in areas where it is under control (WHO, 2000).

The profound consequences that one or more episodes of malaria may have on a child's subsequent health and development are often unrecognized or inadequately managed (WHO/RBM, 2006). Majorly, these under- recognized consequences include the following: Low-birth weight, anaemia, neurological problems as a result of cerebral malaria and recurrent fever. It is the malaria in pregnancy that leads to low birth weight and premature delivery, both of which are associated with an increased risk of neonatal death and impaired cognitive development. In many parts of the developing world including Nigeria, specialist care for low birth weight babies is very limited, and untreated hypoglycaemia (low blood glucose, a common problem in low- birth weight babies) may cause brain damage (WHO/RBM, 2006). Children are vulnerable to cerebral malaria when they are stricken with severe malaria. Approximately seven percent of children who survive cerebral malaria (a severe form of the disease, characterized by coma and convulsions) are left with permanent neurological problems. These include weakness, spasticity, blindness, speech problems and epilepsy. The limited availability of specialized educational provision and equipment for such children means that opportunities for subsequent learning and for attainment of independence are compromised. Epilepsy may be inadequately treated, due to lack of appropriate drugs and expertise, and further injury or death may result from uncontrolled convulsions. Recent evidence suggests that some children who appear to have made a complete neurological recovery from cerebral malaria may develop significant cognitive problems (attention deficits, difficulty with planning and initiating tasks, speech and language problems), which can adversely affect school performance (WHO/RBM 2006, Adeyemi, 2009)

Fever reduces appetite, and exacerbates malnutrition, (UNICEF, 2007). Although nutritional deficiencies, hookworm infestation, and Human Immuno deficiency Virus (HIV) all predispose children to anaemia. Evidence suggests that, in endemic countries, malaria is also one of the most important factors (UNICEF, 2007). Antimalarial drug resistance exacerbates the situation, by increasing the proportion of children who fail to be adequately clear of parasitaemia after treatment, and who consequently remain anaemic (RBM/WHO, 2006, Kakkilaya, 2007, UNICEF, 2007). It has been estimated that severe malaria anaemia causes between 190 000 and 974 000 deaths each year among children aged less than five years. Although blood transfusion may be life-saving in this situation, it also exposes children to other risks such as HIV and other blood-borne infections (WHO/RBM, 2006). Recurrent fever is common in many parts of Africa. It is estimated that generally, African children have between 1.6 and 5.4 episodes of malarial fever each year, a figure that varies according to geographical and epidemiological circumstances. The disease does not only cause severe illness and death in the vulnerable groups (infants and pregnant women) but also causes school and work-absenteeism and makes the poor poorer (FMOH, 2005).Nigeria contributes about 25% of malaria burden in Africa, and still parades a terrible figure of 30% of childhood mortality (FMOH, 2005). Children are vulnerable to malaria from about four months of age, and, in highly endemic areas during the peak transmission season, approximately 70% of one-year-olds have malaria parasites in their blood, (FMOH, 2005). The Demographic Health Survey (DHS), 2003 revealed that percentage of children under-five years of age with fever receiving any anti-malarial medicines was 33.9% .Recurrent episodes of malaria in children, or in a family member (the child may be required to stay at home to help with domestic chores), are likely to result in the loss of a substantial amount of time from school (WHO/RBM, 2006). In a study conducted on the epidemiology and management of pediatric malaria in a Nigerian tertiary hospital, it was discovered that most children have a range of 2–6 bouts of the disease a year with an average of four bouts (Ainadi and Okogun, 2005).This confirms that malaria is a major cause of school absenteeism in sub-Saharan Africa. In the study, an average cost of managing a bout of the disease was about 25USD for outpatients and 31 USD for in-patients, this could be more if blood transfusion is required. Data from Sri Lanka suggests that multiple attacks of

uncomplicated malaria have a deleterious effect on school performance, and that this is independent of both school absenteeism and socioeconomic circumstances (WHO, 2006)]. In Nigeria, at least one third of primary school children in endemic rural areas miss a week of school time due to the disease. (Amadi and Okogun, 2005)

2.3.4 Prevention and control Interventions aimed at tackling malaria

Attention and funding to combat malaria have significantly increased in recent years. International funding for malaria control has risen more than ten-fold over the past decade (UNICEF, 2007; WHO, 2008). Endemic countries including Nigeria are currently well positioned to take advantage of the creation of the Global Fund (GF) to fight AIDs, TB and Malaria (GFATM). These funds came from such sources as donor governments, corporations, philanthropists and even government of donor countries invested in the Global Fund (GF). The GF not only provides a coordinated source of large pools of money for disease control, it also reinforces standard and scientifically proven strategies to control these diseases (Brieger, 2009; UNICEF, 2007, Global Fund, 2006). Many international agencies and bodies have done a lot to implement the efforts of GF. These included: UNICEF, United States Agency for International Department (USAID), The U.S. President's Malaria Initiative (PMI) which focuses its intensive effort on 15 African countries, with the World Bank Malaria Booster Program taking on some of the more highly endemic nations. The Department for International Development (DFID), (Great Britain), and Japan International Corporation Agency (JICA) have also played enviable roles. (Brieger, 2009).

Besides the funding made available from international partners, malaria has been included among major international development targets, notably the Millenium Development Goals (MDGs) and the targets set at the 2000 African summit on Roll Back Malaria (RBM) in Abuja, Nigeria. For example, the sixth goal of the Millenium Development Goals (MDGs) specifically relates to malaria, HIV/AIDs and other infectious diseases and the fourth goal aims to reduce child mortality. Overall, malaria affects directly or indirectly six out of the eight targets of the MDGs (APPGM, 2006). All the development goals will be difficult to achieve in malaria endemic countries without substantially reducing the malaria burden (UNICEF, 2007).The recognition of the

unacceptably high mortality and morbidity from malaria in Africa, and the availability of a number of evidence based, cost effective interventions led to the formation of the Roll Back Malaria Initiative in 1998(WHO/RBM, 2006).

According to UNICEF (2007), the adopted tools for the RBM initiative include: Insecticide Treated Nets (ITNS), Intermittent Preventive Treatment-using Sulphadoxine Pyrimethamine (SP) in the prevention of malaria cases in pregnant women and early diagnosis and effective treatment. The other factors that play crucial role in the effective management of malaria are those relating to improvement in access to effective treatment, adherence to the use of antimalarial drug combination therapy, strengthening of health infrastructure and preventive control such as the use of Long Lasting Insecticidal Nets (personal protection) and Insecticidal residual spraying(vector control) (UNICEF,2007).

2.3.5 Roll back malaria (RBM) Initiative

In view of the high burden of the disease, WHO together with United Nations Development Programme (UNDP), UNICEF, and the World Bank, agreed in Amsterdam in 1992 to launch its initiative called the Roll Back Malaria (RBM) in 1998, based on the Global Malaria Control Strategy (Nabarro, 1999). This strategy is considerably different from the approach used in the eradication era, as it focuses on reducing the burden of disease and mortality rather than parasite control. It is also rooted in the primary health care approach and it emphasizes decentralized and flexible programmes (Okafor and Amzat, 2007)

Roll Back Malaria (RBM) is an International alliance of more than 90 organizations-including WHO, the UNDP, UNICEF and the World Bank (APPGM, 2006). The initiative began its work by technically endemic countries conduct national needs assessments from which strategic plans could be developed. The RBM provided the forum for matching country plans with the efforts of international donors (Brieger, 2009).

The goal of the Roll Back Malaria Initiative is to reduce by half deaths due to malaria by 2010. On the average, it is not certain that the burden of malaria is decreasing, and these

goals are far from being met (APPGM, 2006). As at the end of 2008, the incidence rate for malaria is 23.4/1000(FMOH, 2009). In 2009, it was documented that malaria prevalence in Nigeria especially in underfives still remained at 38%. These findings are signals that the RBM goals can be realized. Since donors would not be expected to give unless endemic countries themselves show a commitment to their own malaria control efforts, a meeting in the year 2000 of African Heads of State was convene by the Nigerian President to discuss the commitment of African countries by African leaders themselves. The commitments of the African heads of state constitute what is called the Abuja declaration (Brieger, 2009).

The Abuja Declaration in 2000 reaffirmed International commitment to Roll Back Malaria and called upon member states in Africa to undertake health system reforms including promoting community participation in joint ownership and control of the Roll Back Malaria (RBM) alliance. The Abuja goals included ensuring that 60% of those with malaria have access to treatment within 24 hours of the onset of symptoms. (African Summit on Roll Back Malaria, 2000).

The Roll Back Malaria Partnership thereby focused on four key prevention and treatment interventions in order to tackle the malaria scourge. An overview of these interventions is presented below.

Provision of Insecticide-treated nets

Insecticide-treated nets are one of the most effective ways to prevent malaria transmission, and studies have shown that regular use can reduce overall under-five mortality rates by about 20 per cent in malaria-endemic areas (UNICEF, 2007;WHO /RBM,2008). Malaria-infected mosquitoes bite at night, and these nets provide a sleeping individual a physical barrier against the bite of an infected mosquito. In addition, a net treated with insecticide provides much greater protection by repelling or killing mosquitoes that rest on the net—an additional and important protective effect that extends beyond the individual to the community (Knkkilaya, 2006).

A mosquito net is classified as an insecticide-treated net if it has been treated with insecticide within the previous 12 months. Long-lasting insecticidal nets(LLINs), a recent technological innovation, are nets that have been permanently treated with insecticide that lasts for the useful life of a mosquito net, defined as at least 20 washes and at least three years under field conditions [UNICEF,2007,WHO Pesticide Evaluation Scheme (WHOPES), 2005]. Currently, WHO recommends that the national malaria control programmes and their partners purchase only long lasting insecticidal nets(LLINs) (WHO, 2007).

According to a UNICEF report, much progress has been made across sub-Saharan Africa in scaling up insecticide-treated net coverage. All sub-Saharan countries with trend data available showed major progress in expanding insecticide-treated net use among children aged less than five years, with 16 of 20 countries at least tripling coverage since 2000. These countries include: Kenya, Sierra Leone, Cote d'Ivoire, Niger, Senegal, Burundi, Burkina Faso, Uganda, Cameroun, Rwanda, Central African Republic, Tanzania, Benin, Ghana, Malawi, Zambia, Togo, Guinea-Bissau,Sao Tome and Principe and then the Gambia. Apparently, Nigeria was not part of those countries. Despite big increases in the supply of mosquito nets, especially of long-lasting insecticidal nets in Africa, the number available is still far below need in most countries((UNICEF, 2007:WHO, 2008). For instance, between 2004 and 2006, there were modest increases in the supply of conventional ITNs to countries in the African, South-East Asia and Western Pacific regions, the three regions where nets are most frequently used (WHO, 2008).

By contrast, there was a large increase in the supply of LLINs to countries in the African Region, reaching 36 million by 2006. Based on National Malaria Control Programme records of ITN supplies however, only six countries in the African Region had sufficient nets (ITNs including LLINs) by 2006 to cover at least 50% of people at risk(WHO,2008). These were Ethiopia, Kenya, Madagascar, Niger, Sao Tome and Principe, and Zambia. According to World Malaria Report in 2008, Insecticide Treated Nets (ITNs) supplies were only sufficient to protect 26% of people in 37 African countries that reported in 2006. Nigeria is one of the countries (due to size and other factors) that contribute to the low utilization rate of LLINs in African countries. However, in order to bring down the

burden of malaria to half in Nigeria, to meet the RBM target before the end of year 2010, a national strategic plan has been developed for the country (FMOH, 2009). One of the strategic plans is to distribute 64 million nets free of charge to 32 million households in Nigeria. This is one of the major outreaches of the concept referred to as Scaling Up For Impact (SUFI) (FMOH, 2009; WHO, 2008). Presently, the nation had only been able to ensure the distribution of these nets in just twelve states out of the 37 states. These are Kano, Anambra, Niger, Ogun, Adamawa, Kebbi, Sokoto, Jigawa, Ondo,Rivers, Kaduna,Cross River, states. The remaining 25 states have been pooled into clusters such that the process of net distributions can occur simultaneously among cluster states. The goal is to achieve universal coverage of the LLINs before the end of year 2010.

The increase in the production of nets and in resources available has led to a rapid rise in the number of nets procured and distributed within countries. For example, UNICEF, one of the largest procurers of insecticide-treated nets worldwide has significantly increased its procurement and distribution in recent years as part of its integrated strategy to improve child survival through accelerated programming efforts. The Global Fund to fight AIDS, Tuberculosis and Malaria- a major source of funding for net procurement and distribution has also increased support for insecticide-treated nets, with its distribution of nets increasing around thirteen fold in only two years (from 1.35million in 2004 to 18 million in 2006 (UNICEF, 2007, Global fund, 2006)

Indoor Residual Spraying (IRS)

Indoor residual spraying is an effective malaria prevention method in settings where it is epidemiologically and logistically appropriate. Indoor residual spraying involves applying a long-lasting insecticide to the inside of houses and other structures to kill mosquitoes resting on interior walls (FMOH, 2009). The main source of data on indoor residual spraying coverage is Ministry of Health programme records and documents. However, given the recent interest in scaling up, the use of this malaria control strategy, standardized indicators and household data collection methods are being developed for future household surveys (UNICEF, 2007). In the African region, National Malaria Control Programme (NMCP) data indicate that more than 70% of households at any risk

of malaria were covered in Botswana, Namibia, Sao Tome and Principe, South Africa and Swaziland (WHO, 2008). The revised strategic plan for roll back malaria recommends that from 2006 to 2010, 80% of the population at risk should be protected using effective vector control measures. In Nigeria, in line with the renewed global interest for indoor residual spraying, the country is embarking on IRS for malaria control. To this end, in 2006 and 2007, the NMCP and her partners initiated a pilot project to assess the potential effectiveness and feasibility of IRS in three distinct ecologic zones: the rain forest, Sudan savannah and Sahel savannah. This was done in three IRS sites including: Lagos (Epe), Borno (Damboa), and Plateau state (Bakin Ladi). Evaluation results of the projects confirmed the residual effectiveness of the insecticides lasting for at least 4 months on sprayed surfaces in the study sites (FMOH, 2009)

In some other regions of the world such as Bhutan and Suriname, relatively high coverage of IRS (> 20% of people at risk) was achieved. (WHO, 2008)

Prompt and Effective Treatment of Malaria

Prompt and effective treatment of malaria within 24 hours of the onset of symptoms is necessary to prevent life-threatening complications (CATMAT, 2004; WHO, 1993). In Africa, where most malaria is due to Plasmodium falciparum and potentially fatal, early and effective treatment could save many lives (WHO/UNICEF, 2003). There are several challenges to providing prompt and effective treatment for malaria in Africa. First, the majority of malaria cases are not seen within the formal health sector (Korte and Fischer, 2005). A review by Brinkmann and Brinkmann (1991) concluded that malaria is responsible for 20%-50% of all admissions in African health services, although only 8%-25% of all persons with malaria seek treatment at the public health facilities. Secondly, the resistance of *P. falciparum* parasites to conventional antimalarial monotherapies, such as Chloroquine, Sulfadoxine- pyrimethamine and Amodiaquine, has become widespread, resulting in new treatment recommendations (WHO,2001; WHO,2006).. The World Health Organization now recommends treating malaria using artemisinin-based combination therapies, which are based on combinations of artemisinin, extracted from the plant *Artemisia annua*, with other effective antimalarial medicines. When combined

with other medicines, artemisinin derivatives are highly potent, fast- acting and very well tolerated (WHO, 2001; Depoortere, et al., 2004; FMOH, 2005).

In order to make treatment effective, diagnosis is recommended to confirm all suspected cases of malaria regardless of age; however, the majority of malaria cases are treated based on clinical diagnoses alone (WHO,2008). Really, diagnosis of the disease has been based on the clinical symptoms and the presence of malaria parasites (FMOH, 2005; Kote and Fisher, 2005). However, in holoendemic areas, the presence of malaria parasites might be only marginally useful as a diagnostic tool, as the majority of the population, including asymptomatic individuals, have parasitaemia most of the time (WHO, 2000). In Africa, diagnostic tools such as microscopes may be lacking and the diagnosis of malaria is generally based on clinical criteria (Greenberg, Ntumbanzondo, Ntula, Mawa, Howell, Davachi, 1989). Taking this into consideration in areas of intense transmission, WHO therefore recommends as part of the strategy of Integrated Management of Childhood illneses (IMCI), that all under-fives with fever to be presumptively treated with antimalarials (Nicoll, 2000). Besides, the RBM programme also promotes the "Integrated Management of Childhood illness" guidelines as a key intervention for improving the management of children with fever, either in the health facility or at home (World Bank, 2001).

Intermittent preventive treatment during pregnancy

According to UNICEF, some 50 million pregnant women a year are exposed to malaria and at least 60% of them are in Africa (UNICEF, 2006). Studies in sub-Saharan Africa indicate that 25 percent of deliveries in areas of stable transmission show evidence of *Plasmodium falciparum* malaria infection in the placenta (Mermin, *et al.*, 2004; UNICEF, 2007). In malaria-endemic areas, up to 25% of severe maternal anaemia cases are attributable to malaria, as are nearly 20 percent of low-birth weight babies (Mermin, *et al*, *2004*; UNICEF, 2007).

Together with regular insecticide treated net use, intermittent preventive treatment during pregnancy is key in preventing malaria among pregnant women in endemic areas (FMOH, 2005). It must however be noted that Intermittent preventive treatment is not

recommended in areas of low or unstable malaria transmission (UNICEF, 2007). The treatment consists of at least two doses of an effective antimalarial drug during the second and third trimesters of pregnancy. This intervention is highly effective in reducing the proportion of women with anaemia and placental malaria infection at delivery. Currently, Sulfadoxine-Pyrimethamine is considered a safe and appropriate drug for intermittent preventive treatment for pregnant women (FMOH, 2005; UNICEF, 2007).

These reviewed core strategies inherent in the RBM initiative were selected because of their proven efficacy and effectiveness (Meremikwu *et al*, 2006, FMOH, 2005). Care givers including mothers of under-fives have important roles to play in harnessing these strategies for the benefit of treating children aged less than five years.

2.4 Malaria Treatment - Home Management of Malaria (HMM) and pivotal roles of nursing mothers and other caregivers

More than half the children who die of malaria do so within 48 hours (WHO, 2005). Therefore fast and appropriate diagnosis and treatment of malaria would significantly reduce mortality and morbidity. Up to 82% of all malaria episodes in sub-saharan Africa are treated outside of the formal health sector (WHO, 2002). People often use combinations of traditional and biomedical treatment (Heggenhougen, Hackethal and Vivek, 2003), and there is often a hierarchy of resort where, if one treatment fails, people turn to other remedies (Mc Combie, 1996). Mothers are usually actively involved in the search of these alternative sources of care. For instance, this is a practice very popular in rural settings such as Ibarapa (Briegers *et al*, 1986).

Most people at risk of malaria do not have access to effective health system and so RBM promotes 'Home management of malaria' to make treatment as near to the home as possible (WHO, 2005). How and when people seek treatment for fever is critical. People act logically to treat the symptoms of fever and in their view solve the problem. Most mothers take the most important actions for their ill children within 48hours, for example with aspirin or antimalarials. Building on this action is an important activity for those working in malaria control and therefore communication strategies around treatment should focus on ensuring mothers give the right drug and complete the course. (Haaland,

2005). Often, people do not take the correct dose, stopping the treatment when they feel better and keeping tablets from one course for the next time someone is ill. This increases the likelihood of development of drug resistant malaria. (Ajayi, *et al.*, 2008).

The poor accessibility of health posts and the economic situation, especially in Sub-Saharan Africa make self care including self-medication and treatment at home often the only chance for receiving any kind of treatment (Korte and Fisher, 2005). Research has shown that in Africa, that majority of families treat their children for malaria at home but that homebased treatment is often incomplete or inadequate (WHO, 2006). Most medications or treatment for under-fives are administered by mothers and caregivers (Salami, 2008). About 75% of first action during malaria illness is taken at home which is often described under the common practice – self-medication. However most of these actions may not be appropriate or require improvement.(FMOH, 2005) Evidence from Nigeria shows that most episodes of fever are initially self-treated and over 70% of cases rely exclusively on it (FMOH Situation Analysis ,2000). However of this proportion only 15% of the actions taken were adjudged as appropriate. This pattern has been consistent across the country as documented in several other reports. For instance, a study of health seeking behaviour for childhood illnesses in three rural Nigerian communities showed that the most common form of first line treatment was drugs from a patent medicine vendor (49.6%) while only 3.6% did nothing (Salako *et. al.*, 2000). The situation in urban settings is different as shown (Ezedinachi *et. al.*, 1991) who reported that diagnosis and treatment of malaria in Calabar were carried out by self (54%), qualified medical doctor (32%), and paramedical staff (2%). About 12% took traditional remedies. In a study done at Igbo Etiti and Ibarapa North in Nigeria on 105 pre school children, (Brieger *et al.*, 1984) found that 74% of parents took treatment action under 8 hours of onset of illness while nearly 96% acted within 24 hours. Unfortunately only 14.3% of these actions were judged to have been appropriate. Studies in rural areas have shown the feasibility of home management and its positive impact on the burden of malaria (FMOH, 2005).

Rational self-medication is encouraged within this context of primary health care (PHC). In order to promote rational self medication in PHC, a package of interventions for home-based management of malaria was developed and tested in several countries. This

included training on basic diagnostic and treatment practices for shopkeepers who sell antimalarial drugs, and improved packaging of the drugs for consumers (WHO, 2006). It is mothers that seek for the help of Patent Medicine Vendors (PMVs). In fact it has been confirmed that the PMVs are among the major sources of antimalarial drugs in the rural areas for example in Ibarapa communities (Salako *et. al.*, 2001). The PMVs are well organized and highly patronized and active in Igboora and Idere A training programme was even organized for them in 1990 (Oshinamo and Brieger, 1990). In order to facilitate community ownership of HMM, It was specifically advocated by WHO that trained community health providers (Community Health Workers, Medicine Sellers or Retailers) should be provided with basic resources such as : ACTs for the treatment of uncomplicated malaria; rectal artemisinin suppositories for prereferral treatment of severe malaria; rapid diagnostic tests where applicable, Information, Education and Communication (IEC) materials and simple patient registers and reporting forms.

Home Management of Malaria (HMM) is a key approach within malaria case management of providing access to prompt, appropriate and effective treatment especially for children in Africa and the success of this scheme or interventions hinges on mothers of under-fives and other care-givers. The essence of this strategy is to provide access to quality antimalarial drugs within 24 hours of the onset of symptoms delivered through a network of community resource persons, and to improve community knowledge of malaria and its treatment. This increases compliance and significantly leads to the reduction in childhood morbidity and mortality (FMOH, 2005).

It is now widely acknowledged that access to appropriate and effective treatment for malaria should be provided within 24 hours of onset of symptoms. In rural communities, the access to the formal health facilities is very difficult. However, not only the poor accessibility contributes to the self treatment, but economic factors like transport costs, loss of work time and the cost at the health facilities: be it in the form of user fees or "under the counter motivations" or a combination of both (Korte and Fisher, 2005). A strategy to provide such access should take into account poor rural populations in malaria-endemic countries who are particularly inadequately served by the health system (WHO, 2000). This is the access gap that the HMM strategy addresses, enabling the

home to be the first "hospital" given the fact that about 70% of cases first get treatment at this level (WHO, 2008). HMM relies upon the community and the services offered by the formal and informal private health sectors (FMOH, 2005). It may also be applicable to both adults and children in areas of low to moderate transmission, in whom the disease could advance rapidly to severe malaria during epidemics. The Home Management of Malaria complements and extends the reach of public health services (FMOH, 2005) especially when mothers of under-fives and other care givers are actively involved and their capacities for carrying out this services are enhanced.

2.5 Overview of the National Antimalarial Treatment Policy (NATP) and its implications

The national antimalarial treatment policy is a set of recommendations and regulations concerning the availability and rational use of antimalarial drugs in a country. The policy is designed to provide decision-makers with evidence-based recommendations in addition to giving health workers clear guidelines for providing early diagnosis and prompt treatment appropriate to the local context (WHO/CDS/RBM, 2001).

The objectives of an antimalarial treatment policy are to ensure rapid cure of the infection, reduce morbidity and mortality, including malaria-related anaemia, prevent the progression of uncomplicated malaria to severe and potentially fatal disease, reduce the impact of malaria infection on the fetus during pregnancy, reduce the reservoir of infection, prevent the emergence and spread of drug resistance, and prevent malaria in non-immune travelers (WHO, 2008). Unfortunately, emergence and rapid spread of *P. falciparum* resistance to commonly used antimalarial drugs poses a serious challenge to the effectiveness of early diagnosis and prompt treatment as a priority strategy within current malaria control efforts (WHO, 2001).

As a response to increase level of resistance to antimalarial medicines, WHO recommends that all countries experiencing resistance to conventional monotherapies such as Chloroquine, Amodiaquine and Sulphadoxine –Pyrimethamine (SP) should use combined therapies, preferably ACTs for falciparum malaria (WHO/CDS/RBM, 2001).

The WHO currently recommends the following combination therapies for uncomplicated malaria (WHO/RBM, 2006).

- Artemether/lumefantrine
  Artesunate plus amodiaquine (in areas where the cure rate of Amodiaquine monotherapy is greater than 80%).
- Artesunate plus Mefloquine (insufficient safety data to recommend its use in Africa).
- Artesunate plus Sulfadoxine/pyrimethamine (in areas where the cure rate of Sulfadoxine/pyrimethamine is greater than 80%.

Currently, only Artemether/Lumefantrine (AL) and Artesunate-Amodiaquine (AA) are promoted, procured and distributed to the LGAs for the treatment of malaria free of charge by the Federal Ministry of Health.

It must be noted that amodiaquine plus sulfadoxine pyrimethamine may be considered as an interim option where ACTs cannot be made available provided that efficacy of both is high (WHO/RBM, 2006). This measure aims at reducing deteriorating effects of malaria situation and minimizing the wasteful use of resources and contributing approximately to the development of health services.

Provision for the treatment of severe falciparum malaria was also proposed by WHO, and any of the following three medicines have been recommended for countries to adopt for the treatment of severe malaria (WHO, 2008): Artesunate (i.v. or i.m), Artemether (i.m) or Quinine (i.v. infusion or i.m. injection).

As part of WHO policy support for malaria endemic countries, a set of criteria to assist in determining the relative merits of various combination therapy antimalarial drugs for different epidemiological conditions were proposed (WHO, 2001). These criteria formed the parameters of a framework to guide the choice and selection of antimalarial combination drugs. Although a scoring system is part of this set of criteria, the scores and weights are arbitrary and secondary to the process of identifying the key determinants highlighted by these criteria. The scores generated from these criteria are not intended to

be strictly applied, but rather provide a means of guiding comparisons of different combination therapies. The major criteria in order of significance are:

1. Therapeutic efficacy of the combination, irrespective of the efficacy of the individual components;
2. Safety of the drugs in combination, especially amongst high risk groups;
3. Potential for widespread use of the combination at all levels of the health care system, including its use for home management;
4. Potential for consumer compliance;
5. Cost effectiveness;
6. Potential to delay or prevent development of resistance;
7. Other factors including product availability, production capacity and potential for widespread use at a sub-regional level.

It is very pertinent that the government of every malarious country should have a national malaria control policy guiding prevention and case-management. However, WHO has been supporting such countries with policies in recommending strategies and guidelines in order to achieve global and international targets in malarial control (WHO, 2008). The following recommendations and guidelines are the recent publications of WHO in order to support countries endeavors in fighting malaria disease:

1. The treatment of malaria infections should be based on a laboratory-confirmed diagnosis, with the exception of children under 5 years of age in areas of high transmission in whom treatment may be provided on the basis of a clinical diagnosis.
2. All uncomplicated *P. falciparum* infections should be treated with an artemisinin-based combination therapy, and P. vivax with chloroquine and primaquine (except where *P. vivax* is resistant to chloroquine, when it should be treated with ACT and primaquine).
3. Four ACTs are currently recommended for use: Artemether-lumefantrine (AL), Artesunate-amodiaquine (AA), Artesunate-mefloquine and Artesunate-

sulfadoxine-pyrimethamine. The choice of the ACT should be based on the efficacy of the partner medicine in the country or area of intended deployment.

4. Patients suffering from severe malaria presenting at the peripheral levels of the health system should be provided prereferral treatment with Quinine or Artemisinins, and transferred to a health facility where full parenteral treatment and supportive care can be given.

5. Severe malaria should be treated parenterally with either an Artemisinin derivative or Quinine until the patient can swallow, when a complete course of ACT must be administered.

6. In areas of high transmission, intermittent preventive treatment (IPT) with Sulfadoxine-pyrimethamine (SP) should be administered to pregnant women at least twice during the second and third trimesters of pregnancy, and three times in the case of HIVpositive pregnant women. The effectiveness of IPT should be monitored in light of increasing SP resistance.

More widespread agreement on policy and strategy has stimulated leaders of the countries most affected, backed by international organizations and donors, to set increasingly ambitious targets for control: that is, to achieve at least 80% coverage of key interventions by 2010 (WHO, 2008). Scaling Up For Impact (SUFI), 'Malaria No More' are some of strategies adopted by African countries in a drive to achieve this target. In Nigeria, the National Malaria Control Programme has adopted SUFI for universal coverage (FMOH, 2009). Up till this time, it is amazing to note that many countries including Nigeria are still permitting the sale of Artemisinin monotherapy. Some of these countries are presented below:

Table 2.2 Countries selling artemisinin monotherapy and their WHO regions, 2008

S/N	COUNTRY	WHO Region
1	Burkina Faso	AFRO
2	Cambodia	WPRO
3	China	WPRO
4	Columbia	PAHO
5	Congo	AFRO
6	Cote d'voir	AFRO
7	Ecuador	PAHO
8	Equatorial Guinea	AFRO
9	Gambia	AFRO
10	Ghana	AFRO
11	Guinea	AFRO
12	Guinea Bissau	AFRO
13	Guyana	PAHO
14	Indonesia	SEARO
15	Lao People's Democratic Republic	WPRO
16	Liberia	SEARO
17	Mali	AFRO
18	Mauritania	AFRO
19	Myanmar	AFRO
20	Nepal	SEARO
21	Nigeria	AFRO
22	Pakistan	EMRO
23	Papua New Guinea	WPRO
24	Peru	PAHO
25	Philippines	WPRO
26	Rwanda	AFRO
27	Sao Tome and Principe	AFRO
28	Senegal	AFRO
29	Sierra Leone	AFRO
30	Solomon Islands	WPRO
31	Somalia	EMRO
32	Sri lanka	SEARO
33	Suriname	PAHO
34	Timor Leste	SEARO
35	Togo	AFRO
36	Uganda	AFRO
37	Vanuatu	WPRO
38	Venezuela	PAHO
39	Vietnam	WPRO
40	Yemen	EMRO

Source: World malaria Report, 2008

This practise is not in agreement with the global strategy to fight malaria especially in endemic regions of the world. Though Artemisinin is a major component of Artemisinin based Combinntion Therapy (ACT), using it alone, will encourage development of resistant strains of the malnia parasites (WHO, 2001). One key challenge facing an antimalarial treatment policy development is the achievement of balance between two essentials, but at times competing, principles: ensuring prompt treatment of malnrin and ensuring that antimalarial drugs have n maximum useful therapeutic life (WHO, 2001). These two essential parts should however be complementary. Ensuring adequate regulation and control of drug use should allow for equity and rational use of antimalarial drugs with the resultnnt reduction in mortality and at the same time reduce or delay drug resistance by the parasites. Patient adherence is another major determinant of the therapeutic response to antimalarial drugs, as most treatments are taken at home without medical supervision (White and Young, 2005). According to them, with the introduction of new, effective, but more expensive antimalarials, there is concent that the high levels of efficacy observed in clinical trials may not be translated into effectiveness in the nomial context of use. An effective first-line antimalarial treatment would have a greater impnct on reducing malaria mortality than merely improving second-line treatment or the management of severe malaria. Therefore, combination therapies must be available and affordable to communities for use in the first-line treatment of malaria (WHO, 2001). One of the global efforts in enhancing and sustaining availability and quality of ACT is in the production of Artemisinin chemicals. Artemisinin production represents a significant proportion of the manufacturing cost of ACTs (Hale and et al., 2008). Hale and colleagues were of the view that the price of artemisinin is extremely volatile and quality is variable. Artemisinin is derived from the medicinal plant *Artemisia annua*, but yields from the plant are low and supplies are uneven.

In Nigeria, the strategy for the implementation of the national malaria treatment policy is that of Roll Back Malaria (RBM). This strategy seeks to establish a social movement in which the local communities, public and private sectors, all tiers of government and non-governmental development agencies, and so on come together in a partnership and network to implement malaria control interventions (FMOH, 2005).

It is obvious that achieving the goal of this policy would require the availability of appropriate antimalarial drugs and their proper management, including storage and rational use. As part of her efforts to implement the policies, the National Malaria Programme had to fortify its Procurement and Supply Management (PSM) unit with five pharmacists in 2008 to ensure an effective distribution of antimalarial medicines and commodities to the end users (FMOH, 2008). Beyond these efforts, however, there is need for adequate financial provisions at all levels for the regular availability of these drugs at costs that the people can afford (Brieger, 2009: FMOH, 2005). The consumers and providers have to be properly educated on malaria and its treatment and an effective monitoring and evaluation system put in place to ensure that the objectives are being properly pursued and achieved.

Children aged less than five constitute a special group within the context of the new antimalarial treatment policy. It has been noted that malaria in children less than 5kg and aged less than 3 months can be very severe and these children have increased risk of dying if not treated promptly (FMOH, 2005). Oral Quinine and other supportive therapy are to be provided for treatment as soon as the need arises. The body of knowledge on ACTS used in this age group is insufficient for definite statement on its use (FMOH, 2005). The National anti malarial policy is silent on the use of ACT in sickle cell patients. It is recommended that children with known sickle cell anaemia be given chemoprophylaxis. The most common prophylactic agent is Proguanil and the recommended dose is 100mg daily for children (FMOH, 2005).

2.6 The antimalarial combination therapy

The concept of combination therapy is based on the synergistic or additive potential of two or more drugs, to improve therapeutic efficacy and also delay the development of resistance to the individual components of the combination. Combination therapy (CT) with antimalarial drugs is the simultaneous use of two or more blood schizontocidal drugs with independent modes of action and different biochemical targets in the parasite (WHO, 2001). Within the context of malaria management, multiple-drug therapies that include a non-antimalarial drug to enhance the antimalarial effect of a blood

schizontocidal drug are not considered combination therapy (WHO, 2001). Examples of such combinations are multivitamins and haematinics. Similarly, certain antimalarial drugs that fit the criteria of synergistic fixed-dose combinations are operationally considered as single products in that neither of the individual components would be given alone for antimalarial therapy. An example is Sulfadoxine-Pyrimethamine (WHO, 2001).

Pre-clinical studies have shown that artemisinin and its derivatives do not exhibit mutagenic or teratogenic activity (Emdex,2006). However, the drugs have caused fetal resorption in rodents at relatively low doses of > 10 mg/kg, when given after the sixth day of gestation. Reports on the use of these drugs in humans during pregnancy are limited. Thus, because of the effects in rodents and the very limited data in humans, the artemisinin derivatives are not currently recommended for use in the first trimester of pregnancy (WHO, 2001; FMOH, 2005). Artemisinin itself has physical properties such as poor bioavailability that limit its effectiveness, semi-synthetic derivatives of artemisinin, including artemether and artesunate, have been developed. However, their activity is not long lasting, with significant decreases in effectiveness after one to two hours. To counter this drawback, artemisinin is typically given with lumefantrine (also known as benflumetol) to treat uncomplicated falciparum malaria (Yeung and White,2005)

Emdex, 2006). Due to the very short half-life of artemisinin derivatives, their use as monotherapy requires a multiple dose regimen of seven days duration. Combination of one of these drugs with a longer half-life "partner" antimalarial drug such as Lumefantrine, Amodiaquine, etc. allows a reduction in the duration of artemisinin treatment, while at the same time enhancing efficacy and reducing the likelihood of resistance development to the partner drug (WHO, 2001).

The combination of artesuoate plus mefloquine is not considered a viable option for use as first-line therapy in Africa. There is concern that the long half-life of mefloquine may lead to the selection of resistant parasites in areas of intense transmission. Furthermore, there are also concerns of a possible increase of mefloquine related adverse reactions when used unsupervised on a large scale for treatment of malaria (WHO, 2001; WHO, 2008).

It is currently estimated that 90% of global episodes of clinical malaria and 90% of global malaria mortality occur in sub-Saharan Africa (Amzat and Okafor, 2007). Malaria control efforts in the region have been greatly affected by the emergence and spread of Chloroquine resistance (CDC, 2006, WHO/RBM, 2006, FMOH, 2005). This phenomenon was first recorded in 1979 in East Africa, but has now been reported from almost all malaria endemic countries of Africa. Nigeria is not spared of Chloroquine drug resistance (Mereinikwu 2006, Okogun and Amadi 2005, Ajayi *et al.* 2008). Sulfadoxine-pyrimethamine (SP) was later discovered to be the obvious successor to Chloroquine following the emergence of drug resistance to Chloroquine (FMOH, 2005, Koram, 2005). However, resistance to SP is developing quickly even with its current use, thus reducing the useful therapeutic effect of this drug. Although Artemisinin-based combination therapies have been shown to improve treatment efficacy, incidence of resistance to it has been noticed in South-East Asia (WHO, 2007). Nevertheless, it offers a better window of opportunity for the management of malaria as at today.

The combination therapies affords the users of the medicines advantages in two respects, one, it is often more effective and two in the rare events that a mutant parasite that is resistant to one of the drugs arises de novo during the course of the infection, the parasite will be killed by the other drug. This mutant protection is thought to prevent or delay the emergence of resistance. To realize the two advantages, the partner drugs in a combination must be independently effective. A major disadvantage of combination treatments is the increased cost especially in rural economically depressed environment (Olumese, 2006).

Artemisinin and its derivatives (Artesunate, Artemether, Artemotil, and Dihydroartemisinin) produce rapid clearance of parasitaemia and rapid resolution of symptoms (Olumese, 2006). They reduce parasite numbers by a factor of approximately 10,000 in each asexual cycle, which is more than other current antimalarial (which reduce parasite numbers 100 to 1000 fold per cycle) (Olumese, 2006). Artemisinin and its derivatives are eliminated rapidly when given in combination with rapidly eliminated compounds (tetracyclines, clindamycin), a 7-day course of treatment with an artemisinin compound is required, but when given in combination with slowly eliminated

antimalarials, e.g. Sulphadoxine-pyrimethamine (SP), shorter courses of treatment (3 days) are effective. (Olumese, 2006). It has also been proven that Artemisinin compound in combination with Amodiaquine (commonly referred to as Camoquine) is therapeutically superior to a combination of Chloroquine plus SP, and significantly reduced gametocyte carriage following treatment (Sowunmi, Fehintola, Adedeji, Gbotosho, Tambo, Falcye, Happi and Oduola, 2005) The Artemisinin compounds are active against all four species of malaria parasites that infect humans and are generally well tolerated. The only significant adverse effect to emerge from extensive clinical trials has been rare. (Olumese, 2006).

These drugs also have the advantage from a public health perspective of reducing gametocyte carriage and thus the transmissibility of malaria. This contributes to malaria control in areas of low endemicity. (Olumese, 2006). Although there are some minor differences in oral absorption and bioavailability, between the different artemisinin derivatives, there is no evidence that these differences are clinically significant in current formulations. It is the properties of the partner medicine that determine the effectiveness and choice of combination (WHO, 2006; WHO, 2001).

The Artemisinin derivative component of the combination must be given for at least 3 days for an optimum effect. Artemether-Lumefantrine should be used with a 6-dose regimen. (WHO, 2006). However, major challenges still exist in the deployment and use of antimalarial drug combination therapies, particularly in Africa (WHO, 2001). These according to WHO include the following:

- The choice of drug combinations best suited for the different epidemiological situations
- The cost of combination therapy
- The timing of the introduction of combination therapy (e.g. should combination therapy be deployed in areas where monotherapy is still effective?).
- The operational obstacles to implementation, especially compliance.

The costs of antimalarial combination therapies are over ten times more expensive than those of the conventional drugs used in Africa as monotherapy (WHO/CDS, 2001) Thus a change to and implementation of combination therapy would involve higher direct and

indirect costs to health services, necessitating substantial financial support through sustained international public/private support, as these higher costs would be out of reach for many developing nations, especially in sub-Saharan Africa (WHO, 2001). Although combination therapy is accepted as the rational approach to case management in Africa, current evidence of its effectiveness within the region is limited. There is also little or no information on the safety and efficacy of combination treatment in pregnant women and young children, which are specific high-risk groups in Africa (WHO, 2006).

At this juncture, an overview of artemisinin-lumenfantrine (AL) one of the ACT related drugs adopted by the Federal ministry of health will be presented.

In Nigeria, AL is adopted as the first line drug of choice for malaria treatment. It is currently available as co-formulated tablets containing 20mg of artemether and 120mg of Lumefantrine. The total recommended treatment is a 6-dose regimen of artemether-lumefantrine twice a day for 3 days. The dosing schedule for Artemether -Lumefantrine by weight and age is presented in the table below:

Table 2.3 Dosing Schedule for Artemether-Lumefantrine

Body weight in kg	Age in years	0hrs	8hrs	24hrs	36hrs	48hrs
		Number of Tablets				
5-14	(<3)	1	1	1	1	1
15-24	(≥3-8)	2	2	2	2	2
25-34	(≥9-14)	3	3	3	3	3
>34	(>14)	4	4	4	4	4

Source: Culled from WHO guidelines for the treatment of malaria, 2006

A major concern with this kind of dosing schedule is its appropriateness for the mothers in the management of malaria in predominantly rural illiterate settings. In order to ensure an appropriate prescription pattern of these medicines and its right application among the care givers, the FMOH occasionally print out job aids that has a pictorial illustrations on the use of medicines for different age groups, but the job aids hardly go round the health

facilities in the country not to even talk of getting to the mothers in the rural communities.

An advantage of this combination is that lumefantrine is not available as a monotherapy and has never been used by itself for the treatment of malaria (WHO, 2006). Recent evidence indicates that the therapeutic response and safety profile in young children of less than 10kg is similar to that in older children and artemether-lumefantrine is now recommended for patients greater or equal to 5kg. Lumefantrine absorption is enhanced by co-administration with fat. Low blood levels, with resultant treatment failure, could potentially result from inadequate fat intake, and so it is essential that patients or caregivers are informed of the need to take this ACT with milk or fat-containing food- particularly on the second and third days of treatment (EMDEX, 2006). Again, affordability may pose a great challenge for the rural dwellers. Adding the cost of milk or some other fat containing food to the already expensive ACT medicine will be putting an extra pressure on their finances. The most likely consequence of this is that ACT medicines would be used with little concern about fatty food. Absorption of drugs will not be maximum in the malaria infected patients and resistance will begin to set in gradually with time.

2.7 Perceptions of malaria and use of antimalarials with special reference to ACT related drugs

In order to discuss exhaustively issues related to perceptions in this context, three major terms would need to be explored. They are attitude, belief and practice. According to Rokeach (1976), a belief could be operationally defined as any single proposition, conscious or unconscious, inferred from what a person says or does, what is acceptable and what is not. An attitude is a relatively enduring organization of beliefs around an object or situation, predisposing one to respond in some preferential manner. Attitudes either attract us to things, or make us wary of them (WHO, 1988). A practice is the performance of an activity, often regularly, in order to improve one's skill. Perception is the way a person thinks about something and the idea of what it is like (Longman, 2005).

Beliefs, perceptions and attitudes are behavioral antecedent factors (Green and Kreuter, 1999). They play great roles in influencing peoples health related behaviors or practices.

Malaria still remains a leading cause of morbidity and mortality especially in sub-Saharan Africa and constitutes a major disease burden in Nigeria (FMOH, 2005). Since it is a problem that affects the people, it is pertinent to examine some of the social connections in malaria prevalence and control (Okafor and Amzat, 2006). The incorporation of the multi-factorial scheme of biological, socio-cultural and ecological stance in our understanding of health is a major breakthrough of our time. This favours the exploration of health issues in the social realm (Emeka and Amzat, 2006).

Perception could be expressed in terms of perceived aetiology, mode of transmission, vulnerability, age specificity and symptoms. The elusiveness of these social correlates may account for retrogression in rolling back the disease (Amzat, 2004). It also extends to treatment seeking behavior of mothers in their home management of malaria particularly in the rural communities. Perception of disease is related to a person's socio-cultural reality (their social role and expected behaviours) to shape both behavior and ability to respond to disease (Jones and Williams, 2004). It is further observed that it is the interaction between the expected behaviour and perceptions of disease, as defined individually and by society, that affects both if and how an individual acts to prevent disease, as well as what they do when they become sick (their illness behaviour). Kleinman (1981) also observed that illness recognition, definition and management procedures depend on the general axiom about health and illness within a people's culture. Erinsho (1998) buttresses the fact that the culture incorporates belief systems, which in turn undermines the perception and interpretation of disease in societies. Hence, there are different etiologic categories among different cultures.

Jegede (1998) examined causes of illness based on four categories: natural causes (when unclean water or unhygienic food is taken), supernatural causes (when illness is inflicted by witchcraft and other underworlds), mystical causes (result from neglect of gods, broken taboos etc) and hereditary causes (passed from one generation to the other). Various studies have documented peoples' perception of malaria. Inappropriate

etiologic perception, elusiveness of mode of transmission, and inadequate perceived threat of malaria are among the major behavioural setbacks in malaria control and prevention. All these translate to discrepancies in health seeking behaviour and may cause delay in seeking appropriate treatment (Okafor and Amzat, 2006).

Several studies have shown that illness recognition determines treatment responses. for example in the rural Ibarapa Central LGA of Oyo State, Nigeria, people view malaria and convulsion as completely separate conditions with the former caused by heat and sun and the latter caused by cold. Malaria is perceived as a less serious condition while convulsion prompts an immediate treatment response often using dangerous herbal concoctions. Malaria is also perceived to be of different types of malaria itself including cold, yellow, and ordinary varieties (Salako *et al.2001*)

In many cultures, there is no general term or illness concept that illustrates malaria. An illness with symptoms like malaria might be subsumed under a general term. Among the Dangla of Ghana, *asra* is a contestable illness concept for malaria as it can also be attributed to other illness conditions (McCombie, 1996). Among women in rural Uganda, *omusujja* is the local term for malaria (Kengeya-Kayonda et al., 1994). In another study conducted in Hakara in Tanzania, there is clear conceptual appellation as malaria is often referred to as *homaya malaria* (Malaria fever), which is often used interchangeably with *homaya mbu* (fever due to mosquitoes) (Mucla and Ribera, 1998). Among the Yoruba of Southwestern Nigeria, *iba* is the concept designated as malaria (Okafor and Amzat, 2006). Malaria in Yorubaland is known as iba and it is recognized by high temperature, aches, and chills. In fact, people associate jaundice like symptoms like yellow eyes, dark urine to malaria. Not surprisingly, the local name for jaundice is *iba ponju* or fever with yellow eyes (Ramakrishna, Brieger and Adeniyi, 1989).

The illness concept in the community gives some understanding of the perceived etiologic agent of the disease. Where illness term that appropriate malaria is contestable, there may be problem of perception and generally health seeking behaviour. Etiologic consideration is also an important link in understanding people's understanding of malaria. In a study conducted in Kibaha district in Tanzania, severe malaria is often

referred to as *degedege* (Comoro, Nsimba, Warsame and Tomson, 2003). Most of the mothers avoid mentioning it because there is a cultural belief that it is a bad omen. They simply refer to it as childhood disease. On the perceived causes, three views emerged, the dominating one being that it is caused by the *sherani* (evil spirits).This is also in line with other studies (Ahorlu, Dunyo, Afari, Koram, and Nkrumah, 1997). In Masaka, Uganda, *Omusujja* (Malaria) is believed to be caused by what is eaten or drunk and other environmental condition (Kengeya – Kayondo et al., 1994).

Brieger , Sessay, Adesina, Mosanya, Ogunlade, Ayodele, and Orisasona, (2001) observed that there are still several points of overlap in etiological attributions in Nigeria which include mosquitoes, overwork, sun exposure, dirty water, eating red palm oil, intense heat (and so on). A study in Kenya among mothers reports that mosquito as a cause of malaria was mentioned by 56% but only 10% understood the mechanism of transmission. (Mwenesi, Harpham, and Snow, (1995) and Amzat (2004) also reported in a study that up to 51.9% of Bodija market women, Ibadan, Nigeria hold inappropriate view about etiologic agents of malaria while up to 71.9% do not know how malaria is transmitted or whether it can be transmitted.

Several other studies have confirmed inappropriate etiologic perception and mode of transmission of malaria, (Akogun and John, 2005). The problem of malaria recognition is also compounded by lack of definite symptom complex as it can manifest with different signs in individuals. Description of *usra* (malaria) in Ghana is often with headache, yellowish urine, hot body, vomiting, loss of appetite, weakness and so on (Ahorlu et al., 1997). In Kenya, 90% of women interviewed in a survey mentioned headache, fever, vomiting and the rest as symptoms of malaria. Other studies also have confirmed varying symptoms of malaria as recognized by the respondents (Nwenesi, 1996; Muela and Rebera, 1998; Brieger et al., 2001; Clarke, 2003; Amzat, 2004, Akogun and John, 2005). There are also variations and inadequacy in recognizing complications of malaria especially in children. As it has been noted, convulsion is usually attributed to evil spirit. Yet, effective management of malaria in children under the age of five requires mother to seek, obtain and use medication appropriately (Malik, Hanafi, Ali, Ahmed and

Mohammed, 2006).This is linked to timely decisions, accessibility, correct use of the drugs, and follow- up. Unfortunately, most mothers do not understand that malaria can result in stillbirth, low-birth weight and other pregnancy related complications are still elusive(Nwenesi, 1996).

This lack of recognition of such complications may translate into delay in seeking appropriate care. Hence, severe morbidity, which may result in mortality, may be developed (Okafor and Amzat, 2006). An understanding of community perception of illness, especially disease definition that are unique to a particular culture is essential for developing culturally appropriate primary health care programmes (Bricger, Ramakrishna and Adeniyi,1986). Malaria is endemic in Ibarapa LGA of Oyo state, (where this study was actually carried out) and one of its major complications, febrile convulsions affects nearly one-third of pre-school children at least once in their life-time (Salako, *et al, 2001*). In many cases among the local Yoruba people, malaria and its implications to be perceived as different illness entities, for instance febrile convulsion might not be perceived as a complication of malaria. Ideas of causation, severity, seasonality are in many ways opposite. This means that mothers don't perceive the dangers of convulsions when their children have malaria. Unfortunately small children are not part of the decision making process which involves potentially toxic substances (Adeniyi *et al*, 1984). Much of the adverse reactions of malaria are actually preventable by early recognition and prompt treatment. However, quick actions may not be taken due to social and cultural reasons. When parents react, they do when the malaria has got to critical level (convulsion) and most of parents' efforts are more often life threatening than life saving.

2.8 Conceptual framework

When practitioners begin the process of planning an intervention to promote health or change health behaviour, theory helps them interpret the situation and guides their decisions about what design, procedures, and measurement indicators to select. (U.S Department of Health and Human Services, 2005). Depending on the unit of practice (e.g., individuals groups, organization or community) and the nature of the health

problem. different theoretical approaches may be appropriate. For this study, the PRECEDE MODEL was used as it offered a framework for identifying the factors that are linked to the knowledge and utilization of ACT among mothers in the treatment of malaria. It was developed by Green, Kreuter and associates. in 1970.

The PRECEDE is a planning model, not a theory. It does not predict or explain factors linked to the outcomes of interest. but offers a framework for identifying intervention strategies to address these factors. In addition, the framework can be used as a guide in selecting and analyzing behavioural antecedent factors (NIH, 2005). The model therefore facilitates the design of health education and health promotion programs. It guides planners through a process that starts with desired outcomes and works backwards to identify a mix of strategies for achieving objectives.

The PRECEDE acronym stands for:

ACRONYM		THE STEPS	
P:	Predisposing	Step I:	QUALITY OF LIFE DIAGNOSIS
R:	Reinforcing and	Step II:	HEALTHSTATUS DIAGNOSIS
E:	Enabling	Step III:	BEHAVIOURAL DIAGNOSIS
C:	Causes	Step IV:	EDUCATIONAL DIAGNOSIS
E:	Educational	Step V:	STRATEGY PLANNING (Administrative diagnosis)
D:	Diagnosis and	Step VI:	IMPLEMENTATION
E:	Evaluation	Step VII:	EVALUATION

The PRECEDE acronym stands for Predisposing, Reinforcing and Enabling Causes, Educational Diagnosis and Evaluation.

The model posits that an educational diagnosis is needed to design a health promotion intervention, just as a medical diagnosis is needed to design a clinical intervention. An educational diagnosis is the isolation of the factors which causes a behavior and these factors can be organized into three key typologies- Predisposing factors, Enabling factors

and Reinforcing factors. The predisposing factors are those which are related to knowledge, attitude, beliefs, norms, culture and perceptions. The enabling factors are those due to resources such as skill, time, money, drugs, supplies,etc while the reinforcing factors are those related to the influence by significant others. These typologies of factors can influence behaviour positively or negatively.

The adaptation of the PRECEDE framework for the use of ACT in the management of malaria in the under-fives among mothers and care-givers is presented in the figure below.

Administrative Diagnosis

Education Diagnosis

Behavioural Diagnosis

Planning:
- Policy Formulation
- Training
- Public enlightenment

Predisposing factors
Knowledge about malaria problems affecting under-fives
Knowledge of ACT in the treatment of malaria
Perception of ACTs in terms of efficacy, availability and affordability.
Beliefs relating to ACT vis-a-vis conventional antimalarias.

Developmental Strategies:
Training and a host of other capacity building methods and strategies

Enabling factors
- Provision of ACT drugs
- Provision of malaria drugs
- Upgrading of mothers' skills relating to use of ACTs
- Regular financial support
- Efficient transport for referrals

Utilization of ACTs in health facilities by under-fives
Reduced child morbidity and mortality due to malaria infection.

Advocacy social policy

Reinforcing Factors
- Supervision from ministry of health
- Visit to household by health workers for health assessment
- Donation of malaria drugs to health facilities
- Advocacy by all stakeholders in health industry regarding the provision of malaria drugs

Figure: 2.1. The PRECEDE Framework applied to the use of ACT for malaria treatment in under-fives in Ibarapa central LGA

The principles of the framework were used in facilitating the design of the study instrument. It was for instance used to formulate questions used for assessing mothers' level of awareness and knowledge relating to malaria and anti-malaria drugs, the artemisinin based combination therapy, perceptions relating to artemisinin based combination therapy and pattern of use of antimalaria drugs for treating underfives by mothers. The objective of analysis of the data and pattern of presentation of results were all geared towards revealing the educational diagnostic factors are teased out with the help of the PRECEDE framework. Using the framework this way, the study was carried out as a needs assessment exercise whose results could be relied upon for the proposition of evidence- based health promotion and education interventions.

CHAPTER THREE
METHODOLOGY

3.1 Study design

The study was a descriptive cross-sectional survey. It was aimed at determining mothers' knowledge, perceptions, and use of Artemisinin- based Combination Therapy (ACT) for the management of malaria in under-fives in Ibarapa Central Local Government Area, Oyo state, Nigeria.

3.2 Description of the study area

The study took place in Ibarapa Central Local Government Area of Oyo State. The LGA is one of the thirty-three LGAs in Oyo State and it has its headquarters in Igbo-Ora. Ibarapa Central LGA is situated in the Western part of the state. It shares boundaries with Ibarapa North LGA to the North, Ibarapa East LGA to the East and with Ogun state to the South and West. The LGA was created in 1996 from the defunct Ifeloju LGA. Ibarapa Central LGA is made up of two major towns- Igboora and Idere. Each of these two major towns has numerous satellite farm hamlets locally called *abule* The LGA has a total population of 106,583 (National Population Commission, (NPC) 2006). The LGA consists largely of the Yorubas. The ethnic minorities in the LGA include Igbos, *Hausas, Sabes, Igala* and *Fulani*.

Igbo-Ora the LGA headquarter is situated on longitude 71° 2'N and latitude 30° 4' E (Watson and Wareham, 1963). It is located approximately 130 km southwest of Ibadan, the Oyo state capital and about 40 km northwest of Abeokuta, the Ogun State capital. *Onko* Yoruba is the major language of communication. The settlement patterns of the two major towns, Igboora and Idere are quite similar. They are made up of clusters of extended family units usually called compound or *agboole* in the local language. The whole LGA is comprised of 10 political wards, consisting of seven in Igboora and three in Idere. The people of both towns are predominantly peasant farmers. The other prominent agriculture related occupations in the LGA include food processing (e.g. gari- cassava meal) trading in food products and transportation of farm produce to Lagos or

Ibadan (Titiloye, 2001). Cash crops like cocoa and tobacco are grown by a few people, but these are being replaced with intensive cultivation of food crops like cassava, melon, maize, yam, tomatoes, and pepper that constitute the bulk of the farm products transported to major, urban markets of Ibadan, Abeokuta and Lagos (Brieger and Kendall 1996). There are also artisans (e.g. tailors, mechanics) and civil servants. Majority of the women engage in processing farm produce and trading. Many women are self employed and they engage in fashion related occupation and petty trading, and have direct contact with their babies all through the day. However, a number of them engage in large scale business which involves travelling with or without their children for days or weeks at a time (Brieger, 1984).

The vegetation of the LGA is of the derived guinea savannah type, with vast stretches of open grasslands and shrubs. There are patches of isolated thick forests near bodies of water (Titiloye, 2001). The LGA experiences two seasons, the warm dry season from November to March, and the cooler wet season from April to October (Ogunlesi, 1989).

There are four main markets situated at different parts of Igboora and two main markets situated at Idere. The former has *Onilado*,*Oja Oba*, *Oja Isale* and *Towobowo* which are held alternatively in a four day circle, and two held in the same day, while the latter has *Kajola* and *Ayeda* market. The inhabitants of the LGA rely mainly on boreholes and wells for their drinking water supply. Several people still use pond water. Some of these ponds constitute the sites for the transmission of guinea worm.

A variety of health facilities are available within the LGA. These include four LGA maternity Centre/dispensary units which are located in Igbole, Isale Oba, Oke Odo and Idere. The Oyo State Ministry of Health has one general hospital jointly run with the College of Medicine, University of Ibadan. This general hospital is the site of the University of Ibadan- Ibarapa Community Medicine Programme. Six private health facilities are also located within Igboora community. Presently, 68 patent medicine shops are scattered across Igbooro and Idere.

All the health care facilities in the LGA consisting of maternity, dispensary units, public general hospital at Igboora, the private clinics, patent medicine vendors and traditional

herbal homes are involved in the primary health care management of malaria. There are several herbalists in the LGA but because they are not registered, it is difficult to know the exact number of herbal medical practitioners in the LGA. There are also numerous trained Volunteer health workers in the LGA (Salako, *et. al.*, 2001).

The Islamic religion is predominant in the LGA followed by Christianity. The African traditional religious adherents constitute the smallest religious group, but residents in the main towns of Igbo -Ora and Idere still participate in traditional ceremonies and festivals. During this festive period, homage is paid to local divinities (Chirwa, 1987; Oshiname and Brieger, 1992). It is not uncommon for people in the LGA to have one official religion and then practice another one when the need arises.

Migrant farm labourers from other Nigerian States, notably Benue and neighboring countries such as the Republic of Benin and Togo also reside in the LGA. The Fulani nomads who are mainly animal rearers are found in the LGA and they constitute the largest minority group. They practice subsistence farming as a supplementary job. They live in separate settlements outside the main towns with their cattle (Titiloye, 1999). A typical Fulani settlement is called a *gaa*. There are several clusters of such *gaa* in Ibarapa Central LGA. The Fulanis are often left out of the state or national primary health care programme (Dau and Brieger, 1995).This is due to the migrating nature of their settlement as they interact with the neighbouring Yoruba communities.

There are 84 primary schools in the LGA and twenty-four are privately owned. There are nine public secondary schools and seven private secondary schools in the LGA. The only institution of higher learning in the LGA is the Oyo State School of Agriculture situated in Igboora.

MAP OF IBARAPA CENTRAL LOCAL GOVT. AREA, OYO STATE.

SETTLEMENT PATTERN AND INFRASTRUCTURE

IBARAPA NORTH LOCAL GOVT. AREA

IBARAPA EAST LOCAL GOVT AREA

FOREST

OGUN STATE

OGUN STATE

OGUN STATE

Legend

Duro-Kas Consultants

SCALE — 1:125000

Study Population

Women with children aged 1-59 months and guardians having children less than five years in their care constituted the target population. While women with children aged 1-59 months were women of reproductive age group, the guardians also include women who have attained the age of menarche.

Inclusion Criteria

All mothers and guardians with children aged less than five years.

The mothers and guardians must be permanent residents of Ibampa Central Local Government Area.

3.4 Sample Size Determination

Sample size Calculation

The minimum number of mothers studied to estimate the prevalence of ACT use to within 5% points level of precision was determined using the formula for estimating single proportions

$$n = \frac{DZ_{\alpha}^{2} PQ}{d^2}$$ (Kirkwood & Sterne, 2003)

where n is the minimum sample size

Z_{α} is the standard normal deviate corresponding to a 2 sided level of significance of 5% = 1.96

P is the proportion of under-fives reported to have received ACT from a previous study = 59% (Ajayi et al 2008)

Q = 1-P = 41%

d is the desired level of precision = 5%

D = Design effect (allowance for the cluster sampling design) = 1.5

This gives a minimum sample size of 558 participants. (Assuming a non response rate of 15% a minimum sample size of 656 participants was determined). However 720 participants were studied for a higher precision. This is further explained as follow:

The whole of the 360 family clusters (*agboole*) in Igboora and Idere were enumerated. The 360 compounds consist of 288 in Igboora and 72 in Idere. Efforts were made to visit all the compounds in the two towns. Two mothers/guardians of under-five children were randomly picked from each of these compounds to get a total of 720 respondents which constituted the sample size.

A compound in the study area, as in the other Yoruba communities, is a cluster of dwelling units inhabited by persons who are related by paternal blood, including their wives and their children (Salami, 2008).

3.5 Sampling Procedure:

A four stage- random sampling technique was used to select 720 participants from 360 compounds in the two communities. The procedure for the selection of the mothers that participated in the study involved the following steps:

Step 1: Two houses were randomly selected by balloting from each of the 360 compounds

Step 2: Within each of these houses, where there were more than one household, a household was randomly selected by balloting for study. (i.e. two households were selected for study in the selected two houses in a compound).

Step 3: On reaching a selected household, an inquiry was made as to whether there were children under the age of five: if there was none, another household was randomly selected.

Step 4: The mother to be interviewed was selected based on parity, (a mother with higher parity experience (minimum of two children) and another with the first baby were picked from each household. Where the family was polygamous, the two eligible mothers were randomly selected by balloting.

3.6 Methods and Instruments for Data collection

The interview method was used for data collection. This was done with the aid of a semi-structured questionnaire. The questionnaire was divided into five sections — labeled as

Sections A, B, C, D, and E. Section A consisted of questions for documenting the demographic characteristics of mothers or guardians of under-fives, while section B contained questions that determined respondents' level of awareness and knowledge about malaria and anti-malarial drugs. Section C contained questions that assessed their level of awareness and knowledge about ACT. Section D contained questions that documented their perceptions relating to the use of ACT. The pattern of anti-malarial drug use in the under-fives was documented using the questions contained in section E (See appendix II). The questionnaire was designed after reviewing literature and extracting the pertinent variables relating to the use of ACT- related drugs for managing under-fives with malaria. Experts in the fields of Child Health, Pharmacy and Health Promotion and Education were also consulted during the design of the instrument.

3.7 Validity and Reliability

Several measures were taken to ensure the validity and reliability of the instrument. In-house pre-testing of the instrument was done among experts in the fields of Child Health, Community Medicine and Health Promotion and Education in the College of Medicine. The questionnaire was translated into Yoruba language by Yoruba specialist and later back translated into English. This was done to make sure that the instrument maintains its originality. The Yoruba version of the instrument was also pre-tested for content and construct validity in Igangan, one of the major towns in Ibarapa North LGA which shares similar characteristics with Igbo-Ora and Idere. Both Local Government Areas (Ibarapa Central and Ibarapa North) are similar in terms of types of available health facilities, level of development, dialect, culture, ethnic and religious affiliations. Necessary corrections were made following the second pretest exercise.

The statistical package for Social sciences (SPSS) software version 15 was used to run the reliability analysis of the cronbach alpha type on the instrument. The data collected from fifty respondents who had similar characteristics with the target sample during the pretest was used. The corrected item-total correlation of the items that constitute the questionnaire averaged 0.7; this established the construct validity of the instrument. The overall cronbach reliability coefficient alpha estimated on the instrument was 0.9. The

measure of internal consistency with the use of Cronbach's alpha coefficient analysis thereby confirmed its reliability.

Training was conducted for the research assistants (RAs) to ensure that they had adequate understanding of the instrument prior to commencement of data collection. The training focused on the objectives and importance of the study, sampling process, how to secure respondents informed consent, basic interviewing skills and how to review questionnaires to ensure completeness. The RAs were involved in the pre-testing of the questionnaires in order to create an opportunity for them to acquire practical interviewing skills. The researcher checked the questionnaires administered daily and problems discovered during data collection were resolved immediately.

3.8 Data collection process

The study carried out within a period of three weeks. Four RAs were employed for data collection. Each research assistant completed a questionnaire after listening carefully to the responses of the interviewed mother. This was done because a lot of the respondents did not have formal education while those who had formal education had poor reading and writing skills. All the interviews were done in Yoruba language using the local *onko* dialect. It took between 15 – 30 minutes to complete each questionnaire. The data collection process involved the following steps:

Identification of a compound (*agboole*)

Identification of compound head for formal introduction and to seek permission to conduct the study (where the compound head is absent, the recognized most elderly person available was approached)

Identification of a household where an eligible mother would be interviewed

Identification and establishment of rapport with an eligible mother in each of the households including a disclosure of the nature of the study.

Administration of a questionnaire to a respondent.

Collection of completed questionnaires

3.9 Data Management and Analysis

The investigator checked each of the administered questionnaires each day and made necessary corrections. A coding guide was developed to facilitate the coding and entry of

data into a computer. Each questionnaire was coded and entered into a computer using EPI-Info Version 6.04. The data entered into the computer was subjected to descriptive (i.e. mean, median and mode) and inferential (i.e. Chi-square and t-test) statistical test. Finally, the information obtained were summarized and presented in tables and charts as contained in chapter four of this dissertation.

3.10 Knoledge Score Categorization

The maximum knowledge score was 36. Scores 0-4, 5-9 and 10-25 were rated poor, fair and good respectively.

3.11 Ethical Consideration

Entry into each of the communities was facilitated by the letter of introduction by Department of Health Promotion and Education, University of Ibadan. Informed consent was sought from the participants through the use of a consent form (see appendix I). This was after they had been thoroughly briefed about the study and their right to participate or not to participate. Participants were given the choice to withdraw their consent freely if they so choose at any time. Assurances of confidentiality of participants' responses were maintained during and after the conduct of interviews. In order to ensure anonymity of responses names of respondents or compounds' were not written on the questionnaires. The study protocol including the instrument for data collection was sent to Oyo state ethics review committee for review and approval (see appendix V for the ethical approval for the study.)

3.12 Limitations

The main problem encountered during the study was the migrating nature of the community members from one part of the community to another. Some respondents moved out of their compounds *(agboole)* to live in another area while still retaining the name of the ancestral compounds. In such cases, the research assistant moved to another compound to avoid duplication of data for the same set of people. There were instances in which the respondents were reluctant to divulge details of their children to research assistants due to cultural reasons. The popular belief is that it is abominable to count children for a family. To overcome this, time was taken to establish rapport with the

participants and entertained questions asked for clarifications before interviews started. The problem of recognizing Coartem or any of the ACT-related drugs by the respondents was perceived and so samples of the ACT-related drugs were made available to show respondent who did not know the drugs by its name

CHAPTER FOUR

RESULTS

4.1 Respondents' Socio-demographic charnctcristics

Table 4.1 shows the basic socio-demographic characteristics of the respondents. A majority (92.1%) of the mothers were in the 20-39 years age bracket. A few of the mothers (2.8%) were teenagers aged 10-19 years. The mean age of the mothers was 29± 5.3 years with an age range of 10-49 years. Majority (88.1%) of the mothers were married and in monogamous union (71.0%). Over half (59.3%) of the mothers were Muslims while 40.1% were Christians. Slightly more than half (56.7%) had a primary school education and about a quarter (26%) of them had no formal education. Most (97.4%) of the respondents were of Yoruba ethnic group and 68.4% were petty traders.

Table 4.1: Socio-demographic characteristics

N= 720

Variables	N	%
Age of respondents (years):		
10-19	20	2.8
20-29	364	50.6
30-39	299	41.5
40-49	37	5.1
Family type:		
Monogamy	511	71.0
Polygamy	209	29.0
Marital Status:		
Married	634	88.1
Cohabiting	42	5.8
Separated	34	4.7
Widowed	4	0.6
Never married	3	0.4
Divorced	3	0.4
Highest level of education:		
No formal education	187	26.0
Primary education	365	50.7
Secondary education	133	18.4
Tertiary education	35	4.9
Occupation:		
Trading	482	67.0
Farming	72	10.0
Housewife	48	6.7
Students	24	3.3
Civil servant	34	4.8
Other+	65	9.0
Ethnic Group:		
Yoruba	701	97.4
Hausa	5	0.7
Igbo	3	0.4
Other++	23	2.2
Religion:		
Christianity	289	40.1
Islam	427	59.3
Traditional	4	0.6

+ = Fashion related occupation, apprentice, patent medicine vendors

++ = Igbira, Fulani, Togolese, Sabe, Benin Republic

•Mean age of the respondents = 29±5.3 years

•Respondents age range =16-46

Table 4.2: Age of children of respondents in months

N=720

Age group (months) *	No	(%)
1-9	34	4.7
10-19	111	15.4
20-29	71	9.9
30-39	173	24
40-49	164	22.8
50-59	167	23.2

* Mean age of children in months = 18±9.6 months with a range of 1-54 months

4.2 Awareness and Knowledge about malaria and antimalarial drugs

The respondents were asked an open ended question requesting them to state what they understand to be the main cause of malaria. Table 4.3 shows their responses. A majority (61.3%) listed mosquito as the main cause of malaria. Several misconceptions of the cause of malaria were also listed. These included: playing in the sun (13.6%); bad air (4.0%); and cold weather (1.9%); In table 4.4, respondents' perception of the mode of transmission of malaria is presented. 'Bite of mosquitoes' (43.2%) was listed as the mode of transmission of the disease by many mothers. This is distantly followed by 'sharing the same apartment with malaria infected person' (21.1%), 'mother to baby during pregnancy' (13.1%), and 'blood transfusion' (5.1%). Overall, 82.5% of the mothers could state at least one correct possible mode of malaria transmission. (See asterisked for correct responses.)

Majority (83.3%) of the respondents correctly stated increase in the body temperature as a symptom of malaria. Many (41.3%) mentioned lack of appetite,, while 35.3% listed feeling cold or shivering as a malaria symptom. Only a few (20.4%) listed headache as a malaria symptom. Several other symptoms which may not be due to malaria were also mentioned. They are as shown on table 4.5.

Majority of the respondents (84.6%) correctly mentioned under-fives as group of persons in which malaria is most severe. Only 9.3% mentioned adults while none mentioned pregnant women, sickle cell anaemic patient, immigrant who have little or no immunity and such individuals that are at high risk of malaria (See table 4.6). Chloroquine (92.5%) topped the list of the antimalarial drugs respondents ever heard. This is distantly followed by SP group of drugs such as fansidar/maloxine/amalar (34.5%). The Physician (48.5%) topped the list of respondents' sources of information about chloroquine. Other sources mentioned were hospitals/health centres (23.5%) for chloroquine and television (14.5%) in respect of SP. A majority (69.0%) had never heard about Artemeter/Lumefantrine (AL) such as Coartem which is the first line ACT related drug been promoted in Nigeria. (See table 4.7 for details)

Majority (80.8%) of the respondents had never heard of any of such malaria cases that cannot be treated with antimalarial drugs. Respondents' knowledge of antimalarial drugs not currently effective in Nigeria is presented in table 4.8. Majority of the respondents (66.7%) correctly stated Chloroquine/Nivaquine and only 16.0% mentioned Fansidar/Maloxine/amalar. (See table 4.8 for details). Table 4.9 shows respondents' knowledge of drugs for the management of uncomplicated malaria. A majority (77.6%) mentioned Chloroquine/Nivaquine. Only few of the respondents correctly mentioned the recommended drugs based on the new malaria treatment policy which are artemisinin based combination drugs such as coartem (Artemeter/ Lumefantrine) (29.0%), Artesunate-Amodiaquine (0.9%) and Artesunate-SP (0.7%). (table 4.9).

Majority (61.1%) stated chloroquine as the most effective drug for the treatment of malaria in Nigeria. A large proportion (71.8%) did not know that coartem is the new drug used for the treatment of malaria in Nigeria. Only few respondents (27.5%) identified coartem as the new and most effective drug for malaria treatment currently while 28.5% affirmed that it is the first line drug one should take once malaria is noticed. Only 9.2% had current knowledge of the use of SP for the prevention of malaria in pregnancy. (table 4.10).

Table 4.3: Respondents' perceived main cause(s) of malaria

N=720

Main Causes of Malaria	No	(%)
Mosquito	441	61.3
Playing in the sun	98	13.6
Eating too much of palm oil	19	2.6
Cold weather	14	1.9
Dry weather/dry season/bad weather	17	2.4
Bad air	29	4.0
Impure water	20	2.8
Dust	6	0.8
Drinking of garri/eating too much of garri	5	0.7
High temperature/body temperature	5	0.7
Unclean environment/Bush around the house	4	0.6
Bed bug	1	0.1
I don't know	54	7.5
No response	7	0.7

Table 4.4: Respondents' knowledge of mode of malaria transmission

N= 720

Listed mode of transmission	No	(%)
Bite of mosquito*	311	43.2
Sharing the same apartment with malaria infected person*	152	21.1
Mother to baby during pregnancy*	94	13.1
I don't know/Not sure	80	11.1
Sharing needles and syringes with other infected children*	38	5.3
Blood transfusion*	37	5.1
When children play together	8	1.1

*Correct responses

Table 4.5: Respondents' knowledge of the symptoms/signs for recognizing malaria in children

N= 720

Symptoms for recognizing a child with malaria	No	%
Increase in body temperature •	600	83.3
Loss of appetite/child cannot feed •	298	41.3
Feeling cold and shivering •	254	35.3
Headache •	147	20.4
Muscle/Joint pain •	71	9.9
Yellow eyes/red eyes/change in normal eyes colour	59	8.2
Yellow urine•	38	5.3
Vomiting•	27	3.8
Child not playing/stop playing/crying•	27	3.8
Looking dull/general weakness of the body•	16	2.2
Too much sleeping/sleeping	14	1.9
Drinking plenty water/thirsty•	7	0.9
Catnath	4	0.5
Convulsion•	3	0.4
I don't know	1	0.1

• Correct responses

There were multiple responses

Table 4.6: Respondents' knowledge about the groups of people with risk of severe malaria

N=720

Persons among whom malario is most severe	No	%
Children under-five years*	609	85.0
Adult	67	9.3
All young people	31	4.3
Children aged 6-9 years	6	0.8
Everybody	6	0.8
No response	1	0.1

*Correct response

Table 4.7: Anti-malarial drugs ever heard by respondents as well as their sources of information

N= 718

Anti-malarial drug	Ever heard*		Main sources of information**								
	Yes (%)	No (%)	Pharmacy (%)	Physician (%)	Television (%)	Radio (%)	Patent medicine (%)	Hospital/ health centre (%)	Nurse (%)	Other health workers (%)	Friends/ Neighbour (%)
Artemether- Lumefantrine (Coartem®, Lonart®)	222 (31.0)	496 (69.0)	3 (1.4)	89 (41.4)	2 (0.9)	2 (0.9)	0 (0.0)	72 (32.4)	3 (1.4)	42 (18.9)	8 (3.6)
Amodiaquine –Artesunate (Larima!, Datt, Malmed)	3 (0.4)	715 (99.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100)	0 (0.0)	0 (0.0)	0 (0.0)
Artesunate – Sulphamethoxine & Pyrimethamine (co-Arinate ®, Fanesar)	7 (1.0)	711 (99.0)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)	3 (42.9)	3 (42.9)	0 (0.0)	0 (0.0)	0 (0.0)
Sulphadoxine – Pyrimethamine (fansidar®, maloxine®, Amalar®, Malwin®)	248 (34.5)	470 (65.5)	24 (9.7)	91 (36.7)	36 (14.5)	3 (1.2)	0 (0.0)	53 (21.4)	0	0	41 (16.5)
Artesunate – mefloquine (Artequine®)	8 (1.1)	710 (98.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (25.0)	6 (75%)	0 (0.0)	0 (0.0)	0 (0.0)
Proguanil (Paludrine ®)	9 (1.3)	709 (98.7)	0 (0.0)	1 (11.1)	0 (0.0)	0 (0.0)	4 (44.4)	4 (44.4)	0 (0.0)	0 (0.0)	0 (0.0)
Chloroquine (Nivaquine ®)	664 (92.5)	54 (7.5)	53 (8.0)	322 (48.5)	1 (0.2)	0 (0.0)	0 (0.0)	156 (23.5)	2 (0.3)	7(1.1)	2 (0.4)
Halofantrine (Halfan ®)	10 (1.4)	708 (98.6)	1 (10.0)	2 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (30.0)	0	0	0
Quinine	22 (41.4)	696 (96.9)	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	5 (22.7)	14 (63.6)	0	0	1 (4.5)

*There were multiple responses

**There were multiple responses

Table 4.8: Awareness of common anti-malaria drugs which are no longer effective in Nigeria

N = 138

Drugs no longer effective for treating malaria	No	%
Chloroquine/maxiquine/nivaquine	92	66.7
Fansidar/maloxine/amalar*	22	16.0
Daraprim (Sunday - Sunday)	16	11.6
Local herbs/foreign herbs	3	2.2
Dar/unlined/larimal	2	1.4
Contem	1	0.7
Expired tablets	1	0.7
Camoquine	1	0.7

*Fansidar is however still being currently used for the prevention of malaria in pregnancy as from the second trimester

Table 4.9: Knowledge of new drugs recommended for the treatment of malaria in Nigeria

N=720

New drugs for treating malaria:	Responses			
	Correct		Incorrect	
	No	%	No	%
Chloroquine/Nivaquine	559	77.6	161	22.4
Fansidar (Sulphadoxine-Pyrimethamine)	161	22.4	559	77.6
Coartem, Lonart (Artemeter-Lumefantrin)*	209	29.0	511	71.0
Dart, Malmed (Artesunate-Amodiaquine)*	7	1.0	713	99.0
Farenax, (Artesunate-SP)*	5	0.7	715	99.3
Fansimef (Mefloquine-SP)	279	38.8	441	61.2

*Correct responses

Table 4.10: Respondents' knowledge relating to drugs for treating malaria

N= 720

Statements related to drugs for treating malaria	Responses	
	Correct (%)	Incorrect (%)
Chloroquine is still the most effective drug for the treatment of malaria in Nigeria.	538 (74.7)	*182 (25.3)
Coartem is now the new drug used in place of chloroquine for the treatment of malaria in Nigeria.	*198 (27.5)	522 (72.5)
The most effective anti-malaria drug recommended for sickle cell anaemia patient is proguanil (paludrine).	*10 (1.4)	710 (98.6)
Coartem is the most effective drug for the treatment of malaria as at today	*198 (27.5)	522 (72.5)
It is safe for women who are pregnant for 3-6 months to take coartem	*31 (4.3)	689 (95.7)
Sulphadoxine-Pyrimethamine (Fansidar) is effective in the control or prevention of malaria during pregnancy.	*66 (9.2)	654 (90.8)
Coartem is now the first line drug one should take once malaria is noticed.	*205 (28.5)	515 (71.5)

*Correct responses

4.3 Respondents' level of awareness and knowledge about Artemisinin- Based Combination Therapy

Only 219 (30.4%) of the respondents had ever heard of Artemisinin based Combination Therapy (ACT). Respondents' sources of information about Artemisinin based Combination Therapy (ACT) are shown in table 4.11. Health facilities (86.0%) topped the list of their sources of information about the concept. Others included doctors (14.2%) and nurses (13.2%). Out of the 219 respondents that were aware of ACT, most (93.6%) mentioned coartem as a recommended drug for home management of malaria. Only three respondents (1.4%) mentioned Artesunate-Amodiaquine (AA) such as Dart/Larimal. A large proportion of the respondents (62.6%) had never heard about AA, while few (35.2%) mentioned SP group of drugs for home management of malaria. Slightly above half (53.9%) stated that SP should not be used in under-five children while chloroquine was mentioned by 62.6% as the drug currently recommended for the treatment of malaria in the under-fives (table 4.12).

Respondents' knowledge of the advantages of using the new antimalarial drugs is presented in table 4.13. Majority (69.9%) of the 219 respondents were of the opinion that the new antimalaria drugs are highly effective against malaria in under-five children. Few (19.2%) said the drugs are very safe to use (table 4.13).

Majority, (85.4%) of the respondents claimed that they knew the recommended dosage of coartem for treating malaria in under-five children. However, only 69.0% was able to state correctly the dosage for day 1, day 2 and day 3 for children aged less than 3 years, while few (21%) could do so for day 1, day 2 and day 3 for children between 4-5 years. (Correct Dosage for under 3: *Half tablet twice daily for 3 days: while for 4-5 years of age: 1 tablet twice daily for 3 days should be used. On the first day, the second dosage is taken after 8 hours while subsequent doses are used every 12 hours*). All the 219 respondents were also requested to state the current dosage of larimal (AA) in children aged 1-3years and those aged 4-5 years. None of them could state the dosages of the drug for children aged 1-3 and 4-5 years. (The correct dosage for age 1-6 years: *1 tablet of*

(50mgArtesunate/150mgAmodiaquine) should be used every 12 hours i.e. morning and evening for three days).

A knowledge scale or marking scheme was used for assessing the respondents' knowledge (see appendix IV for the scale). The actual questions used for the knowledge assessment are given triple asterisk (***) in appendix II. The respondents overall mean knowledge score was 6.9±4.8 out of 36. However, 27.5% scored between 10-25, 41.1% scored between 0 and 4, while 31.4% scored between 5-9.

Mothers aged 16-24 years had a mean score of 6.4±4.2 out of a maximum of 36, while those aged 25-46 years had a mean knowledge score of 7.1±4.9. The difference between the mean scores of the two groups was not statistically significant.(table 4.15) Respondents with one child had a mean score of 6.2±4.2, while those with more than one child had a mean score of 7.5±5.1. The difference between the two groups was statistically significant. There was a significant difference in the mean knowledge scores of respondents with primary education (6.7±4.6); secondary education (7.9±5.5) and tertiary education (11.3±6.4) ($p<0.05$).

The comparison of the mean knowledge scores by religion shows that Christian mothers were more knowledgeable with a mean score of 7.5±5.1 than Muslim mothers with mean scores of 6.5±4.6. The difference among the groups was statistically significant.(table 4.15) Respondents' mean knowledge scores by occupation is shown on table 4.16. Civil servants had the highest mean score of 15.4±6.9; this was followed closely by respondents who were teachers with a mean score of 14.1±5.7. The difference in the mean score of the respondents by occupation was found to be statistically significant.

Table 4.11 Respondents' sources of information about ACT

N=219

Sources	No	%
Health facility (hospital, clinic/maternity)	108	49.3
Doctor and Nurses	60	27.4
Nurses	29	13.2
Pharmacy/Pharmacist	11	5.0
Friends/our people/neighbor	7	3.2
Radio and Television	3	1.4
Patent medicine vendors/chemists	1	0.5

Table 4.12: Knowledge of the drugs recommended for the home management of malaria in under-fives

N= 219

Drugs	Drugs for home management of malaria in under-fives	
	Correct No (%)	Not Correct No (%)
Coartem/Lonart	*205 (93.6)	14 (6.4)
Chloroquine	141 (64.4)	*78 (35.6)
Fansidar/ Amalar/ Maloxine	101 (46.1)	*118 (53.9)
Dar/Larimal(AA)	*3 (1.4)	216 (98.6)

*Correct responses

Table 4.13: Respondents' knowledge of the advantages of ACT drugs

N=219

Advantages	No	%
Highly effective in under 5 children	153	69.9
Very safe to use	42	19.2
Adverse effects are minimal and are rare	2	0.9
Dosage is easy to comply with	1	0.5
Never used it	4	1.8
No Response	17	7.8

Table 4.14: Respondents' knowledge of the use of coartem for treating malaria in under-five children

Correct dose of coartem	Correct (No)	(%)	Incorrect (No)	(%)
Knowledge of correct coartem dosage for 1-3 years (N=187)				
	129	69.0	58	31.0
	129	69.0	58	31.0
	129	69.0	58	31.0
Knowledge of correct coartem dosage for 4-5 years (N=187)				
	21	11.2	166	88.8
	21	11.2	166	88.8
	21	11.2	166	88.8

Table 4.15: Comparison of respondents' mean knowledge scores about anti-malarial drugs by age group, parity, education and religion

Varinbles	Number	Mean score	SD	t-value	p-value
Age Group					
16-24	121	6.4	4.2	1.462	>0.05
25-46	599	7.1	4.9		
Parity					
One child	302	6.2	4.2	3.6	< 0.05
More than one Child	418	7.5	5.1		
Education					
Education	**Number**	**Mean score**	**SD**	**p-value**	
Primary	365	6.7	4.6		
Secondary	133	7.9	5.5		
Tertiary	35	11.3	6.4	< 0.05	
Religion					
Christianity	289	7.5	5.1		
Islam	427	6.5	4.6	< 0.05	

Table 4.15: Comparison of respondents' mean knowledge scores about anti-malarial drugs by age group, parity,education and religion

Variables	Number	Mean score	SD	t-value	p-value
Age Group					
16-24	121	6.4	4.2	1.462	>0.05
25-46	599	7.1	4.9		
Parity					
One child	302	6.2	4.2	3.6	< 0.05
More than one Child	418	7.5	5.1		
Education					
Education	**Number**	**Mean score**	**SD**	**p-value**	
Primary	365	6.7	4.6		
Secondary	133	7.9	5.5		
Tertiary	35	11.3	6.4	< 0.05	
Religion					
Christianity	289	7.5	5.1		
Islam	427	6.5	4.6	< 0.05	

Table 4.16: Comparison of respondents means knowledge score of anti-malaria dose by occupation

Occupation	Number	Mean score	SD	p-value
House wife	48	5.3	3.5	
Trading	475	6.8	4.6	
Student	24	7.9	4.5	
Farming	72	5.4	3.0	
Teaching	17	14.1	5.7	
Civil servant	17	15.4	6.9	
Fashion related	55	6.5	4.1	<0.05
Patent medicine vendor	2	12.5	4.9	
Artisan*	10	5.4	2.8	

*Artisan includes: Food Seller, Phone Call business, Gold Smith and Apprentice

4.4 Perception of Artemisinin Based Combination Therapy (ACT)

Majority (80.4%) of the respondents were of the opinion that the ACT related drugs were readily available in the hospitals. Only 10% had a contrary opinion. Majority (74.4%) of the respondents agreed that the new anti-malarial drugs had less side effects compared with chloroquine while only 6.9% disagreed. Few (14.2%) of the respondents were of the opinion that chloroquine is still very effective for treating malaria while more than half (59.4%) were of a contrary opinion. Majority (90.9%) disagreed with the statement that they don't use these new anti-malarial drugs because they are too expensive. In the same vein, 85.8% also disagreed that they don't know much about these new anti-malarial drugs, and so they don't use them, but a notable few (5.5%) agreed that they don't know them and so they don't use the drug (table4.17)

One hundred and twenty three respondents (56.2%) were of the perception that not much is known about the side effects of ACT related drugs in children under 5. More than half (59.4%) were of the belief that coartem for children are now available everywhere, and almost all (97.7%) did not share the view that coartem and the other new antimalarial drugs are for people who are rich in the society. Majority 193 (88.1%) were of the belief that the new anti-malarial drugs are more effective for treating under-five children compared with Chloroquine(table 4.17)

Table 4.17: Respondents' perception of the new antimalarial drugs (e.g. coartem, larimal etc) for the treatment of children under 5 years

Perception of ACT	Agree		Cnu't say		Disagree	
	No	%	No	%	No	%
I do not use the new anti-malarial drugs because they are not readily available in the hospitals and drug stores.	22	10.0	21	9.6	176	80.4
The new anti-malarial drugs have less side-effect compared to chloroquine.	163	74.4	41	18.7	15	6.9
I do not use these new anti-malarial drugs because they are too expensive; I can not afford them.	2	0.9	18	8.2	199	90.9
Chloroquine is still very effective in treating malaria;	31	14.2	58	26.5	130	59.4
I don't know much about these new Anti-malarial drugs;	12	5.5	19	8.8	188	85.8
Not much is known about ACT medicine side effects for children under 5.	96	(43.8)	-	-	123	(56.2)
Coartem for children under-five is now available everywhere.	130	(59.4)	-	-	88	(40.6)
Coartem and the other new anti-malarial drugs are for people who are rich in the society.	4	(1.8)	-	-	215	(98.2)
The new Anti-malarial drugs are more effective for treating under-five children compared with chloroquine.	193	(88.1)	-	-	25	(11.9)

4.5 Respondents' pattern of anti-malarial drug use in children under-five years

The mothers were requested to list the antimalarial drugs ever used by them for treating their children with malaria. Their responses are highlighted in table 4.18. Local herbs (86.4%) and Chloroquine (85.3%) topped the list of the drugs ever used by the respondents while over a quarter (26.5%) had ever used coartem. Only three of them (1.4%) respondents listed Piriton and other anti-histamine. Table 4.19 highlights antimalarial drugs which respondents still use for treating malaria in their under –five children. Local herbs (81.7%) also topped the list, followed by Chloroquine (71.0%), while 26.1% use Coartem: only 8.2% still used Fansidar/Maloxine/Amalar.

Respondents who still used Chloroquine were asked to adduce reasons for their practice. Their reasons included the following: "Ready availability" (48.5%). "It is the drug recommended by our doctors" (44.6%); "It does not cause problems for my children" (27.4%) "Cheapness of Chloroquine" (20%) (table 4.20 shows details). Figure 4.1 shows respondents' most preferred drugs for treating malaria among their under-fives. Chloroquine (59.0%) topped the list, followed by Coartem (26.5%). Few (11.1%) listed SP (Fansidar/Amalar/Maloxine) as their most preferred drug for treating malaria in their under-five children, while very few 3.1% listed Camoquine and a pocket of others listed herbs (0.1%) and Quinine (0.1%).

The frequency of malaria episodes in respondents' children within the last 6 months preceding the study is highlighted in figure 4.2. Thirty-six percent had malaria once, 35.4% never had malaria during the period under reference, 20.6% had malaria episode twice, 4.7% had malaria thrice, 1.3% had malaria four times while 1.1% had malaria episode up to six times.

More than half (58.0%) of the respondents would use ACT only when physician prescribes it, while few (15.1%) give their children ACT related medicines when they develop mild fever, when physician prescribes it, while few (15.1%) when they develop mild fever (table 4.20). Ten percent would use ACT medicines when the major symptoms of malaria become visible in the child. Only 3.7% use ACT related drugs for prophylactic

purpose while 12.3% don't use them at all. (table 4.21) The respondents were asked if there were antimalarial drugs which they used before but which they no longer use. Majority (77.9%) responded in the affirmative that there are antimalarial drugs which respondents no longer use for treating their children under-five years. The list of antimalarial drugs which 157 respondents no longer use for treating their children under-five years are presented in Figure 4.3 Most (93.0%) listed Chloroquine, very few listed SP (6.4%) while a negligible proportion (0.8%) mentioned local herbs. Respondents' reasons for discontinuing the use of Chloroquine for treating their children under-five years is presented in table 4.23. Some 17.8% discontinued the use of Chloroquine as a result of its associated side effects The reasons adduced by 21.0% of the respondents were because of the newly recommended ACT related drugs. Chloroquine was discontinued by 15.1% because it could not cure malaria in their children. Out of the 191 respondents that use coartem, most (95.7%) obtained the drug from health centres, while only 2.1% got it from patent medicine stores. Four (66.7%) out of the 6 respondents that use Artesunate obtained it from patent medicine stores. Most (84.0%) of the respondents that use Chloroquine obtained it from health centres while only 12.3% obtained it from patent medicine stores. Many (66.5%) out of the 161 respondents that use SP obtained it from patent medicine vendors while few (30.4%) got theirs from health centres.(table 4.24) The 219 respondents that were aware of artemisinin- based drugs were requested to state the dosage forms of the ACT related drugs which they had ever used for treating their under -five children who had malaria, only Coartem was mentioned by 174 respondents (79.4%) and the dosage form of Coartem used was "tablet".

Table 4.18: Drugs ever used by respondents for treating malaria in under-fives

N=720

Drugs ever used for treating malaria in under-five years	No	%
Local herbs	622	86.4
Chloroquine	614	85.3
Fansidar/ Amatar/ Maloxine	217	30.1
Paracetamol/Afabukun/Laila	202	28.1
Coartem	191	26.5
Foreign herbs (Tianshi, etc)	4	0.5
Piriton and other anti-histamine	3	1.4

* These are multiple responses

Table 4.19: Drugs used whenever under five children has malaria

N=720

Anti-malarial drugs still used for treating malaria in under-fives	No	%
Local herbs	588	81.7
Chloroquine	511	71.0
Coartem	188	26.1
Fansidar/ Amalar/ Maloxine	59	8.2
Paracetamol/Alabukun/Laila	18	2.5
Foreign herbs (Tianshi, GNLD products, etc)	4	0.6
Septrin/ other antibiotics	3	0.4

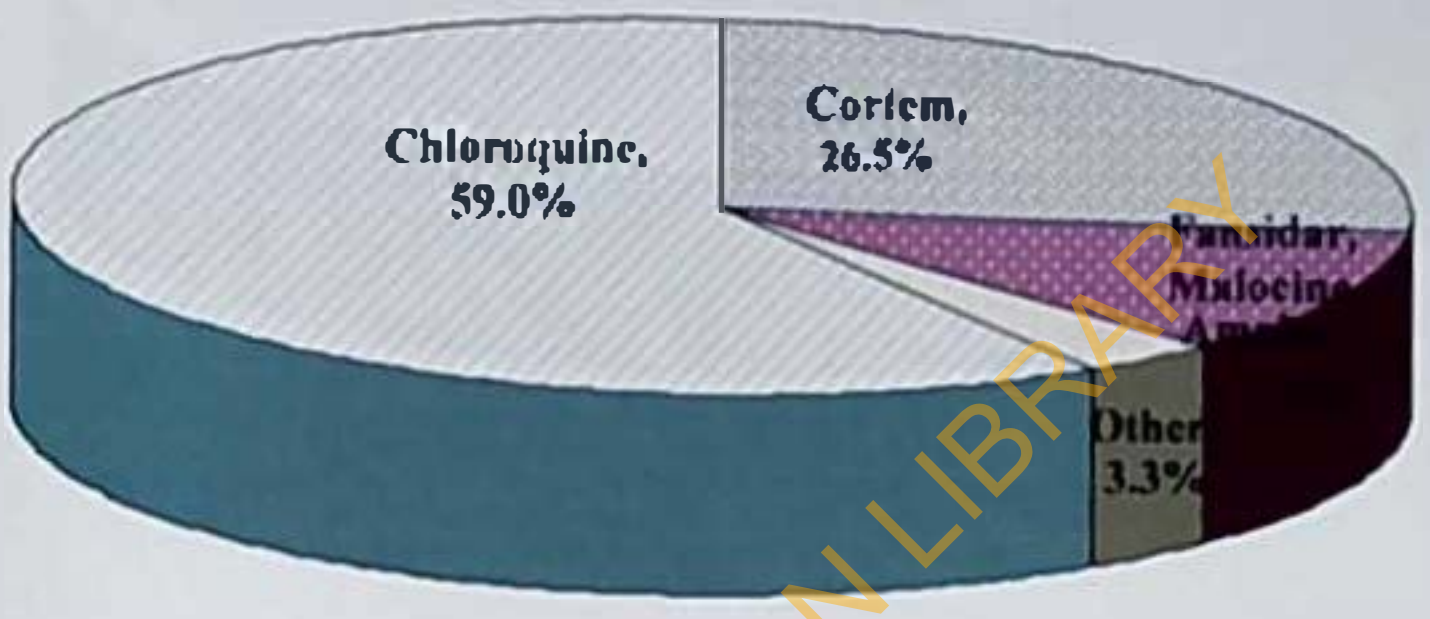
* These are multiple responses

Table 4.20: Reasons adduced for still using chloroquine in treating children under-five years

N=511

Reasons for continued use of chloroquine in under-fives	No	%
Readily available	248	48.5
Recommended by our doctors/health worker	228	44.6
It does not cause problem for my children	140	27.4
Very cheap	102	20.0
Acceptable to children	70	13.7
Recommended by medicine vendor/chemist/medicine seller	18	3.5
Very active/work in children	5	1.0
It is the only one I know/not aware of any other	1	0.2

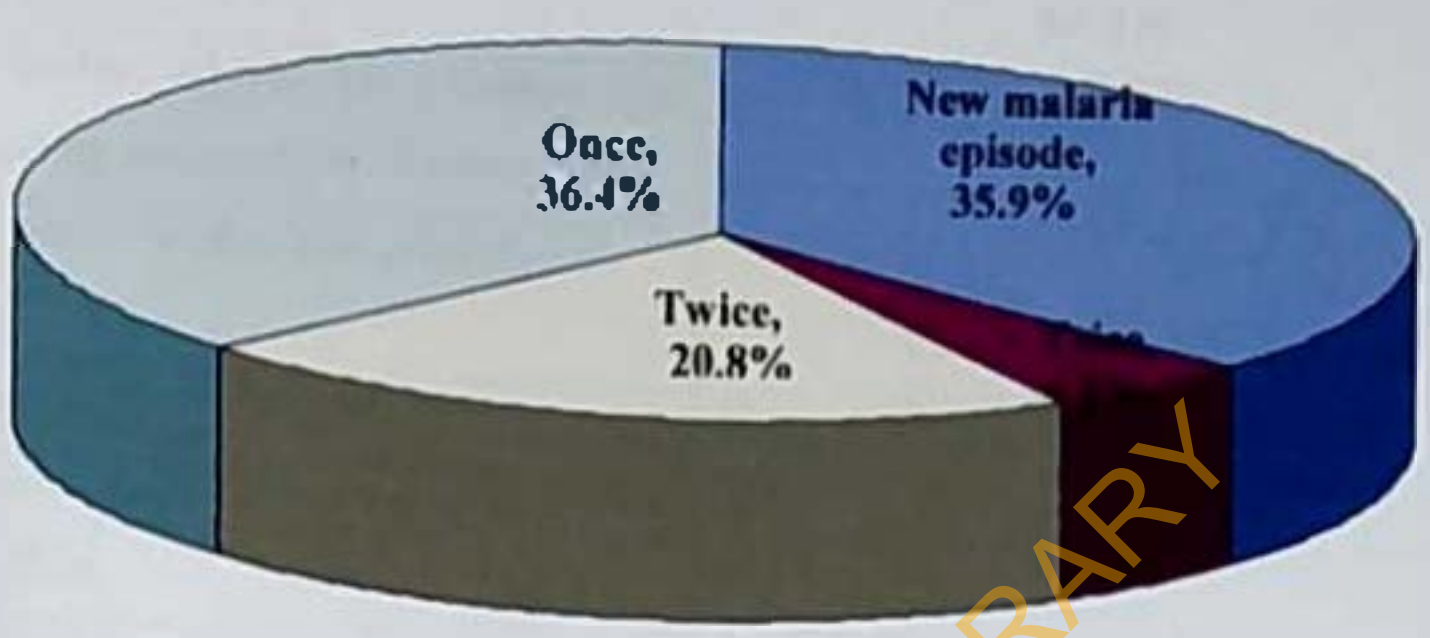
*These are multiple responses



Others: Herbs, Camoquine and Quinine

Figure 4.1: Drugs preferred by respondents for the management of malaria in under-five children

N=720



Others: Four and Six times

Figure 4.2: **Frequency of malaria episodes in respondents' children in the last 6 months preceding the study**

Table 4.21: Conditions under which respondents give under-fives the new anti-malaria drugs

N= 219

Conditions under which new antimalarial drugs are used by respondents in under-fives	No	%
I used it only when the physician prescribes it	127	57.9
When child develops a mild fever	33	15.1
When the major symptoms of malaria become visible in my child	24	11
Every week, to ensure that malaria never strikes	8	3.7
No Response	27	12.3

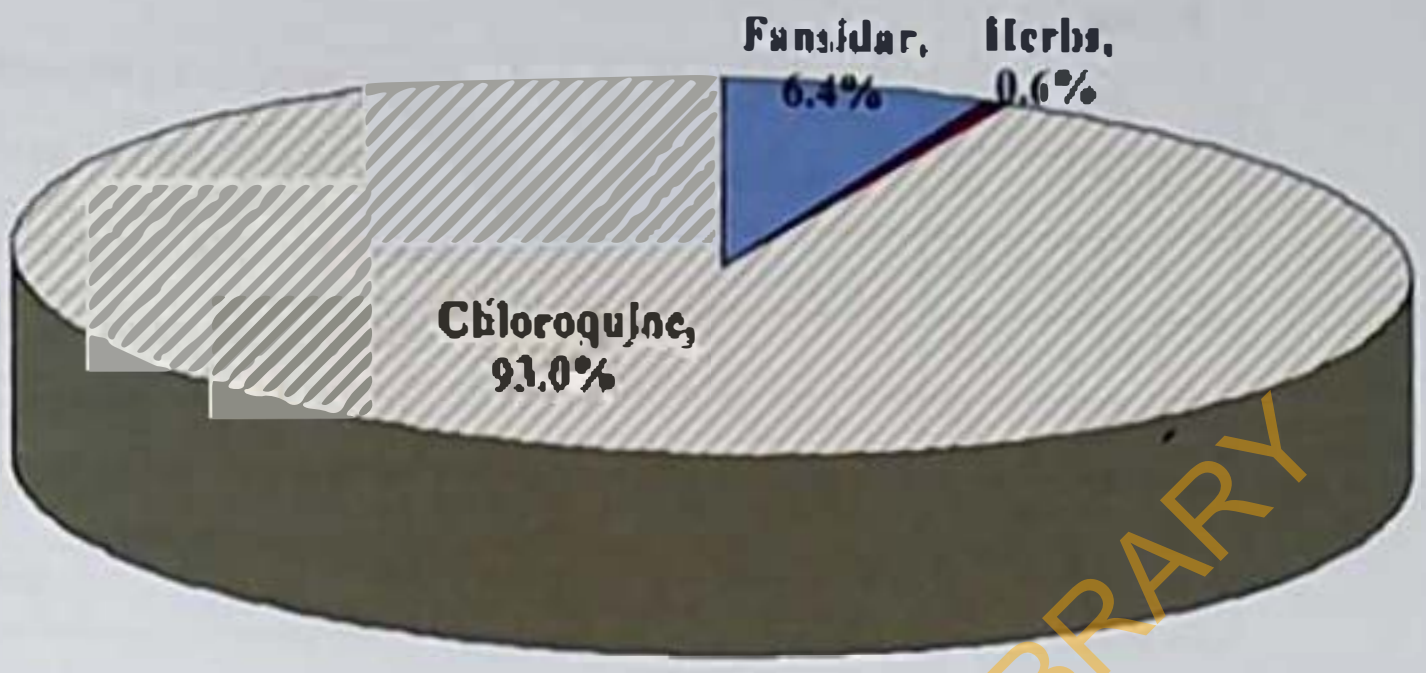


Figure 4.3: Anti-malarial drugs which the respondents no longer use for treating under- fives

Table 4.22: Respondents' reasons for discontinuing the use of Chloroquine as Anti-malarial drugs

N=219

Reasons stopping chloroquine use	No	%
I am aware of the newly recommended anti-malarial drugs	46	21.0
It has many unpleasant side effects	39	17.8
It could not cure the malaria when it was used	33	15.1
My doctor warned me against it	22	10.0
It has bitter taste	11	5.0
No response	68	31.1

*These are multiple responses

Table 4.23: Sources of various drugs used by respondents for treating under- fives who had malaria

DRUGS	Sources of procurement					
	Patent Medicine No (%)	Pharmacy No (%)	Hospitals/ Clinics/Health centres No (%)	Significant others* No (%)	Personal Effort** No (%)	Total of respondents
Coartem	4 (2.1)	7(3.7)	179 (95.7)	1(0.5)	0	191
Artesunate	4 (66.7)	0 (0)	2 (33.3)	0 (0)	0	6
Dan Lanimal	1(100)	0 (0)	0 (0)	0 (0)	0	1
SP (Fansidar or Maloxine)	107(66.5)	4 (2.5)	49 (30.4)	1 (0.6)	0	161
Quinine	4 (50)	0 (0)	4(50)	0 (0)	0 (0)	8
Chloroquine	27 (12.3)	6 (2.7)	184(84.0)	1 (0.5)	1(0.5)	219
Herbs	4(15.4)	2(7.7)	0 (0)	17 (65.4)	3 (11.5)	26

* Grandfathers, grandmothers, close neighbors and friends

** Personal efforts include sourcing the drug from the earlier ones kept in the house, or getting the drugs/herbs from the bush.

CHAPTER FIVE

DISCUSSION

5.1.1 Socio-demographic characteristics

Majority of the respondents fall between 20-39 years of age bracket and are permanent residents of the community. This finding is in agreement with the *'Patients' fact sheet on reproductive aging in women*, a publication of the American Society For Reproductive Medicine (ASRM,2007). According to the report of ASRM, the fertility of a woman is at its peak around this age bracket, (i.e from late teens to late twenties) and then begins to decline. Traditionally, females in the study area are encouraged to marry early so that they can begin their child bearing early. The chances of miscarriage begin to increase when one is in the 30's. The average age of the final menstrual period (menopause) is age 51(ASRM, 2007).. However, advances in medical care now help women in their late 30s and 40s to have safer pregnancies than in the past. (Robyn Nest. 2005).

The average age of the respondents was fairly different from a previous study carried out on treatment of childhood fever and other illnesses in the same community just less than a decade ago. In that study, the average age of the caregivers most of whom were the mothers of under-fives was 38 years (Salako et al, 2001). This difference might be because in that study, older care givers who were not biological mothers of the under-fives were included.

Slightly more than half of the respondents had only primary education while just above a few had no formal education at all. Low level of education may directly or indirectly impacts negatively on the mothers' ability to adequately manage malaria in under- five children. One of the major causes of development of resistance to chloroquine was the misuse of the drug. There should be a concerted effort by the Departments of Health, Education and Women Affairs under the Local Government Authority to facilitate adult

education for women. This will be so necessary especially in the rural setting studied as part of the strategy for promoting the social marketing of the new health innovations including ACT. It was noted in the study that utilization rate of ACTs did not appear to vary greatly with the age of the children or with the educational level of the mothers. This finding is also similar to a study carried out in four African sites on feasibility and acceptability of artemisinin-based combination therapy for the home management of malaria (Ajayi et al, 2008).

More than half of the respondents were Moslems followed by Christians. These were the most popular religions among the respondents. This has been the pattern of distribution of people by religious affiliation in the study area (Salako *et al*, 2001, Brieger *et al*,1986) It was apparent from the study that the religious background of the respondents did not affect their use of either traditional or orthodox medicine in the treatment of malaria among the under-fives in the community. The usage of medicine for the treatment of malaria or other diseases is not discouraged by either of the two main religions in the study area.

5.1.2. Awareness and knowledge about malaria

One of the major findings of the study is the high proportion of the mothers had a correct perception of the causes of malaria, by noting that a *germ in mosquito* (plasmodium) causes malaria disease. However a notable percentage of the respondents still had a misconception relating to the cause of malaria for instance, majority mentioned mosquito as the main cause of malaria while none mentioned plasmodium or *a germ resident in the mosquito*. Although mosquito is implicated in the transmission of malaria [Centre for Disease Control (CDC), 2006; Kakillaya, 2006] it is not the cause of the disease, but a vector for the infection [Centre for Disease Control (CDC), 2006; Kakilaya, 2006]. This kind of misconception is not peculiar to the study area. A similar misconception was noted in rural Ghana in a study carried out among mothers of under-10 years children. (Korte and Fisher, 2005). Other documented misconceptions were that malaria is caused by 'the gods', 'bad air', working in the sun', 'dry weather' and 'eating too much of palm oil. The misconceptions held in the study area are associated with the cultural belief.

(Bricger *et al*, 1986). This cultural belief informed the categorization of malaria into three types in Ibarapa namely (1) *Iba ponju* (2) *Iba olotutu* (3) *Iba ararira* (Bricger, 1993). ("*Pon*" in Yoruba language is one of the words used for red or yellow or orange eyes.) So, *Iba ponju* is associated with dust and eating of palm oil (Bricger, 1993); *Iba ararira* was associated with stress while *iba olotutu* was associated with shivering. Associating the cause of malaria to the gods as shown in the study attest to the prevalence of superstitious beliefs relating to malaria in the study area. The indigenous knowledge of the people including perceptions, beliefs and world view relating to malaria need to be taken into consideration in order to design a culturally appropriate malaria control strategies for the country.

The association of the cause of malaria with bad air as noted in this study by majority (83.3%) of respondents is similar to the ancient perception of the cause of malaria (Kakkilaya, 2006 (www.malariasite.com), CDC, 2004). It was confirmed from malaria history that this perception informed the eventual derivation of the name "malaria" for the name of the disease. Malaria is derived from two Italian root words-'*mala*' meaning bad and '*aria*' meaning air (CDC, 2004).

Majority of the respondents also had some basic knowledge of the major symptoms of malaria in children. The findings of the study agree with the UNICEF report on malaria and children. According to UNICEF (2007), fever is the most common symptom of malaria among children. In another study conducted in Mali, vomiting, fever, dark urine/yellow eyes were the most common perceived means of recognizing malaria among mothers in one of their local districts. (Thera, Dalesandro, Thiero, Quedraogo, Packou, Solcinanne, Fane, Alves, Doumbo, 2000).

The wrong perceptions of the etiology of malaria may lead to defective sick- role behaviours in the community (Amzat and Okafor, 2007). For instance, in a study conducted in Ghana by Ahorlu, Dunyo, Afari, Koram and Nkrumah (1997), it was found that inappropriate etiologic attributions translated to incorrect preventive modalities. The respondents in the study claimed that *asiri* (a local language for malaria) was caused by

heat and that it will continue to occur as long as the sun continues to shine. In the same study, some respondents reported that malaria could not be prevented 'as we are all born with it' and therefore bed nets usage for the prevention of malaria was low in the study.

A major conclusion from these and other cited studies is that current malaria knowledge, may lead to adoption of efficacious treatment and preventive strategies. Generally, the process of illness recognition, treatment seeking, referral practices and treatment itself is poorly understood in most rural African communities (Fisher and Kole, 2005). There is therefore a need to examine the local beliefs of the people on the aetiology of the disease and the perceived associated symptoms. This will be useful in designing comprehensive educational intervention packages relating to malaria control, prevention and treatment.

A major finding in the study is that the respondents had a high level of knowledge about mode of transmission of malaria. Majority of the respondents could mention one correct mode of transmission of malaria. However, less than half of them correctly mentioned mosquito as vector of the disease. This finding is similar to previous findings. A variety of scientific reports have implicated the female anopheles mosquito as the vector for human malaria parasite. [CDC, 2004; (Kakkilaya, 2007. http://www.malasite.com)]. Majority of the respondents listed malaria as most serious health condition among children under-five years. This agrees with a study which was earlier carried out in Igboora on causes of death in under-fives in the community. The study revealed that most major cause of death in the study accounting for about 46.2% of all deaths were associated with malaria (Fadunsi, Lagunju, Odedahunsi, Egbonim, Negbenebor, Onyiuke and Etchie, 1974).

In this study, it was observed that majority of the respondents could rightly identify children under-five years as being most vulnerable to malaria.It had been noted that over 80 per cent of malaria related deaths which occur among African children under age five were infected with Plasmodium falciparum [(UNICEF,2007), RBM/WHO, 2006; Sach and Malaney, 2002; WHO, 2000]. The ability of the mothers to recognize children aged less than five years as the most vulnerable group provides good foundation for health

education relating to the promotion of appropriate early treatment for childhood health fevers (Brieger and Kendall, 1992).

It is good to note that majority of the respondents' children in the study were claimed to have had a bout of malaria at least once in the six months preceeding the study, while a sizeable proportion of the children had two to six episodes in the six months preceding the study. This finding also agrees with the previous findings on the recurrence of episodes of fever in children. It has been found that most children have a range of 2-6 bouts of the disease a year with an average of four bouts (Amadi and Okogun,2005, Orimadegun *et al.*, 2007). Repeated attacks of malaria in children have been shown to be a major cause of school absenteeism in sub-sahara Africa(FMOH, 2005).

5.1.3 Awareness of antimalarial drugs

Chloroquine, followed by Sulphadoxine-Pyrimethamine (SP) topped the list of antimalarial drugs the respondents were aware of with the physicians being their major source of information. Only a few had heard of Coartem, and the physician still was the major source of information about the relatively new antimalarial drug. However, in contrast to this finding, it was noted in a similar study cooducted in selected villages in Ona Ara Local Government Area of Oyo state in Nigeria, that the awareness of coartem[R] was relatively low as none of the participants in the study had ever heard of the drug (Ajayi et.al, 2008). The implication of this is that, coartem[R] the new first line ACT drug adopted by FMOH for treating uncomplicated malaria in Nigeria is still unknown to many mothers. Chloroquine and Sulphadoxine-Pyrimethamine (SP) are the fomer first and second line drug of choice for managing uncomplicated malaria in Nigeria (FMOH, 2001). Though the use of Chloroquine is being discouraged because of its confirmed decline in therapeutic efficacy and its susceptibility to plasmodium parasite resistance (Amadi and Okogun, 2005), its use still remains very popular in the study area. Multiple intervention methods and strategies including enlightenment, advocacy and social marketing are needed to address the situation.

In earlier studies, Physicians were not reported as being the major source of information about drugs. For instance, in a study conducted on the treatment of childhood fevers in three rural communities in Nigeria, the Patent Medicine Vendors (PMV) were the most frequent first line and second line caregivers consulted for malaria care. As many as 46.3% out of 3006 respondents mentioned PMV in respect of treatment choices for recent episodes of illness (Salako, Brieger, Afolabi, Umeh, Agomo, Asa, Adeneye, Nwakwo and Akinlade, 2001). More than half of the respondents in this study were not aware that some malaria cases cannot be treated with common antimalaria drugs. Only a few respondents were aware that Chloroquine is no longer effective for treating malaria in Nigeria. Similarly, only a few could state Coartem® as the new drug recommended for the treatment of uncomplicated malaria in Nigeria. Majority still regard Chloroquine as the drug expected to be used for the treatment of malaria and that it is the most effective drug for the treatment of malaria in Nigeria. This shows that the respondents had a poor knowledge about ACT related drugs and the most effective drug for the home management of malaria. The implication of this is that majority of the population may delay treatment using the ACT drugs and this has potential for creating opportunities for the progression of uncomplicated cases to severe malaria in the under-lives.

5.1.4 Awareness and knowledge of Artemisinin-based Combination Therapy (ACT)

The level of awareness on Artemisinin-based Combination Therapy (ACT) is low among the respondents. Even respondents who claimed to be aware of the use of coartem could not state the dosage correctly for ages 1-3 years and for the 4-5 years age bracket. None of them could state the dosage of Artesunate-Amodiaquine (AA) at all for the under-five children. Most mothers in this study either stated one tablet once daily or one tablet thrice daily. This is a clear misuse of the drug. The implication of this is quite grave. Under dosing of antimalarial medicine has always been one of the major causes of development of resistant strains and the recurrence of the illness or possible progression to severe malaria (CCATMAT, 2004, Okogun and Amadi, 2005). Taking an overdose on the other hand could expose little children to serious adverse effects of the drug. Cases of non-adherence to antimalarial medicines have been noted in previous studies. According to

Amin. Nyandigisi and Tetteh, (2008) in a study carried out in Kenya on access to prompt and effective malaria treatment in Kenya, the high level of non-adherence to older antimalarial medicines like chloroquine suggests that adherence to ACTs is also likely to be poor because of its more complex dosage pattern and the comparatively high cost. These problems need to be addressed with multiple interventional methods and strategies including public enlightenment through the print and mass media. Health education can also be used.

The major source of information about ACT is the health facility. Other sources of information in descending order included doctor, nurses, pharmacists, friends and neighbours, radio, television and PMVs. It is very clear from this finding that information about ACT concept is most pronounced in health facility environment. It is not surprising that the health care facility was mentioned as the main source of information. Okam, Adedokun, Ashebu and Omosule (1975) had several decades ago noted that the fall in infant mortality rate in the study area between 1969 and 1974 was due to increased utilization of maternal and child health services. This positive disposition to the utilization of health facilities should be exploited in designing health promotion and heath education programmes for control of malaria in the under-fives and the social marketing of ACT.

Majority of the respondents that are aware of coartem[R] as the drug for the home management of malaria still apply Chloroquine as the drug for the home management of malaria. For example, majority of the respondents still wrongly believed that Chloroquine is the drug for the home management of malaria. Similarly, less than half of the respondents erroneously believed that SP is the drug for the management of malaria in the home. Only a few could list Artesunate- Amodiaquine (AA). The implication of this is that mothers still resort to the use of Chloroquine or SP which have been delisted by the FMOH of Nigeria as far back as 2004 for home management of malaria. Continued use of either Chloroquine or SP may lead to progression of malaria illness to severe malaria with far reaching physical complications and deaths in under-fives if not promptly treated (FMOH, 2005; WHO, 2006).

The respondents' mean knowledge score was low. This is an indication of wide gap in knowledge. The implication of this is that the knowledge of mothers relating to the causes of malaria, and its treatments is too low for a community directed approach for the control of malaria. The Pharmaceutical Council of Nigeria (PCN) is saddled with the responsibility of regulating the practice and distribution of medicine in Nigeria (PCN. 2008). However, the scope of activities of the council has not been widened enough to accommodate educational packages for communities especially on essential medicines which include antimalarial medicines. The PCN should also extend her activities by collaborating with other agencies and institutions such as the National Agency for Food Drugs Administration and Control (NAFDAC) and the Department of Public Health of Federal Ministry of Health (FMOH) to promote appropriate use of the new antimalarial drugs at the community level. The National Malaria Control Programme of the FMOH would need to collaborate with the Pharmacists Council of Nigeria to promote the rational use of ACT through multiple intervention approaches including public enlightenment, training and social marketing.

Respondents with more than one child were found to be more knowledgeable than those with one child. This finding suggests that experience in children rearing has a role to play in the acquisition of knowledge relating to management of childhood illnesses. It is highly probable that among mothers with more than one child, the approach that was adopted in the treatment of malaria in the previous instances is easily recalled for subsequent episodes of malaria attacks. In a study conducted by Ajayi *et. al*, 2008 it was found out that many Nigerian children with malaria were treated at home. Treatments are mostly incorrect, due to caregivers' poor knowledge of appropriate or correct dose of drugs. (Ajayi, Fnlade, Bamgboye, Oduola and Kale, 2008).

Respondents with higher educational qualification are more knowledgeable than those with relatively lower educational qualifications. This may be as a result of better exposure to different antimalarial medicines including ACT related drugs in the course of their knowledge acquisition. For example, the respondents with tertiary education were most likely to be more exposed to drug issues than those with secondary education and

recipients of secondary education were more exposed than the respondents with primary education.

In terms of occupation, civil servants were most knowledgeable than the rest while teachers rank next to them and the food-sellers had the lowest knowledge score. As far as occupation is concerned, education may be a confounding variable. Various vocations expose staff to diverse opportunities. This includes acquisition of knowledge. Many civil servants are the custodians of antimalarial drugs at the LGAs and government health facilities. Some of them might even have received training on management of malaria including the ACT related drugs. Consequently, they are better exposed to more continuing education opportunities. The knowledge of antimalarials must transcend the confines of the local government or vocational background, if management of malaria at the home level is to be effective. With this type of situation in the community, home management of malaria within the context of ACT is likely to suffer a setback.

5.1.5 Perceptions of ACT

The level of knowledge had a positive bearing on developing either a negative or positive attitudes and practices (Brieger, 2002). In this study, it was noted that respondents, especially those that were already aware of ACT had positive attitudes towards Artemisinin based combination therapy. For example, majority of those who were aware of ACT were of the opinion that the artemisinin combination drugs were not expensive and were readily available in the health facilities. This finding is in contrast to some previous studies about ACT and other antimalarials. In fact, the 2008 annual report of National Malaria Control Programme (NMCP) of the Federal Ministry of Health in Nigeria indicates that out of 96% of health facilities surveyed, 56% of them reported stock-out for one week or more in the last three months (FMOH, 2009). It was noted in a study in Kenya that even though patients were not supposed to pay for antimalarials including AL (coartem^{R}) provided through the public or mission health sector, in practice, facilities continued to charge patients for malaria treatment and services. In addition, a new health financing policy requiring that patients with malaria be exempted from paying the registration fees at dispensaries and health centers was not being

followed, (Chuma, Amin, Nyandigisi, and Tetteh, 2008). In the same study, it was also found that health facilities often suffered from chronic drug shortages including ACT related drugs. There is need to evaluate the policies to address the stock-out syndromes and other shortcomings that have made it difficult for facilities to dispense antimalarials for free in the study area

Majority of the respondents were of the belief that the artemisinin based combination drugs (coartem^{R}) are more effective for treating under-five children than chloroquine. This finding is consistent with the drug efficacy study of Artemeter-Lumenfantrine (AL) and Artesunate-Amodiaquine (AA) by the FMOH in 2004 compared with drug efficacy study of chloroquine in 2002. It was observed that AL and AA has 100% efficacy in the South Western part of Nigeria while chloroquine had 40.9% efficacy as at 2002 (FMOH, 2005). Another finding related to perception in this study is that more than half were of the opinion that not much is known about the side effects of artemisinin based combination drugs in the under- five children There is a need to address this area particularly among the mothers. They need to be aware of the side effects of these drugs and ensure that they are not confusing these with the symptoms of malaria disease. Besides, it is good for mothers to understand that the side effects of the artemisinins themselves are similar to the symptoms of malaria. These include nausea, vomiting, anorexia, and dizziness [WHO, 2001; EMDEX, 2006]. The combination drugs may have additional side effects. No severe adverse event of coartem^{R} was reported in a study carried out by Ajayi *et.al*, (2008). Appropriate perception by mothers and other care givers on malaria disease and therapeutic effects of ACT related drugs including their side effects will facilitate an effective home management approach in the control of malaria. Previous studies have also confirmed that when mothers are well trained, they can be very effective in the home management of malaria (*Ajayi et.al. 2008*). The Role Model Mothers initiative of the National Malaria Control Programme (FMOH, 2009) should be strengthened to address this. Mothers need to be given appropriate health education relating to artemisinin- based combination drugs during Ante Natal Clinic (ANC). Religious institutions such as churches and mosques can also be exploited to

disseminate health information about the therapeutic efficacy and relative advantage of ACT related drugs.

It is a healthy development that majority of the respondents did not consider these new drugs too expensive. Such attitude will facilitate positive health seeking behavior. The mothers or other care givers will be better positioned to take appropriate decision in a situation where the drugs are out of stock in the health facilities, and they have to buy at the retail outlets. However, this finding is at variance with the anecdotal evidence that Coartem is really unaffordable for the poor especially in the rural areas where this study was conducted. Presently a packet of coartem containing 24 tablets costs about N1000:00 which is about 20 times the cost of Chloroquine.

5.16 Patterns of antimalarial drugs use in children under-five years

It is noted that despite the fact that over a third of the respondents claimed to be aware of ACT related drugs, majority still used local herbs and Chloroquine with only a small proportion being current users of Coartem. In fact, Chloroquine topped the list of most preferred drugs among the respondents. The choice of herbs in the communities for the treatment of malaria in the under-five children is consistent with previous studies in Idere, one of the major towns in Ibarapa Central LGA where this study was carried out (Salako, Brieger, Afolabi, Umeh, Agomo, Asa, Adeneye, Nwakwo and Akinlade, 2001). Application of herbs and consultation of traditional healers especially for the treatment of severe malaria is a popular practice in most African communities (Okafor and Amzat, 2007). This of course is not unconnected with the perception of the actiology of malaria in the community and the cultural belief of the people. For instance, in a study carried out by Brieger, Ramakrishna and Adeniyi, 1984 in the study area, it was observed that adults perceived malaria as a temporary indisposition. In fact, malaria which poses a serious threat to the health of under-fives is classified as *iba lasan*, meaning an ordinary illness which is easily treatable. This may account for the usual two to three days delay by mothers in bringing their feverish children to the nearby health centre. (Brieger *et.al.*, 1984). It is against this background that in many cases, the first line of treatment is the application of herbal remedies which many times the care givers keep at home (Salako et

al, 2001). In addition, herbal medicines are part of the ethno-medicine the people started to practice long before the advent of western or orthodox medicine. Use of herbal medicines is part of the traditions of the people (Adeniyi *et. al.*, 1986).

One of the interesting findings of the study was that the most preferred medicine for the treatment of uncomplicated malaria in the under-five children was Chloroquine among more than half of the respondents. Chloroquine was the first line medicine for the treatment of malaria in many African countries including Nigeria until recently. In Nigeria, the change was formally effected at the policy level in 2004 when the new antimalarial treatment policy was published. This should be a major concern to the government and especially health workers.

The confirmed level of acceptability of Chloroquine for treating uncomplicated malaria among underfives strongly suggests and implies a relatively low acceptability of ACT related drugs in these communities As long as the respondents still stick to Chloroquine, it will be impacting negatively on the expected acceptability of coartem in the community. The other implication of this scenario is the possibility of misuse of ACT related medicines. Using chloroquine to complete the coartem dosage where caregivers cannot afford a full course of treatment may lead to undesirable pharmacological effects such as the development of resistant strains of malaria parasites to ACT. In addition, there is the possibility of recrudescence of the infection which may lead to progression to severe malaria and eventual death, especially in under-fives. In contrast to this finding, in a study conducted in three African countries (Nigeria, Ghana and Uganda), it was found out that acceptability of ACT related drugs was very high in the communities chosen for the study sites. However this was achieved through community based strategy using trained community medicine distributors (CMDs) (Ajayi, Browne, Garshong, Balcganya, Yusuf, Agyei-Baffour, Doanekpor, Balyeku, Munguti, Cousens and Pagnoni, 2008). The multi -country study also revealed that making ACT available at the community level through trained Community Medicine Distributors (CMDs) resulted in a high degree of adherence by sensitized caregivers. Interestingly, these findings were

consistent in four different sites in sub-Saharan Africa, both in West and East Africa (Ajayi *et.al., 2008*)

It is gratifying to note that out of 157 respondents, majority (93%) identified chloroquine as a drug they will not use again for treating malaria in their children aged less than 5 years. One of their major reasons was that the medicine could not cure the disease when used. This claim agreed with several previous studies that established the emergence of resistance parasites to chloroquine medicines thus rendering it virtually useless in fighting malaria disease (WHO, 2001; WHO, 2007; FMOH, 2005; Okogun and Amadi, 2005). This reason also accounted for the Federal Ministry of Health to change the National Antimalarial Treatment Policy from Chloroquine to ACTs (FMOH, 2005). It was also the same reason that informed WHO to advise malaria endemic countries to change their antimalarial treatment policy to Artemisinin based combination therapy (WHO, 2006). As at November, 2005, fifty-six (56) countries including Nigeria had adopted ACTs, several of them as their first line drug and few as second line medicine for the treatment of uncomplicated malaria (WHO, 2006).

Another interesting finding of this study is the fact that the major sources of antimalarial medicine by the mothers in this community are the health centres and the patent medicine vendors. This attitude of the community in procuring ACTs from the health facility agrees with previous studies (Salako *et. al., 2001*). Over and above this, NMCP claimed that 6 million doses of ACTs were distributed to under-five children free of charge between 2006-2007 through the support of Global Fund for AIDS, Tuberculosis and Malaria (GFATM). Nigeria is still in her GFATM Round 4 grant which is implemented through the use of public health facilities. It involves distribution of coartem through the Primary Health Care clinics in eighteen states of Nigeria including Oyo state (FMOH, 2008) .Unfortunately; the claim of many of mothers during the course of this study was that the drugs were not available in their PHC facilities. This may either be as a result of dispensing the drugs to the adults who were not originally targeted with the supplies or that the drugs were misused by the Health Workers.

The patronage of PMVs by mothers for the procurement of antimalarial medicine especially SPs is in agreement with previous studies (Salako, *et al.*, 2001). Salako and his colleagues in the study claimed that the PMVs were the most popular choice among parents who started at a government clinic but continued their search for treatment when the health of their children was not improving. According to Salako and his colleagues, the decision-making process with PMVs is usually one of negotiation. Customers most frequently come, select the kind of drugs they want and bargain over the quantity and price they can afford. The situation still remains the same till now in the study area. Now the ACTs have been approved to be dispensed as the Over the Counter (OTC) drugs by the Federal Ministry of Health (FMOH, 2008). This implies that the PMVs could legally stock these medicines and dispense them. There is need however to regularly update the knowledge of PMVs operators about the use of ACT drugs, the possible adverse reactions and pharmacovigilance of ACTs. The latter is being coordinated by the National Agency of Food and Drugs Administration and Control (NAFDAC) in collaboration with NMCP. The challenge is that most of these efforts are directed at the urban communities. Beside this, monitoring, inspection and approval of drug retail outlets is the statutory responsibility of Pharmacists Council of Nigeria (PCN) PCN, 2008. Unfortunately, the rural setting hardly enjoys these services. The implication of these gaps is obvious. The PMVs are usually businessmen whose passion is primarily driven by profits. The kind of health counsel that would be rendered to clients would possibly be sub- standard. The NMCP should be more proactive in facilitating a regular education update for the PMVs particularly in the rural settings.

5.2 Implication for Health Education

Health education is part of health care that is concerned with promoting healthy behavior. Health education is therefore any planned combination of learning experiences designed to predispose, enable, and reinforce voluntary behavior conducive to health in individuals, groups or communities (Green and Kreuter, 1991). Health education encourages behaviours that promote health, prevents illness, cure disease and facilitates rehabilitation (Brieger, 2002). The needs and interests of individuals, families, groups, organizations and communities constitute the focus of health education programmes.

Health education involves collaborating with families, communities, regional and national authorities and stake holders so that necessary resources and support are available to enable individual live a healthy life (WHO, 1988). The implications of the results of this study would therefore be discussed within the context of the definition, strategies and goals of health education.

Results of the study suggest that the participants' level of awareness and knowledge about malaria, antimalarial medicines especially ACT was low. The gaps in the mothers' awareness and knowledge will certainly affect the adoption of the medicine in combating malaria disease especially in the under-lives. Recent findings from previous studies have confirmed that Chloroquine and SP are being resisted by malaria parasites, none or low adoption of ACT among mothers will continue to facilitate increase in malaria morbidity and mortality especially in the rural setting. Concerted efforts must therefore be made by the NMCP and Roll Back Malaria Partners in the country to increase the awareness and the knowledge of mothers on the concept of ACT, the different brands of ACT medicines approved by NAFDAC, the first line ACT medicine, Coartem approved by the government of Nigeria, access to ACTs and how to use the medicine for treating under-fives. This can be done through public enlightenment and health facility based patient education servicessuch as health talks, use of posters and other IEC materials. .

The press, especially the mass media is a good source of dissemination of messages in Nigeria. Radio and television have contributed immensely in facilitating awareness of public concerns to target populations (Breslow and Cengage, 2002). The NMCP have been collaborating with the Roll Back Malaria (RBM) partners in the country to sensitize people about the use of Long Lasting Insecticidal treated Nets (LLINs) through Scaling Up For Impact (SUFI) for universal coverage to prevent attack of the malaria vectors This commendable effort should also be extended to the deployment of ACT drugs in the rural settings.

Training is a key strategy that can be used to impart knowledge on the mothers. The concept of Role Model Mothers (RMM) to facilitate distribution of ACT medicines

especially in the rural setting is a welcome development. The initiative uses the community based drug distribution approach to promote rational use of drugs among mothers for treating malaria in the under-fives. Presently, only two states, Ebonyi and Taraba states had been used for a pilot RMM project (FMOH. 2009). This project needs to be replicated in all the states of the country. The activity of the RMM should extend beyond distribution of ACTs to including training of mothers on malaria recognition, primary health care management and use of available formal health care services.

The control of malaria needs to be given more radical, practical and community directed approach by adopting preventive strategy at all levels of government. The LLIN campaign adopted by the FMOH is an ambitious approach to eradicate malaria in Nigeria. The FMOH in collaboration with the RBM partners have mapped all the states of the country for the distribution of LLINs in a bid to achieve SUFI by the year 2010. The strategy is to distribute minimum of two nets per household in every Nigerian community. This translates to about 64 million LLINs for about 32 million households in Nigeria (NPC. 2006).The LGA authorities under whose domain the rural communities fall should therefore be involved in this arrangement. Beyond the campaign, they need to be committed to set a significant portion of their monthly funds allocated to them from the Federal Government to sustain a routine supply of ACT medicines to their communities. In this direction, the burden of malaria cases especially among the under-fives will be drastically reduced. The Indoor Residual Spraying (IRS) policy of the FMOH (FMOH, 2009) should also be rolled out beyond the few selected states of the country to all the states of Nigeria. Of course, there will be need for an intensive and high degree of advocacy to achieve all these. Advocacy is intended to secure the support of key constituencies in relevant local, national and international policy discussions and is expected to prompt great accountability from government and international sectors (http://www.who.int/tb/people accessed on 11/5/2008).

The Advocacy and Community Social Mobilization (ACSM) branch of NMCP should collaborate with the other technical officers of the programme especially the Case Management and logistic unit to massively distribute job aids for malaria management to

all the health facilities especially at the PHC level. (Job Aids are packages of Standard Operating Procedure (SOP) designed to assist health workers at service delivery points including health facilities, RMM and PMVs in following treatment guideline of the National malaria Control Programme.) Appropriate job aids should also be designed for Role Model Mothers who will use them to translate relevant knowledge especially on the ACT drugs to mothers in the community. The NMCP will therefore need to involve key opinion leaders at the state and local level to facilitate maximum community participation in the implementation of these activities.

Majority of the respondents especially among the users of coartem had a positive perception to ACT medicines. They believe it is regularly available in the health facilities and it is not supposed to be for only the rich in the society. Health Education Specialists should exploit this positive disposition of mothers to design comprehensive Behavioural Change Communication (BCC) materials targeted at promoting the use of ACT medicines. Based on the finding of this study that the two health institutions most patronized by mothers for procuring antimalarials for their under-five children were the health facilities and patent medicine vendors. these BCC materials should be made available in their premises within the community.

5.3 Recommendations

1. There is need to design an appropriate educational interventions to improve the knowledge of mothers of under-fives on the cause of malaria since majority of the respondents had misconceptions of the cause and prevention of malaria. Antenatal and child welfare clinics are excellent fora for implementing such interventions.
2. Multiple intervention strategies including advocacy, public enlightenment, social marketing and use of VPHW are needed to enhance the awareness of Coartem which is the first line drug for the treatment of uncomplicated malaria in Nigeria since the drug is still unknown by most mothers in the study area.
3. There is a need for the involvement of local herbalists in the management of uncomplicated malaria. Majority of the respondents still use local herbs for the

treatment of malaria especially in under-five children. They need to be trained to refer malaria in under-fives to the nearest healthcare facilities for proper management.

4. There is need for an organized continuing education programme on antimalarial medicines for the patent medicine vendors, since they constitute major sources of procurement of antimalarial medicines in the study area.
5. The level of knowledge and skills relating to accurate ACT –related drugs dosages need to be improved. This will promote home management of uncomplicated malaria among nursing mothers and other case givers.

5.4 Conclusions

From the findings of this study, it can be deduced that the level of knowledge of malaria causation and Artemisinin Combination Therapy (ACTs) by mothers was low. Knowledge of the use of ACT- related drugs was also low. Use of Coartem® as first-line drug for treating malaria in under-fives is not yet a common practice. Advocacy, public enlightenment and social marketing strategies are necessary to address the situation.

There was however a positive perception towards the use of ACT medicines especially among those mothers who were already aware of the medicines. This set of mothers can be coordinated or organized into a forum where they can be trained on community directed distribution of coartem. In addition, they can be useful as peer educators regarding knowledge and use of ACT related drugs. Appropriate health education for expectant mothers at ante-natal clinics (ANC) will also be useful. Chloroquine is still the main antimalarial first line drug for the management of uncomplicated malaria. Their level of knowledge about the current limitation of chloroquine need to be upgraded.

The patent medicine vendors were the major sources of medicine in the rural setting in the private sector. There is need to update their knowledge especiallyon the use of antimalarial medicines. This should also form the basis of renewing their annual practicing license by the Pharmacists Council of Nigeria.

5.5 Suggestions for further research

There will be need for a cross sectional survey to determining the knowledge, perceptions and use of ACTs among male heads of households in the study area. This is because male heads of households play crucial roles regarding decisions relating to when or where and how under-fives are treated when sick.

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Appendix I: Consent form for Survey Respondents

Name of Principal Investigator: Osuolale O. Adekunle

Name of Organization: University of Ibadan

Name of Sponsor: Self

Title of Project: Mothers' Knowledge, Perceptions and use of Artemisinin-based combination therapy for treating malaria among under-fives in Ibarapa Central Local Government area, Nigeria.

Greetings: My name is _____ and I am a student of Department of Health Promotion and Education, College of Medicine, University of Ibadan. I am part of a team doing a research study to document knowledge, perceptions and use of mothers of under-five concerning drugs for the treatment of malaria. Your honest answer to these questions will be useful in planning for appropriate ways of improving the health of children in the community.

Purpose of the research:

We are planning to carry out a study to document mothers' knowledge, perceptions and use of Artemisinin Based Combination therapy (ACT) for treating malaria in the under - fives in Ibarapa Central Local Government Area. We would therefore like to find out what you know about ACT drugs and your experience in the use of it in the home management of malaria in the under –fives. Your honest answer to these questions will be useful in planning for appropriate ways of improving the health of children in the community.

Procedures:

To find answers to some of these questions, we invite you to take part in this research project and participate in an interview. You have been randomly selected to participate, if you accept, you will be asked to answer some questions about several aspects of your life. A lot of the questions will relate to your experience on knowledge, perception and pattern of use of ACT drugs in the treatment of malaria of your children under-five years of age. For example, you will be asked whether or not you have ever heard about

Artemisinin-Based Combination Therapy (sometimes called ACT). And if you do, what are your sources of information.

I will record your answers to these questions on this form (questionnaire). This is done so that I will remember everything that you have told me. Although it is important for the research that you answer all the questions, if you do not wish to answer any of the questions included in the survey, you may ask to move on to the next question. We assure you that we will not tell any other person whatever you disclose to us. Remember also that your name is not required in the interview. Participation in the study is voluntary and you are free to discontinue if you so desire. You are also free to ask questions about the study at any time.

The expected duration of the interview is about 30-35 minutes.

Risks and Discomforts:

There is a slight risk that you may feel uncomfortable talking about some of the topics. However, we do not wish this to happen, and you may refuse to answer any of the questions or not take part in a portion of the survey if you feel the question(s) makes you uncomfortable.

Benefits:

There will be no direct benefit to you but the information obtained from this study will help to provide suggestions that will enable the researchers develop an appropriate intervention programme in the home management of malaria especially among under-fives. If you need any professional counsel on drug matters especially on the ACT's and in its administration for children, the researchers will arrange that for you at no cost at all.

Incentives

You will not be provided any incentive to take part in the research.

Confidentiality:

We have taken the following steps to ensure that you are safe and that the information you provide is confidential.

1. The interview will take place in a private place, where no one else hears what you discuss with the interviewer.

2. The information that we collect from this research project will be kept confidential.

3. Information collected from you will be stored in a file that will not have your name on it, but a number assigned to it instead.

5. You may talk to the leader of the research team in case you have any concern or questions.

6. The questionnaires will be destroyed after the research is completed.

Risk to refuse or withdraw:

You do not have to take part in this research if you do not wish to do so, and refusing to participate will not affect your future in the community. Even if you do not wish to answer these questions, you are eligible to government's packages of intervention as they implement the recommendations from this research. You may stop participating in the interview at any time that you wish, and there will be no negative consequences for you in any way.

Who to contact:

If you have any questions you may ask now or later. If you wish to ask questions later, you may contact any of the following:

(i) **Osuolale Oludayo Adekunle,**

Department of Health Promotion and Education. College of Medicine. University of Ibadan

Telephone: 0805-527-9110

Email:osuolale2007@yahoo.com

(ii) **Dr F. O. Oshinaike (Supervisor)**

Department of Health Promotion and Education. College of Medicine. University of Ibadan

Email: Foshinaike@ yahoo.com Telephone: 0803.500-1060

Certificate of Consent for Qualitative Study

I have been invited to take part in the research on mothers' knowledge, perceptions and use of Artemisinin-based combination therapy for treating malaria among under-fives in

Ibarapa Central Local Government area, Nigeria. I have read the foregoing information. or it has been read to me. I have had the opportunity to ask questions about it and all the questions i nsked have been answered to my satisfaction. I consent voluntarily to be a participant in this study nnd understand that I have the right to withdraw from the interview at any time without in any way affecting my medical care.

Print Name of Subject

Date and Signature of subject

Print Name of Interviewer

Date and Signature of Interviewer

APPENDIX II:

PERCEPTIONS AND PATTERN OF USE OF ARTEMISININ-BASED COMBINATION THERAPY FOR TREATING UNDER-FIVE MALARIA AMONG MOTHERS IN IBARAPA CENTRAL LOCAL GOVERNMENT, OYO STATE

INTRODUCTION: Greetings. My name is ..... from Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan. We are interviewing mothers of under-five concerning drugs for the treatment of malaria. Your honest answer to these questions will be useful in planning for appropriate ways of improving the health of children in the community. We assure you that we will not tell any other person whatever you disclose to us. Remember also that your name is not required in the interview. Participation in the study is voluntary and you are free to discontinue if you so desire. You are also free to ask questions about the study at any time.

SCREENING QUESTION

Do you have a child between ages 1-5 years old in your care? (1) Yes ☐ (2) No ☐

If YES, proceed with the interview, if NO, discontinue the interview

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Please answer the following questions by completing the blank spaces or by ticking (✓) the options that concern you in the boxes provided.

1. What is your occupation? 1. Housewife ☐ 2. Trading ☐ 3. Student ☐
   4. Farming ☐ 5. Teaching ☐ 6. Civil servant ☐
   7. Others (specify) .....

2. Highest level of Education completed ---------- 1. No formal Education ☐
   (2) Did not complete Primary ☐ (3) Completed Primary ☐
   (4) Did not complete Secondary ☐ (5) Completed Secondary ☐

(6) Polytechnics ☐ 7. University ☐

(8) Others (specify) .....

3. Marital status: (1) Never Marr ☐ (2) Cohabiting ☐ (3) Married ☐

(4) Separated ☐ (5) Divorced ☐ (6) Widowed ☐

(7) Others (specify)_____

4. Family Type: (1) Monogamous ☐ 2 Polygamous ☐

5. What ethnic group do you belong? (1) Yoruba ☐ (2) Hausa ☐

(3) Igbo ☐

4. Others (specify) _____

6. Which religion do you practice?

(1) Christianity ☐ (2) Islam ☐ (3) Traditional ☐

(4) Others (specify) .....

7. How many living children do you have? _____

8. How old are the children in your care who are aged less than 5 years?

a. Child A
b Child B
c Child C
d Child D
e Child E

SECTION B: AWARENESS AND KNOWLEDGE ABOUT MALARIA AND ANTI-MALARIAL DRUGS

INSTRUCTION:

Kindly respond to each of the following statements by ticking (✓) the appropriate option(s) that best expresses your opinion or which you consider correct.

9. What do you think are the causes of malaria? (You may tick (✓) more than one that you feel is (are) correct).

(1) Cold weather ☐ (2) Bad air ☐ (3) The gods ☐ (4) Mosquito ☐

(5) Plasmodium/germ in mosquito ☐ (6) Eating too much of palm oil ☐

(7) Working in the sun ☐ (8) Dry weather ☐

(9) Others (Specify)_____

10. What in your opinion is the main cause of malaria?

_____

_____

11. How can malaria spread from person to person?

(1) Through the bite of mosquitoes. ☐ (2) Through blood transfusion ☐

(3) From mother to baby during pregnancy ☐

(4) Sharing needles and syringes with other infected children. ☐

(5) By sharing the same apartment with malaria infected person. ☐

(6) Others (specify) _____

12. What are the symptoms or signs for recognizing a child with malaria? (You may tick (✓) one or more that you feel is (are) correct).

(1) Headache ☐ (2) Increase in body temperature. ☐

(3) Loss of appetite ☐ (4) Muscle/joint pain ☐

(5) Feeling cold and shivering ☐ (6) Others: _____

13. Among which of the following groups of people is malaria most serious?

(1) Children under-five years ☐ (2) Children aged 6 – 9 years ☐

(3) All young people ☐ (4) Adult ☐

5. Others (specify) _____

14. For each of the following list of drugs – indicate by ticking (✓) whether you have ever heard about it: also put down your main source of information for each of the drugs.

DRUG (A)	EVER HEARD Tick (✓) (B)		One main source of Information (C)				
	Yes	No	Pharmacy	Physician	Television	Radio	Others Specify
a.) Artemether-Lumefantrine (Coartem®, Lonart®)							
b.) Amodiaquine – Artesunate (Larimal, Dar. Malmed)							
c) Artesunate – Sulphamethoxine & Pyrimethamine (co-Arinate ®, Farenax)							
d.) Sulphadoxine – Pyrimethamine (fansidar®, maloxine®, Amalar®, Malwin®)							
e.) Artesunate – mefloquine (Artequine®)							
f.) Proguanil (Paludrine ®)							
g.) Chloroquine (Nivaquine ®)							
h.) Halofantrine (Halfan ®)							
i.) Quinine							

Have you ever heard that there are malaria cases that do not get cured even after using some anti-malarial drugs? 1. Yes ☐ 2. No ☐

If YES go to question 16. If No. go to question 17.

16. Which common anti-malarial drugs are you aware of that is no longer effective for the treatment of malaria in some parts of Nigeria?

1. Maloxine ☐ 2. Halfan ☐ 3. Amalar ☐
4. Chloroquine ☐ 5. Artesunate ☐ 6. Daraprim (Sunday)-Sunday) ☐

7. Others (Specify)_____

17 Which of the drugs in the table below are the new drugs now recommended for the treatment of malaria in Nigeria? Also put down one main source of information for each drug.

Drug	Yes	No	Not sure	Main Source of information (If Yes)
a) Chloroquine/ Nivaquine				
b) Fansidar (Sulphadoxine – Pyrimethamine)				
c) Coartem.Lonart (Artemeter – Lumefantrine)				
d) Dart, Malmed, (Artesunate – Amodiaquine)				
e) Farenax (Artesunate – Sulphadoxine – Pyrimethamine)				
f) Fansimef (Mefloquine – SulphadoxinePyrimethamine)				
g) Others – specify.				

18. The following questions relate to malaria treatment, for each question – indicate by ticking (√) whether it is true or false or you don't know or never heard.

S/N	STATEMENT	True	False	I don't know	Never heard
a)	Chloroquine is still the most effective drug for the treatment of malaria in Nigeria.				
b)	Coartem is now the new drug used in place of Chloroquine for the treatment of malaria in Nigeria				
c)	The most effective anti-malaria drug recommended for sickle cell anaemia patient is proguanil (Paludrine®)				

d)	Coartem is the most effective drug for the treatment of malaria as at today.				
e)	It is safe for women who are pregnant for 3-6 months to take Coartem.				
f)	Sulphadoxine – Pyrimethamine (Fansidar) is effective in the control or prevention of malaria during pregnancy				
g)	Coartem is now the first drug you should take once one notice he/she has malaria.				

SECTION C: AWARENESS AND KNOWLEDGE ABOUT ARTEMISININ-BASED COMBINATION THERAPY "ACT"

INSTRUCTION: Kindly respond to each of the following statements by ticking ( ) the appropriate option(s) that best expresses your opinion(s):

19 Have you ever heard about Artemisinin-Based Combination Therapy (sometimes called ACT)?

1. Yes ☐ 2. No ☐

If YES, proceed to Question 20 and if NO, go to Question 31.

20. What is (are) your source(s) of information about the term Artemisinin based Combination Therapy (ACT). You may tick (✓) one or more appropriate option.

Source	Tick(√)
Doctor	
Pharmacy/pharmacist	
Health Facility (Hospital, Clinic/Maternity)	
Working Place	
Newspapers	
Radio	
Television	

Patent Medicine Vendors	
Nurses	
Drug Hawkers	
Others specify	
Others specify	

21. For each of the drugs listed below. tick (✓) Yes or No whether it is a recommended drug for the home treatment of malaria in children under-five years nowadays. If in doubt tick (✓) not sure.

Drugs	Yes	No	Not sure	Never Heard
a) Coartem/Lonart (Arthemeter + Lumefantrine)				
b) Dart/ Larimal (Artesunate + Amodiaquine)				
c) Chloroquine				
d) Fansidar, Amalar, Maloxine (Sulphadoxine + Pyrimethamine)				
e) Others (specify)				

22. What are the advantages of using the newly introduced Anti-Malarial drugs such as Coartem, Lonart in under 5 children? (You may tick ( ) one or more option(s) that you consider correct).

(1) Never heard about them. ☐

(2) They are active against all forms of malaria infections in children. ☐

(3) They are very safe to use for under 5 children. ☐

(4) Adverse effects are minimal and are rare in under-five children. ☐

(5) They are cost effective. ☐ (6) Dosage is easy to comply with ☐

(7) They are not bitter. ☐

(8) Others (specify) _____

23. Do you know how to use Coartem for the treatment of malaria in under-five children?

(1) Yes ☐ (2) No ☐

If Yes, go to question 24. If No, go to question 27.

24. What is the recommended dosage of Coartem for treating malaria in children aged 1-3 years

State dosage for day 1, day 2 and day 3.

DAY	DOSAGE
DAY 1	
DAY 2	
DAY 3	

25. What is the recommended dosage of Coartem for treating malaria in children aged 4-5 years?

State dosage for day 1, day 2 and day 3.

DAY	DOSAGE
DAY 1	
DAY 2	
DAY 3	

26. Do you know how to use such new drugs called Larimal or Dart for treating malaria?

1. Yes ☐ 2. No ☐

If Yes, go to question 27. If No, go to question 29.

27. What is the recommended dosage for Larimal or dart for treating malaria in children aged 1-3 years?

State dosage for day 1, day 2 and day 3.

DAY	DOSAGE
DAY 1	
DAY 2	
DAY 3	

28. What is the recommended dosage of other new anti-malarials e.g Larimal and Dart for treating malaria in children aged 4-5 years?

State dosage for day 1, day 2 and day 3.

DAY	DOSAGE
DAY 1	
DAY 2	
DAY 3	

SECTION D: PERCEPTIONS RELATING TO THE USE OF "ACT"

29. Kindly respond to each of the following statements in the table below by ticking (✓) the appropriate option(s) that best expresses your feelings concerning the new anti-malarial used e.g Coartem, Larimal, e.t.c for under 5 children.

S/NO	STATEMENT	Agree	I Can't Say	Dis-agree
a.	I do not use the new Anti-malarial drugs because they are not readily available in the hospitals and drug stores.			
b.	The new Anti-malarial drugs have less side-effect compared to chloroquine.			
c.	I do not use these new anti-malarial drugs because they are too expensive: I can not afford them.			
d.	Chloroquine is still very effective in treating malaria: so it is the drug I use.			
e.	I don't know much about these new Anti-malarial drugs: so I don't use them.			

30. Which of the following statements in the table below represents your opinions or beliefs about the new Anti-malarial drugs e.g. Coartem, Larimal and Dait e.t.c?

Opinion		Tick (✓) the appropriate option(s) that best expresses your opinion	
		Yes	No
(a)	Not much is known about their side effects for children under 5.		
(b)	Coartem for children under-five is now available everywhere.		
(c)	Coartem and the other new anti-malarial drugs are for people who are rich in the society.		
(d)	The new Anti-malarial drugs are more effective in treating under-five children compared with chloroquine.		

SECTION E: PATTERN OF ANTI-MALARIAL DRUG USE IN UNDER-FIVE CHILDREN

31. Which of the following drugs have you ever used in treating malaria in your children aged under-five? You may tick (✓) one or more option (s) that you feel is (are) correct.

Drugs	Tick (√) if ever used
Local herbs	
Foreign herbs (Tianshi, GNLD products, etc)	
Chloroquine	
Coartem	

Dart	
Fansidar	
Amalar	
Laila	
Alubukun	
Maloxine	

Others (specify) _____

32. Which of the folfowing drugs do you still use whenever any of your children under-five has malaria fever? Tick (✓) all you mention.

(1) Local herbs ☐ (2) Foreign herbs (Tianshi, GNLD products, etc) ☐

(3) Chloroquine ☐ (4) Coartem ☐ (5) Dart ☐ (6) Larimal ☐

7. Others (specify_____

33. If you still use chloroquine in treating malaria in your children aged under-five, what are your reasons? Tick (✓) one or more appropriate option (s).

(1) It is generally acceptable to children ☐ (2) It is very cheap ☐

(3) It is readily available ☐ (4) It does not cause problem for my child(ren) ☐

(5) It was recommended by our Doctors/health worker. ☐

(6) Others (specify) _____

34. Below is a list of drugs. Which of them do you prefer most for treating malaria in your children aged under-five?

Anti-malarials	Tick (√)
1. Chloroquine	
2. Coartem	
3. Artequine, (Larimal, Dart)	
4. Fansidar, (Amalar, Maloxine)	
5. Camoquine	
6. Halfan	
7. Quinine	

35. How many times did any of your children aged under-five had malaria fever within the last six months? Indicate by ticking (√) in the table below the number of times

S/N	No of Times	Tick (√)
1	Once	
2	Twice	
3	Thrice	
4	Four times	
5	Five times	
6	Six times or more	
7	No malaria episode	

36. When do you give the new anti-malarial drugs e.g Coartem. Larimal to any of your children aged less than five years to take?

(1) When my child develops a mild fever. ☐

(2) Every week, to ensure that malaria never strikes. ☐

(3) When the major symptoms of malaria become visible in my child ☐

(4) I use it only when the physician prescribes it. ☐

(5) Others (specify)_____

37a. Are there anti-malarial drug(s) you used to use but you no longer use for treating your children aged under-five when they have malaria?

Yes ☐ (2) No ☐

37b. If YES, what are they?_____

_____

_____

If Yes to question 37a, go to question 38. If No, go to question 39.

38. Why are you no longer using it?

1. It has bitter taste ☐
2. It has many unpleasant adverse effects. ☐
3. It could not cure the malaria when it was used. ☐
4. My doctor warned me against it. ☐

APPENDIX III:

AWON IRISI A TI SISE AGBEKALE AKOJOPO OGUN TI ARTEMISININ PILE FUN SISETOJU IBA LAARIN AWON IYA OMO TI OJO WON KO JU ODUN MARUN LO NI IJOBA IBILE AARIN GUGU IBARAPA. IPINLE OYO.

IMONI: Ikini, Oruko mi ni.....

Lati eka ti nse idagbasoke eto ilera ati idaleko, ile iwosan orita mefa, ti oje ti ile iwe giga julo ti ilu Ibadan ni a ti wa. A nse iforowanilenuwo awon iya omo ti ojo ori won ko ju odun marun lo nipa awon

Oogun fun itoju arun iba. Idahun ododo yin si awon ibeere yi yoo wulo ninu erongba fun awon ona ti o ye lati mu ilosiwaju ba eto ilera awon omode ni adugbo yi. A lid a yin loju wipe a ko ni so fun elomiran ohunkohun ti e ba so fun wa. E ranti bakanna wipe a ko nilo oruko yin ninu iforowanilenuwo yi Ikopa ninu iwada yi je atokan wa ati wipe a ko nilo oruko yin ninu iforowunilenuwo yi. Ikopa ninu iwadi yi je atokan wa ati wipe e ni aaye lati da ikopa duro ti e ba fe. E tun ni aaye bakanna lati beere awon ibeere nipa iwadi yi ni igba kugba.

IBEERE AYEWO KINIKIN

N je e ni omo ti ori re wa laarin odun kan si odun marun labe itoju yin?

(1) Beeni ☐ (2) Beeko ☐

To o ba je beeni, tesiwaju pelu iforowanilenuwo yi, ti o ba je beeko, ma se tesiwaju.

IPIN A: ABUDA ISEDALE IWA ENIYAN LOLORIJORI.

Jowo dahun awon ibeere wonyi nipa didi awon alafo tabi sisaami (✓) si awon idahun ti o kan e ninu awon apoti ti a pese.

Kini Ise re?

1. Iyawo Ile ☐ 2. Isowo ☐ 3. Akeeko ☐
4. Agbe ☐ 5. Olukoni ☐ 6. Osise Ijoba ☐

7. Omiran (so pato) .....

2. Eko ti e ko pari: 1. Ko si eko kan 2. ☐ pari iwe alakobere ☐

3. Pari iwe alakobere ☐ 4. Ko pari iwe girama ☐ 5. Pari iwe girama ☐

6. Ile iwe gbogbonise ☐ 7. Ile iwe giga julo (Fasiti) ☐

8. Omiran (so pato) .....

3. Ipo aya/oko nini? (1) Mi o ti ni oko/ri ☐ (2) ajoogbe ☐ (3) Mo ti ni oko ☐

(4) An gbe lotooto ☐ (5) Mo ti ko okoo mi sile ☐ (6) Opo ☐

(7) Awon iniran (so pato)_____

4. Iru Ebi: 1. Oko kan ati iyawo kan ☐ 2. Oko kan ati iyawo ju eyokan lo ☐

5. Kini eya tie yinje? 1. Yoruba ☐ 2. Hausa ☐ 3. Igbo ☐

4. Awon iniran (so pato)_____

6. Esin wo ni o n sin? 1. Kristieni ☐ 2. Islamu ☐ 3. Esin Ibile ☐

4. Awon mirun (so pato) .....

7. Oino melo ni e ni? _____

8. Odun melo ni awon omo ti owa ni abe itoju yin ti ojo ori won ko tii ju odun amarun lo?

a. Omo A
b Omo B
c Omo C
d Omo D
e Omo E

IPIN B: MIMO ATI IMO NIPA IBA ATI AWON OGUN TI O N DEKUN IBA ATOKA:

E dahun si okookan awon gbolohun wonyi nipa sisaami (✓) awon esi ti o je. eleyi ti o salaye ipinu yin tabi ti e ri wipe o tona.

9. Kini o ro wipe o je awon ohun ti o n fa iba? (O lee saami (✓) ju eyokan lo ti o ba ri wipe o tona).

1. Asiko ogilinli/otutu ☐ 2. Afefe buruku ☐ 3. Awon eosa ☐

4. Efon ☐ 5. Kokoro aifoju ri ninu efon ☐ 6. Jije epo pupa pupo ☐

7. Sise ninu oorun ☐ 8. Asiko ogbele ☐

9. Awon miran (so pato) _____

10. Kinni ninu ero yin to je ohun kon Pataki ti o n fa iba? _____

Bawo ni iba se fee ran lati odo enikan si enikeji? (O le saami (✓) eyokan tabi ju bee lo ti o baro wipe won tona

1. Nipa ki efon ge eniyan je ☐
2. Nipa gbigba eje si ara lati odo elomiran ☐
3. Lati ara iya si omo lasiko oyun ☐
4. Pinpin lo awon enu abere ati onfa won ☐
5. Ajoolo ibugbe pelu awon eniyan ti o ni iba ☐
6. Awon miran (so pato) _____

12. Kinni awon aami tabi akojopo awon aami ti a lee fi mo omo ti o ni iba? (o lee saami (✓) eyokan tabiju be lo ti o baro wipe won tona)

1. Ori fifo ☐ 2. Ki ara maa gbona 3. Ki o omo ma lee jeun ☐
4. Isan/orike ara didun ☐ 5. Ni otutu ati gbigbon riri ☐
6. on miran (so pato): _____

13. Laarin ewo ninu awon akojo eniiyan wonyi ni iba maa n le julo?

1. Awon omo ti ojo won ko to odun marun ☐
2. Awon omo ti ojo ori won wa laarin odun mefa si odun mesan ☐
3. Gbogbo awon odo ☐ 4. Agba ☐
5. Awon miran (so pato) _____

14. Fun okookan awon oogun ti a daruko wonyi, toka nipa sisaami (✓) boya o ti gbo nipa re ri, bakanna ko sile onakan Pataki ti o ti gbo iro fun okookan ogun yi.

OGUN (A)	MO GBO RI Saa mi (✓) (B)		Ibikan pato too ti gboro (C)				
	Beeni	Beeko	Olupon Oyinbo	Onisegun Oyinbo	Amohun Maworan	Asoro Magbesin	Awon Miran (so pato)...
a.) Artemether-Lumefantrine (Coartem®, Lonart®)							
b.) Amodiaquine –Artesunate (Larimal, Dart, Malmed)							
c) Artesunate – Sulphamethoxine & Pyrimethamine (co-Arinate ®, Forenax)							
d.) Sulphadoxine – Pyrimethamine (fansidar®, maloxine®, Amalar®, Malwin®)							
e.) Artesunate – mefloquine (Artequine®)							
f.) Proguanil (Paludrine ®)							
g.) Chloroquine (Nivaquine ®)							
h.) Halofantrine (Halfan ®)							
i.) Quinine							

15. N je oti gbo nipa arun iba ti ko gbo ogun lehin igbati olo ogun iba?

Beeni ☐ Beeko ☐

To ba je beeni, tesiwaju lati dahun ibeere 16. To ba je beeko, tesi waju lati dahun ibeere 17.

16. Ewo ninu awon ogun iba ti o mo towopo ti kosi kapa wiwo iba mo in awon agbegbe kan in ile Nijeria?

1. Maloxine ☐ 2. Halfan ☐ 3. Amalar ☐

4. Chloroquine ☐ 5. Artesunate ☐ 6. Daraprim (Sunday-Sunday) ☐

7. Awon miran (So pato) _____

17. Ewo ninu awon ogun ti o wa ninu tabili isale yi ni o je ogun titun ti ijoba fowosi ni asiko yi fun titoju iba ni Nijiria?

OGUN	Beeni	Beeko	Ko daju	Ona kan Pataki ti iro ti wa (ti o ba je beeni)
a) Chloroquine/ Nivaquine				
b) Fansidar (Sulphadoxine – Pyrimethamine)				
c) Coartem.Lonart (Artemeter – Lumefantrine)				
d) Dart. Mulmed. (Artesunate – Amodiaquine)				
e) Fansnax (Artesunate – Sulphadoxine – Pyrimethamine)				
f) Fansimef (Mefloquine – SulphadoxinePyrimethamine)				
g) awon miran (so pato).....				

18. Awon ibeere wonyi jemo titoju iba fun ibeere kookan-koka nipa sisaami () boya lotito ni tabi iro ni tabi o ko mo tabi o ko gbo o ri rara.

S/N	GBOLOHUN	Otito	Iro	Mi O Mo	Mi O Gbo o ri
(a)	Chloroquine si je ogun kan ti o ni ikapa julo fun titoju iba ni Naijiria				
(b)	Coartem ni ogun titun fun titoju iba ni Nijiria ni a si ko yi				
(d)	Ogun ti o ni ikapa julo ti won fowosi fun romoleegun ni proguanil (Paludrine (R)				
(e)	Coartem ni ogun ti ni ikapa julo fun titoju iba				
(f)	Ko lewu fun awon obirin ti o wa ninu oyun osu meta si osu mefa lati lo Coartem				
(f)	SulphadoxinePyrimethamine (Fansidar) ni ikapa ninu didekun tabi didena iba obirin to ba wa ninu oyun				
(g)	Yato si Coartem, awon ogun titun inirun bi Larimal, Dart ati Fanenax lee ni ikapa damdam ninu titoju iba				
(gb)	Coartem ni ogun akoko gbodo lo ni asikoyi ni kete ti o ba ni iba				
(i.)	Nigba ti o ba lo Coartem ti ko si iwo iba naa san, ogun ti o kun ti o ye ki o lo ni Quinine				

IPA C: MIMO ATI IMO NIPA OGUN TITUN TI AN PE NI ARTEMISININ-BASED COMBINATION THERAPY "ACT"

ATOKA:

E dahun si okookan awon gbolohun wonyi nipa sisaami (✓) awon esi ti o ye. eleyi ti o salaye ipinu yin tabi ti e ri wipe o tona.

19. Nje etigbe nipa ogun titun ti a n peni ACT ti afi n p'oro iba.

1. Beeni ☐ 2. Beeko ☐

To ba je beeni, tesi iwaju lati dahun ibeere 20. To ba je beeko, tesi waju lati dahun ibeere 31.

20. Awon ibo ni oti gbo iro nipa awon ogun titun ti o ka pa iba ti an pe ni ACT? (O lee saami (✓) ju eyokan lo ti o ba ti wipe o tona).

Orisun iro	Saa mi (✓)
Oni segun oyinbo	
A won apo ogun / ile ita ogun oyinbo	
Ilewosan oyinbo / Ile igbebi	
Ibi ise	
Iwe iroyin	
Ero asoromagbesi	
Ero amohun ma woran	
Awon keniisi	
Noosi	
Awon ti won pate oogun	

21. Fun okookan awon oogun ti a daruko wonyi, toka nipa sisaami (✓) beeni abi beeko boya awoo onisegun oyinbo ti ko awoo ogun naa fun itoju iba awon omode ti kope odun marun. Ti koba da e loju, saa mi koda mi loju.

Oogun	Beeni	Beeko	Ko da mi loju	Mi o gbuti
a) Coartem/Lonart (Arthemeter + Lumefantrine)				
b) Duo/ Larimal (Artesunate + Amodiaquine)				
d) Chloroquine				
c) Fansidar, Amalar, Maloxine (Sulphadoxine + Pyrimethamine)				
e) Awon ogun miran ti o mo				

22. Kinni awon anfaani ti o wu ninu lilo awon ogun iba titun ti o jade bii Coartem, Lonart fun awon omo ti ojo ori won ko ju odun marun lo? (O lee suami ( ) eyokan tabi ju bee lo awon idahun ti o ri wipe o tona).

1. Mi o gbo nipa won ri ☐
2. Won maa sise lati koju gbogbo orisi arun iba ni ara awon omode. ☐
3. Won ko lewu lati lo fun awon omo ti ojo ori won ko ju odun marun lo ☐
4. Awon inira ti o mo niwon ati wipe o sowon lanrin awon omo ti ojo ori won ko ju odun marun lo. ☐
5. Won kii na eeyan ni owo pupo ☐
6. Odiwon si ronu lati tete ☐
7. Won ko koro ☐
8. Awon miran (so pato) .....

23. N je o mo bi a ti se n lo Coartem fun titoju iba awon omo ti ojo ori won ko ju odun marun lo? 1. Beeni ☐ 2. Beeko ☐

Ti ba je beeni. lo si ibeere 24. ti o ba je keeko. lo si ibeere 27.

24. Kinni odiwon Coartem ti ijoba fowosi fun sisetoju iba awon omo ti ojo ori won je odun kan si odun meta?

So odiwon fun ojo kini, ojo keji ati ojo keta

Ojo Kini	Odiwon:
Ojo Keji	Odiwon:
Ojo Keta	Odiwon:

25. Kinni odiwon Coartem ti won fowosi fun sisetoju iba awon omo ti ojo ori won je odun merin si odun marun?

So oodiwon fun ojo kini. ojo keji ati ojo keta.

Ojo Kini	Odiwon:
Ojo Keji	Odiwon:
Ojo Keta	Odiwon:

26. N je o mo bi a se nlo awon ogun tiitun gege bii Larimal ati Dart fun sisetoju iba?

1. Beeni ☐ 2. Becko ☐

Ti o ba je beeni, lo si ibeere 27. Ti o ba je beeko, lo si ibeere 29.

27. Kinni odiwon lilo awon ogun iba titun miran ti ijoba fowosi, bi apeere Larimal ati Dart fun sisetoju iba awon omo ti ojo ori won odun kan si odun meta?

So odiwon fun ojo kini, ojo keji ati ojo keta.

Ojo Kini	Odiwon:
Ojo Keji	Odiwon:
Ojo Keta	Odiwon:

Kinni odiwon lilo awon ogun iba titun miran ti ijoba fowosi, bi apeere Larimal ati Dart fun sisetoju iba awon omo ti ojo ori won je odun merin si odun maaun? So odiwon fun ojo kini, ojo keji ati ojo keta.

Ojo Kini	Odiwon:
Ojo Keji	Odiwon:
Ojo Keta	Odiwon:

IPIN D: AWON IRISI TI O JEMO LILO "ACT"

29. Jowo, fesin si okookan awoo gbolobun inu tabili isale wonyi nipa sisaami (✓) idahun ti o ye eleyi salaye ero tiyyin ti o ro mo lilo ogun iba titun bi apeere Coartem. Larimal ati bee bee lo fun awon omo ti ojo ori won ko ju odun marun lo.

GBOLOHUN	Mo gba	Mi o le so	Mi o gba
Emi kii lo ogun iba titun nitori pe won ko ti bee si ni awon ile iwosan ati ile ikoogun pamo si			
b) Awon ogun iba titun yi inira ti o mo niwon ti a ba woo si Chloroquine			
c) Emi kii lo awon ogun iba yi nitori pe owo won ga ju ara lo: Emi ko lee ra won			
d) Chloroquine si ni o n sise ju lati toju iba, fun idi eyi oun ni ogun ti mo maa n lo			
e) Emi o mo pupo nipa awon ogun iba titun yi, fun eyi emi kii lo			

30. Ewo ninu awon gbolohun inu tabili isale wonyi jo ipinu re tabi igbagbo re nipa awon ogun titu bi apeere Coartem, Larimal ati Dart bee bee lo

IPINU	Beeni	Beeko
a) Kop o ti je nimo nipa awon inira ti won maa n fa fun awon omo ti ojo ori won ko ju odun marun lo		
b) Coartem fun awon omo ti ojo ori won ko ju odun marun lo tiwa niibi egbegbe bayi		
c) Coartem ati awon ogun iba titun miran wa fun awon ti o ni owo lawujo		
d) Awon ogun iba titun n sise gidigidi lati setoju awon omo ti ko ju odun marun lo ti a ba woo si chloroquine		

IPIN E: SISE AGBEKALE OGUN IBA LILO LAARIN AWON OMO TI OJO ORI WON KO JU ODUN MARUN LO.

31. Ewo ninu awon ogun wonyi ni o ti lo ri ninu sisetoju iba awon omo ti ojo ori won ko ju odun marun lo? O le e saami (✓) eyokan tabi ju bee lo idahun ti o ro wipe o tona.

OGUN	SAAMI (√) TI O BA TI LOO RI
Agbo ibile	
Agbo ile okeere (Tianshi, tabi awon miran)	
Chloroquine	
Coartein	
Dart	
Fansidar	
Amolar	
Laila	
Afabukun	
Maloxine	
Awon iniran (so nato)	

32. Ewo ninu awon ogun wonyi ni o lun mo nlo nii sin ti eyikeyi ninu awon omo re ti ojo ni won ko ju odun marun lo ba ni iba? Saami (✓) gbogbo yi ti o daruko.

1. Awon agbo ibile ☐
2. Awon agbo ile okeere (Tianshi, GNLD) ati bee bee lo ☐
3. Chloroquine ☐ 4. Coartem ☐
5. Dart ☐ 6. Lariinal ☐
7. Awon miran (so pato) .....

33. Ti o batun n lo chloroquine ninu sisetoju iba awon omo re ti ojo ☐ won ko ju odun marun lo. kinni awon idi re? Saami (✓) eyokan tabi jubee lo awon idahun ti o ye. 1. Gbagbo omode lo nifee re ☐ 2. Ko won rara ☐ 3. O wa kankiri ☐
4. Kii fa wahala fun omo tabi awon omo mi ☐
5. Onimo isegun/osise ilera wa lo fi owo si ☐
6. Awon miran (so pato) .....

Ni isale yi ni a daruko awon ogun si. Ewo ninu won iwo ti ara mu julo fun sisetoju iba awon omo ojo ori won ko ju odun marun lo?

Ogun Iba	Saami (√)
1. Chloroquine	
2. Coartem	
3. Artequine, (Larimal, Dart)	
4. Fansidar, (Amalar. Maloxine)	
5. Camoquine	
6. Halfan	
7. Quinine	

35. Igba melo ni eyikeyi ninu awon omo re ti ojo ori won ko ju odun marun lo ni iba laarin osu mefa ti o koja lo? Tika nipa sisaami (√) ninu tabili isale iye asiko ati ogun iba ti o lo

s/n	Iye asiko	Saami (√)
1	Ekan	
2	Emeji	
3	Eemeta	
4	Igba Merin	
5	Igba Marun	
6	Igba mefa tabi ju bee lo	

36. Igba wo ni o maa n fun awon ogun iba titun bi apetee Coartem. Larimal eyikeyi awon omo re ti ojo ori won ko ju odun marun lo?

1. Ni igba ti omo mi ba bere iba ti ko le ☐
2. Gbogbo ose, lati ri daju wipe iba ko jade mara. ☐
3. Ni igba ti akogun awon aami iba ba fi oju han lara omo mi ☐
4. Mo maa n lo ni igba ti onimo isegun koo fun mi nikan ☐
5. Awon miran (so pato) .....

37a. N je awon ogun iba kan wa ti e ko lo mo fun sise toju awon omo yin ti ojo ori won ko ju odun marun lo ni igbati won ba ni iba?

Beeni ☐ 2. Becko ☐

37b. Ti o baje beeni, lo si ibeere 38. Ti o baje becko, lo si ibeeere 39.

38. Kilode ti e ko fi loo mo? 1. O ni adun kikoro ☐

2. O ni orisirisi wahala ti ko dara ti o maa n jeyo leyin lilo ☐

3. Ko lee wo iba san ni igba ti a lo o ☐

4. Onimo isegun nii kiini ni ilo nipa re ☐

5. Mo ni imo nipa awon ogun iba titun ti won fi owo si bi apeere Coartem ☐

6. O miran (so pato) .....

39. Fun okookan awon ogun inu tabili yi, saami (✓) eya awon eya ti o ti lo ri fun awon omo ti ojo ori won ko ju odun marun lo ti o ni iba

		Iru Ogun		
Awon ogun titun	Olomi	Onikoro	Ogun ti a n ti boni lara	Abere
Dar				
Larimal				
Malmed				
Lonart				
Coartem				

40. Ti o ba fi lo awon ogun wonyi ri ninu sisetoju iba awon omo re ti ojo ori won ko ju odun marun lo, ibo ni e ti ra/gba won?

Oogun	Ibi ti o ti ra tabi ti o ti gba				
	Ile ita ogun	Ile ipin ogun	Ile itaja	Ile iwosan aladani	Ile iwosan ijoba
Coartem					
Artesunate					
Dart					
SP (Fansidar or Maloxine)					
Larimal					
Quinine					
Chloroquine					
Awon miran (so pato)					

41. Kinni ojo ori re pelu ojo ibi ti o se kehin? _____

E se pupo fun ifowosowopo yin

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Serial Number _____ Interviewer's Code _____

Date of Interview _____ Name of Community _____

o/o Knowledge Score _____

APPENDIX IV: KNOWLEDGE SCALE

Question	Variables Measured	Score assigned
Q9	Causes of malaria	1
Q10	Main cause of malarin	1
Q11	Mode of spread/transmission of malaria	3
Q12	Symptoms/Signs for recognizing a child with malarin	4
Q13	Groups of People where malaria is perceived to be most serious	1
Q16	Commnon antimalarial drugs no longer effective for the treatment of malaria in Nigeria	2
Q17	New drugs now recommended for the treatment of malaria	6
Q18	Statement /Questions relating to malaria treatment	7
Q21	Knowledge of recommended drugs for the home treatment of malaria in under-five	4
Q22	Advantages of using newly introduced antimalarial drugs such as Coartem, Lonart	3
Q23	Knowledge of how to use Coartem for malaria treatment in under-fives	1
Q24	Knowledge of Dosage pattern for coartem for age 1-3	1
Q25	Knowledge of Dosage pattern for coartem for age 4-5	1
Q27	Knowledge of Dosage pattern for Larimal/Dart(AA) for age 1-3	1
Q28	Knowledge of Dosage pattern for Larimal/Dart(AA) for age 4-5	1
	Total Number of Points	36

*Scores are assigned depending on the number of right answers present in each question with one mark allotted to each answer.