MALARIA RELATED KNOWLEDGE, PERCEPTION AND USE OF ARTEMISININ-BASED COMBINATION THERAPY AMONG STUDENTS OF SCHOOL OF NURSING ELEYELE, IBADAN. OYO STATE, NIGERIA.

BY

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Dedication

This work is dedicated to God almighty for all his marvelous works to me throughout this program, may his name alone be praised daily in my life in Jesus name.

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ABSTRACT

Malaria, a protozoan infectious disease, is endemic in Nigeria with very high population at risk of infection and most of them are due to Plasmodium falciparum. This parasite is transmited by mosquitoes and accounts for 90% of malaria cases in Africa and almost all malaria death worldwide. The treatment of malaria in Nigeria today is presumptuously dependent on the use of Artemisinin-based Combination Therapy which was recommended by the WHO as the first line drug for the treatment of uncomplicated malaria. Artemisinin-based Combination Therapy known as ACT is a combination of artemether and lumefantrine. The correct use of ACT has not been fully explored; therefore this study was designed to assess malaria-related knowledge, perception and use of Artemisinin-based Combination Therapy among students of School of Nursing, Eleyele, Ibadan, Oyo State, Nigeria.

This study was a descriptive cross-sectional study which involved purposive sampling technique, involving all three classes of 150 students in the school of nursing. Data were collected through a semi-structured and self-administered questionnaire which included questions on socio-demographic characteristics of respondents, knowledge and perception of malaria, use of ACT, and knowledge of the National Policy on Malaria Treatment. Knowledge on malaria and ACT was measured on a 78-point scale, scores ≥39 was categorised as good knowledge and score ≤39 was categorised as poor. Quantitative data were analysed using descriptive statistics at p = 0.05 level of significance.

The mean score for the age of the respondents was 18.67±3.4 and 35.3% were Year One class. Majority (78.0%) of the respondents had a good knowledge of Artemisinin-based Combination Therapy with score of 17.1±6.7.Some of the respondents (46%) had the knowledge that plasmodium is the cause of malaria, 52% of the respondents had the knowledge that female anopheles mosquito is the cause of malaria. Majority (94.7%) had good knowledge that fever is one of the signs and symptoms of uncomplicated malaria. Few (16.7%) perceived that ACT related medicines should not be used for treating under-five children because of the associated side effect. Some (37.3%) of the respondents stated that ACT are not always available in health care facilities so it is better to use chloroquine that is very common. Majority (69.3%) had heard of Artmether Lumenfantrin commonly called “Coartem” and 46.7% of the respondents were sure

of the adult dosage. Few (18.0%) of the respondents had heard about the National Policy on Malaria Diagnosis and Treatment. Very few (6.0%) of the respondents had a copy of the policy.

Majority of the respondents had good knowledge of ACTs but in-training service on the use of this drug is suggested.

Keywords: Artemisinin-based Combination Therapy, Malaria, Students of School of Nursing, Female Anopheles mosquito, National Policy on Malaria Treatment.

Word count: 442

Certification

I certify that this study was carried out by **EGOR Gloria Peter** in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

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LIST OF ABBREVIATIONS

HMM- Home Management of Malaria

NMCP- National Malaria Control Programme

RDT- Rapid Diagnostic Tests

TFM- Thick film microscopy

WHO- World Health Organization

SP- sulphadoxine/pyrimethamine

Operational definition of terms

Artemisinin-based Combination Therapy- According to Web definition, Artemisinin-based Combination Therapy (ACT) is a combination of artemisinin or one of its derivatives with an antimalarial or antimalarials of different class.

Coartem- A combination of artemether and lumefantrine, recommended by WHO for the treatment of uncomplicated malaria(Anvikar et al 2012).

Malaria-An infectious disease caused by protozoan parasites from the plasmodium family that can be transmitted by the female anopheles mosquito.

Adherence- An act of completing stated dosage of anti-malarial drugs for a given period of time.

National Antimalarial Treatment Policy- The National Anti-malarial Treatment Policy describes the treatment of malaria in a given country.

Perception- Perception simply explains those sensory experiences of the world around us and involves the way individuals view things around them which could be based on unverified or unreliable information (Cherry 2014).

CHAPTER ONE

INTRODUCTION

1.1. Study background

Malaria is a great endemic infectious disease, responsible world-wide for millions of deaths every year, especially in children (Mechai, Loulergue, and Bouchaudo, 2012). Malaria, a protozoan infectious disease, is transmitted throughout Nigeria with very high population at risk of infection and most of them are due to Plasmodium falciparum (Balogun, Jibrin, Tahir, Bassi, Balogun and Fehintola, 2013). Over the years, malaria treatment has been undermined in countries like ours, other endemic countries and throughout Sub-Saharan Africa (Njau, Goodman, and Kachur, 2008). Malaria also affects the world at large and it is a major obstacle to human development especially the world's poorest countries (WHO, 2006).

Conventional anti-malarial drugs such as chloroquine and Sulphadoxine/Pyrimethamine (SP) have become increasingly out of date in terms of drug resistance (Njau, Goodman, and Kachur, 2008).This led to the reason why Sixty-seven malaria endemic countries with 41 of them in Africa, recently adopted Artemisinin-based Combination Therapies (ACTs) since the most reliable treatment against malaria is a combination of drugs using artemisinin derivatives, highly potent extracts of the Chinese plant Artemesia annua (Bosman and Mendis, 2007). It has been recorded by several authors that the artemisinin derivatives have been shown to produce faster relief of clinical symptoms and faster clearance of parasites from the blood than other antimalaria drugs (Mclntosh 1999, Adjuik, 2004, WHO, 2006). Artemisinin-based combination therapy (ACT) has been recommended by the WHO for the treatment of falciparum malaria (Anvikar, Sharma, Shahi, Tyagi, Bose, Sharma, Srivastava, Kiechel, Dash, and Valecha, 2012).

Anyikar and colleagues went further to explain that artemisinin-based compounds could be combined with drugs from different class and that these companion drugs are lumefantrine, mefloquine, amodiaquine, sulfadoxine/pyrimethamine, piperaquine and chlorproguanil/dapsone. Artemisinin derivatives include dihydroartemisinin, artesunate and artemether (Malaria Consortium 2014). Anyikar also pinpoint that compliance to treatment is necessary to ensure treatment effectiveness and prevention of future resistance to ACT. But when combinations are

provided as two separate drugs, patients might take only one of the two drugs or fail to complete the whole course (Anyikar et al., 2012). By this, one fixed-dose ACT exist which is Coartem an association of artemether and lumefantrine. The combination of amodiaquine and artesunate, along with four more combinations, is recommended by WHO for malaria control programmes (Anvikar et al., 2012).

None the less, to stay away from malaria and not having malaria which is geared towards those activities developed by the National Malaria Control Programme (NMCP) is mainly geared towards early detection and prompt treatment; distribution of long lasting insecticide treated mosquito nets (LLINs) and education programmes (Forero, Chaparo,Vallejo, Benavides, Guttierrez, Herrera and Herrera, 2014). Even though malaria has witnessed decrease in malaria transmission in some countries the disease still remains a public health problem with an estimated 10 million people currently living in areas with malaria risk and 61,000 cases reported as at 2012 (Forero et al., 2014). That is to say malaria affects so many people. Nurses have crucial roles to play in the treatment of malaria. Their instrument in strategies for its control is usually very essential. Persons at the basic post/basic training nursing should be conversant with malaria management strategies.

1.2. Statement of the Problem

Over 1 million people are at the risk of malaria every year in Nigeria and it has been estimated that 50% of the adult in Nigeria population have at least one episode yearly while the under-five have up to 2 – 4 cases of malaria annually (FMOH, 2005). It has also been recorded that Nigeria bears about 25 percent of the disease burden of malaria in Africa, thereby contributing drastically to the one million lives lost yearly in the region, this proportion consist of children and pregnant women (MIS, 2010). Malaria in Nigeria poses a major public health problem despite the fact that it is curable. None the less, malaria-related deaths account for up to 11 percent of maternal mortality owing to the fact that they contribute up to 25 percent of infant mortality and 30 percent of under-5 mortality, amounting to 300,000 childhood deaths annually MIS., quoting Jimoh et al., 2007. According to Jimoh, et al., about 110 million clinical cases of malaria are diagnosed yearly, and malaria contributes up to 60 percent of outpatient visits and 30 percent of admissions. Malaria also exerts a huge social and economic burden on families, communities, and the country

at large, causing an annual loss of about 132 billion Naira in payments for treatment and prevention as well as hours not worked (MIS, 2010) quoting (Jimoh et al., 2007). Malaria or a disease that resembles malaria has been noted for more than 4,000 years. Also that malaria has greatly influenced human populations and human history (CDC, 2012). The sixth Millennium Development Goal (MDG 6) has malaria, HIV/AIDs and other diseases among its second target to have been halt by 2015 has begun to reverse the incidence of malaria. Two of the indicators for this goal are the proportion of children under 5 sleeping under insecticide-treated bed nets and the proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs (Macho, Onwujekwe, and Uzochukwu, 2012).

The 2008 NDHS data shows that the proportion of children with fever who received appropriate treatment with Artemisinin-based Combination Therapy (ACT) was found to be 2 percent and the proportion of pregnant women who received Intermittent Preventive Therapy (IPT), that is, two doses or more doses of Sulphadoxine-Pyrimethamine (SP) with at least one dose provided during ANC visit, was 5 percent (MIS, 2010). The National Malaria Control Programme (NMCP), of the Ministry of health, as well as international partners, are aggressively combating this disease burden which adversely affects the national economy through proven malaria control strategy such as prompt treatment of malaria cases (MAPS, 2014). According to Roll back Malaria, there are an estimated 300 million acute cases of malaria every year around the world, resulting in more than one million deaths. Approximately 90 percent of these deaths occur in Africa mainly in children (MAPS, 2014).

In view of these, this study tend to focus on the knowledge, perception, and use of Artemisinin-based Combination Therapy among students of school of nursing Eleyele Oyo State. Nurses are often actively involved in the management of malaria cases especially of the primary health care level. Since the formulation of the National Malaria Treatment Policy, not much effort have been made to in practising nurses on integrating the teaching of the policy in the schools of nursing. In order to facilitate the infusion of the provisions of the policy into the curriculum of the schools of nursing dependable baseline information is needed. This process of information should relate to the knowledge, perception and use of ACT among student nurses. However these issues have not been adequately investigated among the study area, therefore, this study tend to investigate

malaria related knowledge, perception and use of Artemisinin-based Combination Therapy among students in the school of nursing, Eleyele Ibadan, Oyo State, Nigeria.

1.3. Justification

Malaria a disease of human origin becomes more deadly as the year goes by even with the introduction of various anti malarial drugs. Although in countries like ours, measures are being taken to reduce the menice of this so called disease. The World Health Organization sees to this fact and allowed the introduction of the Artemisinin-based Combination Therapy in the year 2004 which became the first line drug for the treatment of malaria in Africa and all malaria endemic countries that is why this study tends to investigate malaria related knowledge, perception and use of artemisinin-based combination therapy among students of school of nursing. Although study has been carried out on Artemisinin-based Combination Therapy but little has been done as regards the knowledge, perception and use of these drug among students in the school of nursing Eleyele, Oyo State.

1.4. Research Questions

1. What is the knowledge of school of student in the school of nursing on malaria?
2. What is the knowledge of students in the school of nursing on Artemisinin-based Combination Therapy? `
3. What is their perception on Artemisinin-based Combination Therapy?
4. What is the pattern of use of Artemisinin-based Combination Therapy among students in the school of nursing?
5. What are those factors that can influence the use of Arthemisinin-based Combination Therapy?

1.5 Objectives

Goal

To investigate the Malaria related knowledge, perception, and use of Artemisinin-based Combination Therapy (ACT) among students of School of Nursing Eleyele Oyo State.

Specific Objectives

The specific objectives were to:

1. Assess the knowledge of school of nursing students on malaria
2. Assess the knowledge of school of nursing students on Artemisinin-based Combination Therapy.
3. Assess their perception on Artemisinin-based Combination Therapy.
4. Determine the use of Artemisinin-based Combination Therapy among students of school of nursing Oyo State.
5. Determine the factors that could influence use of Artemisinin- based Combination Therapy among the students of School of Nursing

1.6 Study Variables

Variables to be measured

The independent variables for this study include age, religion, marital status, ethnic group, gender and level of study. The dependent variables that were examined include knowledge, perception, and use of Artemisinin-based Combination Therapy.

Target Population

The target population for this study were Students of the School of Nursing Eleyele Ibadan, Oyo State.

Issues to be investigated

This study aims at investigating dependent and independent variables such as socio-demographic characteristics which includes age, sex and educational level of the respondents as well as their Knowledge, Perception, and use of Artemisinin-based Combination Therapy (ACT).

CHAPTER TWO

LITERATURE REVIEW

2.1. Knowledge relating to causes, mode of transmission and prevention of malaria

2.1.1 Causes of Malaria

Regarding the causes of malaria, it was recorded that malaria is caused by a protozoan parasite from the plasmodium family that is capable of invading the red blood cells (Kakkilaya, 2011 and Kerns, 2014). This parasite is transmitted by mosquitoes in many tropical and subtropical regions (MedicineNet.com, 2014). Four types of plasmodium can cause malaria in humans which are P. falciparum, P. vivax, P. malariae, and P. ovale (Sinclair, 2009 and Kerns, 2014). Amongst all these, P. falciparum is the most deadly and account for over 90% of malarial cases in Africa and almost all malarial death all over the world (Sinclair, 2009). Although NHS Choices went further by saying that five types of plasmodium causes malaria which included P.knowlesi which is very rare and found in parts of South East Asia (NHS, 2014, Anonymous, 2013).This implies that not all the malaria parasites are domicile in Africa such as the P. Knowlesi.

Nettleman, 2014 added that P. Knowlesi is mainly found in Malaysia, this species is capable of causing high levels of parasites in the blood, leading to organ failure or death (Nesttle, 2014). Furthermore, Nestlle added that clinicians that treat malaria in the United States are being asked in most cases if malaria is contagious? The answer is that malaria is not spread directly from person to person. A few cases have occurred in other countries through intravenous drug abuse with shared needles, or organ transplantation (Nesttle, 2014).

According to the Travel Health Centre, P vivax commonly found in India and Central and South America which is certainly found worldwide has an incubation period of 8-13 days. Also, its infection can in most cases lead to rupture of the spleen which can be life threatening. In people treated only with chloroquine, this type of malaria can hide in the liver and return later. While P ovale is some time found outside Africa and has an incubation period of 8-17 days and can hide in the liver of people who are not properly treated and return later. P malariae is dominant

worldwide but less common than the other forms and has an incubation period of 2-4 weeks. If not treated, the infection can last for years and the P falciparum which is common worldwide is the most life-threatening type of malaria and has an incubation period of 5-12 days (Travel Health Centre, 2014).

2.1.2 Mode of Transmission of Malaria

Malaria has several ways in which it gets into the body, some of which as recorded by various authors are through contaminated needle or transfusion (MedicineNet.com 2014, Sinclair et al., 2009, PHAC, 2004, and Kakkilaya, 2011). Malaria can also be acquired through organ transplants and Intra Venous-IV drugs (Anonymous, 2014). This implies that accidental needle prick, and those used by drug addicts if contaminated can transfer malaria parasite to victims. Also, the tendency of acquiring malaria from blood transfusion is certain, although low in non endemic countries such as the United States, while in endemic countries, it is much higher. Therefore, those who have suffered from malaria should not donate blood for at least three years after showing the signs and symptoms of malaria especially in the case of P.malariae (Kakkilaya, 2011).

It has also been recorded by several authors that; the female Anopheles mosquitoes bite and feed from an infected person's blood then become infected with the malaria parasite and transfers it to other uninfected people when it bites and feed from their blood (Kerns, 2014, Kakkilaya 2011, and CDC, 2012).

Since the reproduction of malaria takes place in the blood and in the liver, malaria can certainly be transported most of the time to the placenta of a mother to her unborn baby either in her womb or during labour commonly called congenital malaria (Kakkilaya, 2011). Kikkilaya also went further by reporting that in recent years, congenital malaria has a higher prevalence ranging from 8% to 33% in endemic and non endemic areas of malaria, including the United States, Europe, India, etc. This was as a result of the four plasmodium species that always infect humans, although in most cases are as a result of P.falciparum or P.vivax malaria in mother. In such countries where malaria is not endemic, P.malariae may cause a very high number of congenital malaria cases as a result of its longer persistence in the host. Congenital malaria is most times noticeable during the first pregnancy (Kikkilaya, 2011).

2.1.3 Prevention of Malaria

2.1.3.1 The Use of Long Lasting Insecticide Treated Mosquito Net (LLINS)

Malaria could be prevented when certain measures are put into considerations. In order to achieve the fullest benefit of staying away from the deadly vector causing malaria, there should be need to adequately utilize those strategies developed to prevent contact or bite from malarial vector through focusing on universal access to LLINs. Increased indoor residual spraying, elimination of mosquito breeding places and environmental management in line with the National Malaria Control Strategic Plan 2009–2013 (Kyu**,** Georgiades and Shannon, 2013, Mbachu et al., 2012). Kyu and colleagues further explained that the net distribution termed a "scale-up phase" 2009–2010 involved the distribution of 2 LLINs per household and also a phase called the "keep-up phase" of replacing "torn or worn out nets" and providing LLINs to new household members and new families (Kyu et al., 2013).

MedicineNet.com went further by stressing on the fact that Bed nets become more effective when they are treated with permethrin or deltamethrin insecticide and that bed net should be purchased only when they are treated with insecticide (MedicineNet.com, 2014). An insecticide treated net is one that has been treated with insecticide for about 12 months (Adekunle, 2005). This I believe boiled down to the reason why the sixth Millennium Development Goal (MDG 6) came up and is to combat HIV/AIDS, Malaria and other diseases, and also to have halted and reversed the incidence of malaria by 2015 (Mbachu, Onwujekwe, and Uzochukwu, 2012).

Record has it that a lot of progress has been made throughout sub-Saharan Africa in order to increase coverage on insecticide treated nets. Some of these countries are Kenya Sierra Leone, Cote d'lvoire, Niger, Senegal, Burundi, Burkina Faso, Uganda, Cameroun, Rwanda, Central African Republic, Tanzania, Benin, Ghana, Malawi, Zambia, Togo, Guinea,-Bissau,Sau Tome and Principe and then the Gambia Adekunle quoting (UNICEF 2007, and WHO, 2008). The WHO went further to say that in 2004 up till 2006, there had been increase in the delivery of ITNs to countries in African, South-East Asia and Western Pacific regions where nets are most frequently used (Adekunle, 2005) quoting (WHO, 2008).

According to World Malaria Report, Insecticide Treated Nets (ITNs) supplies could only cover a very few percentage of people in 37 African countries that reported in 2006. Nigeria is termed one of the countries that contributed to the low utilization rate of LLINs in African countries. Notwithstanding, bringing down the burden of malaria to half in Nigeria, to meet the RBM target before the end of year 2010 is necessary (Adekunle, 2005) quoting (FMOH, 2009).

2.1.3.2 The Use of Anti malarial (Chemoprophylactics)

Malaria prevention in Nigeria anchors on the multi-pronged global strategies for malaria control. These include prompt and effective case management (early diagnosis and prompt treatment with effective drugs - artemisinin-based combination therapy); intermittent preventive treatment of malaria in pregnancy (IPTP) (Mbachu et al., 2012).

Also, the federal ministry of Health stresses on the fact that antimalarial medications should be used for the prevention of malaria. This boiled down to the reason why the Roll Back Malaria (RBM) laid down guidelines in order to attain specified goal/objectives (FMOH, 2005). One of these is the reduction of malaria burden everywhere by the year 2010 (FMOH, 2005).
The Roll Back Malaria strategy recommends a combination of interventions for malaria control. Zanzibar implemented artemisinin-based combination therapy (ACT) for uncomplicated malaria in late 2003 and long-lasting insecticidal nets (LLINs) from early 2006. ACT is provided free of charge to all malaria patients, while LLINs are distributed free to children under age 5 years ("under five") and pregnant women (Mail, Ali and Kachur, 2007).

Record has it that using malaria preventive drug called Prophylaxis is not encouraged for those living in malaria endemic area since this could lower ones resistance to the disease. Malaria preventive drugs or prophylaxis should rather be used in sickle cell anaemia and in non-immune visitors because of risk for severe disease although there is no guarantee of 100% protection. Also children with sickle cell anaemia should be given Proguanil which is the most common prophylactic drug and the recommended dosage is 100mg daily for children and 200mg daily for adults (FMOH, 2010).

The Centre for Disease Control and Prevention added that drugs to prevent malaria differ by country of travel and can be found in the country-specific tables of the Yellow Book.

Recommended drugs for each country are listed in alphabetical order and have comparable efficacy in that country. Also they added that no antimalarial drug is 100% protective and must be combined with the use of personal protective measures, (i.e., insect repellent, long sleeves, long pants, sleeping in a mosquito-free setting or using an insecticide-treated bed net (CDC, 2012).

The Novartis Malaria Initiative is one of the largest access-to-medicine programs in the healthcare industry. Moving forward, Novartis is committed to malaria elimination by driving the development of the next generation antimalarials, with two new classes of anti-malaria drugs currently in development. The most advanced compound is in Phase II clinical trials (The Novartis Malaria Initiative, 2013).

2.1.3.3 Routine Immunization on malaria

Record has it that despite the increase in vector control , improvement of epidemiological methods and the introduction of new and effective antimalarials, malaria still remains a major public health issue. Introduction of a vaccine is still a public health priority since it would greatly modify malaria epidemiology in a relatively near future if associated with vector control and improvement of diagnosis and treatment (Mechai, Loulergue, and Bouchaudo, 2012). Also Mechai, et al., still added that this vaccine initiative has been on ground since sixties, and that several studies have assessed vaccine-candidates targeting different stages of Plasmodium falciparum cycle with different approaches depending on targets. Some aiming a reduction of morbidity and mortality, others a transmission disruption (through vaccine specific of the pre-erythrocytic stage using the circumsporozoite protein with promising phase 3 studies). Other vaccine targets are being studied with hopefully an effective knowledge of the immunological mechanisms (Mechai, et al., 2012).

On the 8th of August 2014, Daily Independent news papers recorded that RTS, which is supposed to be malaria vaccine was believed to have halved the number of malaria cases in young children during a trial and also reduced by about 25 percent the number of malaria cases in infants. Daily went further to stress on the fact that Nigerians expect that the Federal Government to commence process of including it into the National Programme on Immunization (NPI) routine immunisation schedule for children and subsidise also for the adult population (Daily

Independent, 2014). Also, Adetokunbo Fabamwo an Associate Prof. of the Lagos State University College of Medicine (LASUCOM), reported; *"I think the malaria vaccine is a good idea. Malaria is both an infant and adult killer, talk less of pregnant women. Ethically conducted clinical trials in Nigeria will however be a good idea"* (Daily Independent, 2014).

Another issue of discuss was the route for administration which was noted to be the nasal route as documented by Carcaboso, Hernandez, Igartua, Rosas, Patarroyo, and Pedraz, 2004 as they argued that the intranasal administration of the adequate PLGA vaccine formulations greatly improves and maintais higher antibody levels compared to the conventional alum adjuvant and to the administration of the particles by other routes such as subcutaneous and oral (Carcaboso, Hernandez, Igartua, Rosas, Patarroyo, and Pedraz, 2004).

Another issue recorded was the local immunization of malaria DNA vaccines at the site of the liver using a gene gun as a useful tool. Although this was carried out in the liver of a mouse and record has it that those vaccines bombarded into the liver were more effective than those bombarded into the skin (Yoshida, Kashiwamura, Hosoya, Luo, Matsuoka, Ishii, Fujimura, Kobayashi, 2000).

2.2. Knowledge relating to malaria recognition and non agent with special reference to signs/symptoms, overview of medicines used for treating malaria prior to the introduction of Artemisinin based Combination Therapy

Malaria recognition as regards non agent implies the evaluation of a patient or person who has been exposed to malaria parasite. For malaria treatment to be effective, it must be promptly recognised and treated in time so as to prevent spread of infection (CDC 2012, Montanari, Bangali, Talukder, Banqui, Maheswary, Gosh, Rahman, and Mahmood, 2001). Also, to make a definitive diagnosis, laboratory investigation must be carried out to show the malaria parasite or its component (CDC, 2012).

Montanari and colleagues went further by explaining that in area where malaria is endemic, routine blood slide examinations is normally the routine, although approaches has become inadequate; thereby changing public health focus to early detection and treatment of the disease

and not only on the surveillance of laboratory based confirmation of malaria infections (Montanari et al., 2001). Epidemiological surveillance involves ‘‘the detection of cases; the screening criterion is the presence of fever, which leads to the microscopic examination of the blood of anyone having fever or having had fever recently.’’ (Montanari et al., 2001).Although most malaria-like illness is first recognised and defined at the home level. Most a times, a predisposition of fever which could be a sign of any illness accounted for fever at the home level and could be based on belief system, in line with the presentation of the illness. It is actually the belief system that forms the basis at which illnesses are been categorised into serious, mild or mundane, thereby determining treatment seeking behavior such as home, traditional or modern (Mwenesi, 2003).

Mwenesi still explained further by saying that people fail to realise malaria can be severe and calls for prompt and appropriate treatment with referral as in the case of convulsion and severe anaemia and some other presentations, which in most places are viewed as being separate disease entity with no relationship to malaria (Mwenesi, 2003).

By this, mothers especially of under-five should try to recognize early malaria symptoms, fever in particular. Recognition in this case will help to foster intervention as such it is necessary to note that Home Malaria Management (HMM) is one of the important ways to reach the target of eliminating malaria (Elmardi et al., 2009). Elmardi and colleagues went further by saying that incorrect confirmation of malaria status by the use of microscopy may lead to inappropriate patient management and that diagnosing malaria mainly on the clinical feature can reduce the risk of missing cases of malaria which can lead to over-treatment and can increase the pressure on drugs and predispose to appearance of strains as regards resistance so using Rapid Diagnostic Tests (RDT) to support (HMM) is necessary (Elmardi et al., 2009).

2.2.1 Signs and Symptoms of Malaria

The signs and symptoms of malaria are discussed under two main types of malaria namely benign and malignant malaria. Benign malaria is less serious and easy to treat while the malignant one is very severe and most times fatal. Malignant malaria is caused by P. falciparum and usually begins with similar symptoms like benign malaria, but will lead to serious

complications, such as breathing problems, liver failure and shock. Malignant malaria can also affect the brain and central nervous system which can even lead to death (Sinclair et al, 2005).

Uncomplicated or benign malaria explains the unserious form of the disease and presents such illness as headache, muscle pains, tiredness, abdominal pains, nausea and vomiting, as well as rigors (severe shivering). If this stage is left untreated P. falciparum malaria can quickly develop into complicated or malignant form of malaria and anaemia could set in including hypoglycaemia (low blood sugar), pulmonary oedema (fluid in the lungs), convulsions (fitting), coma, renal failure, and then death (WHO, 2006). Sinclair also went further by saying that some common symptom of benign malaria is a high fever, cough, and feeling more tired than usual and feeling generally unwell and that children are more tired and can have diarrhoea and vomiting. Malaria fever in several individuals has no particular pattern and could present 1-2 days after the symptoms must have shown. If malaria infection establish, malarial symptoms can come up in cycles, occurring every 2-3 days (Sinclair et al., 2005).

Record has it that the plasmodium parasite enters the blood and travels to the liver and then re-enters the bloodstream where it can invade red blood cells and eventually, these red blood cells burst leading to the release of more tiny parasites into your blood. These infected red blood cells tend to burst every 48-72 hours. Each time they burst, you will usually experience an episode of chills, fever and sweating (Kerns 2014, and Sinclair et al., 2005). Sinclair and colleague went further by explaining that in some cases, although this still depends on the type of plasmodium one has been infected with, it can take up to a year before any symptoms start to show. This means that you should suspect malaria in anyone with a feverish illness who has travelled to a malaria area within the past year, especially in the previous three months (Sinclair et al., 2005).

Also there could be jaundice-yellow colouring of the skin and eyes. Persons with severe falciparum malaria can develop bleeding problems, shock, kidney and liver failure including central nervous system problems (MedicineNet.com, 2014).

In view of the signs and symptoms of malaria, record has it that recognition and awareness of major symptoms of severe malaria in the community could help in action taking, but perceptions of causes of malaria and discrimination of other danger signs like vomiting might affect early treatment. Also that in the case of complicated malaria, education is needed targeting formal and

informal care providers on the introduction of rectal artemisinins and rectal artesunate to patient as pre-referral treatment for severe malaria. Also the Role of traditional healers in administering such medication to members of community is necessary (Mail, Kimbute, Machinda, Ruddy, Melkisedick, Peto, Ribeiro, Kitua, Tomson and Gomes, 2007).

2.2.2 Overview of Medicines used for treating Malaria prior to the Introduction of Artemisinin based Combination Therapy

2.2.2.1 Quinine and Related Agents

Before the recommendation of ACTs in 2001, certain drugs such as the chloroquine, sulfadoxine-pyrimethamine and amodiaquine had built resistance to falciparum malaria (Bosman and Kamini, 2007). Although chloroquine is still the first line treatment for P.vivax and P.ovale, while primaquine is used for the treatment of liver stage parasites of P.vivax, in low endemic area especially when there is adherence to drug (Malaria consortium, 2014). Documentation has it that chloroquine, mefloquine, piperaquine suppresses the emergence of the relapse of P. vivax which occurs about 6 weeks after treatment (Nosten and White, 2007).

Also Quinine is less effective and more toxic than chloroquine since it is a blood schizonticidal agent. Notwithstanding it is still very effective (Adekunle, 2005) and generally used in the treatment of acute cases of severe P. falciparum. It is useful in areas of high level resistance to chloroquine, mefloquine, and sulfa drug combinations with pyrimethamine. Quinine is also useful in treatment of post-exposure of individuals returning from a high endemic area to malaria (Wekipeadia, 2012).

It has also been recorded that the treatment regimen of quinine is complex and can be determined in most cases by level of resistance. The World Health Organization recommendation for quinine is 20 mg/kg first times and 10 mg/kg 8 hr for 5days where parasites are sensitive to quinine, combined with doxycycline, tetracycline or clindamycin. Doses can be given by oral, intravenous or intramuscular routes. The recommended method depends on the urgency of treatment and the available resources (i.e. sterilised needles for IV or IM injections) also that the use of quinine is characterised by an experience called cinchonism and could be less effective and more toxic as a blood schizonticidal agent than chloroquine however it is still very effective and widely used in

acute cases of P.falciparum. It is especially useful in areas where there is known to be a high level of resistance to chloroquine, mefloquine, and sulfa drug combinations with pyrimethamine. Quinine is also used in post-exposure treatment of individuals returning from an area where malaria is endemic (Wekipeadia, 2012).

2.2.2.2 Amodiaquine

Amodiaquine is an aminoquinoline used for the therapy of malaria. Amodiaquine has been linked to severe cases of acute hepatitis which can be fatal, for which reason it is recommended for use only as treatment and not for prophylaxis against malaria (The malaria Solutions Foundations, 2014). Amodiaquine is related in structure to chloroquine, and highly chloroquine-resistant P. falciparum is also resistant to amodiaquine. Amodiaquine remains a useful agent for treating falciparum malaria, but because of its potential for causing hepatotoxicity, it is no longer used for antimalarial prophylaxis. Amodiaquine is available in tablets of 150 to 600 mg in generic forms and under the brand names Camoquin and Flavoquine. The recommended dosage is 10 mg/kg of amodiaquine base once daily for 3 days usually in combination with other antimalarial agents. Common side effects of amodiaquine include nausea, diarrhea, skin rash and itching (The malaria Solutions Foundations, 2014).

Due to fatal adverse reactions in adults caused by amodiaquine, several organization asked for its withdrawal as first line drug (Olliaro and Mussano, 2009).Caution should be exercised in patients with G6pD deficiency, nerve disease, any allergy, kidney or liver impairment, during pregnancy and breastfeeding. Avoid long-term use of this medication; otherwise vision loss may occur (Anonymous, 2009).

Sulfadoxine-pyrimethamine combined with amodiaquine (SP-AQ) has been identified as a highly efficacious regimen for treatment of malaria and for IPT. However, when used for IPT in children, SP-AQ has been associated with an increased incidence of mild adverse events, particularly vomiting and fever, in the days following the IPT course. One answer to this problem would be to use other antimalarials as the partner drug to SP, which has been shown extensively to be safe and well tolerated when used for intermittent preventive treatment (Cairns, Cisse, Sokhna, Cames, Simondon, Ba, Trape, Gaye, Greenwood and Milligan, 2010).

2.2.3 Mefloquine

Record has it that Mefloquine is a quinoline methanol compound related to quinine and that several different mefloquine formulations are now available with different oral bioavailability. Employment of mefloquine as monotherapy for the management of malaria has lead to rapid spread of resistance. There is theoretical evidence to suggest that initial deployment of the lower dose of mefloquine encourages resistance, and that initial use of higher doses, preferably in combination with an artemisinin derivative is less likely to lead to resistance (Nosten and White, 2007). Where adherence can be assured the dose should be split at 15 mg/kg initially followed 8–24 hours later by a second 10 mg/kg or as 8.3 mg/kg daily for 3 days (this is approximately the dose in the new fixed dose combination). This reduces reduces vomiting. There is no formulation of mefloquine for children. Despite earlier restrictions there is no reason to withhold mefloquine from young children. Limited information suggested that mefloquine was probably safe in pregnancy, although the observation in Thailand of an increased stillbirth risk when mefloquine was used in treatment at any stage of pregnancy has cast uncertainty over its use in pregnant women (Nosten and White, 2007).

The slowly eliminated drugs (e.g., chloroquine, mefloquine, piperaquine) suppress the emergence of the first relapse in the frequently relapsing “tropical strains” of P. vivax so the first successful emergence of a relapse (i.e., the second relapse) typically occurs about 6 weeks after treatment. (Nosten and White, 2007)

2.2.2.4 Atovaquone/Proguanil

It has been documented that atovaquine-proguanil mainly comprises of two drugs for the purposes of malaria prevention for travels and mainly found in the United States by prescription only. It is dispensed under the name Malarone and also sold at generic medicine in two sizes such as adult and pediatric tablet. 250mg atovaquone plus 100mg proguanil for adult while 62.5mg atovaquone plus 25mg proguanil. Atovaquone can also be used for treatment of malaria. Atovaquone-proguanil can be prescribed to adults and children who weigh at least 11 pounds (5 kg) (WebMD, 2005)

Also that to prevent malaria, adults need to take one tablet daily 1 to 2 days before entering an area where malaria is present, continue to take it daily during their stay in the area, and then take

it for 7 days after they leave the area while to treat malaria, adults can take a daily dose of four tablets for 3 days in a row while children dosage vary according to their body weight.

Malarone appears to be effective in the prevention and treatment of malaria caused by P. falciparum, including infections acquired in areas with chloroquine-resistant strains (WebMD, 2005).

There is also the likely hood of resistance of Plasmodium falciparum to atovaquone or atovaquone-proguanil (Happi, Gbotosho, Folarin, Milner, Sarri, Sowunmi, Eyle, Milhous, Wirth and Odola, 2006).

2.2.2.5 Primaquine

Record has it that primaquine is an antimalarial medicine that can be found in the United State by prescription only. It is commonly called primaquine phosphate implying its generic name and has its brand name as primaquine (WebMD, 2014). It is available in tablets of 15mg base (26.3mg salt). This 15mg is also the same as 26.3mg salt meaning that it has two different ways of describing it. Adult and children can take primaquine if prescribed to them but pregnant women and persons having glucose-6- phosphate dehydrogenase (or G6PD) are been excluded from taking premaquine if they primaquine can make them very sick and can led to death. Also, nursing mothers should screen their babies before the mother take primaquine. Adult also should go for blood screening befor taking primaquine to be sure they are not having glucose-6-phosphate dehydrogenase (or G6PD) (WebMD, 2014)

Primaquine can also be used after returning from a long trip to other countries in the world where malaria transmission occurs. Apart from prevention purposes, primaquine can also be used for treating malaria caused by mosquito bites in malaria endemic countries of the world. Primaquine is used after other medications (such as chloroquine) have killed the malaria parasites living inside red blood cells. Primaquine then kills the malaria parasites living in other body tissues. This prevents the return of the infection. Both drugs are needed for a complete cure (WebMD, 2014).

Kelvin and Stephen recorded that the risk of relapse of Plasmodium vivax malaria without primaquine therapy was very high depending largely upon geographic location and that almost all

reports of malaria resistant to primaquine are associated with lack of supervision. Also, that they suspect that there is widespread resistance to the standard course of primaquine therapy, which is 15 mg primaquine base daily for 14 days. Clinical evidence confirms that a course of 15 mg daily for just 5 days, a regimen widely used in areas where malaria is endemic, has no discernible efficacy (Kelvin and Stephen, 2004).

2.2.2.6 Halofantrine

halofantrine hydrochloride **commonly called halfan** has its generic name as halofantrine and brand name as halfan (Multum, 2004). Halofantrin has rare report of serious ventricular dysrhythmias (Kluwer, 2014,) sometimes associated with death, which may be sudden. Also recorded that halofantrine caused serious heart problems (Kluwer, 2014). Halfan is not recommended for use in combination with drugs like mefloquine (Healthdigest, 1999) or in people who have heart attack (Kluwer, 2014). Halfan should be prescribed only by physicians who have special competence in the diagnosis and treatment of malaria and use of antimalarial drugs. Physicians are also advised to thoroughly get themselves acquainted with halofantrin leaflets. Halofantrin is available as tablets containing 250 mg of halofantrine hydrochloride (equivalent to 233 mg of the free base) for oral administration (WebMD, 2005).

It is also documented that various private and public institutions are at work to discover and develop new compounds. Most development relies on the quinoline, antifolate and artemisinin compounds and that there is urgent need to have effective antimalarial drugs that can last a long time. Drug combinations that have independent modes of action are seen as a way of enhancing efficacy while ensuring mutual protection against resistance (Olliaro and Tailor, 2004).

Explaining further, Olliaro and colleague went on pinpointing that most research work has focused on the use of artesunate combined with currently used standard drugs, namely, mefloquine, amodiaquine, sulfadoxine/pyrimethamine, and chloroquine. There is clear evidence that combinations improve efficacy without increasing toxicity. However, the absolute cure rates that are achieved by combinations vary widely and depend on the level of resistance of the standard drug (Olliaro and Tailor, 2004).

2.3. Artemisinin based Combination Therapy (ACT) – Concept, year introduced, rationale for its introduction and dosages for various age groups

2.3.1 Concept of Artemisinin-based Combination Therapy (ACT)

In explaining the concept Artemisinin-based Combination Therapy (ACT), the term Artemisinin also known as sweet Annie or annual wormwood in the China origin should be noted. This Artemisinin is an annual herb of the China origin, known as qinghao for emergency treatment of fevers (MedicineNet.com, 2014). The WHO highly discourages its use as a monotherapy, since it has shown that malarial parasites are developing resistance to the drug. Therapies combining artemisinin and some other antimalarial drugs are the best treatment for malaria and are both effective can be well tolerated in patients (Douglas et al, 2010).

Artemisinin and its compouds (such as artesunate, artemether, and dihydroartemisinin) are newly introduced antimalarial drugs, with special structure and mode of action. The first published report of clinical trials appeared in the Chinese Medical Journal in 1979. Until recently there had been no reported resistance to the artemisinin derivatives; however, the possibility of emerging resistance on the Thai-Cambodian border is currently being investigated (WHO, 2008).

According to Web definition, Artemisinin-based Combination Therapy (ACT) is a combination of artemisinin or one of its derivatives with an antimalarial or antimalarials of different class.

Record has it that Artemisinin-based combination therapies (ACTs) are currently the most effective medication for the treatment of Plasmodium falciparum malaria and are the first-line treatment recommended by the WHO (Yaday, Moucheraud, Alphs, Larson, 2013). Also another record has it that the cocktail of artemisinin and lumefantrin is marketed as Coartem and Raimet (MedicineNet.com, 2014).

It has further been explained that Artemisinin derivatives have shown to produce faster relief of clinical symptoms and faster clearance of parasites from the blood than other antimalarial drugs. When used as monotherapy, the short half-life of the artemisinin derivatives (and rapid elimination from the blood) means that patients must take the drug for at least seven days. Failure to complete the course, due to the rapid improvement in clinical symptoms, can lead to a high

treatment failure rate even in the absence of drug resistance. Artemisinin derivatives are therefore usually given with another longer-acting drug, with a different mode of action, in a combination known as artemisinin-based combination therapy (ACT). These combinations can then be taken for shorter durations than artemisinin alone, and they have a lower treatment failure rate (Sinclair, Zani, Donegan, Olliaro, and Garner 2009, WHO, 2006).

Documentations also have it that Artemisinin-based compounds that are termed fast acting, are combined with a drug from a different group. Combination of this includes lumefantrine, mefloquine, amodiaquine, sulfadoxine/pyrimethamine, piperaquine and chlorproguanil/dapsone. Artemisinin derivatives include dihydroartemisinin, artesunate and artemether. The use of ACT is been influenced by poor Implementation regarding recommendation to use of ACTs due to limited number of available and affordable co-formulated anti-malarial drugs, although majority of the countries have started using this regimen (Malaria Consortium, 2013).

Muheki et al recorded that there is growing international consensus that wide-scale, systematic implementation of ACT is one of few effective measures that will enable malaria-endemic countries to achieve the ambitious goals set in Abuja in 2000 to 'Roll Back Malaria', particularly that of halving malaria morbidity and mortality by 2010. The World Health Organisation (WHO) explicitly recommended 'the use of ACT' in order to 'provide effective treatment against malaria and to slow the spread of drug resistance' in a statement released on 20 February 2002 (Muheki, McIntyre and Barnes, 2004).

Also the Nigeria MDGs+10 Show Case No.5 Roll Back Malaria in Nigeria 2010 explains that Artemisinin-based Combination Therapy is a potent and rapidly acting drug against all plasmodium species, killing all stages of the parasite. But artemisinin has now given way to even more potent derivatives. By creating ACTs with multiple drug combinations and transmission-blocking components, resistance can be prevented (MDG, 2010).This implies that ACTs are beneficial due to their high efficacy, fast action and the reduced rate of resistance been developed. As such, measures can be put in place to enable proper use of these products to make sure the problem of malaria especially in Nigeria and even in Africa becomes a thing of the past since the disease is common but dreading.

2.3.2 Year ACT was introduced

In response to the increasing burden of malaria caused by parasite resistance to the conventional antimalarial medicines, WHO, in 2001 recommended the use of artemisinin-based combination therapies (ACTs) (Bosman and Mendis, 2007). In 2004, the rapid increase in demand led to a global shortage of the single-source ACT, artemether-lumefantrine increased rapidly from 2001/2002, when WHO ordered only 0.3 million treatment courses, to 2004/2005. During the period from 2004 to March 2005, WHO and UNICEF ordered treatment courses. The reason for the shortage was an insufficient supply of artemisinin, the raw material extracted from the plant Artemisia annua, needed to manufacture artemether (Bosman and Mendis, 2007).

The issue of drug resistance to existing antimalarial drugs brought about the introduction of two or more drugs as combination to fight P.falciparum to achieve adequate cure rate and delay development of resistance to such drugs (Mutabinqua, 2005). It was also recorded that the introduction of Artemisinin-based Combination therapy (ACT) in Nigeria is as a result of the increase in the prevalence of chloroquine resistant malaria in Nigeria (Odor, Adekunle and Oshiname 2012, Balogun, Jibrin, Tahir, Bassi, Balogun,and Fehintola, 2013). Balogun and colleagues went further to explain that Artemisinin-based Combination Therapies (ACT) was introduced in February 2005 (Balogun et al., 2013). In January 2006, WHO made a strong appeal to Pharmaceutical companies, National Drug Regulatory Authorities, and international funding and procurement agencies to manufacture, procure, and promote ACT S as the best standard of care for malarial treatment. This called for an end to the deployment of artemisinin monotherapies for the treatment of uncomplicated malaria, a practice common in the private sector to prevent the development of resistance to artemisinins (Bosman and Mendis, 2007).

It has been recorded that sixty-seven countries with endemic Plasmodium falcparum malaria, 41of them in Africa, have recently adopted the highly effective artemisinin-based combination therapies (ACTs) and that in 2005, 31.3 million ACT treatment courses were produced globally for public sectors use, 25.5 million of them in Africa. However, in the 39 countries, and in particular the 21 Africa countries in which ACTs are being deployed, access to these medicines is still unacceptably low. After a period or more market instability, the global manufacturing capacity for ACTs is now sufficient to meet the demand (Bosman and Mendis, 2007).

WHO currently recommended therapeutics options were; artemether/lumefantrine ,artesunate plus amodiaquine, artesunate plus sulfadoxine/pyrimethamine (in areas where the efficacy of SP is high), artesunate plus mefloquine (in areas where transmission is moderate) and amodiaquine plus sulfadoxine/pyrimethamine, in areas where efficacy of both amodiaquine and sulfadoxine/pyrimethamine is still high (especially countries in West Africa). The non artemisinin-based combination therapy is mainly for countries that had not been able to move to ACTs (Majori, 2004).

2.3.3 Rationale for the introduction of ACT

Rationale which means aim could explain the purpose behind the introduction of Artemisinin-based Combination Therapy (ACT). According to Balogun et al, the rationale for the introduction of ACT is behind the fact that chloroquine or sulfadoxine-pyrimethamine has become ineffective due to drug resistance. This represents a serious threat to global public health (Balogun et al., 2013).

Also the Travel Health Centre explained that in as much as drug resistance develops to existing drugs, new ones will be introduced and that for plasmodium falciparum, use of two or more drugs with several modes of action in combination is recommended in order to provide adequate cure rate and delay development of resistance (Anonymous, 2014).

White and Nosten also documented that Artemisinin-based combination treatments (ACTs) have been accepted generally as the best treatments for uncomplicated falciparum malaria. They are rapidly and dependably effective and that efficacy is determined when drug is combined with artemisinin derivative and, for artesunate–mefloquine, dihydroartemisinin–piperaquine, and artemether–lumefantrine, effectiveness usually exceeds 95%. Nosten also explained that Artesunate–sulfadoxine–pyrimethamine and artesunate–amodiaquine are effective in some areas, but in other area they are not effective since resistance precludes their use (White and Nosten, 2007). Nosten still went further to explain that it is not certain if it is safe in the first trimester of pregnancy, and cannot be used when there are effective alternatives. Otherwise, except for hypersensitivity reactions that occurs occationally, the artemisinin derivatives are safe and well tolerated. The adverse effect profiles of the artemisinin-based combination treatments are determined by the partner drug. Most malaria endemic countries have now adopted artemisinin-

based combination treatments as first-line treatment of falciparum malaria, but in most of these only a minority of the patients that need artemisinin-based combination treatments actually receive them (White and Nosten, 2007).

ACTs ensure prompt recovery and high cure rates. (Nosten and White 2007, Bosman and Kamini, 2007). Bosman and Kamini also went further to say that ACT could reduce the spread of drug resistance (Bosman and Kamini, 2007).

2.3.4 ACT Dosage for Various age groups

In ACTs a 3-day treatment course exposes 2 asexual cycles and so reduces the number of parasites in the body by approximately one hundred million-fold. The gametocytocidal activity of the artemisinin compounds is an important bonus reducing transmissibility and thus further reducing malaria incidence in low-transmission settings (Nosten and White, 2014).

As described, from a resistance prevention perspective, the combination partners should have similar pharmacokinetic properties to provide optimum mutual protection. Slow elimination of the partner drug allows 3-day regimens to be given, but at the price of providing days or weeks of subtherapeutic blood levels that provide a selective filter for resistant parasites acquired from elsewhere, and thereby encouraging the spread of resistance (Nosten and White, 2014).

Children, and particularly neonates, differ from adults in their response to drugs. Special care is needed in ensuring the drug prescribed is appropriate and that the correct dosage is given, especially in the neonatal period. Compliance in children is influenced by the formulation, taste, appearance and ease of administration of a preparation. Children are not mini-adults so paediatric doses should be obtained from a paediatric dosage reference text and not extrapolated from the adult dose (Anonymous, 2013).

Patient co UK advocated on the issue of children's dosage that body-weight may be used to calculate doses expressed in mg/kg and that young children may require a higher dose per kg than adults because of their higher metabolic rates. They also went further by saying that other problems need to be considered like, calculation by body-weight in the overweight child may

result in much higher doses being administered than necessary; in such cases, dose should be calculated from an ideal weight, related to height and age (Anonymous, 2013).

They still added that body-surface area estimates are more accurate for calculation of paediatric doses than body-weight since many physiological phenomena correlate better to body-surface area and that body-surface area may be calculated from height and weight by means of a nomogram or using the Body Surface Area (BSA) calculator (Anonymous, 2013)

Furthermore, since the combination is available as blister pack, compliance may be poor and this provides opportunity for consuming monotherapy. There is also the issue of dosage in paediatric age group. This forms the basis of evaluation of different forms of ACT, which may form an alternative to AS + SP combination (Malaria Consortium, 2014).

Artemether/lumefantrine was the first fixed-dose artemisinin-based combination therapy recommended and pre-qualified by WHO for the treatment of uncomplicated malaria caused by P. Falciparum multi-drug resistant P. falciparum in Southeast Asia. It is currently recommended as first-line treatment for uncomplicated malaria in several countries. However, its complex treatment regimen of two doses daily for three days could affect adherence (Malaria Consortium, 2014).

Artemether–lumefantrine is dispensed as tablets containing 80/480 mg respectively. It was introduced originally as a 4-dose regimen given at 0, 8, 24, and 48 hours. This shorter course proved insufficiently efficacy and dependent on co-administration with fats and thus plasma concentrations vary markedly between patients. With the 4-dose regimen plasma concentrations of lumefantrine during the third and fourth post-treatment cycles (4–8 days) were insufficient to eradicate all infections. In order for cure rate to be increased, a 6-dose regimen (adult dose 80/480 mg at 0, 8, 24, 36, 48, and 60 hours) was then evaluated. This has proved highly effective and remarkably well tolerated (Nosten, 2007). Nosten and White went further to explain that a fixed combination of mefloquine and artesunate has newly been developed. This is dispensed as tablets containing 200 mg of artesunate and 400 mg mefloquine (base). Also, they pinpoint that trials in Asia indicated that the tolerability of this new regimen (mefloquine dose 8 mg/kg/d for 3 days) is better than that of the standard regimen. This combination has been evaluated and used mainly in Southeast Asia and South America. More information on tolerability, safety, and

efficacy is needed in African children so that its potential utility in Africa can be assessed objectively (Nosten and White, 2007).

ACT Treatment Schedule/Dosage for Various Age Groups

Medicines	Dosage form	Presentation	Strength
Artemether- Lumenfantrin	Tablet	Co-formulated	20mg artemether + 120mg Lumenfantrin per tablet
Artemether- Lumenfantrin	Dispersible (Children)	Co-formulated	20mg artemether + 120mg Lumenfantrin per tablet

(FMOH, 2010)

Dosage Regimen for Artemether-Lumenfantrin

Weight	Age	Dosage Regimen
5 – 14 kg	6 months – 3 months	1 tablet twice daily for 3 days
15 – 24 kg	4 years – 8 years	2 tablet twice daily for 3 days
25 – 34 kg	9 years – 14 years	2 tablet twice daily for 3 days
= 35 kg	Over 14 years	4 tablet twice daily for 3 days

The first day dosage should be taken 8 hours apart. (FMOH, 2010)

Alternate Treatment

Medicines	Dosage form	Presentation	Strength
Artesunate - Amodiaquine	Tablet	Co-formulated	Artesunate – Amodiaquine Each tablet exist at ratio 1:2.7
Artesunate + Amodiaquine	Tablet	Blistered Co-packed	Artesunate 50mg and Amodiaquine 153.1mg

(FMOH, 2010)

Dosage Regimen for Co-formulated Artesunate+Amodiaquine

Weight	Tablet Strength	Dosage Regimen
= 4.5kg - < 9 kg 2 months – 11 months	25mg/67.5mg	1 tablet once daily for three days
= 9kg - < 18 kg 1 year – 5 years	50mg/135mg	1 tablet once daily for three days
= 18 - < 36 kg 6 years – 13 years	100mg/270mg	1 tablet once daily for three days
= 36 kg 14 years and above	100mg270mg	2 tablets once daily for three days

(FMOH, 2010).

2.4 Perception relating to ACTs

It has been recorded that among the ACTs that are avaliable, AL and AA are adopted as first and second line drugs, as regards the treatment of uncomplicated malaria in Nigeria (Balogun et al., 2013). According to Nosten and white, the simple reason behind this is the fact that ACTs are easy to use, and well tolerated (Nosten and White, 2007). Review of relevant studies conducted over 10 years ago in Africa on the treatment of uncomplicated P. falciparum malaria showed that amodiaquine (AQ) are significantly more effective compared to chloroquine as regards clearing parasites, and also gives room for faster clinical recovery (Anonymous, 2013). Also, it is important to ensure wide access to these drugs through effective delivery systems and prices should be affordable (Anonymous, 2014).

A systematic review of relevant studies on the treatment of uncomplicated P. falciparum malaria conducted over the past 10 years in Africa showed that amodiaquine (AQ) proved significantly more effective than chloroquine in clearing parasites, with a tendency for faster clinical recovery. This difference was also observed in areas with considerable chloroquine resistance. Further,

serious adverse events have not been reported with curative short-term regimen of AQ (Anonymous, 2013). More available evidence has shown that the Artemisinin derivatives are safe in the second and third trimesters of pregnancy. Artemether-lumenfantrin and Artesunate-Amodiaqine are safe and recommended for the treatment of uncomplicated malaria during pregnancy in the 2nd and 3rd trimester of pregnancy. They should only in the first trimester, if quinine is not available or compliance to treatment with quinine cannot be assured (FMOH, 2005). Notwithstanding, it is necessary to note that Artemisinin-based Combination Therapy, proven to be efficacious and for the treatment of malaria should be used with caution (FMOH, 2010).

A randomized trial was conducted to assess the safety and efficacy of the fixed dose combination of ASAQ and AQ alone for treatment of uncomplicated falciparum malaria for the first time in India. The study sites were located in malaria-endemic, chloroquine-resistant areas. Currently, AS + SP has been recommended by the National Vector Borne Disease Control Programme in India. The combination is efficacious but treatment failures have been reported with the partner drug SP. There is also evidence of dhfr and dhps mutations especially in the north-east. Further, since the combination is available as blister pack, compliance may be poor and also provides opportunity of consuming artesunate mono-therapy. Hence, there is need to shift to fixed dose ACT. ASAQ fixed dose combination could be one of the options since it is safe, efficacious and the partner drug AQ also has an acceptable efficacy at least in the study areas. Amodiaquine is known to have cross-resistance with chloroquine. However, studies have shown ASAQ to be effective even in areas with chloroquine resistance. Even the present study was carried out in areas with chloroquine resistance. The utility of ASAQ has also been demonstrated in home management of malaria and also as intermittent preventive therapy in children. The combination can also be useful for vivax malaria and clinically suspected malaria.

It has also been recorded that, to qualify as ACT the combination should also have independent anti-malarial activity. The study showed that AQ had PCR-corrected efficacy of 88.3% (80.0 - 90.6%). The combination is also one of the five WHO prequalified forms of ACT (Anvikar et al., 2012).

Artemisinin-based combination treatments (ACTs) are now generally accepted as the best treatments for uncomplicated falciparum malaria. They are rapidly and reliably effective. Efficacy is determined by the drug partnering the artemisinin derivative and, for artesunate–mefloquine, artemether–lumefantrine, and dihydroartemisinin–piperaquine, this usually exceeds 95%. Artesunate–sulfadoxine–pyrimethamine and artesunate–amodiaquine are effective in some areas, but in other areas resistance to the partner precludes their use. There is still uncertainty over the safety of artemisinin derivatives in the first trimester of pregnancy, when they should not be used unless there are no effective alternatives. Otherwise, except for occasional hypersensitivity reactions, the artemisinin derivatives are safe and remarkably well tolerated (Nosten and White, 2007).

This was the first fixed dose combination of an artemisinin derivative with a second unrelated antimalarial compound. Lumefantrine (formerly benflumetol) is an aryl amino-alcohol in the same general group as mefloquine and halofantrine. It was discovered and developed in the People's Republic of China. Lumefantrine is active against all the human malaria parasites, including multi-drug–resistant P. falciparum (although there is some cross-resistance with halofantrine and mefloquine) (Nosten and White, 2007).

The ACTs seem to be tolerated as well or better in children than in adults. There is no specific age-related toxicity. In younger children vomiting or regurgitation of the administered dose are always a concern but are no more common with ACTs than monotherapies. Recent pharmacokinetic studies indicate that the dose regimen advocated for SP in children for many years is probably too low. There are insufficient pharmacokinetic data on amodiaquine and more data on the pharmacokinetics of piperaquine in children are needed. Dose regimens for artesunate–mefloquine and artemether–lumefantrine in children are justified by pharmacokinetic studies. Further work is needed to optimize dosing in children based on weight or surface area and, where necessary, to introduce specific pediatric formulations (Nosten and White, 2007).

The main concern surrounding the general deployment of ACTs is their safety in the first trimester of pregnancy. Work by Chinese scientists in rodents and rabbits conducted in the 1970s indicated that early pregnancy exposure could induce fetal resorption. Recent reproductive toxicity studies have confirmed that this is a class effect of the compounds and is seen in all

experimental animal species studied. It results from a specific inhibition of fetal erythropoeisis. Fetal resorption would result in early pregnancy loss (Nosten and White, 2007).

ACTs should have a significant effect in reducing the burden of malaria throughout the tropical world, but to achieve this they will need to become more affordable and more available. This would be best achieved by subsidizing their cost both in the public and the private sectors. As deployment of ACTs increases, we will need to invest more in education, health service delivery, monitoring of rare adverse effects, and assessment of resistance to optimize their use, and thereby ensure they have the greatest impact on malaria (Nosten and White, 2007).

ACTs provide complete protection for the artemisinin derivatives from selection of a de novo resistant mutant if adherence is good (Nosten and White, 2007).

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Artemisinin-based combination therapies have been shown to improve treatment efficacy and also contain drug resistance in South-East Asia. However, major challenges exist in the deployment and use of antimalarial drug combination therapies, particularly in Africa. These include: 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, the operational obstacles to implementation, especially compliance. As a response to increasing levels of antimalarial resistance, the World Health Organization (WHO) recommends that all countries experiencing resistance to conventional monotherapies, such as chloroquine, amodiaquine or sulfadoxine/pyrimethamine, should use combination therapies, preferably those

containing artemisinin derivatives (ACTs-artemisinin-based combination therapies) for malaria caused by Plasmodium falciparum (Majori, 2004).

There is a pressing need to have effective, easy to use, affordable drugs that will last a long time. Drug combinations that have independent modes of action are seen as a way of enhancing efficacy while ensuring mutual protection against resistance (Olliaro and Tailor, 2004).

Artemisinin-based combination therapy (ACT) is the quickest and most reliable way of clearing malaria infection, and it is very well tolerated. Using a combination of drugs shortens the treatment course, and has also been shown to protect each individual drug from resistance. Although extremely effective, it needs to be taken with a fatty meal, can cause gastric side-effects, and is relatively expensive. New fixed-dose combinations are therefore necessary to offer endemic countries a wider range of treatment options adapted to their needs (Balogun, et al., 2013). There is increasing evidence of safety for this combination in the second and third trimesters of pregnancy. But plasma concentrations of artemether, the metabolite dihydroartemisinin, and lumefantrine are all significantly reduced in late pregnancy, suggesting that a longer course of treatment may be needed in this vulnerable patient group (Nosten, 2007).Also, it has been recorded that Artemisinin derivatives are safe and well tolerated by young children (WHO, 2014).

2.5 Perception relating to other anti malarial medicine

According to Balogun et al., clinicians in Nigeria now prescribe ACTs as against previous report of non-compliance during early years of adoption. However, single antimalarial preparations are readily available and are often consumed without doctor's prescription (Balogun et al., 2013).

Record also has it that mefloquine commonly induces nausea, dysphoria, and dizziness. mefloquine treatment predisposes to acute neuropsychiatric syndrome manifest by encephalopathy, convulsions, or psychosis and even suicide has been reported. The risks of this acute neuropsychiatric syndrome are increased if the patient has a previous history of psychiatric illness or epilepsy. Neuropsychiatric reactions are also more common if mefloquine has been used in the previous 2 months, and therefore mefloquine should not be used to treat reoccuring infections occurring within 2 months of treatment (Nosten and White, 2007). However in practice

the principle adverse effect of mefloquine is vomiting. This is more likely in young children, and even if the drug is administered again, low blood levels and an increased risk of treatment failure result coupled with rapid spread of resistance (Nosten and White, 2007).

Also the use of mefloquine for treatment during pregnancy is still uncertain (Nosten and White, 2007). Another issue of discuss was the record of halofantrin contraindication in nursing mothers, and that it is better to continue with drug and stop nursing or nursing and stop drug (Anonymous, 2005).

2.5 Patterns of use of ACT related medicines with special reference to study population

Over the years, record has it that improper anti-malarial use is a major cause of death and disease among so many people in malaria endemic countries, including Kenya. However, there are limited reports on improper use of Artemisinin-based Combination Therapy (ACT) which is a first-line drug in the treatment of malaria in Kenya. It is proper to increase knowledge on this issue to ensure sustained cure rates and also protect against the resistant malarial parasites (Onyango, Ayodo, Watsierah, Were, Okumu, Anyona, Raballah, Okoth, Gumo, Orinda and Ouma, 2012).

In Nigeria, although ACT has been adopted for first-line treatment, evidence still shows the improper use of anti-malarial drugs, such as the use of monotherapy and other less effective anti-malarial drugs, as well as inappropriate use of ACT. This is especially so in the retail sector where studies have reported significant inappropriate use of anti-malarial drugs. Since the introduction of ACT in many countries, reports have shown that while public sector malaria treatment has largely conformed to policy recommendations, inadequate use of ACT, fake and adulterated drugs is widely reported, increasing the risk of treatment failures and development of drug resistance (Ezenduka, Ogbonna, Ekwunife, Okonta and Esimone, 2014).

Also, regarding the retail sector, varieties of anti-malarial drugs in circulation has the problem of drug quality and accuracy of dosing as a result of wide variations in brand formulations and composition of active ingredients. Irrational provision and use of anti-malarial drugs constitutes a major risk of increasing Plasmodium resistance to effective products and treatment, undermining the goals of malaria control. Factors that contribute to inappropriate use of anti-malarial drugs are

influenced by demand for drugs by consumers, such as costs, lack of information about appropriate treatment and difficulties in assessing quality treatment by patients. None the less, it is important to adherence to anti-malarial treatment policy by providers and patients alike to achieve the goals of the policy (Ezenduka et al., 2014).

Igboeli and colleagues added that the standard practice of prescribtion with generic name is still not adhered to, since doctors and pharmacists respectively could not properly list the drugs specified in the guideline (Igboeli, Ukwe, Ekwunife, 2010).

Another issue recorded by Onyango et al., was that which relates to out of stock syndrome in government parastatals. Onyango states; “Previous studies reported that prescribing health care, physicians and the patients, particularly those that rely on the government supplies, continually battle with ‘a drug is out of stock’ syndrome and these challenges lead to non-adherence to effective anti-malarial drugs” (Onyango et al., 2012).

They still went further to explain that another challenge for effective intervention is non-adherence due to socio-economic, cultural, environmental factors and individual differences. And that non-adherence to these drugs may promote resistance by the malarial parasites to the available drugs. For example, chloroquine, a drug that was once highly effective against the parasites that cause the disease, has become compromised as drug-resistant P. falciparum parasites have become increasingly prevalent in the recent decade. This was followed by resistance to other drugs, including sulfadoxine-pyrimethamine (SP), mefloquine, and quinine. Globally, anti-malarial drug resistance undermines efforts to reduce the public health burden in areas where malaria transmission occurs (Onyango et al, 2012). Adherence was defined as abiding by the recommended dose and period of usage of ACT (Onyango et al, 2012).

2.6.1 Management of Malaria at the Home Base Level

Malaria has been a major public health issue especially in Nigeria. In spite of the efforts made in the provision of effective anti-malarial drugs, some remote area still suffer access regarding malaria services. As such home-based management of malaria (HMM) strategy using artemisinin-based combination therapy (ACT) for treatment is essential to avoid cases of mortality caused by malaria (Ajayi, 2008).

Effective management of malaria requires that the consumers and the care-givers, seek, obtain, and use drugs appropriately. This should be linked to timely decision, accessibility, correct use of the drugs and follow-up after prescription. (Elmardi et al., 2009). Malaria in children under five years of age requires mothers to recognize early the malaria symptoms, in particularly fever. This recognition in addition to classification by caregivers is a key to intervention. Home Malaria Management (HMM) has become one of the important strategies to reach this precious target of malaria elimination (Elmardi et al., 2009).

Incorrectness in confirming malaria status by the use of microscopy may lead to inappropriate patient management. It has been found that diagnosing malaria solely on the clinical feature can reduce the risk of missing malaria cases which can lead to over-treatment thereby increasing the pressure on drugs and predisposing to appearance of strains as regards resistance as such using Rapid Diagnostic Tests (RDT) to support (HMM) is necessary (Elmardi et al., 2009).

Malaria in children under five years of age requires mothers to recognize early the malaria symptoms, in particularly fever. This recognition in addition to classification by caregivers is a key to intervention. In this context, Home Malaria Management (HMM) has become one of the important strategies to reach this precious target of malaria elimination (Elmardi et al., 2009).

Home Management of Malaria (HMM) for children with uncomplicated malaria in high transmission areas in Africa is an integral part of malaria case management within the overall Roll Back Malaria (RBM) strategy. If the Abuja target of 60% of uncomplicated malaria episodes receiving effective treatment within 24 hours and the Millennium Development Targets 5, 8 and 17 (reducing childhood mortality, halting the increase in malaria incidence and providing access to affordable essential drugs in developing countries) are to be met, there is an urgent need to increase access to effective malaria treatment at the community level, especially in underserved rural areas (Ajayi et al., 2008).

2.6.2 Policy on Malaria Treatment

It has been documented that the policy for the treatment of severe malaria in Nigeria was revised in June 2011 to parental artesunate followed by a full course of artemisinin-based combination therapy (Odey, Esu and Effa, 2013). 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. This means that proper financial provisions should be made at all levels for the regular availability of these drugs at cost that the people can afford (FMOH, 2005). Part of available funds should be invested into capacity building and strengthening (personnel, resources and infrastructure) of institutions in malaria endemic countries. This will create enabling environment and a critical mass of scientists and public health experts to spearhead ACT policy implementation (Mutabingwa, 2005). Regular monitoring of drugs is also essential as Malaria treatment policy recommends regular monitoring of drug utilization to generate information for ensuring effective use of anti-malarial drugs in Nigeria (Ezenduka, Ogbonna, Ekwunife, Okonta and Esimone, 2014).

In most endemic countries malaria diagnosis depends mainly on clinical evidence and in some cases thick film microscopy (TFM) and rapid diagnostic technique (RDT) may be used for laboratory confirmation. Microscopy remains the gold standard for malaria diagnosis and it is less costly with a threshold sensitivity of 5 to 50 parasite/µL (depending on the microscopist expertise). Microscopy can also characterize the infecting species and also determine their relative densities. The major constraints of microscopy include the requirement of considerable technical expertise and the fact that it is time-consuming for optimal blood film preparation, examination and interpretation. RDT, an immunochromatographic capture procedure was developed to improve the timeless sensitivity, and objectivity of malaria diagnosis through less reliance on expert microscopy (Ojurongbe, 2013).

The introduction of malaria case management with parasitological diagnosis adds a layer of complexity, with questions as to the ability of community level volunteers to adequately perform the RDTs and administer treatment according to test results. Recently, successful introduction of RDTs into HMM programmes has been reported in several African countries (Diouf, Perry, Ndige).

Concurrently, the World Health Organization has opened a dialogue with scientists, clinicians, and manufacturers on the realistic possibilities for developing accurate, sensitive, and cost-effective rapid diagnostic tests for malaria, capable of detecting 100 parasites/µl from all species and with a semiquantitative measurement for monitoring successful drug treatment. This

necessitated the evolution of the national policy on the treatment of malaria which follows the systematic way of diagnosing the disease with the Rapid Diagnostic test in line with the (HMM) Home Based Management of Malaria (CMR, 2014).

2.0b. Conceptual frame work

A conceptual framework is an analytical tool with several variations and contexts. It is used to make conceptual distinctions and organize ideas (ASK.COM, 2014 and Zapmeta, 2013). Zapmeta went further to say that Strong conceptual frameworks capture something real and do this in a way that is easy to remember and apply (Zapmeta, 2013)

An example of a conceptual frame work is the Health Belief Model (HBM), which relates to those factors that could help influence behavior (Zapmeta, 2014).

The Health Belief Model (HBM) was developed in the early 1950s by social scientists at the U.S. Public Health Service in order to understand the failure of people to adopt disease prevention strategies or screening tests for the early detection of disease (Globio 2013 and Zameta 2014). Later uses of HBM were for patients' responses to symptoms and compliance with medical treatments. The HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior (Zameta, 2014).

The HBM derives from psychological and behavioral theory with the foundation that the two components of health-related behavior are; the desire to avoid illness, or conversely get well if already ill; and, the belief that a specific health action will prevent, or cure, illness. Ultimately, an individual's course of action often depends on the person's perceptions of the benefits and barriers related to health behavior (Rosenstock, Strecher and Becker, 1988).

Rosenstock and collegues still went further to explain that there are six constructs of the HBM and that the first four constructs were developed as the original tenets of the HBM. The last two were added as research about the HBM evolved. These constructs are;

1. Perceived susceptibility - Which refers to a person's subjective perception of the risk of acquiring an illness or disease. There is wide variation in a person's feelings of personal vulnerability to an illness or disease.
2. Perceived severity - This refers to a person's feelings on the seriousness of contracting an illness or disease (or leaving the illness or disease untreated). There is wide variation in a person's feelings of severity, and often a person considers the medical consequences (e.g., death, disability) and social consequences (e.g., family life, social relationships) when evaluating the severity.
3. Perceived benefits - This refers to a person's perception of the effectiveness of various actions available to reduce the threat of illness or disease (or to cure illness or disease). The course of action a person takes in preventing (or curing) illness or disease relies on consideration and evaluation of both perceived susceptibility and perceived benefit, such that the person would accept the recommended health action if it was perceived as beneficial.
4. Perceived barriers - This refers to a person's feelings on the obstacles to performing a recommended health action. There is wide variation in a person's feelings of barriers, or impediments, which lead to a cost/benefit analysis. The person weighs the effectiveness of the actions against the perceptions that it may be expensive, dangerous (e.g., side effects), unpleasant (e.g., painful), time-consuming, or inconvenient (Rosenstock, Strecher and Becker 1988).

The last two which were added latter are;

5. Cue to action - This is the stimulus needed to trigger the decision-making process to accept a recommended health action. These cues can be internal (e.g., chest pains, wheezing, etc.) or external (e.g., advice from others, illness of family member, newspaper article, etc.).

6. Self-efficacy - This refers to the level of a person's confidence in his or her ability to successfully perform a behavior. This construct was added to the model most recently in mid-1980. Self-efficacy is a construct in many behavioral theories as it directly relates to whether a person performs the desired behavior (Rosenstock, Strecher, Becker, 1988).

Knowing what aspect of the Health Belief Model, patients accept or reject can help you design appropriate interventions. For example, if a patient is unaware of his or her risk factors for one or more diseases, you can direct teaching toward informing the patient about personal risk factors. If the patient is aware of the risk, but feels that the behavior change is overwhelming or unachievable, you can focus your teaching efforts on helping the patient overcome the perceived barriers. (Rosenstock, Strecher, Becker, 1988).

For this very study, the Health Believe Model (HBM) goes a long way to offer a frame work on malaria related knowledge, perception and use of artemisinin-based combination therapy among students.

Theoretical Proposition of the Health Belief Model

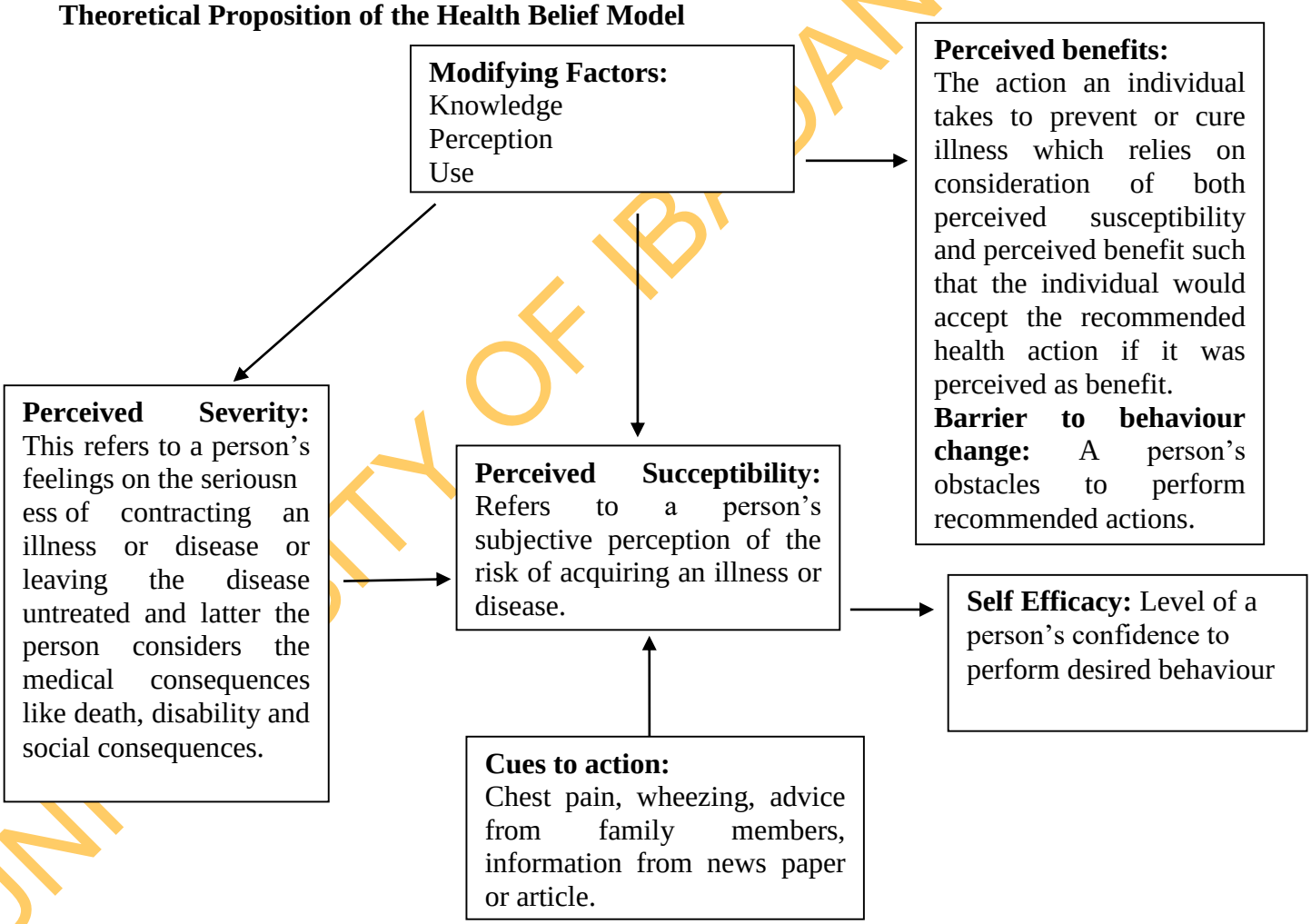


Figure 1
The Health Belief Model
Source: Adapted from Glanz et al., 2002, p. 52

The Precede Model

The conceptual frame work that can be applied to this study again is the precede model. This model throws light on the determinants of human behaviour. This model was put together by a group of Health Promotion and Education professionals trained in the US amongst who are Marshal Kreuter and lauris

Green (Sharma and Romas, 2012). According to this model, the determinants of any given behaviour can be divided into three factors;

1. Predisposing factors
2. Enabling factors
3. Reinforcing factors

Predisposing Factors: Refers to issues that are cognitive in nature such as presence or absence of knowledge, believes, attitudes, etc

Enabling Factors: Are related to resources and include time, money, skill, personnel, services, facilities.

Reinforcing Factors: Simply refers to the influence of significant others such as friends, parents, siblings, religious leaders, political leaders, peers, etc.

The precede model can also be applied to this study and used to plan an intervention (Sharma and Romas, 2012). Strongin went further to explain that multiple levels of factors such as ones mentioned above (predisposing, reinforcing, and enabling factors) could be examined in explaining instances such as drug adherence (Strongin, 2008).

Once health communications planners identify a health problem, they can use a planning framework such as preceed model. This planning systems can help identify the theories most appropriate for understanding the problem or situation. Thus, planners use the theories and models within the construct of a planning framework (National Cancer Institute, 1995).

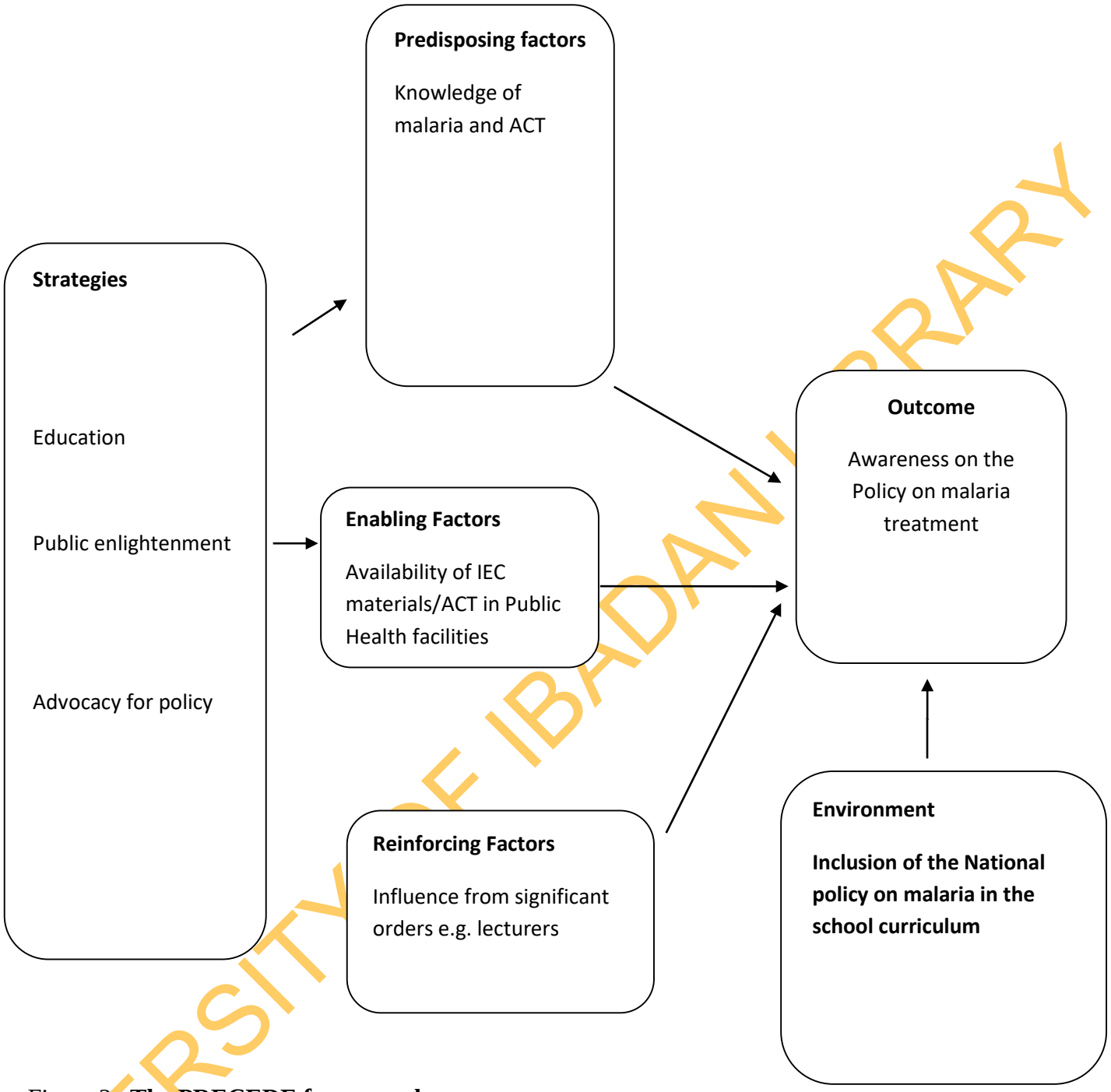


Figure 2. **The PRECEDE frame work**

(Sharma and Roman 2012)

CHAPTER THREE

METHODOLOGY

This section deals with the research design, study population, sampling technique, methods and instrument for data collection, procedure for data collection and data analysis.

3.1. Study Design and Scope

The study was a descriptive cross sectional-survey. It involved the use of qualitative date collection through the use of self administered questionnaires which was geared towards determining Malaria related knowledge, perception, and use of Artemisinin-based Combination Therapy among students of school of nursing Eleyele in Ibadan North-West Local Government Area of Oyo State, Nigeria.

3.2 Description of Study Settings

The study took place in Oyo State School of Nursing Eleyele Ibadan Oyo State. Eleyele is a major neighborhood in Ibadan North-West Local Government Area of Oyo State with its head quarters in Onireke. Ibadan North West is bounded in the North by Ido LGA, in the South by Ibadan South East LGA, in the West by Ibadan North-East LGA. Eleyele is made up of the communities in political ward 10 and 11 of Ibadan North-West LGA. Ibadan North-West has several Institutions including commercial, health, as well as other government parastatals. Among all these are the School of Hygiene Eleyele, Oyo State Polytechnics Eleyele, the Oyo State Police command Eleyele, Army Barracks, Oyo State Road Maintenance Agency headquarters, and the College of Nursing and Midwifery where the study was conducted.

School of Nursing is a Department in the College of Nursing and Midwifery Eleyele. History has it that School of Nursing was established in 1949 at the old prefabricated Army Barracks in Eleyele. The first set in 1949 constituted girls between the ages of 17 and 19 years. They temporarily resided at Jericho quarters for some years with government buses taking them to school and clinical areas. A few years after, the school moved to its permanent site in Eleyele. The female students were the first to move to the present site while the male waited till 1968. Two bungalow building served as hostels for the females at the new Eleyele site.

The principals in succession were; chief (Mrs) Ebun Shajjnu, chief (Mrs) Adenike Sanni, Mr. P. O. Ajayi, Mrs. D. K. Udo, Mrs. L. T. Adeniran. Recently, school of nursing under the college of nursing and midwifery has an acting provost by name Mrs. G. O. Owolabi. Apart from the provost, the school of nursing has lecturer/tutors who tried their best to transfer nursing and sciences related knowledge to students and up till date, the students embark on clinical practice as well as attend their normal classes at assigned days of the weeks and period according to their schedules. Particular hospitals where they got their clinical/ward experience were the Adeoyo State Hospital and State Hospital Ring Road, Ibadan. When the latter was recognised as the State Maternity Hospital in 1990, Ring Road assumed the role of major Clinical area for the School till date. Other Hospital are, Jericho Nursing Home, Jericho General Hospital now Jericho Specialist Hospital, Jericho Chest Hospital and Hospital Moore plantation, Ibadan.

The School was pronounced to be College of Nursing and Midwifery Eleyele as far back as 2005 by the edict signed into law in 2005 but was actussalized by the present government of Oyo State in May in May 2013. Presently, the college is running a three (3) year programme for Nursing and eighteen (18) months for Midwifery. The Schools of Nursing and Midwifery had their accreditation exercise as College proper on Thursday and Friday 18th and 19th September 2014 which formally ushered the institution into College of Nursing and Midwifery.

3.3 Study Population

School of Nursing has a total population of 150 comprising of males and females which made it possible for the study to assume a purposive sample of the whole population.

3.4 Sample Size Determination and Sampling Procedure

Sample size determination

The purposive sampling technique was employed during data collection, 150 respondents was used. The issue of using whole population came up since the population to be studied was just 150 in number. Data were collected through a semi-structured/self administered questionnaire.

3.5 Method and Instrument for Data Collection

The data collected was facilitated by employing research assistants who helped during the quantitative data gathering using a self administered semi structured questionnaire.

The questionnaire was made up of five sections such as the socio-demographic characteristics of respondents, which investigated independent variables such as level of education, marital status, religion, and ethnic groups of respondents. A section on knowledge was also made to investigate the knowledge of respondents on malaria and Artemisinin-based Combination Therapy. The third section captured respondents perception on matters relating to ACT, and another section was on the use of ACT. The last section was on the policy on malaria treatment, which was to investigate knowledge of nursing students on the policy.

3.6 Reliability and validity of instrument

Validity

Validity can be defined as the degree to which a test measures what it is supposed to measure. There are three types of validity which are content validity, construct validity and criterion-related validity (www.okstate.edu/../newpage18.htm).

In order to ensure that the instrument was valid, the questionnaire was given to colleagues, health education specialist and lecturers in the department of Health Promotion and Education which aided in the development of the instrument.

Reliability

In this context, reliability connote that any instrument used for measuring experimental variables gives the same result every time (explorable.com/instrument-reliability).To ensure the reliability of the semi-structured questionnaire, a pre-test was conducted on a 10% sample size of the target population. My pre-test population consisted of students of school of nursing UCH, Ibadan. Oyo State Nigeria.

3.7 Data Collection process

A total of 150 questionnaires was administered to various classes in the school of nursing where the study was carried out.

Before the study commenced, a visit was made to the school administration and letter of introduction was given to them, which latter paved room on how and when the research will hold since time was a factor, as the students were not all the time in the class due to their clinical practice experience.

3.8 Data Management and Analysis

Data collected were coded and analysed in a data base using statistical package for social science (SPSS) Version 16.

3.9 Ethical Consideration

Ethical approval was obtained from the Ethics review committee of Oyo State Ministry of Health, Ibadan. The reason behind this was to ensure that the study meets up with the scientific principles and international ethical guidelines required in research involving human subjects.

Participants' informed consent was also included in the questionnaire. Participants were assured of confidentiality as regards information given during and after the data collection.

CHAPTER FOUR

RESULT

.4.1: Respondents' Socio-demographic characteristics

Table 4.1 shows the socio-demographic characteristics of the respondents. Year one nursing students topped (35.3%) the list. Majorities (86.7%) of respondents were female and most (96.6%) of them were singles, 91.3% of the respondents were of the Yoruba ethnic group. More than half (64.0%) were Christian.

Table 4.1: Socio-demographic characteristics N=150

Socio-demographic	No	%
Level of study:		
Year one	53	35.3
Year two	51	34.0
Year three	46	30.7
Sex:		
Male	20	13.3
Female	130	86.7
Marital status:		
Single	145	96.6
Cohabiting	1	0.7
Married	4	2.7
Ethnic group:		
Yoruba	137	91.3
Igbo	7	4.7
Hausa	4	2.7
Kogi	1	0.7
Edo	1	0.7
Religion:		
Christianity	96	64.0
Islam	52	34.7
Catholic	2	1.3

4.2: Knowledge about Malaria and Artemisinin-based Combination Therapy

Most (52.0%) of the respondents in table 4.2 lack basic knowledge of microbiology and reported that female anopheles mosquito is the main cause of malaria, while 46.0% said Plasmodium is the main cause of malaria. More than half (62.7%) of the respondents stated that mosquito transfers germ that cause malaria into people when it bites.

Table 4.2: Knowledge about Malaria and Artemisinin-based Combination Therapy N=150

Description	Knowledge	No	%
Main cause of malaria	Plasmodium	69	46.0
	Palm oil	1	0.7
	Male anopheles mosquito	2	1.3
	Female anopheles mosquito	78	52.0
Role of mosquito in malaria causation	It produces toxin	35	23.3
	It is when it bites one that malaria occurs	21	14.0
	It transfers the germ that cause malaria into people when it bites	94	62.7

4.3: Micro- organism associated with most cases of malaria in Nigeria

Mainly (77.3%) listed Plasmodium falciparum as the most common organism associated with most cases of malaria in Nigeria as deduced from table 4.3. Several organisms were also listed; these included Plasmodium malariae (54.0%), Plasmodium vivax (50.7%), Plasodium ovale (47.3%), male anopheles (16.0%), curex mosquito (12.7%) and tiger mosquito (9.3%).

Table 4.3: Respondents knowledge of the micro- organism associated with most cases of malaria in Nigeria

N=150

Micro organism	True		False	
	No	%	No	%
Plasmodium vivax	76	50.7	74	49.3
Male anopheles	24	16.0	126	84.0
Plasmodium malariae	81	54.0	69	46.0
Curex mosquito	19	12.7	131	87.3
Plasmodium falciparum*	116	77.3	34	22.7
Tiger mosquito	14	9.3	136	90.7
Plasmodium ovale	71	47.3	79	52.7

*correct responses

4.4: Signs and symptoms of uncomplicated malaria

Table 4.4 reveals the responses of the respondents relating to the signs and symptoms of uncomplicated malaria. Majority (94.7%) correctly stated fever as a symptom of uncomplicated malaria. Others included loss of appetite (90.7%), general body aches (81.3%) and chill (80.0%).

Table 4.4: Knowledge of signs and symptoms of uncomplicated malaria N=150

Signs/Symptoms	Yes	%	No	%	Not sure	%
Chills*	120	80.0	21	14.0	9	6.0
Nausea	109	72.6	31	20.7	10	6.7
Vomiting	114	76.0	26	17.3	10	6.7
Fever*	142	94.7	5	3.3	3	2.0
Weight loss	79	52.7	51	34.0	20	13.3
Loss of appetite*	136	90.7	11	7.3	3	2.0
General body ache*	122	81.3	19	12.7	9	6
Inability to work and perform daily house cores	98	65.3	37	24.7	15	10.0
Change in the colour of eyes	58	38.7	61	40.7	31	20.7
Perspiration	62	41.3	55	36.7	33	22.0
High blood pressure	44	29.3	66	44.0	40	26.7

*correct responses

4.5: Signs and symptoms of complicated malaria

Majority (81.3%) of the respondents in table 4.5. stated that convulsion was the symptoms of complicated malaria. A large proportion (72.7%) of them correctly stated that cerebral problem was a symptom of complicated malaria. The other listed symptoms included shock (62.0%), coma (50.7%) and liver problems (48.0%).

Table 4.5: Knowledge of signs and symptoms of complicated malaria N=150

Signs/Symptoms	Yes	%	No	%	Not sure	%
Convulsion*	122	81.3	21	14.0	7	4.7
Coma	76	50.7	45	30	29	19.3
Breathing problem	76	50.7	48	32.0	26	17.3
Liver problem	72	48.0	56	37.3	22	14.7
Shock	93	62.0	34	22.7	23	15.3
Cerebral problem*	109	72.7	34	22.7	7	4.7
Bleeding problem	43	28.7	77	51.3	30	20.0

*correct responses

4.6: Physical and social consequences of untreated malaria

The physical and social consequences of untreated malaria listed by the respondents was shown in table 4.6. Majority (85.3%) of the respondents stated that untreated malaria could lead to death in infants while (84.6%) rightly stated that untreated malaria could lead to reduced performance at work and at home. Other physical and social consequences of untreated malaria included convulsion (78%), cerebral malaria (77.3%), death of mother (67.3%) and low birth weight (60%).

Table 4.6: Respondents knowledge of the Physical and social consequences of untreated malaria **N=150**

Physical/Social consequences of malaria	True	%	False	%	Don't know	%
Malaria result in low birth weight in new born	90	60.0	22	14.7	38	25.3
Malaria can cause convulsion	117	78.0	23	15.3	10	6.7
Untreated malaria can result to cerebral malaria	116	77.3	22	14.7	12	8.04
Untreated malaria can lead to death in infants	128	85.3	16	10.7	6	4.0
Untreated malaria can lead to death of mothers	101	67.3	21	14.0	28	18.7
Untreated malaria can lead to reduced performance at	127	84.6	13	8.7	10	6.7

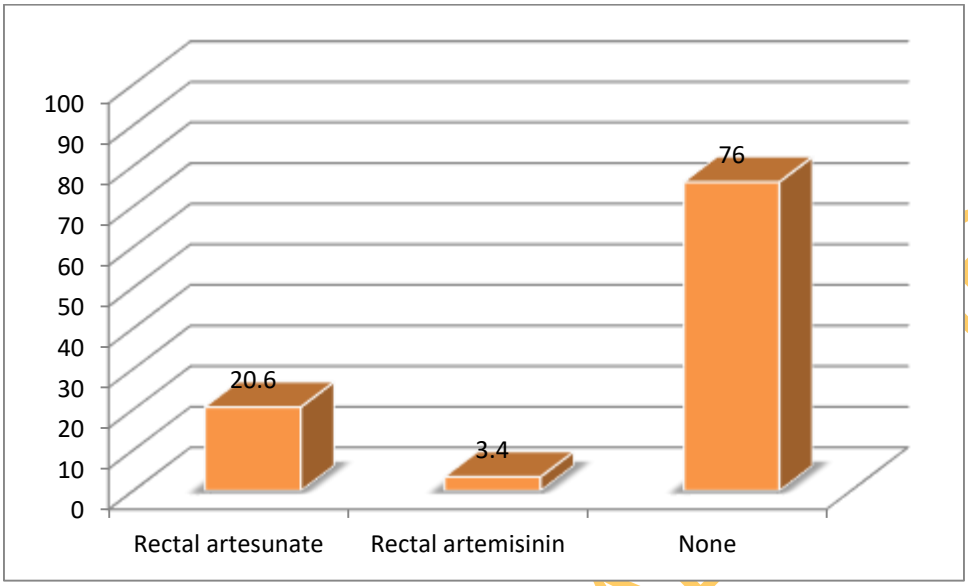
4.7: Knowledge about physical and social consequences of untreated malaria

Table 4.7 summarizes the knowledge of the respondents relating to ACT and some other anti malarials. Most (72.6%) of the respondents rightly stated that Coartem is now the new drug used in place of chloroquine for the treatment of malaria in Nigeria. Over half (58.6%) of the respondents correctly stated that Coartem is the most effective drug for the treatment of malaria as at today. Half (50.0%) of the respondents said that Sulphadoxine-Pyrimethamine (Fansider) is effective in the prevention of malaria during pregnancy. Some (44.7%) of the respondents stated that the most effective antimalaria drug recommended for sickle cell anaemia patients is proguanil. Only 40.0% of respondents stated that Coartem is now the first drug one should take once one notices he/she has malaria. Some (36.0%) respondents stated wrongly that Chloroquine is still the most effective drug for the treatment of malaria in Nigeria.

Table 4.7: Respondents knowledge related to anti malaria drugs including Artemisinin-based drugs N=150

Statement	True		False		Not sure	
	No	%	No	%	No	%
Chloroquine is still the most effective drug for treatment of malaria in Nigeria	54	36.0	63	42.0	33	22.0
Coartem is now the new drug used in place of chloroquine for the treatment of malaria in Nigeria	109	72.6	19	12.7	22	14.7
The most effective antimalaria drug recommended for sickle cell anaemia patient is proguanil	67	44.7	9	6.0	74	49.3
Coartem is the most effective drug for the treatment of malaria as at today	88	58.6	35	23.4	27	18.0
Coartem is safe for women who are pregnant for more than 3 months	53	35.3	33	22.0	64	42.7
Sulphadoxine-Pyrimethamine (Fansider) is effective in the control or prevention of malaria during pregnancy	75	50.0	24	16.0	51	34.0
Coartem is now the first drug you should take once one notice he/she has malaria	60	40.0	45	30.0	45	30.0
It is right for a women who pregnant for 1-3 months to take Coartem	31	20.7	41	23.7	78	52.0

N=150



. **Figure 4.1: Rectal artemisinin-based antimalaria ever heard by respondents**

Figure 4.1 shows 76.6% had neither heard about rectal artesunate nor rectal artemisinin, while (20.6%) had heard about Rectal artesunate and (3.4%) had heard about Rectal artemisinin.

N=150

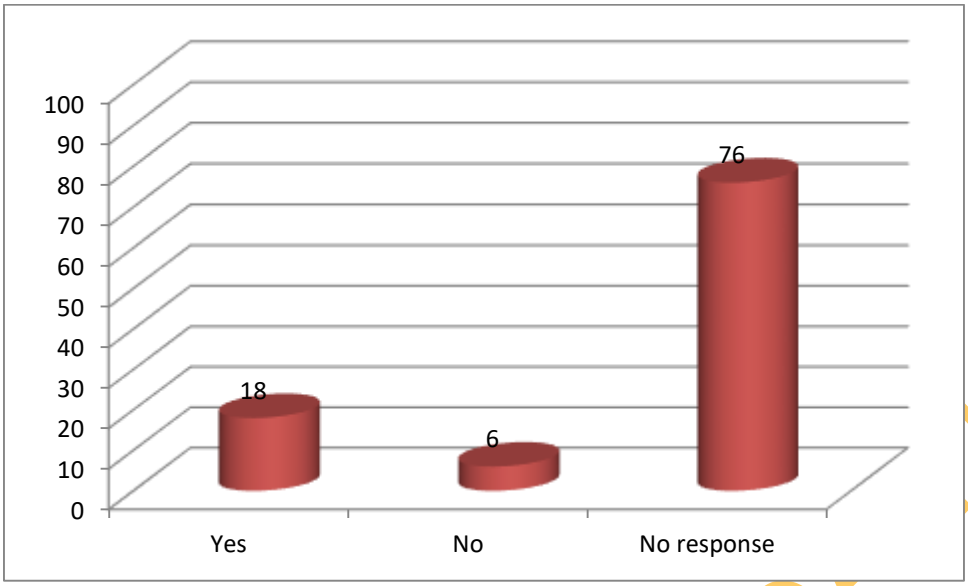


Figure 4.2: Rectal artsesunate is used as pre-referral for severe malaria

Figure 4.2 presents that 18% said yes to the fact that rectal artesunate is used as pre-referral treatment for severe malaria and (6%) said rectal artesunate is not used as pre-referral treatment for severe malaria.

N=150

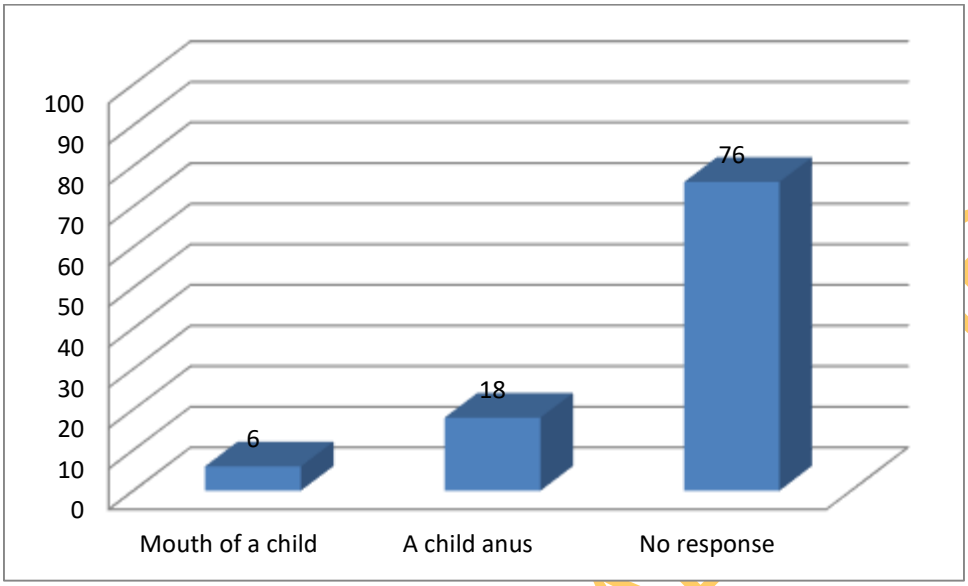


Figure 4.3: Area of rectal artesunate insertion

Figure 4.3 presents the places in children where rectal artesunate is inserted. 18.0% of the respondents said it was through the anus/rectum, while 6% of them said it was through the mouth.

N=150

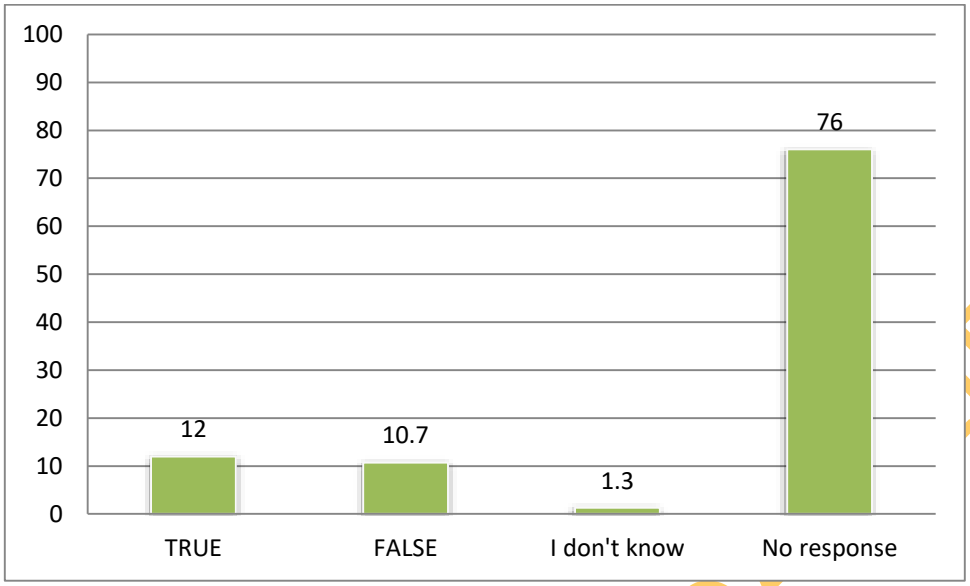


Figure 4.4: Persons who can administer rectal artesunate in an emergency before referral

Figure 4.4 highlights that 12% of the respondents said yes to the fact that rectal artesunate can be administered by parents or care givers during emergency before referral to health facility. 10.7 said it was false that parents or care givers can administer rectal artesunate or artemisinin to patinents during emergency before referral to health facility and very few (1.3) of the respondents don't know if parents or care givers should administer rectal artesunate or artemisinin to patients during emergency before referral to health facility.

N=150

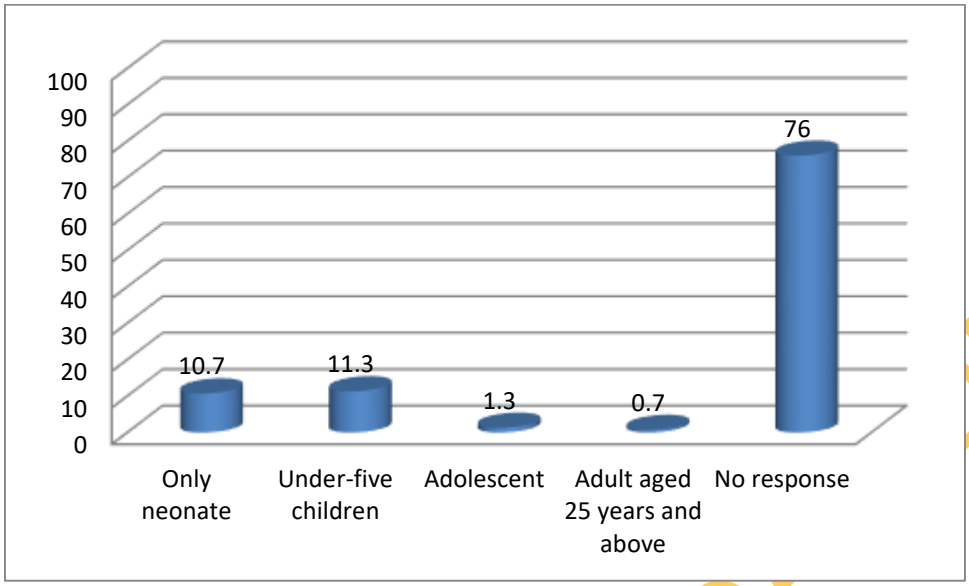


Figure 4.5: Categories of people that are usually given rectal artesunate

Category of people that are usually depends on rectal artesunate as presented in 4.5 are Under – five children (11.3%) who topped the list. Followed by neonates (10.7%), adolescents (1.3%) and adult (0.7%).

Awareness and sources of ACTs

Table 4.7.1 shows that majority (68.3%) of the respondents had heard of ACT while 31.7% had not heard of ACT. Most (46.7%) of the respondents stated that they heard of ACT from nurses, followed (38.7%) by doctor. Other sources of information were pharmacy, working place, media, patent medicine vendor and Drug hawkers,

Table 4.7.1: Awareness and sources of ACTs N=150

Variables	Frequencies	Percent
Ever heard of ACT N=150 Yes	103	68.3
Sources of information on ACT N=150	47	31.7
Doctor	58	38.7
Pharmacy	49	32.7
Working place	53	35.3
News paper	38	25.3
Radio	45	30.0
Television	40	26.7
Patent medicine vendor	32	21.3
Nurses	70	46.7
Drug hawkers	22	14.7
Magazine	39	26.0

Respondents knowledge of antimalaria commonly used for treating malaria

Table 4.8 below shows the drugs currently used to treat malaria. Most (66.7%) of the respondents correctly stated that Artemether Lumefantrine (Coarten, Lonart) is currently used to treat malaria in Nigeria. A good number (51.3%) that Artesunate Amodiaquine (Larimal, Dart, Malmed) is also currently used to treat malaria.The other listed medicines were artemether-sulphadoxine-pyrimethamine (42.0%) and chloroquine (36.0%).

Table 4.8: Respondents knowledge of antimalaria commonly used for treating malaria

N=150

Antimalaria	**Yes**		**No**	
	No	**%**	**No**	**%**
ArtmetherLumefantrine (Coarten, Lonart)	100	66.7	3	2.0
Artesunat Amodiaquine (Larimal, Dart, Malmed)	77	51.3	26	17.3
Chloroquine	54	36.0	49	32.7
Artesunate-sulpfadoxine-pyrimthamine (Co-Arinate, Farinax)	63	42.0	40	26.7
Artesunate-mefloquine (Artequine)	63	42.0	40	26.7

Effect of poor adherence to anti malaria medicines

Table 4.9 shows the consequences of malaria infected patients who fails to adhere to malaria drugs. Most (31.0%) of the respondents said it will lead to complicated malaria. 12.9% said it could lead to reoccurrence, 7.8% said it will lead to relapse. Others consequences included organ damage (8.6%), resistant malaria (7.8%), cerebral malaria (6.9%), anaemia (4.3%).

Table 4.9: Effect of poor adherence to anti malaria medicines

Effect	No	%
Organ damage	10	8.6
Complicated malaria	36	31.0
It destroys the immune system	5	4.3
Reoccurrence	15	12.9
Resistant malaria	9	7.8
Relapse	12	10.3
Severe weakness	2	1.7
Cerebral malaria	8	6.9
Anaemia	5	4.3
Death	12	10.3
Convulsion	2	1.7
Total	116	100

Multiple responses

Perception of the respondents on Artemisinin-Based Combination Therapy

In table 4.10 below, the perception of respondents on Artemisinin-Based Combination Therapy was shown. Few (25.3%) agreed that ACT related medicines are too expensive even if they have high efficacy. 28.7% perceived Chloroquine is still more effective compared to the new antimalarial drugs. Some (16.7%) perceived that ACT related medicines should not be used for treating under-five children because of the associated side effect. Many (37.3%) of the respondents disagreed that ACT are not always available in health care facilities so it is better to use chloroquine that is very common. Others respondents (81.0%) stated that ACT is not safe to use by pregnant women in the second trimester, 12.7% are of the opinion that combining herbs with ACT medicines will help malaria go away quickly. While 16.0 said traditional herbal medicines are more effective medicines.

Table 4.10: Perception of the respondents on Artemisinin-Based Combination Therapy N=150

Description	Agree		Disagree		Undecided	
	No	%	No	%	No	%
ACT related medicines are too expensive even they have high efficacy	38	25.3	31	20.7	34	22.7
Chloroquine is still more effective compared to the new antimalarial drugs	43	28.7	45	30.0	15	10.0
ACT related medicines should not be used for treating under-five children because of the associated side effect	25	16.7	51	34.0	27	18.0
ACT are not always available in health care facilities so it is better to use chloroquine that is very common	14	9.3	56	37.3	33	22.0
ACT is not safe to use by pregnant women in their 2nd trimester.	27	18.0	29	19.3	47	31.1
Combining herbs with ACT medicines will help malaria go away quickly.	12	8.0	72	48.0	19	12.7
Traditional herbal medicines are more effective medicines	14	9.3	65	43.3	24	16.0

Respondents opinions relating to malaria and antimalarial medicine

The opinions of the respondents relating to malaria and antimalarial medicines are revealed in Table 4.11. Majority (53.3%) said that Artemisinin-Based Combination Therapy is not only for the rich in the society. Over half (52.7%) of the respondents were of the belief that chloroquine is as effective as Artemisinin Lumenfantrin. A few (22.0%) said that foreign product like the GLND are far better than the new antimalarial drugs such as Coartem. 40% are of the opinion that the dosage of ACT are not too cumbersome to comply with.

Table 4.11: Respondents opinions relating to malaria and antimalarial medicine N=150

Variables	**Yes**		**No**	
	N	**%**	**N**	**%**
Artemisinin-Based Combination Therapy is only for the rich in the society	23	15.3	80	53.3
Artemisinin Lumenfantrin is not as effective as chloroquine and Chinese medicines	24	16.0	79	52.7
Foreign product like the GLND are far better than the new antimalarial drugs such as Coartem	33	22.0	70	46.7
The dosage of ACT related medicines is too cumbersome to comply with	42	28.0	61	40.0

Respondents occurrence of malaria per year

In table 4.12 a good number (30.0%) of the respondents said they had experienced malaria once this year, (28.0%) had not experienced malaria this year while 29.3% had experienced malaria twice this year. See table 4.12 for details.

Table 4.12: Respondents occurrence of malaria per year

Variables	No	%
None	42	28.0
1	45	30.0
2	34	29.3
3	11	7.3
4	5	3.3
5	3	2.0

Antimalarial drug ever used by the respondents

Majority (66.7%) of the respondents in table 4.13 used coartem to treat malaria. Chloroquine was used by 60.7% of respondents for treating malaria malaria while 44.7% of the respondents had used fansider. See table for details.

Table 4.13: Antimalarial drug ever used by the respondents N=150

Drugs	Yes		No	
	N	%	N	%
Coartem	100	66.7*	50	33.3
Larimal	12	8.0	138	92.0
Farina	15	10.0	135	90.0
Chloroquine	91	60.7*	59	39.3
Halfan	19	12.7	131	87.3
Fansider	67	44.7*	82	54.7
Artequine	37	24.7	113	75.3
Amalar	67	44.7*	83	55.3
Lonart	47	31.3	103	68.7

Antimalarial drug still in use by the respondents

Table 4.14 shows the antimalarial drugs still used by respondents. Coartem topped (28.0%) the lot of the antimalarial still being used. This was followed by Lonart (10.7%) and Amalar, (10.0%). See table for details.

Table 4.14: Antimalarial drug still in use by the respondents N=150

Description	Yes		No	
	N	%	N	%
Coartem	42	28.0*	108	72.0
Larimal	4	2.7	146	97.3
Farina	5	3.3	145	96.7
Chloroquine	11	7.3	189	92.7
Halfan	7	4.7	143	95.3
Fansider	6	4.0	144	96.0
Artequine	5	3.3	145	96.7
Amalar	15	10.0*	135	90.0
Lonart	16	10.7*	134	89.3

Antimalarial drug if used by the respondents

Table 4.15 shows the type of antimalria drugs used by the respondents in their last episode of malaria. Majority (61.3%) of the respondents used Coartem to treat malaria in their last episode of malaria. 29.3% used chloroquine in their last episode while 23.3% used Amalar. Other antimalarial used included, Larimal 8.7%, Farina 10.7%, 12.7 Halfan, Artequine 12.7%.

Table 4.15: Antimalarial drug if used by the respondents N=150

Description	Yes		No	
	N	%	N	%
Coartem	92	61.3*	58	38.7
Larimal	13	8.7	137	91.3
Farina	16	10.7	134	89.3
Chloroquine	44	29.3*	106	70.7
Halfan	19	12.7	131	87.3
Fansider	34	22.7*	116	77.3
Artequine	29	19.3*	121	80.7
Amalar	35	23.3*	115	76.7
Lonart	29	19.3*	121	80.7

Respondents first reaction when notice signs and symptoms of malaria

Table 4.16 represents the first response of the respondents when they notice signs and symptoms of malaria. Majority (53.3%) of respondents incorrectly stated that they observed the symptoms two to three days to be sure is malaria, while 49.3% of the respondents stated that they go to a nearby health facility for complaint and diagnosis by doctors. Many (48.7%) treat themselves using antimalarial drugs. See table for details.

Table 4.16: Respondents first reaction when notice signs and symptoms of malaria N=150

Description	Yes		No	
	N	%	N	%
I go to the nearest patent medicine to buy drug	35	23.3	115	76.7
I observed the symptoms say two to three days to be sure if is malaria	80	53.3	70	46.7
I go to a nearby health facility for complaint and diagnosis by doctors	74	49.3	76	50.7
I used herbs and concoction to make sure it quickly go away completely	17	11.3	113	88.7
I treat myself using antimalarial drugs	73	48.7	77	51.3

Use of Artemther-Lumenfantrin commonly called Coartem

Majority (69.3%) of the respondents had ever used Artemether-Lumenfantrin commonly called Coartem in table 4.17, while 46.7% of the respondents were sure of the dosage for Coartem.

Table 4.17: Use of Artemther-Lumenfantrin commonly called Coartem N=150

Description	Yes		No	
	N	%	N	%
Have you ever used Artemether-Lumenfantrin commonly called Coartem	104	69.3	46	30.7
Are you sure of the adult dosage of Coartem	70	46.7	80	53.3

Recommended dosage of Coartem for treating malaria in aged 1-3 years

Table 4.18 represents respondent's knowledge relating to the recommended dosage of Coartem for treating malaria in aged 1-3 years. Few (15.3.0%) of the respondents rightly stated that 1 tablet of Caortem is taking by aged 1-3 years. 1 tablet in the morning and another I tablet after 8 hours on the same day. 1 tablet in the morning and I tablet in the evening on the second and third day respectively.

Table 4.18: Recommended dosage of Coartem for treating malaria in aged 1-3 years N=150

Drugs	Day 1			Day 2			Day 3		
	No of tablets	N	%	No of tablets	N	%	No of tablets	N	%
Coartem dosage for aged 1-3 years	1 tablet	23	15.3	1 tablet	25	16.7	1 tablet	24	16.0
	2 tablets	13	8.7	2 tablets	13	8.7	2 tablets	14	9.3
	3 tablets	9	6.0	3 tablets	9	6.0	3 tablets	9	6.0
	4 tablets	24	16.0	4 tablets	22	14.7	4 tablets	22	14.7
	8 tablets	1	0.7	8 tablets	1	0.7	8 tablets	1	0.7
	No response	80	53.3	No response	80	53.3	No response	80	53.3

Knowledge on recommended dosage of Coartem for treating malaria in aged 4-5 years

Table 4.19 summarizes respondent's knowledge relating to the recommended dosage of Coartem for treating malaria in aged 4-5 years on the first three days. Some (20.0%) of the respondents rightly stated that 2 tablets of Coartem is taking by aged 4-5 years. 2 tablets is taking in the morning and another 2 tablets after 8 hours on the same day. 2 tablets is taking in the morning and 2 tablets in the evening on day two and three.

Table 4.19: Recommended dosage of Coartem for treating malaria in aged 4-5 years N=150

Drugs	**Day 1**			**Day 2**			**Day 3**		
	No of tablets	**N**	**%**	**No of tablets**	**N**	**%**	**No of tablets**	**N**	**%**
Coartem dosage for age 4-5	1 tablet	10	6.7	1 tablet	12	8.0	1 tablet	12	8.0
	2 tablets	30	20.0	2 tablets	29	19.3	2 tablets	29	19.3
	3 tablets	13	8.7	3 tablets	13	8.7	3 tablets	13	8.7
	4 tablets	17	11.3	4 tablets	16	10.7	4 tablets	16	10.7
	No response	80	53.3	No response	80	53.3	No response	80	53.3

Knowledge on recommended dosage for treating adult with Coartem using 24 tablets pack

Table 4.20 shows respondents knowledge relating to the recommended dosage of Coartem for treating malaria in adults in 24 tablets pack regimen. Most (30.0%) of the respondents rightly stated that 4 tablets of Caortem are taking by adult in the morning and 4 tablets after 8 hours on the first day. 4 tablets in the morning and 4 tablets in the evening on second and third day respectively.

Table 4.20: Recommended dosage for treating adult with Coartem using 24 tablets pack N=150

Drugs	Day 1			Day 2			Day 3		
	No of tablets	**No**	**%**	**No of tablets**	**No**	**%**	**No of tablets**	**No**	**%**
Coartem 24 tablets dosage for adult	1 tablet	2	1.3	1 tablet	2	1.3	1 tablet	2	1.3
	2 tablets	10	6.7	2 tablets	10	6.7	2 tablets	11	7.3
	3 tablets	7	4.7	3 tablets	8	5.3	3 tablets	8	5.3
	4 tablets	45	30.0	4 tablets	44	29.3	4 tablets	43	28.7
	8 tablets	6	4.0	8 tablets	6	4.0	8 tablets	6	4.0
	No response	80	53.3	No response	80	53.3	No response	80	53.3

Knowledge on recommended dosage for treating adult with Coartem using 6 tablets pack

Table 4.21 represents respondent's knowledge relating to the recommended dosage of Coartem for treating malaria in adults in 6 tablets pack. (4.0%) of the respondents rightly stated that 1 tablet of Coartem is taken in the morning and another I tablet after 8 hours on the first day. 1 tablet in the morning and I tablet in the evening on the second and third day.

Table 4.21: Recommended dosage for treating adult with Coartem using 6 tablets pack N=150

Drugs	Day 1			Day 2			Day 3		
	No of tablets	No	%	No of tablets	No	%	No of tablets	No	%
Coartem dosage 6 tablets	1 tablet	6	4.0	1 tablet	7	4.7	1 tablet	7	4.7
	2 tablets	20	13.3	2 tablets	20	13.3	2 tablets	20	13.3
	3 tablets	3	2.0	3 tablets	3	2.0	3 tablets	3	2.0
	4 tablets	40	26.7	4 tablets	39	26.0	4 tablets	39	26.0
	8 tablets	1	0.7	8 tablets	1	0.7	8 tablets	1	0.7
	No response	80	53.3	No response	80	53.3	No response	80	53.3

Awareness of the National Policy on Malaria (NPM)

Table 4.22 shows the respondents awareness of National Policy on Malaria (NPM). Very few (18.0%) of the respondent had heard about National Policy on Malaria Diagnosis and Treatment. Few numbers (9.3%) had seen a copy of National Policy on Malaria Diagnosis and Treatment. Majority (12.7%) of those who had heard about National Policy on Malaria Diagnosis and Treatment also stated that National Policy on Malaria Diagnosis and Treatment was part of the curriculum for training nursing. (10.0%) stated that they have read a copy of the policy and (6.0%) stated that they have a copy of the policy

Table 4.22: Awareness of National Policy on Malaria

Awareness of National Policy on Malaria	Yes		No	
	Freq	%	Freq	%
Have you heard about the National Policy on Malaria Diagnosis and Treatment	27	18.0	123	82.0
Have you seen a copy of the NPMDT	14	9.3	13	8.7
Is the NPMDT part of the curriculum for training nursing	19	12.7	8	5.3
Have you ever read a copy of the policy	15	10.0	12	8.0
Do you have a copy of the policy	9	6.0	18	12.0
No response	123	82.0	123	82.0

CHAPTER FIVE

DISCUSSION

5.1 Socio-demographic characteristics

Most of the respondents were year one student of School of Nursing, Eleyele, Ibadan. Majority of the respondents were females. This has been the pattern of distribution of students in nursing schools in Nigeria. Majority of the respondents were the Yoruba ethnic group followed by Igbo, this was as a result of the location of the school is predominantly Yoruba speaking community.

More than half of the respondents were Christians followed my Muslims (Nigeria Demographic Profile, 2014). The large population of Christians in this study is contrary to what Salako, et al, (2001) noted. He observed that Muslims are more populated in this location of study. It was cleared that religious background and faith of the respondents did not affect the use or knowledge of ACTs in treating malaria.

5.2: Knowledge about Artemisinin-Based Combination Therapy

One of the interesting findings in this study is the high proportion of the nursing students who had incorrect knowledge that female anopheles mosquito causes malaria. This might be due to the common view that state that female Anopheles mosquitoes bite and feed from an infected person's blood, then become infected with the malaria parasite and transfers it to other uninfected people when it bites and feed from their blood (Kerns 2014, Kakkilaya 2011, Anonymous 2012, CDC 2012). It is better explained that mosquito transfers the germ (plasmodium) that causes malaria into human beings when it bites. Although mosquito is implicated in the transmission of malaria (Center for Disease Control, 2012) it is not the cause of the disease but a vector for the infection (CDC, 2012, Kalillaya, 2006). It is a misconception that mosquito causes malaria. Other documented misconceptions were that malaria is caused by 'the gods', bad air, working in the sun, dry weather (Brieger et al, 1986).

Malaria is caused by a protozoan parasite from the plasmodium family that is capable of invading the red blood cells (Kakkilaya 2011, Kerns 2014). This parasite is transmitted by mosquitoes in many tropical and subtropical regions (MedicineNet.com 2014). Four types of plasmodium can cause malaria in humans which are P. falciparum, P. vivax, P. malariae, and P. ovale (Sinclair

2009, Kerns 2014) were looked into in this study. Among these, P. falciparum had the highest percent (77.3%) of the total study population and plasmodium falciparun is the most deadly and account for over 90% of malarial cases in Africa and almost all malarial death all over the world (Sinclair 2009).

Majority of the respondents had some basic knowledge of the major symptoms of uncomplicated malaria; this study agreed with UNICEF's report (2007)on malaria. This finding showed that fever (94.7%) has the highest response of symptoms of uncomplicated malaria. According to UNICEF (2007, Sinclair 2005), fever is the most common symptoms of malaria. Other symptoms of uncomplicated malaria include chill, loss of appetite, general body ache, changes in the color of the eyes and nausea and vomiting. These findings are in line with the study carried out by Sinclair, 2005.

Untreated malaria untreated can lead to complicated malaria. Most of the respondents in this study listed the signs and symptoms complicated malaria which are in accordance with the view that malignant malaria is caused by *P. falciparum* and that malignant malaria usually begins with similar symptoms like benign (uncomplicated) malaria, but will lead to serious complications, such as breathing problems, hypoglycaemia (low blood sugar), pulmonary oedema (fluid in the lungs), convulsions (fitting), coma, renal failure, and liver failure and shock. Malignant malaria can also affect the brain and central nervous system which can even lead to death (Sinclair, et al 2005, WHO 2006, MedicineNet.com 2014). In this study it was observed that majority of the respondents could rightly identify the physical and social consequences of untreated malaria as observed earlier by Sinclair, et al (2005).

It was observed in this study that majority of the respondents had a good knowledge of the use and purpose of previous and current anti malaria drugs. Less than half of the respondents stated incorrectly that chloroquine and Fansider are still the most effective anti malarial drugs and drugs like chloroquine, sulfadoxine-pyrimethamine and amodiaquine had in-built resistance to falciparum malaria. Although chloroquine is still the first line treatment for P.vivax malaria (Malaria Consortium, 2014). It was interesting to note that majority of the respondents stated that Coartem is the new and effective drugs for treating malaria and this agreed with Douglas et al

(2010), who stated that therapies combining artemisinin and some other antimalarial drugs are the best treatment for malaria and are both effective can be well tolerated in patients.

In this study, far less than half of the respondents had not heard of rectal artesunate nor rectal artemisinin and few respondents also know that it is administered through the child's anus during emergency before referral to health facility.

5.3: Awareness of Artemisinin-based Combination Therapy (ACT)

The level of awareness of Artemisinin based Combination Therapy is high among the respondents. Among many who claimed to be aware of the use of coartem could not state properly the dosage for aged 1-3 years, 4-5 years and the 6 tablets pack of coartem. Nurses followed by doctors top the list of sources of information Artemisinin-based Combination Therapy. Other sources of information in descending orders included working place, pharmacy, radio, television, magazine, newspaper, patient medicine vendor and drug hawkers. It was not surprising that health care facility was mentioned as the main source of information.

Most of the respondents rightly stated that the drug currently used to treat malaria in Nigeria is ArtmetherLumefantrine (Coarten, Lonart). Record has it that Artemisinin-based Combination Therapies (ACTs) are currently the most effective medication for the treatment of Plasmodium falciparum malaria and are the first-line treatment recommended by the WHO (Yaday, Moucheraud, Alphs, Larson 2013). It has further been explained that Artemisinin derivatives have shown to produce faster relief of clinical symptoms and faster clearance of parasites from the blood than other antimalarial drugs when used as monotherapy (WHO, 2006). In accordance with (Sinclair, Zani, Donegan, Olliaro, and Garner 2009, WHO 2006), most of the respondents rightly stated that failure to adhere to anti malaria drugs to malaria infected patients can lead complication, relapse, resistance, reoccurrence and the rest.

5.4: Perception on Artemisinin-based Combination Therapy

The findings from this study noted that respondents who have a good knowledge of Artemisinin-based Combination Therapy were of the opinion that these medicines are too expensive even though they have high efficacy and readily available. This finding is in contrast with the previous

studies about ACT and other antimalarials. In 2008 annual report of National Malaria Control Programme (NMCP) of the Federal Ministry of Health in Nigeria indicated that out of 96% of health facilities surveyed, 56% of them reported stock-out for one week or more in the last three months.

Most of the respondents were of the opinion that Artemisinin-based Combination Therapy and new antimalarial drugs is still more effective when compared with Chloroquine. This finding is in agreement with the efficacy study of ACT by Federal Ministry of health in 2004 compared with drugs efficacy study of chloroquine in 2002. It was discovered that ACT has 100% efficacy in the South Western part of Nigeria while chloroquine had 40.9% efficacy as at 2002 (FMOH, 2005). Most of the respondents were rightly in the opinion that ACTs are safe to use by pregnant women in their second trimester. This is in agreement with the (FMOH 2010), in that study it was seen the Artemisinin derivatives are safe in the second and third trimesters of pregnancy. Artemether-lumenfantrin and Artesunate-Amodiaqine are safe and recommended for the treatment of uncomplicated malaria during pregnancy in the 2nd and 3rd trimester of pregnancy. They should only in the first trimester, if quinine is not available or compliance to treatment with quinine cannot be assured (FMOH 2005). Notwithstanding, it is necessary to note that Artemisinin-based Combination Therapy, proven to be efficacious for the treatment of malaria.

5.5: Pattern of use of Artemisinin-based Combination Therapy

Majority of the respondents had had malaria once this year while a good number of the respondents had not had malaria this year. Most of the respondents that had used antimalaria drugs indicated they used coartem, this was followed by chloroquine. Majority of the respondents who had noticed the signs and symptoms of malaria observed the symptoms for two to three days to be sure if is malaria and visited a nearby health facility for complaint and diagnosis by doctors.

The dosage for ACT is designed to be taken twice a day for aged 1 -3 years are to take one tablet twice daily for three days. Aged 4-8 years are to take 2 tablets twice daily for three days and adults are to take four tablets twice daily for three days (Federal Ministry of Health, 2010). Although most of the respondents had heard of ACT, they lack knowledge of the proper dosage regimens.

5.6: Awareness of the National Policy on Malaria

Majority of the respondents had not heard about the National Policy on Malaria but few respondents did hear about National Policy Malaria. Among those that had heard, few of them have seen or have a copy the policy with them. Few respondents stated that National Policy on Malaria Diagnosis and Treatment is part of their school curriculum for training nurses. However, in formal interview with some students in the school revelled that the provisions of the policy is yet to be integrated with curriculum of school of nursing.

5.7 Implications of findings for Health Promotion and Health Education

Health promotion is a process whereby individuals are enabled to increase control over, and improve their health. This goes beyond a focus on individual behavior towards a wide range of social and environmental interventions (WHO 2014). Health promotion seeks to improve a person's or population's health by providing information about, and increasing awareness of, at-risk behaviors associated with various diseases (Thefreedictionary, 2014). While health education is any combination of learning experiences designed to help health, by increasing their knowledge or influencing their attitudes (WHO, 2014). Health education is also very important in effective communication of factual information, especially to groups or individuals in order to bring about change in behaviour. In this context, Health education can be used to bridge the gap between health information and health practices among students of school of nursing regarding knowledge of malaria, and artemisinin-based combination therapy.

This study so far shows that more than half of the respondents had high knowledge on some issues pertaining to ACT and malaria. The study also revealed high knowledge on the signs and symptoms of complicated malaria, however there is need for school based educational intervention programs among the study population on pre-referral treatment. This is necessary because few respondents had heard of rectal artesunate/rectal artemisinin. More than half of the respondents have heard of ACT, however there is need for public enlightenment, such as the use of posters/hand bills and other IEC materials, mass media such as television and radios for promoting ACT as the first line drug for malaria treatment.

Health education/intervention programme is also implicated in areas relating to consequences malaria, if nurses come in contact with malaria patients, they should be able administer the new recommended drugs to the and also make sure adherence to malaria drugs properly followed.

This study also reveals the perception of study population towards Artemisinin-based Combination Therapy. There is the need for school curriculum review to take into account misconceptions on malaria related issues. Also training is needed for nursing students to acquire knowledge relating to the new malaria diagnosis and treatment approach.

Opportunities/observations for health educating clients/patients on first line treatment/anti-malarial dosage should be given to student nurses to prepare them for clinical work proper in order not to increase mortality and morbidity as a result of misinformation.

5.8 Conclusion

Findings from this study show that the knowledge of students on Artemisinin-based Combination Therapy was high. More than half had good knowledge on the cause of malaria but while most of them had low knowledge on the use of Coartem for the management of malaria.

It was also deduced that very few of the respondents had heard about the National Policy on Malaria Diagnosis and treatment and less than half of the respondents have a copy of the Policy. From all that was deduced, advocacy, the use of IEC materials such as poster and hand bills will be necessary. Re-orientation/workshop of lecturers and students on issues regarding malaria and its management will also go a long way in helping out the problem.

5.9 Recommendations

The following recommendations are made in line with knowledge about malaria and the first line recommended anti-malarial drugs;

1. There is need for school based training intervention on pre-referral treatment of malaria in line with the provision of the national policy on malaria with special reference to ACT.

2. Public enlightenment involving the use of posters, leaflets and handbills could be used in combination with co-curricular activities such as debates and seminars to upgrade the respondents' knowledge of ACT.

3. Advocacy is needed to ensure the revision of the curriculum for the schools of nursing with the view to taking into consideration the new malaria treatment policy

4. Training workshops are needed to upgrade nursing students' knowledge and practices relating to the new malaria management approach.

5.10 Suggestions for further research

A similar study is needed to be conducted among lecturers in schools of nursing with a view to determine their knowledge, perception and practices relating to artemisinin-based combination therapy.

KNOWLEDGE SCALE

QN	VARIABLES	MAXIMUM SCORE PER QUESTION
6	**Main cause of malaria** 1.Plasmodium (1) 2.Palm oil (1) 3.Male anopheles mosquito (1) 4.Female anopheles mosquito (1)	4
7	**Role of mosquito in malaria causation** 1.It produces toxins (1) 2.It is when it bites one that malaria occurs (1) 3.It transfers the germs that causes malaria into people when it bites (1)	3
8	**Micro-organism associated with most of the cases of malaria in Nigeria** 1.Plasmodium vivax (1) 2.Male anopheles mosquito (1) 3.Plasmodium malariae (1) 4.Curex mosquito (1) 5.Plasmodium falciparum (1) 6.Tiger mosquito (1) 7.Plasmodium ovale (1)	7
9	**Major symptoms of uncomplicated malaria** 1.Chills (1) 2.Nausea (1) 3.Vomiting (1) 4.Fever(high body temperature) (1) 5.Weight loss (1)	12

	6.Loss of appetite (1) 7.General body ache (1) 8.Inabilty to work and perform daily house cores (1) 9.Change in the colour of eyes (1) 10.Perception (1) 11.Loss of appetite (1) 12.High blood pressure (1)	
10 11	**Symptoms of complicated malaria** 1.Convulsion (1) 2.Coma (1) 3.Breathing problem (1) 4.Liver problem (1) 5. Shock (1) 6.Cerebral problem (1) 7.Bleeding problem (1) **Consequences of untreated malaria** 1.Malaria result in low birth weight in new born (1) 2.Malaria can cause convulsion (1) 3.Untreated malaria can result to cerebral malaria (1) 4.Untreated malaria can lead to death of infants (1) 5.Untreated malaria can lead to death of mothers (1) 6.Untreated malaria can lead to reduced performance at work and home (1)	7 6
12	**Malaria treatment** 1.Chloroquine is still the most effective drug for the treatment of malaria in Nigeria (1) 2.Coartem is now the new drug used in place of chloroquine for the treatment of malaria in Nigeria (1) 3.The most effective anti-malarial drug recommended for sickle cell anaemia patient is proguanil (Paludrine) (1) 4.Coartem is the most effective drug for the treatment of malaria as at today (1) 5.Coartem is safe for women who are pregnant for more than 3 months (1) 6.Sulphadoxine-Pyrimethamine (Fansidar) is effective in the control or prevention of malaria during pregnancy (1)	8

	7.Coartem is now the first drug you should take once one notice he/she has malaria (1) 8.It is right for a woman who is pregnant for i-3 months to take Coartem (1)	
14	**Rectal artesunate is used as pre-referal treatment for severe malaria** 1.Yes (1) 2.No (1)	2
15	**Places rectal artesunate is inserted** 1.Mouth of a child (1) 2.A child's anus (1) 3.A child's armpit (1) 4.A child's ear (1)	4
16	**Rectal artesunate can be administered to patients by parents or care givers during emergency before referral to health facility** 1.True (1) 2.False (1) 3.I don't know (1)	3
17	**Category of people usually given rectal artesunate** 1.Only neonates (1) 2.Under-five (1) 3.Youth aged 15-25 years (1) 4.Adults aged 35 years and above (1)	4
20	**Anti-malarial currently used in treating malaria or not** 1.Artemether Lumenfantrine (1) 2.Artesunate Amodiaquine (Larimal), Dart, Malmed (1) 3.Chloroquine (1) 4.Artesunate-Sulphadoxine-Pyrimethamine (Co-Arinate, Farinax) 5.Artesunate-mefloqine (Artequine) (1)	4
21	**Two things that can happen if one fails to adhere to anti-malarial medicine** 1.Correct (1) 2.Incorrect (1)	2

30	**Recommended dosage for treating malaria in children aged 1-3 years** 1.Day 1 (1) 2.Day 2 (1) 3.Day 3 (3)	3
31	**Recommended dosage of Coartem for treating malaria in children aged 4-5 years** 1.Day 1 (1) 2.Day 2 (1) 3.Day 3 (3)	3
32	**Recommended dosage for treating adults with Coartem using the 24 tablets pack** 1.Day 1 (1) 2.Day 2 (1) 3.Day 3 (3)	3
33	**Recommended dosage dosage for treating adults with Coartem using the 6 tablets pack** 1.Day 1 (1) 2.Day 2 (1) 3.Day 3 (3)	3
	TOTAL KNOWLEDGE SCORE	**78**

Knowledge scale was derived manually based on positive and negative scoring of each knowledge question. A total of 78-points scale was gotten and a mean knowledge score of 17.1±6.5 was gotten. Knowledge scores ≤39 were categorised as poor knowledge while scores ≥40 was categorised as good knowledge.

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APPENDIX I

Questionnaire

MALARIA RELATED KNOWLEDGE, PERCEPTION AND USE OF ARTEMESININ-BASED COMBINATION THERAPY AMONG STUDENTS OF SCHOOL OF NURSING ELEYELE OYO STATE

Dear Respondents,

I am Egor Gloria P, a post-graduate student of the University of Ibadan, Department of Health Promotion and Education in the Faculty of Public Health College of Medicine, University of Ibadan, Nigeria. We are issuing out questionnaire on research basis focusing on MALARIA RELATED KNOWLEDGE, PERCEPTION AND USE OF ARTEMISININ-BASED COMBINATION THERAPY COMMONLY CALLED (ACTs). Please your sincere answers to the questions provided is needed which will be useful in academic purposes and also planning for appropriate ways to improving the health of the population at large.

Be fully assured that every information provided will be kept confidential. That is to say it will not be disclosed to anyone. Also it is coregent to note that your name is not required on the questionnaire. Participation in this study is voluntary and you are free to discontinue if you so wish. Do feel free to ask questions regarding this study at any point in time. Thanks for your co operation.

Please indicate by ticking (√) the appropriate box below to indicate or show your willingness to participate or not.

Would you like to participate?

Yes ☐ No ☐

Thank you very much

Office use only

Serial Number.....

Date.....

Mobile Number: 08037938771, email: gloumapee@yahoo.com

Section A: Socio Demographic Characteristics

Instructions: 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 level of study: (1) Year one ☐ (2) Year two ☐ (3) Year three ☐
2. Sex: (1) Male ☐ (2) Female ☐
3. Age: (Specify)
3. Marital Status: (1) Single ☐ (2) Cohabiting ☐ (3) Divorced ☐ (4) Married ☐
   (5) Separated ☐ (6) Others (Specify).....
4. Ethnicity: (1) Yoruba ☐ (2) Igbo ☐ (3) Hausa ☐
   (4) Others (Specify).....
5. Religion: (1) Christianity ☐ (2) Muslim ☐ (3) Catholic ☐ (4) Traditional
   (5) Others (Specify).....

Section B: Knowledge about Malaria and Artemisinin-based Combination Therapy

(Tick (√) the answer you feel is correct or best expresses your opinion)

6. What is the main cause of malaria? (1) Plasmodium ☐ (2) Palm oil ☐
   (3) Male anopheles mosquito ☐ (4) Female anopheles mosquito ☐
7. What is the role of the mosquito in malaria causation?
   (1) It produces toxins ☐ (2) It is when it bites one that malaria occurs ☐
   (3) It transfers the germ that causes malaria into people when it bites ☐

8. Which of the micro-organism in table 1 is associated with most of the cases of malaria in Nigeria?

Table 1

S/NO	Options	True	False
1.	Plasmodium vivax		
2.	Male anopheles mosquito		

3.	Plasmodium malariae		
4.	Curex mosquito		
5.	Plasmodium falciparum		
6.	Tiger mosquito		
7.	Plasmodium ovale		

9. Table 2 contains a list of symptoms, for each tick (√) "Yes" if it is a major symptom of uncomplicated malaria and "No" if it is not a major symptom. If not certain tick (√) not "sure"

Table 2

S/N	Signs and Symptoms of Uncomplicated Malaria	Yes	No	Not sure
1	Chills			
2	Nausea			
3	Vomiting			
4	Fever (high body temperature)			
5	Weight loss			
6	Loss of appetite			
7	General body ache			
8	Inability to work and perform daily house cores			
9	Change in the colour of eyes			
10	Perspiration			
11	Loss of appetite			
12	High blood pressure			

10. Table 2.1 contains a list of symptoms; for each tick (√) "Yes" if it is a symptom of complicated malaria. Tick "No" if it is not and tick not sure if you are not certain about it.

Table 2.1

S/N	Signs and Symptoms of Complicated Malaria	Yes	No	Not Sure
1	Convulsion			
2	Coma			
3	Breathing problem			
4	Liver problem			
5	Shock			
6	Cerebral problem			
7	Bleeding problem			

11. Table 3 contains a list of consequences of some diseases. For each tick (√) **True** if it is a consequence of untreated malaria and **False** if it is not consequences of untreated Malaria

Table 3

S/N	Physical and Social Consequences of Untreated Malaria	True	False	Don't Know
1	Malaria result in low birth weight in new born			
2	Malaria can cause convulsion			
3	Untreated malaria can result to cerebral malaria			
4	Untreated malaria can lead to death of infants			
5	Untreated malaria can lead to death of mothers			
6	Untreated malaria leads to reduced performance at work and home			

12. The following questions relate to malaria treatment, for each question – indicate by ticking Whether it is "**true**" or "false; if you don't know which is correct tick **Don't know**.

S/N	STATEMENT	True	False	I don't know
1	Chloroquine is still the most effective drug for the treatment of malaria in Nigeria.			
2	Coartem is now the new drug used in place of chloroquine for the treatment of malaria in Nigeria.			
3	The most effective antimalaria drug recommended for sickle cell anaemia patient is proguanil (Paludrine ®)			
4	Coartem is the most effective drug for the treatment of malaria as at today.			
5	coartem is safe for women who are pregnant for more than 3 months.			
6	Sulphadoxine – Pyrimethamine (Fansider) is effective in the control or prevention of malaria during pregnancy			
7	Coartem is now the first drug you should take once one notice he/she has malaria.			
8	It is right for a woman who is pregnant for 1-3 months to take Coartem.			

13. Which of the following have you ever heard? (You can tick (√) more or one you have ever heard) (1) Rectal artesunate ☐ (2) Rectal artemisinin ☐ (3) None ☐

If rectal artesunate is ticked then go to question 14 but if you have heard of Rectal artemisinin or have not heard of both skip to question 18

14. Rectal artesunate is used as pre-referral treatment for severe malaria (1) Yes ☐ (2) No ☐

15. In which of the following places is the rectal artesunate inserted?

(1) Mouth of a child ☐ (2) A child's anus ☐ (3) A child's armpit ☐

(4) A child's ear ☐

16. Rectal artesunate can be administered to patients by parents or care givers during emergency before referral to health facility? (1) True ☐ (2) False ☐

(3) I don't know ☐

17. Which categories of people are usually given rectal artesunate?

(1) Only neonates ☐ (2) Under-five children ☐

(3) Adolescent aged 10-19 years (4) Youth aged 15-25 years ☐

(5) Adults aged 25 years and above ☐

If you have not heard of questions 13 please answer question 18

18. Ever heard of Artemisinin-based Combination Therapy? (1) Yes ☐ (2) No ☐

If yes go to question 19 if no skip to question 24

19. What are your sources of information about Artemisinin-based Combination Therapy? (You may tick (√) one or more option as it applies to you).

Table 4

Sources	**Yes**	**No**
1.Doctor		
2.Pharmacy		
3.Working place		
4.News paper		
5.Radio		
6.Television		
7. Patent medicine vendor		
8.Nurses		
10.Drug hawkers		
11.Magazine		
12.Others specify		

20. For each of the medicines in table 5 tick (√) either "Yes" or "No" weither it is an antimalarial currently used in treating malarial or not

Table 5

S/NO	Drugs	Yes	No
1.	Artemether Lumefantrine (Coartem®, Lonart®)		
2.	Artesunate Amodiaquine (Larimal®), Dart®), Malmed®)		
3.	Chloroquine		
4.	**Artesunate-sulpfadoxine-pyrimethamine** (Co-Arinate, ®) Farinax®)		
5.	**Artesunate-mefloquine** (Artequine) ®		

21. State two things that can happen if one fails to adhere to antimalarial medicine

(1).....

(2).....

Section C: Perception on Artemisinin-Based Combination Therapy

22. Table 6 presents a list of statements. For each tick (√) weither you "agree" or "disagree" with it; if "not certain" or your mind is not yet made up on it, tick "Undecided".

Table 6

S/N	OPTIONS	Agree	Disagree	Undecided
1	ACT related medicines are too expensive even if they have high.			
2	Chloroquine is still more effective compared to the new antimalarial drugs.			
3	ACT related medicines should not be used for treating under-five children because of the associated side effect.			
4	ACTs are not always available in health care facilities so it is better to use chloroquine that is very common.			
5	ACTs are not safe to use by pregnant women in their 2nd trimester ie 6months of prgnancy			
6	Combining herbs with ACT medicines will help malaria go away quickly.			
7	Traditional herbal medicines are more effective medicines.			

23. Table 7 contains people's opinions relating to malaria and antimalarial medicine. For each tick (√) Yes or No wither it reflects your opinion or not.

Table 7

Opinion		Tick (√) the appropriate option(s) that best expresses your opinion	
		Yes	No
1	Artemisinin-based Combination Therapy is only for the rich in the society.		
2	Artemisinin Lumenfantrin is not as effective as chloroquine and Chinese medicines		
3	Foriegn product like the GLNDs are far better than the new antimalarial drugs such as Coartem		
4	The dosage of ACT related medicine is too cumbersome to comply with		

Section D: Pattern of Use of Arthemisinin-Based Combination Therapy

24. How many times have you experience malaria this year?.....

25. (a). Which of the following drugs in table 7 below have you ever used during a case of malaria? Tick (√) one or more option which you have ever used.

Table 7

Drugs	**Tick (√) if ever used**		**Still use**	
	Yes	**No**	**Yes**	**No**
1. Coartem				
2. Larimal				
3. Farinax				
4. Chloroquine				
5.Halfan				
6.Fansider				

7. Artequine				
8. Amalar				
9.Lonart				

26(b) Table 8 contains a list of medicines, tick (√) the ones you used for treating your last episode of malaria

Drugs	Tick if used **(√)**	
	Yes	**No**
1. Coartem		
2. Larimal		
3. Farinax		
4. Chloroquine		
5.Halfan		
6.Fansider		
7. Artequine		
8. Amalar		
9.Lonart		

27. Which of the following statements in table 9 best explains what you do first when you notice signs and symptoms of malaria?

Table 9

S/N	What usually do first	Yes	No
1.	I go to the nearest patent medicine store to buy drugs		
2.	I observe the symptoms say two or three days to be sure its malaria		
3.	I go to a nearby health facility for compliant and diagnosis by doctors		
4.	I use herbs and concoction to make sure it quickly goes away completely		
5.	I treat myself using antimalarial drugs		

28. Have you ever used Artemether-Lumenfantrin commonly called Coartem?

(1) Yes ☐ (2) No ☐

29. Are you sure of the adult dosage of Coartem? (1) Yes ☐ (No) ☐

Please fill in the **dosage** of Coartem for **various ages** in tables10a – tables 10c below

30. 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.

Table 10 (a)

DAY	**DOSSAGE**
DAY 1	
DAY 2	
DAY 3	

31. 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.

Table 10 (b)

DAY	**DOSSAGE**
DAY 1	
DAY 2	
DAY 3	

32. What is the recommended dosage for treating adults with Coartem using the 24 tablets pack?

Table 10 (c)

DAY	**DOSSAGE**
DAY 1	
DAY 2	
DAY 3	

33. What is the recommended dosage for treating adults with Coartem using the 6 tablets pack?

Table 10 (d)

DAY	**DOSSAGE**
DAY 1	
DAY 2	
DAY 3	

Section E: Awareness of the National Policy on Malaria

34. Have you ever heard about the new **National Policy on Malaria Diagnosis and Treatment**?

(1) Yes ☐ (2) No ☐ NO""**stop interview** but if yes proceed to answer questions **35-37**.

35. Have you ever seen a copy of the National Policy on Diagnosis and Treatment?

(1) Yes ☐ (2) No ☐ on Malaria

36. Is the National policy on Malaria Diagnosis and Treatment part of the curriculum for training nurses? (1) Yes ☐ (2) No ☐

36. Have you ever read a copy of the policy? (1) Yes ☐ (2) No ☐

37. Do you have a copy of the Policy? (1) Yes ☐ (2) No ☐

THANK YOU FOR PARTICIPATING IN THIS STUDY

APPENDIX II

TELEGRAMS.....

TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to the Honorable Commissioner quoting

Our Ref. No. AD 13/ 479/305

February, 2015

The Principal Investigator,
Department of Health Promotion and Education,
Faculty of Public Health,
College of Medicine,
University of Ibadan,
Ibadan.

Attention: Egor Gloria

Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled: "Malaria Related Knowledge Perception and Use of Artemisinin-based Combination Therapy among Students of School of Nursing Eleyele, Ibadan Oyo State Nigeria."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. Wishing you all the best.

Sola Akande (Dr)
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee