MALARIA AND ITS CONTROL PROGRAM IN KILOLO DISTRICT, IRINGA REGION – TANZANIA (2001-2006)

BY

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(K. I. U)

November, 2008

DECLARATION:

I here by declare that, this research report is my original work and has not been submitted to any institution of learning for any award.

Signature.....

Wesley Luyangi

Date.....

CERTIFICATION

I hereby certify that this work has been done under my supervision for examination as university supervisor.

Signature.....

Kaizeri Dorothy Gakwavu

Date.....17/12/08.....

DEDICATION

I dedicate this work to my family, friends, sponsor and my supervisor for helping me to complete this research report.

ACKNOWLEDGEMENT

I am most grateful to many people who have helped me complete this work, because without them I would have not reached where I have reached.

I would like to express my sincere thanks to the Doctors, clinical officers and nurses of Mwaya catholic hospital, Itunda Lutheran health center, Mokosa dispensary and No. 8 dispensary to have willingly given me different data about malaria in their hospital.

I also thank my sponsor (Marvin & Jolene Wagler), Ilular orphan program (Madam Berit Skaare) for financial assistance in my studies.
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ABSTRACT

This research project was carried out in Kilolo district, Tanzania being guided by the following objectives, to find out the causes, transmission, symptoms, prevention, cure, causes of change in line with treatment of malaria and their solutions. Also to find out the complications associated with malaria and finally to find out whether the planned controls of malaria are successful or not.

The letter of permission to collect data was obtained from the faculty. Different Doctors, Clinical officers and Nurses of different Hospital in Kilolo District were judgmentaly sampled on the basis of being near, easily to approach the respondents with relevant information and good experts. The research was quantitative where by questionnaires; schedules and direct interviews were used as instruments of collecting data.

Malaria was found to be caused by a protozoan organisms called plasmodium, the symptoms of malaria are headache, pain in joints, general body weakness, vomiting and fever; the mode of transmission of malaria parasite is by female anopheles mosquito during blood meals; whereby drainage of stagnant water, the use insect treated nets, clearing of bushes around home compounds are the key preventive measures of malaria and Artemether Lumefantrine (ALu) and quinine are the drugs of choice for treatment of malaria.

Poor quality of drugs, inadequate dosage, vomiting drugs, fever symptoms from a caused by other diseases, parasite resistance to the drugs, age or state of patients and body resistance to the drugs were the chief causes of change in line of treatment of malaria, whereby provision of adequate dosage according to the state of the body or age, laboratory diagnosis, the use of intravenous injections, provision of current drugs are the solution to the causes of change in line of treatment.

In addition to that, it was found that due to the destruction of capillaries within the organs, the blood supply may be hindered resulting into severe complications, such as, cerebral malaria, kidney problems, liver problems, shock and spleen complications, these contribute to the death of the patient.

Finally the researcher recommended that, People should be given enough education about malaria and its serious effects. Let the government try to do this in rural and urban places through experts and the focus should be more on how malaria can be caused and how can be controlled, During diagnosis a long history should be taken from the sick people and then followed by laboratory diagnosis before treating any patient so that to be aware whether patient has severe malaria or uncomplicated malaria. A researcher also recommended to other researchers to do a research on why sickle cell anemic people are not at high chance of being affected by malaria compared to normal people

CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 Introduction

Up to this date, malaria remains the common public health problem in Tanzania in terms of mobility and mortality especially in children under five years of age.
In 2004 malaria diagnosis in children under five years of age accounted for 43% of all attendance and 40% of deaths recorded in health facilities.

The goal of appropriate malaria diagnosis and treatment is to reduce mobility, mortality and social economic losses. In addition, the aim is to attain uniform malaria cases management in the country. The guideline principle of ant malarial drug is to promote safe, effective, good quality, affordable, accessible and acceptable malaria treatment.

According to the research that has been done shows that, there was a change in malaria treatment policy from chloroquine to sulfadoxine Pynmethamine (sp) monotherapy as the first line drug for the treatment of acute malaria episodes in August 2001. However, the last four years resistance to SP has already been reported to be on the increase and the findings indicated that a change in the treatment guidelines was necessary.

Due to the risk of increasing parasite resistance to existing monotherapies; there is now the global move towards the use of combination therapy (CT).
Combination therapy with anti malarial drugs is the simultaneous use of two or more blood schizonticide drugs with independent modes of actions and different biochemical targets in the parasite. Combination therapy can either be fixed combination medical products which the components are co-formulated in the same tablets or capsule or multiple drug therapy, in which the components are co-administered in separate tablets or capsule.

Artemisinin based combination therapy (ACT) is ant malaria combination therapy with artemisinin derivatives as one component of the combination therapy. Artemisinin derivatives are highly efficacious and have the potential delay the spread of drug resistance.

Basing on these principles combination therapy is recommended. Specifically combination Artemether Lumefantrine (ALU) is recommended as the first line therapy for uncomplicated as second line drug in case of treatment of failure of the presence of a contraindication.

1.2 Statement of the problem

Due to the lack of proper control of malaria, many people of this generation have lost their life.

1.3 Objective of the study.

To examine the cause, transmission, symptoms, prevention and cure of the malaria. But the main aim among those cases above is to examine the measures taken to control malaria.

1.4 Specific objectives

- To find out the cause, transmission, symptoms, prevention and treatment of malaria.
- To find out the vector of malaria parasite and how it is related to man
- To find out whether the planned control measures of malaria are successful.
- To find out the causes of change of line of treatment and their solution.
- To find out the body complications associated with malaria.

1.5: Research questions

1. What are the causes, transmissions, symptoms and control measures of malaria?
2. What are the drugs used in treatment of malaria?, are they effective?
3. What causes the change in line of treatment?, what should be done to reduce drug resistance?
4. Is there any initiatives or programs which have been addressed against malaria, if yes where do focus on?
5. What are the complications associated with malaria?

1.6 Significance of the study:

1. The findings will help Teachers teach their learners and enable them gain more knowledge about malaria.
2. It will help other researchers as secondary source of information about their research concerning malaria.
3. It will help the society to be aware about malaria in terms of causes, control and treatment.

1.7 Definition of terms

Disease - is any abnormal condition of the body.

Vector - is an organism which transmits the parasite from infected organisms to uninfected organism

Parasite – is an organism that lives in or on other organism (host) and depends on it for all requirements such as food, transport, security and shelter which in turn harms the host.

Hypothesis – is a tentative explanation or assumption a researcher makes before going to the field to do research.

Host – is an organism where a parasite lives

Temperature – is a measure of hotness or coldness of the body.

Health – is the state of being well or free from disease.

Plasmodium – is an organism (protozoan) that causes malaria.

Research – Is the systematic art and scientific process of finding information about a problem.

Researcher – is a person who does research.

Society – is a group of people living together with a common language and interest

1.9 Scope of the study

The study was conducted among doctors, clinical officers and nurses in several Hospitals located in Kilolo district, Iringa region- Tanzania

1.10 Limitations of the study

i) The fund I was given for research was below the estimated budget I made; this caused me to face difficulties in completing my research. To overcome this problem I requested for more money from other relatives, which was successful.

ii) Some respondents did not return my questionnaire because they said they were busy with other duties

iii) The time for research was not enough because the researcher had other duties to do during the research such as assisting parents do farming activities. To overcome this extra time was used especially at night and weekends.

CHAPTER TWO

2.0: REVIEW OF THE RELATED LITERATURE

2.1: Introduction to malaria

According to Nester Underson & Robert (2004), Malaria is an ancient scourge, as evidenced by earl Chinese and Hindu writings. During the 4th century B.C, the Greeks noticed its association with exposure to swamps and began drainage project to control the diseases. The Italians gave the diseases its name *Malaria* which means "bad Air," in the 7th century. In early times, Malaria was ranged as far north as Siberia and as far South as Argentina.

Malaria is the most common serious infectious disease worldwide. In 1955, the World Health Organization (WHO) began a program for the worldwide elimination of Malaria. Initially there was great success, as WHO employed insecticides such as DDT against the mosquito vector, detected infected patients by obtaining blood smear, and provided treatment for those were infected. Fifty two nations undertook control programs and, by 1960, ten of them had eradicated the disease. Unfortunately, strains of *Anopheles* mosquitoes resistant to insecticides began to appear, and in cooperation with bureaucracy and complacency, malaria began a rapid resurgence. In 1976, the World Health Organization acknowledged that the eradication program was a failure. To day there are 300-500 millions people infected annually Worldwide, with three millions deaths more people are dying of the disease than when the eradication first began.

2.2: Causes of malaria.

According to D.J Taylor and G.W Stout (1997), Malaria is caused by members of the genus plasmodium. Plasmodium species are apicomplexa and exhibit a heteroxenous life cycle involving a vertebrate host and an arthropod vector. Vertebrate hosts include: reptiles, birds, rodents, monkeys and humans. Plasmodium species are quite hosted specific and there are no zoo noses. Four distinct species infected humans: *P. vivax, P. ovale* and *P. malariae*. These species

differ in regards to their morphology, details of their life cycles, and their clinical manifestations. Mammalian Plasmodium species are transmitted by anopheline mosquitoes.

2.3: Transmission

According A. E Vines and N. Rees (1972), Mammalian Plasmodium species are transmitted by female anopheles mosquitoes.

2.4: Symptoms

According to R.H. Peter and J.B. George (2002), the fever that characterizes malaria develops when merozoites invade and destroy red blood cells. The destruction of red blood cells spills wastes, toxins, and other debris into the blood. The body responds by producing fever, an immune response that speeds up other immune defenses to fight the foreign invaders in the blood. The fever usually occurs in intermittent episodes. An episode begins with sudden, violent chills, soon followed by an intense fever and then profuse sweating that brings the patient's temperature down again. Upon initial infection with the malaria parasite, the episodes of fever frequently last 12 hours and usually leave an individual exhausted and bedridden. Repeated infections with malaria parasite can lead to sever anemia, a decrease in the concentration in the red blood cells in the bloodstream. The malaria parasite consumes or renders unusable the proteins and other vital components of the patient's red cells. The pattern of intermittent fever and other symptoms in malaria varies depending on which species of plasmodium is responsible for the infection. Infections caused by *Plasmodium falciparum, Plasmodium vivax,* and
Plasmodium ovale typically produce fever approximately every 48 hours, or first and third day. Infections caused by *Plasmodium malariae* produce fever every 72 hours, or every fourth.

Infections caused by *Plasmodium falciparum* are their severity and high fatality rate. This type of malaria can also cause severe headaches, convulsions, and

delirium. The infection sometimes develops into cerebral malaria, in which red blood cells infected with parasites attach to tiny blood vessels in the brain, causing inflammation and blocking the flow of blood and oxygen. In Plasmodium vivax and Plasmodium ovale infections, some merozoites can remain dormant in the liver for three months to five years. These merozoites periodically enter the bloodstream, triggering malaria relapses.

2.5: Prevention and control

Strategies for preventing and controlling malaria involve three different approaches. Prevention of malaria in individuals will generally involve the reduction of human-mosquito contract through the use of bed nets, repellants, etc, and/or chemoprophylaxis which will suppress parasitemia, but not prevent infection. Control activities at the community level can utilize approaches which directly reduce human-mosquito contact as well as approaches which reduce the total number of mosquitoes in an area. Such approaches include the reduction in mosquito breeding grounds (e.g. environmental modification); target the larva stages with chemical or biological agents, and massive insecticide spraying for the adult mosquitoes. Biological control methods include the introduction of fish which eat the mosquito larvae or bacteria (e.g., Bacillus thuringiensis) which excrete larval toxins. Case detection and treatment will lower the parasite reservoir within the human population. These approaches are not mutually exclusive and can be combined. Many of the successful control programs include both measures to control mosquitoes and treatment of infected individuals.

There is no standard method of malaria control that has proven universally effective. The epidemiologic, socioeconomic, cultural and infrastructural factors of a particular region will determine the most appropriate malaria control. Some of the factors which need to be considered include:

- Infrastructure of existing health care services and other resources.
- Intensity and periodicity (e.g., seasonality) of transmission.

- Mosquito species (ecological requirements, behavioral characteristics, insecticide sensitivity, etc.)
- Parasite species and drug sensitivities.
- Cultural and social characteristic of the population
- Presence of social and ecological change.

The control of malaria in tropical Africa has been particularly problematic because of the high transmission rate and the overall low socio-economic level. Several studies have shown that insecticide treated bed nets (ITBN) reduce the morbidity and mortality associated with malaria. In most areas the introduction of bed nets does not require large promotional programs and their use is readily accepted.

This may be in part due to the reduction in mosquito nuisance biting. Some questions have been raised in regards to the economic sustainability of bed net programs. It is necessary to re-treat the bed net with insecticide periodically and the bed nets need to be repaired and replaced as they became torn and wear out. In addition, some have raised concerns about the long-term benefits of bed nets since they reduce exposure, but do not eliminate it. This reduction in exposure may delay the acquisition of immunity and simply postpone morbidity and mortality to older age groups. Because of the difficulties in controlling malaria by other means there is much interest in developing a vaccine against malaria. The complex life cycle and biology of the parasite provide several potential targets. Vaccination against the sporozoite stage could prevent infection. However, such immunity would need to be completely effective since the escape of a single sporozoite would lead to a blood-stage infection and disease. Vaccines targeted against merozoites or the infected erythrocyte which lowered parasitism could potentially alleviate much of the pathogenesis.

Similarly, it may be possible to vaccinate against the disease by immunizing against potentially toxic antigens. Antibodies directed against gamete antigens can prevent sporogony which suggests the possibility of an anti-transmission vaccine. Such a vaccine would be altruistic in that it would not protect the individual against disease, but protect others in the community.

2.6: Treatment

According to World Encyclopedia (1974), Malaria is treated with drugs that block the growth of plasmodium parasite but do not harm the patient. Some drugs interfere with the parasite's metabolism of food, while others prevent the parasite from reproducing. Drugs that interfere with the parasite's metabolism are related to quinine, the first known ant malarial drug. Quinine is a chemical derived from the bark of the South American cinchona tree and was used as a fever remedy by the ancient Inca in the 15th century. This drug has a bitter taste and produces sever side effects, such as nausea, headache, ringing in the ears, temporary hearing loss, and blurred vision, and large doses can be fatal. However, quinine is still sometimes used in treating malaria today, particularly in developing nations, because it is inexpensive and effective.

Chloroquine is a synthetic chemical similar to quinine. It became the drug of choice for malaria when it was developed in the 1940's because it was effective, easy to manufacture, lacked most of the side effects of quinine. However, in the last few decades, malaria parasites in many areas have become resistant to chloroquine. Presently, it is effective against malaria only in some parts of Central America and the Middle East. Mefloquine is another drug related to quinine that is still largely effective, but for many people, especially those living in developing nations; it is too expensive to use it routinely. The other important class of ant malarial drugs depends on a unique aspect of Plasmodium biology.

In order to copy its genetic material and reproduce, the malaria parasite must obtain compounds similar to the vitamin folic acid from its human host. Antifolate drugs, which prevent the parasites from properly metabolizing these compounds, inhibit the reproduction of the parasites. In recent years the parasites have developed resistance that diminishes the effectiveness of antifolate drugs when used individually. These drugs can still be effective when given in combination with each other or with other types of ant malarial drugs, because an individual malaria parasite is not likely to be resistant to multiple drugs. Combination drugs are very expensive, however, and are only used in particular severe cases of malaria.

CHAPTER THREE

3.0 Research Methodology

3.1 Research Design

This research was qualitative which aims more at finding out the way through which malaria can be controlled.

3.2 Area and Population of the Study

The research was conducted to the doctors, clinical officers and nurses in different hospitals located at Kilolo district, Iringa region- Tanzania. Some of the hospitals are Itunda Lutheran Hospital, Mwaya catholic hospital, Makosa dispensary and No. 8 hospital

3.3 Sample Selection

Different hospitals and dispensaries in Kilolo district were chosen on the basis of being near, easy to approach respondents with relevant information and also being old hospitals with good doctors/informants (experts). From each hospital one doctor or clinical officer or nurse was selected to give the information which was relevant and correct.

3.3.1 Instruments for Collecting Data

In this research, questionnaire, scheduled and direct interview was used as instruments for collecting data.

3.3.2 Procedures of Collecting Data

- Permission to collect data was obtained from the university and then the respective informants were requested to accept the researcher to conduct research in their hospitals.
- Copies of questionnaires were administered to the respondents.

- Participants or respondents were assured of their confidentiality, whereby a researcher stated clearly the aim of carrying research in each place.

The results of the study were critically analyzed and special consideration were on the results of the control measures of malaria. These were analyzed by looking at the number of patients admitted to the hospital since the control measures started to operate.

3.3.3 Data analysis

The results of the study were critically analyzed and special consideration was on the result of control measures of malaria. These were analyzed by looking at the number of patients admitted to the hospital since the control measure started to operate.

CHAPTER FOUR

4.0 Data analysis, presentation and discussion

4.1 Introduction

Malaria is an infection of blood caused by a protozoan of genus PLASIMODIUM: it is characterized by clinical fever which is often periodic with varying degree of anemia, spleen enlargement and various syndromes resulting from the physiological and pathological involvement of certain organ including the brain, liver and kidney.

4.2 Occurrence

Malaria is one of the wide spread disease of all parasitic diseases. It is found mostly in tropic area. In Tanzania malaria is the most common disease in temperate region. It accounts for many of all sick people (total morbidity), it is the most common disease seen at our patient department and hospital.

It accounts for many of deaths (total mortality) recorded in hospital. The geographic distribution depends on climatic condition necessary for the survival of the vector (the anopheles mosquito), the vector needs a humid climate, a warm average temperature and suitable breeding place.

4.3 The causative organism of malaria

Human malaria may be caused by the following species

1. *Plasmodium falciparum* (cause falciparum malaria)
2. *Plasmodium vivax* (cause vivax malaria)
3. *Plasmodium ovale* (cause ovale malaria)
4. *Plasmodium malariae* (cause malariae malaria)

Of all these infections the commonest and most important are those caused by *Plasmodium falciparum* and those caused by *Plasmodium vivax.*

4.4 Life cycle of malaria parasite

The life cycle of the parasite is essentially the same in all species of plasmodium.

The life cycle in mosquito (Sporogonic (Sexual)

In the mosquito, the plasmodium develops from sexual form (gametocytes) ingested by insect during blood sucking. The fertilized cell penetrates the stomach wall and develops beneath the lining membrane eventually becoming a large cyst within which appears the effective form of the parasite called Sporozoite.

The cyst raptures and sporozoites migrate to the salivary gland. The infected mosquito inserts sporozoites into the host during blood meals (sucking).

Life Cycle in Man (Schizogony/ Asexual Cycle)

The sporozoites rapidly disappear from the blood stream after infection (2 days). During the succeeding 5-7 days the parasite develops further in the cells of the liver called pre-erythrocytic cycle.

At the end of the process merozoites are thrown into the circulation and invade erythrocytes (RBCs) starting the asexual lifecycle or erythrocytic cycle which is repeated at regular intervals.

4.5 Pathology

The merozoites from the exo-erythrocytic schizonts invade the erythrocytes and continue dividing in erythrocytes. Then they burst out of the erythrocytes and invade new erythrocytes and they start dividing again. Pyrogen (toxins) is released causing fever.

The merozoites of *Plasmodium ovale* and *Plasmodium vivax* attack only young erythrocytes. Merozoites of Plasmodium malariae attack mainly old ages (old

erythrocytes). While the merozoites of Plasmodium falciparum erythrocytes of all ages (young and old).

Therefore with *Plasmodium falciparum* more RBCs are invaded thus causing a high parasite density in the body. In P. falciparum infection, the infected erythrocytes may clot together in the blood capillaries and in this way blood supply to the organ is distributed. The combination of high parasite density and severe signs make falciparum infection very dangerous.

4.6 Transmission of malaria

1. Malaria is transmitted by the female mosquito, the male do not suck blood. *Anopheles gambiae* breed in temporary water bodies expressed to sunlight (pods and puddles) which are mostly found during the raining seasons.

This mosquito is responsible for seasonal malaria transmission. But *Anopheles fenestus* breeds in permanent vegetation such as swamps and rice fields. This can transmit malaria all the time.

2. Other ways of transmission are through blood transfusion and congenital malaria (children born with malaria parasite).

4.7 Epidemiology in Tanzania

a) In some area transmission goes on throughout the year. Example are as around Lake Victoria.

b) Other areas are free from malaria because their climate conditions do not favor the survival of mosquitoes.

c) In some area malaria transmission occurs seasonally.

Note:

- When malaria transmission is observed throughout the year, we say it is holoendermic
- When it is lower hypoendermic.
- When there is high transmission hyperendermic.

4.8 Clinical features of malaria

Malaria is an acute disease. Patients usually present with fever, chills and profusion sweating. The clinical features of malaria vary from mild to severe, according to the species of the parasite present, the patient's state of immunity, the intensity of the infection and the presence of accompanying condition such as malnutrition anemia and other diseases.

Fever is the most common feature of malaria. It may persist for several days accompanied by headache, aching joints and general discomfort. The class presentation of malaria with high fever chills, shivering and sweating however may not occur. The onset of malaria symptoms may resemble a flu-like illness. In infant the early symptoms of malaria may be quite variable and difficult to recognize. They may be limited to poor appetite, restlessness and loss of normal interest in the surroundings. Some patients, especially children may present with a cough and vomiting and diarrhea.

In P. falciparum infections (which constitutes more than 90% of the cases Tanzania), the headache, nausea and vomiting are usually more severe than other malarial infections and there is a greater tendency towards the development delirium, haemolytic jaundice and anemia. The mortality is much greater than other forms of malaria. Those who survive but who have continuing infection as result of inadequate or no treatment may suffer several weeks or months of poor health. Anemia, weakness and febrile episodes are characteristics of these cases.

The above signs and symptoms are not specific for malaria and can be found in other disease conditions. Therefore, it is always necessary to find out other causes of illness.

4.9 Assessment of the patient

Clinical assessment

A detailed history should be taken and a thorough physical examination made in order to diagnose disease other than malaria. A careful assessment of a patient with suspected malaria is essential in order to differentiate between uncomplicated and severe disease. Laboratory investigations are done to complement clinical diagnosis. In health care facilities without laboratory services, diagnosis is based only on signs and symptoms.

Table 4.1 Distinguishing features of uncomplicated malaria in relation to age groups

Features	Less than five years	Older children and adults
Fever	Very Common	Less common
Headache	Less common	Common
Joint pains	Less common	Common
Malaise	Less common	Common
Vomiting/diarrhea	Very Common	Less common
Bodyache	Less common	Common
Poor appetite	Common	Common
Body weakness	Common	Common
Pallor	Very Common	Less common
Enlarged spleen	Common	Less common

The table above indicates that malaria has more effects on children compared to adults, as most of symptoms of uncomplicated malaria are very common to children less than five years. This is because children has lower body immunity compare to adults.

Table 4.2 clinical and laboratory features of severe malaria.

Clinical manifestation of severe *malaria*	Less than five years	Older children and *adults*
Behavioral changes	Common	Very Common
Prostration/extreme weakness	Very Common	Very Common
Coma	Very Common	Common
Respiratory distress	Very Common	Common
Convulsions	Very Common	Less common
Vomiting everything	Common	Less common
Inability to drink or breast feed	*Common*	*Less common*
Circulatory collapse/shock	Less common	Common
Pulmonary oedema	Less common	Less common
Bleeding tendency/DIC	Less common	Common
Jaundice	Less common	Very Common
Acute Renal Failure	Less common	Common
Haemoglobinuria	Less common	Common

This shows that severe malaria has more effects on children less than five years compared to adults, this is due to their lower body immunity

4.10 Prevention of malaria

Drainage of stagnant water; the larval stages of the mosquito live in stagnant water, so drainage removes breeding site. This has some success. However, the process is expensive and incomplete because rural population must ensure that ponds, small ditches and even containers holding water are not allowed to provide breeding places for mosquitoes.

Destruction of the breeding stages of the mosquito; the larvae and pupae of mosquitoes obtain their oxygen by means of small tubes which are pushed through the water surface film. Thus any method of blocking these tubes will result in the

death of the intermediate life stages of mosquito. The simplest method is a thin layer of oil spread over the water to block the breathing tubes

Destruction of adult mosquitoes; this is aimed at killing the mosquitoes that enter houses. Thus the indoor surfaces are sprayed for three years the cycle of man-mosquito-man can be disrupted.

The mosquito can be prevented from making contact with the human body by netting of windows and beds, since the insects are nocturnal.

Clearing bushes and vegetation around the village also is another way of controlling material because through this you destroy the breeding places of mosquitoes.

4.11 Management of uncomplicated malaria

The management of a patient with malaria will be determined by the clinical presentation and diagnosis of either uncomplicated or severe disease.

The objectives of treatment of uncomplicated malaria are:

- to provide rapid and long lasting clinical and parasitological cure
- to reduce morbidity including malaria related anemia
- to halt the progression of simple disease into severe and potentially fatal disease

In order to achieve these objectives, uncomplicated malaria must be diagnosed and the correct treatment administered without delay. Since the progression towards severe and fatal disease is rapid, especially in children under five years of age, it is recommended that diagnosis and treatment of uncomplicated malaria should be done within 24 hours from the onset of symptoms.

Clinical features of uncomplicated malaria

All health care providers should be able to recognize the following features of uncomplicated malaria:

- fever
- diarrhea
- headache
- joint pains
- malaise
- body weakness
- vomiting
- chest pains
- poor appetite
- anemia (mild to moderate)
- hepato-splenomegaly especially in children

4.12 Treatment of uncomplicated malaria using combination therapy

Combination therapy refers to the use of two or more antmalarial drugs with independent mode of action and different biochemical targets in the parasite, which are synergetic or addictive, or complementary in their effect.

Combination therapy can be either:

- Fixed combination therapy, where all components are co-formulated in a single tablet/capsule like Artemether-Lumefantrine (ALu)
- Co-administered therapy, where the components are simultaneously administered in separate tablets/capsules.

The aim of combination therapy is to improve, treatment efficacy and also delay the development of drug resistance.

Artmesinin-based combination therapy (ACT) refers to combination comprising of an artemisinin derivative and another antimalarial drug. Examples of artemisinin derivatives are artemether, artesunate and dihydroartemisinin. Artemisinin

derivatives are efficacious, safe and compatible. Some examples of partner drugs are Lumefantrine, Amodiaquine, Chlorproguanil-Dapsone and mefloquine.

Treatment of uncomplicated malaria with first line drug: ArtemetherLumefantrine
The first line drug for the treatment of uncomplicated malaria is Artemether-Lumefantrine

Drug description

Artemether-lumefantrine (ALu) is an oral fixed combination tablet of 20mg Artemether – a derivative of artemisinin and 120mg Lumefantrine. Artemether is effective against all human malaria parasite species. It has a rapid schizonticidal action against Plasmodium falciparum. Recrudescence is therefore frequent when it is used as a monotherapy. Lumefantrine is an aryl amino alcohol. It has a longer elimination half-life of up to 10 days and is associated with a low recrudescence rate, but has a slower onset of action. ALu therefore combines the benefit of the fast onset action of Artemether with the long duration of action and high cure rate of Lumefantrine in a single oral formulation. It is highly efficacious even against multi drug resistant malaria parasites with clearance of the parasites from the blood within 2 days.

Available formulations

Tablets: fixed formulation Artemether 20mg, Lumefantrine 120mg
Indications:

- First line treatment of uncomplicated malaria Contraindications:
- Hypersensitivity to either Artemether or Lumefantrine

Not recommended

- Children below 5kg body weight
- First trimester of pregnancy
- Lactating mothers with child below 5kg of body weight

Use of Artemether-Lumefantrine (ALu) in pregnancy and Lactation

Pregnancy

Presently, Artemether compounds cannot be recommended for treatment of malaria in the first trimester of pregnancy. However, they should not be withheld if treatment is considered to be life saving trimester for the mother and other anti malaria are considered to be unsuitable. In the first trimester (12 weeks of pregnancy) it is not recommended to take ALu at all. After the first trimester ALu tablets is first line medicine.

Lactation

No data is available on the excretion of either of the two compounds in breast milk. Due to the long elimination half-life of Lumefrantrine (up to 10 days), it is not recommended in mothers breast-feeding children below 5kgs. In this case quinine should be used. ALu can be used as first line treatment in lactating mothers if not suitable alternative is available.

Adverse effects of Artemether-lumefantrine (Alu)

While the overall incident of side effects to ALu is low, the common adverse effects reported include sleep disorders, headaches, dizziness, nausea, anorexia, abdominal pain, pririts, rash, cough, palpitation, artralgia and myalgia.

Artemether-Lumefantrine administration

- The first dose of artemether- lumefantrine should preferably be administered thehealth facility as direct observed treatment (DOT)
- When administering Artemether-lumefantrine, if the drug is vomited or spat within 30 minutes, the dose should be repeated.
- ALu should be taken with meals to enhance its absorption.

Table 4.3: dosage schedule of artemether 20mg & lumefantrine 120 mg (ALu) (Number of tablets recommended at approximate timing of dosing)

Day 1				Day2		Day 3	
Kg	Dose	1th	2th	3th	4th	5th	6th
	Hours	0 (*)	8	24	36	48	60
	Age	Tablets	Tablets	Tablets	Tablets	Tablets	Tablets
5 up to 15	3 months -8 years	1	1	1	1	1	1
15 up to 25	3 – 8 years	2	2	2	2	2	2
25 up to 35	8 -12 years	3	3	3	3	3	3
35 up to above	12 and above	4	4	4	4	4	4

(*) 0 hours means the time of starting medication.

For practical purposes, a simpler dosage regimen is recommended in order to improve compliance: the first dose should be given as DOT; the second dose should strictly be given after 8 hours; subsequent doses could be given twice dailly (morning - evening) in the second and third day of treatment until completion of 6 doses (see illustration above.)

Non response to ALu may be due to:

- . Vomiting the drug
- . Poor quality of the drug
- Inadequate dosage
- Fever/symptoms from a cause other than malaria
- Parasite resistance to the drug (rare)

Management of non-response to malaria treatment with ALu

Where a patient returns between 4 to 14 days after treatment with ALu complaining of continued symptoms of malaria, non-response should be considered and the following recommendations followed after a full history and examination:

- Where laboratory facilities are not available and malaria is still suspected treatment with quinine should be started immediately with strict follow up.
- Where laboratory facilities are available, blood smear (and not RDT) should be examined. If parasites are found treatment with quinine should be started and treatment failure recorded. If parasites are not found other causes for the symptoms should be sought and treated accordingly.

As far as possible malaria cases should be followed up on the third day if the symptoms persist or immediately if the condition worsens. Health workers should know where they could refer cases that fail to response to the recommended drug regimen for further investigations and appropriate management.

4.13 Management of fever

Patients with high fever (38.5°C and above) should be given an anti-pyretic drug paracetamol or aspirin every 4 to 6 hours (maximum 4 doses in 24 hours) the symptoms resolve, usually after two days. Children below 12 years should not be given aspirin because of the risk of developing Reye's syndrome.

Table 4. 4 treatment schedule for paracetamol (500mg) tablets

Dosage for children: 10 mg/kg BW

Age (years)	Weight (Kg)	Dose
2 month up to 3 years	4 up to 14	¼
3 up to 5	14 up to 19	½
5 up to 12	19 up to 35	1
12 up to 14	35 up to 45	1 ½
14 and above	45 and above	2

Treatment of malaria with second line drug: Quinine

Available formulation

- Tablets 300 mg
- Injection 600 mg in 2 mls
- Quinine hydrochloride syrup 100 mg/5ml

Indications

- Treatment of uncomplicated malaria where ALu is contraindicated
- Treatment of uncomplicated malaria where ALu has failed
- Drug of choice for treatment of uncomplicated malaria

1. In the first trimester of pregnancy,
2. In lactating mothers with children and below 5kg
3. In children under weighing below 5kg

Drug choice for treatment of severe malaria

Contraindications

- hypersensitivity to quinine
- optic neuritis
- myasthenia gravis

Use in pregnancy and lactation

Quinine is safe in pregnancy. In therapeutic doses not induce labor. Uterine contractions and fetal distress associated with the use of quinine, may be attributable to fever and effects of malaria disease. The risk of quinine induced hypoglycemia is however greater in pregnant woman than in non pregnant woman.

Dosage regimen

Treatment with quinine tablets (salt) should be given for 7-10 days at a dose of 10 mg/kg every 8 hours. Preferably the dose to be given should be calculated for each single patient according to the weight (not exceeding a maximum dose of 600 mg). The table 5 below is given for guidance when it is impossible to weight patients.

Table 4.5: Dosage schedule for malaria treatment using oral Quinine (salt, 300mg tablet) for different age groups

Dose: 10mg/kg body weight given every 8 hours for 7-10 days

Age (years)	Weight (kg)	Number of tablets
Up to 11 months	5 up to 11	¼
1 up to 5	11 up to 19	½
5 up to 8	19 up to 25	¾
8 up to 12	25 up to 35	1
12 up to 14	35 up to 50	1½
14 up to 16	50 up to 60	1¾
16 and above	60 and above	2

Non-response to quinine treatment

Refer the patient for thorough investigations and management.

4.14 Management of severe malaria

Sever Plasmodium falciparum malaria is a medical emergency. Delay in diagnosis and provision of appropriate treatment may lead to serious complications and even death. In Tanzania the commonest presentation of sever malaria are severe anemia and cerebral malaria.

FEATURES OF SEVERE MALARIA

Table 4.5.1: features of severe malaria

Clinical features	Description/ Criteria
Prostration/extreme weakness	Unable to stand or sit without support.
Impaired consciousness	Altered level of consciousness acute confusion state and coma.
Change of behavior	Hallucinations, delusions and agitation.
Convolution	Repetitive abnormal muscular movements
Respiratory distress (due to lactic acidosis and/ or pulmonary oedema)	Acidotic breathing deep and labored breathing pulmonary oedema,labored breathing/restlessness, blood strained frothy sputum especially in adults.
Bleeding tendency	Easy/prolonged bleeding
Jaundice	Yellow colorations of mucus membranes
Circulatory collapse/shock	Low systolic BP and fast pulse rate.
Vomiting everything	Throwing up after every feed/drink

Features shown due to severe malaria are very lethal and this marks the highest stage of infection in different parts and systems of the body. If the patient is not treated immediately, this may result into death. Therefore whenever on of the features above is shown from the patient, one should bear in mind that the patient is experiencing severe malaria and she/he should be treated immediately using quinine as a second line for treating malaria.

Table 4.5.2: clinical features and laboratory indices of severe malaria in adults and children and their prognostic values.

Features	Prognostic	
Clinical manifestation	Children	Adults
Behavioral changes	Less common	Less common
Prostration	Less common	Less common
Coma	Very common	Very common
Respiratory distress	Very common	Very common
Repeated convulsions	*Very common*	*Common*
Circulatory collapse/shock	Very common	Very common
Pulmonary oedema	Very common	Very common
Bleeding tendency	Very common	Very common
Jaundice	Common	Less common
Acute renal failure	Very common	Very Common
Haemoglobinuria	Less Common	Less common
Vomiting everything	Common	Common
Inability to drink or breast feed	Very common	Common

Clinical features and laboratory indices of severe malaria in table (4.5.2) shows that, severe malaria has more effects on children than in adult

Treatment of severe malaria

The drug of choice for treatment of severe malaria is parental Quinine preferably given by intravenous infusion.

4.15 Programs that have been addressed against malaria

There are initiatives or programs which have been addressed against malaria, the major ones are:-

1. The use of insecticide treated nets (INT)
2. Prescriptive treatment of malaria.

These programs focus on pregnant mother and children under 5kg of weight.

These are under high risk of being attacked by malaria, due to their low body immunity against malaria disease.

4.16 Line of treatment of malaria

1. The first line is ALu (Artemether - Lumefantrine)
2. The second line drug is where ALu has failed or contraindicated, is Quinine
    - the drug of choice for treatment of severe malaria is Quinine
    - the drug of choice for pregnant women during the first trimester and children weighing below 5kg is quinine.

4.17 Causes of the change of line of treatment and solutions

The following are the causes of change of line of treatment:

- Poor quality of drug
- Inadequate dosage
- Vomiting the drug
- Fever symptoms from a cause other than malaria
- Parasite resistance to the drug (rare)
- Age or state of patients, example children below 5kg of weight and pregnant mother (the first three months) the fist line treatment of malaria is Quinine instead of ALu.
- Body resistance to the drug.

Solutions

- Patients of malaria should be given adequate dosage according to the stage of infection
- Patients should be given drugs that have good quality (unexpired drugs)
- Patients blood should be tested in the laboratory so that to be sure if it is affected by malaria, before treatment.
- Where parasites show resistance to the drugs, another line of treatment should be used. For example, if the parasite becomes resistant to ALu, then Quinine should be given to the patient.
- When the patient can not swallow the drug intravenous injection should be used as the route of treatment.

Tables 4.6.0 to 4.6.3: show the number of patients who were admitted to different hospitals in Kilolo district, Tanzania since 2001- 2006.

Table 4.6.0: Mwaya catholic hospital.

	Age of the patient	
Year	Below 5 years	Above 5 years
2001	246	818
2002	301	586
2003	224	486
2004	257	506
2005	410	550
2006	361	607

Table 4.6.1 Itunda Lutheran health center

Year	Age of the patient	
	Below 5 years	Above 5 years
2001	252	821
2002	312	672
2003	212	502
2004	247	543
2005	505	541
2006	407	597

Table 4.6.2 NO8. DISPENSARY

Year	Age of the patient	
	Below 5 years	Above 5 years
2001	103	145
2002	221	252
2003	211	197
2004	314	225
2005	250	214
2006	298	198

Table 4.6.3. Makosa dispensary

Year	Age of the patient	
	Below 5 years	*Above 5 years*
2001	145	102
2002	252	205
2003	197	156
2004	225	198
2005	214	187
2006	198	211

The tables above explain the number of patients reported to the sampled hospitals as mentioned above in the indicated years. These patients were treated and recovered to the normal state of the body. This indicates that drugs for the treatment of malaria are effective. Also the tables above indicate that children are at higher risk of being affected by malaria than adults; this is because of their lower body immunity.

4.18 Complications associated with malaria

Due to the destruction of capillaries within the organs; the blood supply may be hindered resulting in severe complications such as

- **Cerebral malaria**

  This can rise over a period of days or may be suddenly. Mental disturbance, meningitis and coma are the symptoms of this complication

- **Kidney**

  Acute tubular necrosis due to anoxia resulting in anural with conquent Uraenua (nephritic syndrome)

- **Liver**

  This is malaria hepatitis with hepatogally and jaundice

- **Shock**

  Due to amount of toxins produced (toxic shock)

- **Spleen**

  The normal functioning of the spleen is to take away old and abnormal red blood cells. But due to the infection of many red blood cells, the spleen has to absorb a huge amount of cells and increase in size. Therefore spleen enlargement is the common finding in malaria.

CHAPTER FIVE

5.0: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1: Introduction

Malaria is an infection of blood caused by a protozoan of genus PLASIMODIUM: it is characterized by clinical fever which is often periodic with varying degree of anemia, spleen enlargement and various syndromes resulting from the physiological and pathological involvement of certain organ including the brain, liver and kidney

5.2: DISCUSSION.

All in all, in this study malaria has been discussed in terms of causative organism, mode of transmission, symptoms, prevention and management of severe and uncomplicated malaria.

Not only that, but also lines of treatment of malaria, cause of change of line of treatment and their solutions, effectiveness of the drug and programs addressed against malaria are also included so that to bring a clear and real picture about the disease, malaria.

This disease is very serious in case of morbidity and mortality. Many people have lost their lives due to this great killer disease, also human power keeps on reducing because of the effect of this disease, many people are in bed sick of malaria, and others are taking care of their patients in hospitals and at home.

Therefore people are spending a lot of time in this problem, rather than doing economic activities like farming. This leads to reduction of individual development and also affects the whole country economically.

Therefore let us be serious and concerned on eradicating this problem of malaria as much as we do and fear HIV/AIDS because malaria is the more killer disease than AIDS.

5.3: CONCLUSION.

Malaria was found to be caused by a protozoan organisms called plasmodium, the symptoms of malaria are headache, pain in joints, general body weakness, vomiting and fever; the mode of transmission of malaria parasite is by female anopheles mosquito during blood meals; whereby drainage of stagnant water, the use insect treated nets, clearing of bushes around home compounds are the key preventive measures of malaria and Artemether Lumefantrine (ALu) and quinine are the drugs of choice for treatment of malaria.

Poor quality of drugs, inadequate dosage, vomiting drugs, fever symptoms from a caused by other diseases, parasite resistance to the drugs, age or state of patients and body resistance to the drugs were the chief causes of change in line of treatment of malaria, whereby provision of adequate dosage according to the state of the body or age, laboratory diagnosis, the use of intravenous injections, provision of current drugs are the solution to the causes of change in line of treatment.

In addition to that, it was found that due to the destruction of capillaries within the organs, the blood supply may be hindered resulting into severe complications, such as, cerebral malaria, kidney problems, liver problems, shock and spleen complications, these contribute to the death of the patient.

5.4: RECOMMENDATION

According to this study I would like to recommend on the following cases;

Mass education

People should be given enough education about malaria and its serious effects.
Let the government try to do this in rural and urban places through experts and the focus should be more on how malaria can be caused and how can be controlled. Because it is very difficult to eradicate malaria if large percent of the societies are

not knowledgeable about malaria. Let us do this much more as we do in HIV/AIDS cases; it will be more helpful than any other ways.

Diagnosis

A long history should be taken from the sick people and then followed by laboratory diagnosis before treating any patient so that to be aware whether patient has severe malaria or uncomplicated malaria. So that right drugs to be administered to the right patient. Also incase, if the sick person is a woman the state of her health should be asked before treatment so that to know whether she is in trimester (in case she is pregnant); this will help a doctor or nurse to give her a right drug to her state.

Route of treatment

In case of patient fails to take tablets (oral route), intravenous treatment should be used to avoid the patient vomiting the drugs and interfere with the dosage.

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APPENDIX ONE

Questionnaire

Dear respondent

I'm Wesley Luyangi, a student of Kampala International University carrying out a research on Malaria and its control programs. This questionnaire seeks to get information on the topic mentioned above. The information to be collected is for academic purpose and will be kept confidentially.

Please feel free to provide the information.

Please feel in your particulars below:

First name .....

Other names .....

Sex.....

Age .....

Occupation .....

How many years have you been in field? .....

Full address .....

Phone number .....

Marital status.....

Questions

1. What are the causes, transmissions, symptoms and control measures of malaria.....
   .....
   .....
   .....
   .....
2. What are the drugs used in treatment of malaria?, are they effective?.....
   .....
   .....
   .....

APPENDIX TWO

LETTER OF PERMISION

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FACULTY OF EDUCATION

December 11, 2006

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

This is to introduce to you Mr. /Ms. WESLEY LUYANGI Registration No. BSE/1176/132/DF who is a student of our University in the Faculty of Education.

He/She is undertaking a research project which requires your input as part fulfillment for the completion of his/her programme of study.

I kindly request you to avail him/her with all the necessary assistance.

Thank You.

With kind regards,

OKIRIMA MICHAEL
DEAN, Faculty of Education
Kampala International University

"Exploring the Heights"

APPENDIX THREE

THE MAP OF CASE STUDY