INFLUENCE OF CHILD CARE PRACTICES ON MALARIA SEVERITY IN CHILDREN UNDER FIVE YEARS OF AGE IN MBEERE DISTRICT OF EASTERN PROVINCE, KENYA.

BY:

MWANIKI P. KABANYA (MPHE)

184/15165/04

DEPARTMENT OF PUBLIC HEALTH

A thesis submitted in fulfillment of the requirement for the degree of Doctor of Philosophy in Public Health in the School of Health Sciences of Kenyatta University.

May, 2010

DECLARATION

"This thesis is my original work and has not been presented for a degree in any other University or any other award"

MWANIKI PETER KABANYA

SIGNATURE_____ DATE_____

Supervisors

This thesis has been submitted after examination with our approval as University Supervisors

PROF EPHANTUS W. KABIRU
DEPARTMENT OF PATHOLOGY
KENYATTA UNIVERSITY

SIGNATURE_____DATE_____

DR ISAAC MWANZO
DEPARTMENT OF PUBLIC HEALTH
KENYATTA UNIVERSITY

SIGNATURE_____DATE_____

DEDICATION

This work is dedicated to my mother Mrs. Lillian Kabura John whose commitment to see me through the formative years of my education gave me the inspiration for continued learning. May the Almighty God bless her and add years into her life.

ACKNOWLEDGEMENT

My very special thanks go to my supervisors at Kenyatta University, Prof E. W. Kabiru, Chairman Department of Pathology and Dr. Isaac Mwanzo, Chairman Department of Public Health for their relentless efforts of guiding me through the long and sometimes lonely journey into the world of real academia. The manner in which they did this was extremely professional and with admirable patience.

I am particularly indebted to my family members for their continued love and moral support. My son Martin gave me excellent tutorials in computer applications and edited each draft of my work with unwavering motivation. I also wish to thank the nurses in Mbeere District health facilities that assisted me in the data collection exercise. I cannot name each one of them but may the Lord bless them in a mighty way. Finally, I thank the Almighty God for enabling me to accomplish this work.

ACRONYMS AND ABBREVIATIONS

AMD	–	Africa Malaria Day
AIDS	–	Acquired Immuno-Deficiency Syndrome.
ANOVA	–	Analysis of Variance
DDT	–	Dichloro-diphenyl Trichoroathane
DOMC	–	Division of Malaria Control (Kenya)
HBM	–	Health Belief Model
HIS	–	Health Information Systems
ITNs	–	Insecticide Treated Mosquito Nets
IPT	–	Intermittent Presumptive Treatment
IRS	–	Indoor Residual Spraying
IMCI	–	Integrated Management of Childhood Ilnesses
KDHS	–	Kenya Demographic and Health Survey
LLITNS	–	Long Lasting Insecticide Treated Nets.
MDGs	–	Millennium Development Goals
MOH	–	Ministry of Health (Kenya)
SSA	–	Sub-Saharan Africa
SqKm	–	Square Kilometres
SP	–	Sulphadoxine-pyrimethamine
SPSS	–	Statistical Package for Social Sciences
UN	–	United Nations
UNICEF	–	United Nations Children Education Fund
UNDP	–	United Nations Development Programme

OPERATIONAL DEFINITION OF TERMS

Caretaker

Caretaker is the prime person responsible for care of the child. In the case of this study the caretaker was defined as the parent (mother or father) or any other guardian of the child who was physically present with the child and seeking care for the same child at the health facility

Complicated malaria

This is a confirmed case of childhood malaria accompanied by fever, inability to feed, difficulty in breathing or history of convulsions.

Endemic

This is the habitual presence of a disease in a certain geographical area.

Fever

Fever is described as a condition where there is a rise in body temperature above the normal body temperature of 37.5 degrees C.

Home based care

This is the care that is extended to the home and community through family participation and community involvement.

Health Belief Model

This is a theoretical framework based on cognitive expectation that addresses the relationship between individual's health beliefs and behaviours.

Immunity

Refers to those processes which prevent infection, re-infection or super-infection, or which assist in destroying parasites or limiting their multiplication, or which reduce the clinical effects of infection.

Malaria severity

Malaria severity refers to the health facility diagnosis and classification of complicated malaria where the child presents with fever, a positive malaria test and one or more of danger signs.

Uncomplicated malaria

This is a **c**onfirmed case of malaria in the absence of any danger signs.

Roll Back Malaria

This is a Global Partnership initiated by WHO, UNDP, UNICEF and the World Bank in 1998. It seeks to work with governments, other department agencies, NGO's and private sector to reduce the human and socio-economic costs of malaria.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Malaria, a blood parasitic disease is a leading cause of mortality and morbidity particularly among children and pregnant women because they are most at risk in many developing countries, especially those in Sub-Saharan Africa. Most of the deaths due to malaria could be averted if care-takers recognized the signs and symptoms of malaria and instituted appropriate measures without delay. Early recognition followed by correct management is a key strategy for malaria control in endemic areas. The effectiveness of this strategy requires an understanding of care-seeking patterns including the actions the care-takers initiate in response to an episode of childhood febrile illness since they greatly influence the severity of the disease. A health facility-based descriptive cross-sectional study was carried out in Mbeere District (a malaria endemic area), where caretakers seeking treatment for their children aged under-five years who tested positive for malaria parasites were recruited into the study. The main objective was to determine health care practices during the illness and their effect on the severity of the illness. A questionnaire was used to collect primary qualitative data from caretakers. Additional qualitative data was obtained through focus group discussions with women groups in each of the study sites. The data was entered using Epi-Info interface and analysis done using the Statistical Package for Social Sciences (SPSS) version 12.0 software. Pearson's chi-square test of independence was used to determine level of associations at 95% confidence interval. The results established that the children had been unwell for mainly 2 days prior to health facility visit. The mean duration of illness for the children was 2.1 (S.D ±1.4) days. On diagnosis and classification of the illness at the health facility, 23.9% of all children seen had complicated malaria, 74.3% had uncomplicated malaria while 1.7% were not classified. There was no significant difference in severity of malaria among the different age groups of children (χ^2 = 2.32, p=0.67). Analysis of actions taken at home showed that 81.3% of the caretakers had taken one or more actions at home while 18.7% never took any action. The action of giving drugs was the most common (64.1%) followed by removal of excessive clothing (16.5%). Although caretakers were not able to accurately identify the specific drugs they gave to the sick children, they were able to report that the drugs were for a specific sign or symptom like drug to reduce fever, pain, drugs to treat malaria etc. Only 8% of the respondents reported having given an antimalarial drug at home. The variation on the caretakers' immediate action was also noted to be associated with the levels of education of the individual caretaker particularly in giving a drug (χ^2 = 15.900, P < 0.05), more fluids to the child (χ^2 = 4.322, P < 0.05) and doing nothing on first notice (χ^2 = 15.924, P < 0.05). All the caretakers with college education gave drugs on first notice that the child was unwell. There was also a significant association between caretakers' religion and occupation with the severity of malaria (χ^2 = 8.62, p = 0.01; χ^2 = 50.2, p=0.001) respectively. Among the Akorino sect, a significant 48.1% of the caretakers and slightly more than half (56.6%) of those in semi-skilled labour had their children diagnosed with complicated malaria. The association between feeding practices and severity of malaria was also significant. Among caretakers who gave food and fluids less frequently during the illness 25.8% and 34.7% of the children had complicated malaria (p=0.42 and 0.001) respectively.

CHAPTER ONE: INTRODUCTION

1.1 Background information

Malaria is a parasitic disease caused by an obligate intracellular protozoan of the genus *Plasmodium*. The disease is systemic, acute and sometimes severe and is a major public health problem since it is one of the biggest killers in the world (WHO, 2008). It is widespread in tropical and subtropical regions, including parts of the Americas, Asia, and Africa. Each year, there are between 300-500 million cases of malaria episodes, and at least one million deaths occur annually (WHO, 2000). It has been estimated that malaria is responsible for approximately 20% of all deaths among children less than five years in Sub-Saharan Africa (WHO, 2008).

In an effort to combat the growing threat of malaria, the Roll Back Malaria partnership was launched in 1998, with the aim of halving the burden of the disease by 2010 (RBMP, 2005). Combating the disease has been set as a high priority within the United Nations' Millennium Development Goals. In May 2002 the strategies for protecting children and pregnant women from malaria were also adopted by the UN which also declared 2001-2010 the "Decade to Roll Back Malaria'' in developing countries, particularly in Africa. Heads of state from across Africa also met in Abuja, Nigeria in 2000 to express their commitment to combating the disease (RBM, 2000). In Kenya, about 28 million people are at risk of being affected by malaria. It accounts for nearly 30-50 percent of outpatient visits and 20 percent of all admissions to health facilities (MOH, 2007a). Malaria remains the leading cause of death among young children and one of the most serious threats to the health of pregnant women and newborns (MOH,

2007a). It is estimated that about 26,000 children die of the infection every year and making it the leading cause of morbidity and mortality in the under fives and hence the greatest threat to the survival of this group (MOH, 2008).

Caretaker practices at home constitute major determinants of the outcome of the illness and complicated malaria may result from poor home management (Sirima *et. al,* 2003). A small number of small scale projects have demonstrated that community and home-based interventions based on training of care-givers, for example mothers to provide early diagnosis and treatment has great potential (Pagnoni, 1997). In a randomized controlled intervention that used mother coordinators in Ethiopia, a reduction by as high as 40% in childhood malaria mortality was demonstrated. From every group of 20 mothers, a coordinator was selected by the mothers themselves to be trained in early recognition and treatment of malaria. The trained mother coordinator passed on the knowledge to the other mothers who had selected her, and this improved the management of malaria at home (Kidane and Morrow, 2000). Other examples such as training of shopkeepers to recognize malaria and dispense appropriate drugs have also been shown to improve compliance with anti-malaria treatment and outcome of the disease (Marsh, 1999).

1.2 Problem statement

The cumulative human suffering and economic damage caused by malaria in Kenya is immense. Children and pregnant women are most at risk. The country is ranked 31st among countries with high under- five mortality rate which currently stands at 115 deaths per 1,000 live births. Among these deaths, an estimated 26,000 children (that is 72 per day) die from the direct consequences of malaria infection (MOH, 2008). Most the deaths occur at home, on the way to health facility or on arrival and before receiving adequate and appropriate therapy. An estimated 170 million working days are also lost each year as a result of the disease and the economy in general and the health sector in particular is burdened by the cost of drugs and treatment (MOH, 2008).

In Mbeere District, malaria ranks first among the top ten commonest diseases causing high morbidity and mortality. It accounts for nearly 30% of outpatient visits and 20% of inpatient admissions (HIS, 2008). The increased burden of the disease has been attributed to water- related projects and the changing climatic and ecologic conditions in the District. According to the Mbeere District Annual Health Report of 2007 prompt access to effective treatment for malaria is unacceptably low. Most of cases are initially managed at home and outside the formal health sector (HIS, 2007/2008). Some of the cases are usually severe at the point of presenting to the health facility (HIS, 2008). Whether the severity observed at the point of presentation is a function of initial child care management practices is not known. The interventions carried out at home and in the community need to be understood in order to strengthen those that are beneficial and discourage those that impact negatively on the outcome of malaria in children.

1.3 Justification for the study

Kenya is one of the 42 countries responsible for 90% of all under-five deaths in the world (Jones, 2003). The findings of the 2003 Kenya Demographic and Health Survey reveal that one in every nine children born dies before the age of five mainly of acute respiratory infections, malaria, diarrhea, measles and malnutrition. In the years between 1970 and 1990's infant and child mortality declined rapidly in Kenya as a result of the global initiatives to improve child health. For various reasons, this trend reversed and the result was that under-five mortality increased from 90 per 1,000 in 1990 to 112 in 1998 and 115 in 2003 (NCPD, 1994; NCPD, 1999; NCAPD, 2004). Given this worrying trends, there was a clear need to assess the caretaker practices in the management of childhood malaria in order to identify the gaps and design appropriate packages for intervention. The interplay between socio-demographic characteristics, behaviour of caretakers of the sick children and their impact on severity of illness need to be understood since the caretakers are the first source of management for the children. Appropriate home-based management of childhood malaria can reduce progression of the disease. This study provides information on these household malaria management practices among caretakers and their influence on severity of malaria among the under-fives in Mbeere district. The results will be used by policy-makers and health managers in designing algorithms for appropriate interventions at community level.

1.4 Research questions

i. What are the child care practices of caretakers during malaria illness?

ii. How do the practices relate with socio-demographic characteristics?

iii. How do the caretaker practices influence the severity of malaria in the children?

iv. What are the community's perceptions on malaria illness?

1.5 Null Hypotheses

1.5.1 Caretaker practices for under-fives diagnosed with malaria do not influence the severity of the illness in the children**.**

1.5.2 There is no relationship between socio-demographic characteristics of caretakers and malaria severity in children under five years of age.

1.6 Objectives

1.6.1 General Objective

To determine the caretaker practices during malaria illness, their influence on the severity of the illness in children under-five years of age and the community's perception on the illness.

1.6.2 Specific Objectives

i) To determine the practices of caretakers during child malaria illness.

ii) To assess how socio-demographic characteristics of caretakers relate with the practices.

iii) To determine the relationships between the caretaker practices and the severity of malaria illness in the children.

iv) To identify the community's perception on malaria illness.

1.7 Significance of the study and anticipated outputs

Recognition and early appropriate management of febrile illness in children is the basis of malaria control. While home-based management of fever caused by malaria has been identified as a key strategy for reducing morbidity and mortality in children, little is known about the home management practices regarding childhood malaria in Mbeere District. An understanding of the caretaker practices will form a good basis for developing an integrated community based programme focused on effective approaches of recognizing and providing prompt and appropriate management for childhood malaria.

1.8 Theoretical framework

This study was guided by the Health Belief Model (HBM) which is based on cognitive expectation. According to Rosenstoch (1974) and Becker and Maiman (1975), Health Belief Model addresses the relationship between a person's belief and behaviours (figure1.1). Human behaviour depends mainly on the value that an individual places on a particular goal and the individual's estimate of the likelihood that a given action will achieve that goal. The model provides a way of understanding and predicting how the clients will behave in relation to their health and how they will comply with health care therapies. People want to avoid illness or get well, and to believe that a specific

behaviour will prevent or reduce illness. The model encompasses the following major variables: health behaviour, illness behaviour and the sick-role behaviour. It suggests that the people's use of health services is a function of their predisposition to use of these services, factors which enable or impede the use and their need for care. Age and gender are presented as some of the demographic factors which influence a need for health services. The first component of this model involves the individual's perception of susceptibility to an illness. For example, the caretaker needs to recognize the vulnerability of young children to malaria illness in order to perceive the relative risk. The second component is the individuals' perception of the seriousness of the illness. This perception is influenced and modified by demographic and psychological variables, perceived threats of the illness and cues to action, for example, mass media campaigns and advice from family, friends and health professionals. The third component is the likelihood that an individual will take preventive action. This component results from the individuals' perception of the benefits of taking action and the barriers that are likely to hinder the individual from taking preventive action. Preventive action may include lifestyle changes, increased adherence to medical therapies or a search for health advice or treatment. The Health Belief Model helps health workers understand factors influencing client's perceptions, beliefs and behaviour to enable them plan for interventions that will most effectively assist clients in maintaining or restoring health and preventing illness.

Health Belief Model Framework

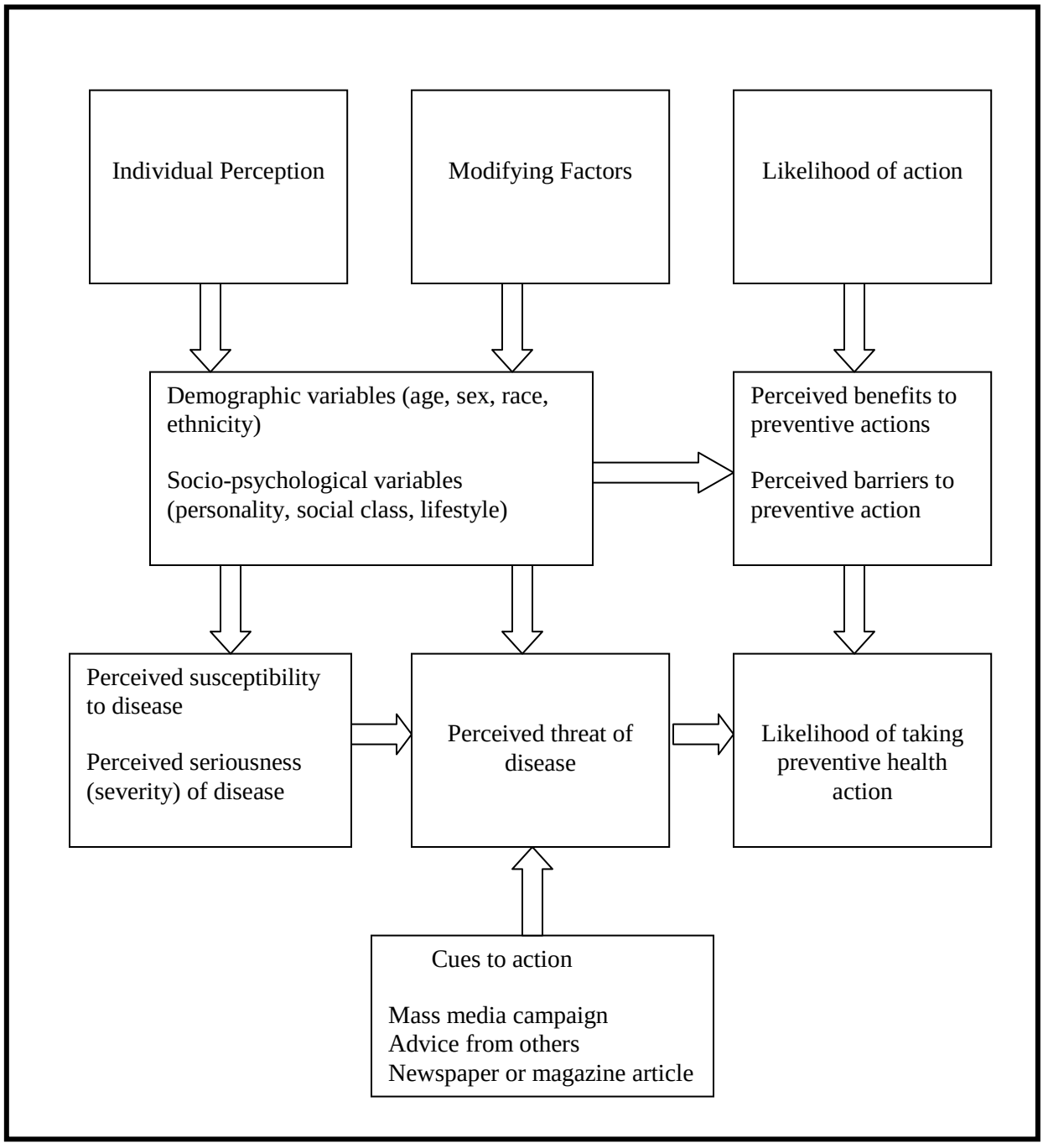


Figure 1.1: Diagrammatic presentation of Health Belief Model

(Source: Becker and Maiman (1974): Socio-behavioural determinants of compliance with health and medical care)

CHAPTER TWO: LITERATURE REVIEW

2.1 Malaria as a public health problem

Malaria is the world's most important parasitic disease that kills more people than any other communicable disease. The disease is ranked 4th among killer diseases and is endemic in 100 countries. Approximately 2 billion people (about 40% of the world's population are at risk of contracting the disease (WHO, 2008).

Malaria kills a child in Africa every 30 seconds and costs the continent 12 billion dollars every year in lost productivity. Consequently, malaria has been reported to slow the economic growth by up to 1.3 percent per year through death and lost hours of economic productivity as well as public funds and family income (AMD, 2008). While these estimates help to quantify the burden, to assess its impact on the health system and to make reasonable estimates of the necessary resources for treatment and prevention, they probably fall short of the real burden. As summarized by Breman (2001), the real burden of malaria is a challenge to quantify given that infections cover a wide continuum from asymptomatic parasitaemia in partially immune persons to acute catastrophic illness such as cerebral malaria that often lead to death. In addition, malaria case detection and reporting are often incomplete for several reasons. Surveillance and diagnostic systems are weak in many parts of Africa where malaria takes its highest toll. Many febrile illnesses in endemic countries mimic malaria and parasitologic confirmation of diagnosis is often not available or unreliable. Most diagnosis whether in clinics or at home is presumptive and is probably more accurately described as "febrile illness presumed malaria" rather than conclusively as malaria.

Despite efforts to reduce transmission and increase treatment, there has been little change in areas that are at risk of this disease since 1992 (Hay, 2004). Indeed, if the prevalence of malaria stays on its present upwards course, the death rate could double in the next twenty years. Precise statistics are unknown because many cases occur in rural areas where people do not have access to hospitals or the means to afford health care. As a consequence, the majority of cases are undocumented (Breman, 2001)

Malaria is presently endemic in a broad band around the equator, in areas of the Americas, many parts of Asia, and much of Africa; however, it is in sub-Saharan Africa where 90 percent of malaria fatalities occur (Layne, 2007). The geographic distribution of malaria within large regions is complex, and malaria-afflicted and malaria-free areas are often found close to each other (Greenwood, 2002). In drier areas, outbreaks of malaria can be predicted with reasonable accuracy by mapping rainfall (Grover-Kopec, 2005). Malaria is more common in rural areas than in cities globally (Van Benthem, 2005*)*. For example, the cities of Vietnam, Laos and Cambodia are essentially malaria-free, but the disease is present in many rural regions (Trung, 2004). By contrast, malaria in Africa is present in both rural and urban areas, though the risk is lower in the larger cities (Keiser, 2004). The global endemic levels of malaria have not been mapped since the 1960s. However, the Wellcome Trust, UK, funded the Malaria Atlas Project to rectify this, providing a more contemporary and robust means with which to assess current and future malaria disease burden (Hay, 2006).

There are several reasons why Africa bears an overwhelming proportion of the malaria burden. Most malaria infections in Africa south of the Sahara are caused by *plasmodium falciparum* , the most severe and life-threatening form of the disease. This region is also home to the most efficient and therefore deadly species of the mosquitoes which transmit the disease. Moreover, many countries in Africa lack the infrastructures and resources necessary to mount sustainable campaign against malaria.

Malaria's pervasive morbidity and high mortality persist because of failed transactions between those at risk of malaria transmission and available preventive and curative health systems (Barat, 2006). The consequence is not just an intolerable burden for individuals, their families and national health systems, but is also a devastating and continuing impediment to socio-economic development on the African continent (Humphreys, 2006). Unlike HIV, TB and the other major fatal communicable diseases in Africa, malaria deaths can be prevented by prompt treatment with relatively affordable and efficacious drugs, yet this goal continues to be elusive (Sachs, 2002). Malaria transmission can be reduced by preventing mosquito bites by use of mosquito nets and insect repellents and by mosquito control measures such as spraying insecticides inside houses and draining standing water where mosquitoes lay their eggs. The paradox of the continuing, but easily preventable cause of high mortality raises important questions for policy makers and health systems particularly in Africa (McCombie, 2000).

2.2 The global economic impact of malaria

Malaria places an enormous burden on the already overloaded health systems, as it accounts for approximately thirty percent (30%) of all outpatient clinic visits within endemic countries. It is commonly associated with poverty, but is also a cause of poverty and a major hindrance to economic development (Sachs, 2002). The disease has been associated with major negative economic effects on regions where it is widespread. It costs so much for any government to prevent and treat malaria. When most of the hospital beds are occupied by malaria-related illnesses as well as complications such as cerebral malaria, other needy patients have no space or patients have to share beds and other services. This lowers the quality of health care provision (Greenwood, 2002).

During the late 19th and early 20th centuries, malaria was a major factor in the slow economic development of the American southern states (Humphreys, 2001). A comparison of average per capita GDP in 1995, adjusted for parity of purchasing power, between countries with malaria and countries without malaria gives a fivefold difference ($1,526 USD versus $8,268 USD). In countries where malaria is common, average per capita GDP has risen (between 1965 and 1990) only 0.4% per year, compared to 2.4% per year in other countries (Sachs, 2002). Poverty is both cause and effect, however, since the poor do not have the financial capacities to prevent or treat the disease. The lowest income group in Malawi carries the burden of having 32% of their annual income used on this disease compared with the 4% of household incomes from low-to-high groups (Hay, 2006).

In its entirety, the economic impact of malaria has been estimated to cost Africa $12 billion USD every year. The economic impact includes costs of health care, working days lost due to sickness, days lost in education, decreased productivity due to brain damage from cerebral malaria, and loss of investment and tourism (Greenwood, 2005). In some countries with a heavy malaria burden, the disease may account for as much as 40% of public health expenditure, 30-50% of inpatient admissions, and up to 50% of outpatient visits. The extensive use of anti-malaria campaigns in recent decades seeks to address the relationships between the disease and poverty. Government subsidies and public healthcare providers if made available in closer proximity to all of the people can be efficient methods to reduce the cost of treatment for the poor and the rest of the social classes (WHO, 2006).

2.3 Occurrence and distribution of malaria in East Africa

2.3.1 East Africa

The risk of malaria in East Africa can be broadly categorized into four ecological zones as follows; Lakeside endemic: in many districts close to Lake Victoria, malaria transmission occurs throughout the year. The community acquires immunity before adulthood and the risks of disease and death from malaria is concentrated among children and pregnant women. Transmission is perennial and the parasite prevalence among children often exceeds 50%. Coastal endemic: the coast is similar in endemicity to the lakeshore with parasite prevalence's often exceeding 50%. However, the transmission and disease risk period exhibits stronger seasonality (Grover-Kopec, 2005). Highland: a

common feature of malaria in highland areas is that while there is always a potential for limited transmission, there is also an overall low risk of disease throughout the year. However, variations in rainfall and ambient temperatures between years can lead to epidemics affecting all members of the community. The prevalence is generally low in these areas. Arid, seasonal: this is where malaria is experienced by communities who live near water bodies (MOH, 2003).

2.3.2 Kenya

In Kenya, the level of endemicity of malaria varies from region to region due to geographical differences in altitude, rainfall and humidity. These factors influence transmission patterns, as they determine vector densities and intensity of biting. According to Kenya Demographic and Health Survey (2003), the country can be divided into four malaria zones: stable malaria (Nyanza, Coast and Western provinces), Seasonal malaria (Central, Eastern and North Eastern provinces), Highland prone malaria epidemics (mainly Rift Valley province and some parts of Central province) and malaria free (Nairobi and parts of Central province). *Plasmodium falciparum* is the most common form of malaria species in Kenya accounting for 98% of the cases (MOH,2003).

In a study carried out in Western Kenya in the period 1992-1994, blood smears were positive for *P. falciparum* in 88.3% of cases (Ruebush, 2005). Mixed infections of *P. falciparum and P. malariae* in older children have been reported in the same area (Bloland *et al.,* 1999). Though preventable, the disease remains the leading cause of death and illness especially among pregnant women and children aged less than five

years and accounts for about 30 percent of outpatient visits (MOH, 2007b). Kenya's Health Policy Framework of 1994 proposed strengthening of activities geared towards reduction of mortality and morbidity due to malaria. The Plan of Action for malaria control launched in 1994 proposed among other things strengthening of case management as one activity to be given high priority. Specifically, the plan proposed the need to develop guidelines for malaria diagnosis, treatment and prevention in view of the widespread development of resistance of the parasite to commonly used drugs available in the market.

A National Malaria Strategy (NMS) was developed and rolled out by the Division of Malaria Control in April, 2001. It contains four key strategic approaches to malaria control in Kenya: Case Management; guaranteeing people access to quick and effective treatment , providing malaria prevention and treatment to pregnant women, ensuring the use of insecticide treated nets (ITNS) and other vector control measures by the at risk communities and improving malaria epidemic preparedness and response. There are also two vital cross-cutting strategies required to support the above strategic approaches to malaria prevention and control: Information, Education and Communication and Monitoring, Evaluation and Research. Although these initiatives have yielded some positive results, the Roll Back Malaria objectives are far from being met (MOH, 2001).

2.4 The malaria parasites and life-cycle

Malaria is caused by protozoan parasites of the genus *Plasmodium*. Four species of the *Plasmodium* parasite infect humans and include *Plasmodium falciparum, P. vivax, P. malariae* and *P. ovale.* This group of human-pathogenic *Plasmodium* species is usually referred to as *malaria parasite*. There are morphological and biological differences between the four species but their life-cycles are similar. The most serious forms of the disease are caused by *Plasmodium falciparum* and *Plasmodium vivax* (Layne, 2007).

Human malaria parasites are transmitted to man by an infective female *Anopheles* mosquito during blood feeding and transmission is facilitated by the obligatory requirements for a blood meal for egg maturation. The infective female mosquito injects sporozoites into the blood stream, which in turn invade the liver cells within a period of 30 minutes to 4 hours. The parasites undergo a somatic cycle in the parenchymal cells of the liver (exoerythrocytic schizogony) with the subsequent release of liver merozoites. These merozoites are liberated into the blood stream where they invade red blood cells (Pates, 2005). The parasites undergo the schizogonic phase (erythrocytic schizogony) in the red blood cells from trophozoites through schizonts. On maturation the infected red blood cells rupture and release the merozoites. In *P. falciparum* infections, maturation of schizonts occurs in deep organs such as the placenta, brain, liver and spleen. After some generations in the blood, a number of merozoites differentiate into either

microgametocytes or macrogametocytes which are male and female sex cells, respectively. These gametocytes initiate the sexual cycle in the female mosquitoes (Trung, 2004).

When a suitable mosquito vector feeds on a human with circulating gametocytes, it ingests some of these gametocytes. In the mid-gut of the mosquito, the gametocytes develop into male and female gametes. Fertilization takes place and a zygote is formed. The zygote develops into a motile ookinete, which traverses the peritrophic membrane and lodges on the outer side of the mid-gut. The ookinetes ultimately develop into oocysts. Nuclear sub-division takes place inside the oocyst (sporogony) with formation of sporozoites, which are the infective stage in mosquitoes (Bloland, 1999). When the oocyst is mature it bursts open and releases the sporozoites into the haemolymph. The liberated sporozoites migrate towards the anterior end of the mosquito and lodge in the salivary glands. When the mosquito takes a blood meal, the sporozoites are inoculated into the human being and the cycle is repeated (Figure 2.1). Although rare, malaria parasites can also be transmitted by blood transfusion (Marcucci, 2004)

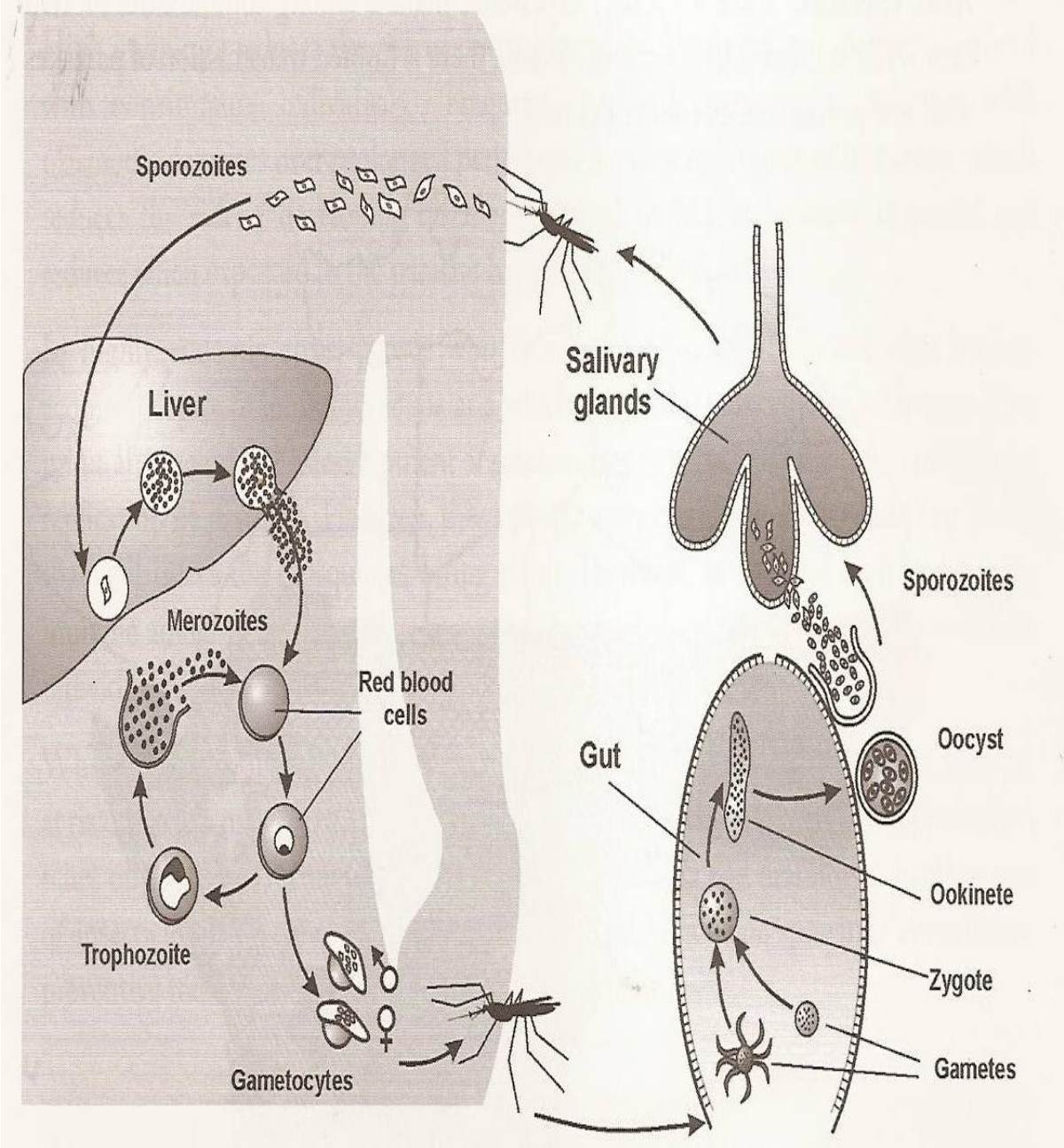


Figure 2.1: The life cycle of malaria parasite

Source: Community Health Manual by Chris Wood, 2008

2.5 Malaria vectors

The parasite's primary (definitive) hosts and transmission vectors are female mosquitoes of the *Anopheles* genus (figure 2.2). Only *Anopheles* mosquitoes can transmit malaria, and they must have been infected through a previous blood meal taken from an infected person. When a mosquito bites an infected person, a small amount of blood is taken, which contains microscopic malaria parasites. About one week later, when the mosquito takes its next blood meal, these parasites mix with the mosquito's saliva and are injected into the person being bitten (Bloland, 1999).

Figure 2.2: Anopheles mosquito the vector of malaria feeding on a human arm

Only female mosquitoes feed on blood, thus males do not transmit the disease. The females of the *Anopheles* genus of mosquito prefer to feed at night. They usually start searching for a meal at dusk, and will continue throughout the night until they take a meal. For a mosquito to transmit malaria, it must be of a species that allows complete

development of the malaria parasite and must have lived long enough in order for the sporozoites to have reached its salivary glands before the final bite (Holding, 2001). Although anophelines do vary in their susceptibility to parasites, experimental work has shown that many species which do not act as vectors of malaria in nature are efficient laboratory vectors. Other characteristics that influence the species importance as a natural vector of malaria include its habits and its average length of life. Prominent among the habits are host preferences and their close association with man. A female mosquito requires a blood meal to mature each batch of eggs and the meal may be obtained from man or other animals (Keiser, 2004).

Most species of *anopheles* show some order of preference for different hosts, but the source of the blood meal may at times be determined by simply by availability. A species is likely to be an important vector of malaria if it has a marked preference for human blood, readily enters houses at night to feed, rests indoors during the day and breeds close to houses. All of these characteristics ensure close contact between the species and man and a change in any one of them will tend to reduce such contact. Species that feed predominantly on man cannot however transmit malaria unless reasonable numbers live long enough for sporozoites to reach the salivary glands, a period of about 12 days for *P. falciparum* at tropical temperatures (Grover-Kopec, 2005).

The distribution of malaria is not uniform, due to geographical differences in altitude, rainfall and humidity. These geographical factors influence the transmission patterns as they determine the vector densities and intensity of biting. The higher the ambient temperature, the shorter the sporogony life cycle of the parasite in the mosquito (Hay, 2006). The continued existence of malaria in an area requires a combination of high human population density, high mosquito population density, and high rates of transmission from humans to mosquitoes and from mosquitoes to humans. Many countries are seeing an increasing number of imported malaria cases due to extensive travel and migration (Brinkmann, 1999).

2.7 Clinical manifestations of malaria

Symptoms of malaria include fever, shivering, arthralgia (joint pain), vomiting, anemia (caused by hemolysis), hemoglobinuria, retinal damage and convulsions (Beare, 2006). The classic symptom of malaria is cyclical occurrence of sudden coldness followed by rigor and then fever and sweating lasting four to six hours. For reasons that are poorly understood, but that may be related to high intracranial pressure, children with malaria frequently exhibit abnormal posturing, a sign indicating severe brain damage (Idro, 2006). Malaria has been found to cause cognitive impairments, especially in children. It causes widespread anemia during a period of rapid brain development and also direct brain damage. The neurological damage is as a result of cerebral malaria to which children are more vulnerable (Boivin, 2002; Holding, 2001).

Severe malaria is almost exclusively caused by *P. falciparum* infection and usually arises 6–14 days after infection (Trampuz, 2003). Consequences of severe malaria include coma and death if untreated—young children and pregnant women are especially vulnerable. Splenomegaly (enlarged spleen), severe headache, cerebral ischemia, hepatomegaly (enlarged liver), hypoglycemia, and hemoglobinuria with renal failure may occur. Renal failure may cause black water fever, where hemoglobin from lysed red blood cells leaks into the urine. Severe malaria can progress extremely rapidly and cause death within hours or days. In the most severe cases of the disease, fatality rates can exceed 20%, even with intensive care and treatment (Trampuz, 2003). In endemic areas, treatment is often less satisfactory and the overall fatality rate for all cases of malaria can be as high as one in ten (Mockenhaupt, 2004). Over the longer term, developmental impairments have been documented in children who have suffered episodes of severe malaria (Carter, 2005).

2.8 Malaria diagnosis and treatment

The commonly used confirmatory tests for malaria are microscopy and rapid diagnostic tests (RDTs). Microscopy is the standard method for parasitological diagnosis of malaria. This is done by examining a stained thick or thin blood smear for the presence of malaria parasites. Thick films are for parasite detection and quantification and can be used to monitor response to treatment. Thin films are for species identification. Rapid Diagnostic Tests are for immunochromatographic tests based on the detection of specific parasite antigens. Most of the RDT tests available are specific for *P .falciparum.* Use of RDTs is

not recommended for follow-up as most of the tests remain positive for up to two weeks following effective antimalarial treatment and clearance of parasites. They also cannot be used to determine parasite density (Para, 1991).

In high malaria endemic areas, any child under five years with fever or history of fever should be presumptively treated for malaria if laboratory diagnostic facilities are unavailable. The use of parasitological diagnosis is not a prerequisite for treatment. In low malaria endemic areas, any child with fever or history of fever in the absence of measles, running nose or any other identifiable cause of fever should be presumptively classified and treated for malaria. The use of parasitological diagnosis is however recommended in all cases where possible. Areas that cannot afford even simple laboratory diagnostic tests often use only a history of subjective fever as the indication to treat for malaria (Rooth, 2002).

A study conducted in Malawi using Giemsa-stained blood smears from children showed that unnecessary treatment for malaria was significantly decreased when clinical predictors (rectal temperature, nail bed pallor, and splenomegally) were used as treatment indications, rather than the national policy of using only a history of subjective fevers (sensitivity increased from 21% to 41%) (Redd, 2006).

Currently, malaria infections are treated through the use of antimalarial drugs such as quinine or artemisinin derivatives. The first effective treatment for malaria came from the bark of Cinchona tree, which contains quinine. This tree grows on the slopes of the

Andes, mainly in Peru. A tincture made of this natural product was used by the inhabitants of Peru to control malaria, and the Jesuits introduced this practice to Europe during the 1640s, where it was rapidly accepted (Kaufman, 2005). It was not until 1820 that the active ingredient, quinine, was extracted from the bark, isolated and named by the French chemists Pierre Joseph Pelletier and Joseph Bienaimé Caventou (MVM, 2007).

The current recommended first line treatment by WHO for uncomplicated malaria is artemether-lumefantrine, which is currently available as a co-formulated tablet containing 20mg of artemether and 120mg of lumefantrine. Artemisinin, the parent compound of the artemether component of coartem is derived from a plant called sweet wormwood (*Artemesia annua*). Its first recorded use was in China in 168 BC for the treatment of fever. In 1967, the Chinese Army screened more than 10,000 traditional remedies in the search for treatment of malaria for stricken soldiers in the Vietnam War. *Artemisia annua* proved successful and by mid-1970s, the active ingredient-artemesinin had been isolated and proved to be potent, rapidly acting antimalarial agent (Woodcrow *et al*., 2006*).*

No vaccine is currently available for malaria and preventive drugs must be taken continuously to reduce the risk of infection. These prophylactic drug treatments are often too expensive for most people living in endemic areas. Most adults from endemic areas have a degree of long-term infection, which tends to recur, and also possess partial

immunity (resistance); the resistance reduces with time, and such adults may become susceptible to severe malaria if they have spent a significant amount of time in non-endemic areas. They are strongly recommended to take full precautions if they return to an endemic area (D'Alessandro, 1998).

In addition to antimalarial drugs it is important that supportive management is provided particularly because of fever. The recommended options for the fever are paracetamol and ibuprofen. Aspirin may be used in adults, but is contraindicated in children because of the risk of gastric mucosa erosion. Other methods of reducing temperature include exposure, fanning or tepid sponging. Intake of adequate fluids and feeds is also encouraged. The fluids and the feeds should be administered as small quantities at frequent intervals, especially when the child is very sick (Baume, 2002).

2.9 Caretaker management practices

Improved understanding of the factors that influence malaria care seeking behaviour is necessary in order to enhance the effectiveness of malaria control strategies. Literature on malaria shows that most treatment for it takes place outside the formal health sector (Snow *et al.*,1995; Brinkmann and Brinkmann, 1999, Lipowsky *et al*., 2002 ; Agyepong, 2001 and Hougvivatana, 2004,). This is especially so for mild malaria and in poor, low literacy populations with inadequate health services (Mwenesi, 1995). Treatment takes the form of presumptive management of fever.

In the early 1990's, the World Health Organization (WHO) commissioned a review of literature on treatment- seeking behaviours for malaria. The results of this review showed that a great deal had been learned about malaria treatment behaviours, but there were several gaps in knowledge and understanding including quantification of actual drug intake and how provider behaviours impacted treatment- seeking behaviours (WHO, 1998).

A number of studies of care-seeking for malaria in Africa reviewed have been reviewed (McCombie, 2000). Many of these studies involve qualitative and sometimes quantitative analyses of data from illness narratives for recalling episodes of recent illness. Common themes emerge which can be summarized as follows: almost every study identified local community or folk perceptions, terminology or explanations of illness that overlapped with malaria disease in ways that distinguished fever, malaria and convulsions as distinct in aetiology and required treatment. Care-seeking patterns for simple fever or uncomplicated malaria were more likely managed initially at home while cases with convulsions or severe malaria were more likely to seek care from a health care practitioner. Cases with simple fever or uncomplicated malaria were more likely to seek formal, modern biomedical care and antimalarial drugs, while cases with convulsions were more likely to be managed by traditional healers or traditional practices, as well as biomedical care (McCombie, 2002).

Health care seeking behaviour in many Sub-Saharan African Countries can be a complex process influenced by cultural beliefs, socio-economic and other factors. Recent studies

indicate that care givers from Kenya and Ghana tend to be well informed about the major symptoms of malaria compared to their counterparts in Tanzania (Agyepong 2001, Ahorln, *et al*; 2001, Rooth and Bjorkman, 2002*).* Knowledge and treatment seeking behaviors in areas where malaria transmission is infrequent but can occur at epidemic proportions may be different from that existing in areas with seasonal or perennial transmission of malaria (Lindblade *et al*. , 2003). However, even in places where people have good knowledge of symptoms and causes of the disease, there is evidence that individual and structural barriers prevent people from seeking prompt and effective treatment.

In Zambia, studies carried out in regard to patterns of care at home showed that most children with symptoms of convulsions are taken to the health centre (Baume, 2002).
The patterns of treatment seeking behaviour for malaria have also been reviewed by Tanner and Ulassoff (1998). They noted that the choice of treatment was affected by factors such as access to services, severity of the disease, attitude towards providers and beliefs about the disease. Studies conducted in Ghana and Tanzania indicated that a significant proportion of care-givers perceived uncomplicated malaria to be a mild disease (Hansmann and Muela , 2000 ; Ahorln and Dunyo , 2001).

Mothers' treatment practices at home may constitute major determinants of the outcome of the illness and complicated malaria may result from poor home management (Sirima *et al*. , 2003). A small number of small scale projects have demonstrated that community and home-based interventions based on training of care-givers, for example mothers to

provide early diagnosis and treatment have great potential (Pagnoni, 1997). For example, a significant decline in overall child mortality has been documented in a situation where a community health nurse and a village health worker delivered primary health care in a village.

A reduction of as high as 40% in childhood mortality was also demonstrated in a study that used mother coordinators in a randomized controlled community intervention in Ethiopia (Kidane and Morrow, 2000). Other examples such as training of shopkeepers to recognize malaria and dispense appropriate drugs have also been shown to improve compliance with anti-malaria treatment (Marsh, 1999). Studies in Ghana revealed that 22 percent of care-givers took appropriate action for malarial illness in children within 24 hours, but only in 15% of those using medicines gave a correct dose at the correct time (Agyepong, 2002).

In a study of malaria in a rural area of Western Kenya, study subjects were generally well informed about the symptoms of the disease. Malaria was perceived as a relatively mild illness, much less than Acquired Immuno-Deficiency Syndrome (AIDS), measles, difficulty in breathing and diarrhoea. Self treatment was extremely common. Out of 138 episodes of febrile illness, 60% were treated at home with herbal remedies or medicine purchased at local shops and only 18% received treatments at a health centre or hospital; no treatment was sought by the remainder. Attendance at a health centre did not ensure adequate treatment because of the common practice of sharing medication among family members (Ruebush, 2005).

2.10 Malaria control and prevention strategies

Efforts to control malaria have included development of anti-malarial drugs and an effective vaccine. Growing political commitment by leaders for action on malaria was given a boost by the founding of the Roll Back Malaria (RBM) global partnership in 1998 with the aim of halving the burden of the disease by 2010. Less than two years later, African Heads of State and their representatives met in Abuja, Nigeria to translate RBM's goal of halving the malaria burden by 2010 into tangible political action (WHO, 1998). The Abuja Declaration, signed in April 2000 endorsed a concerted strategy to tackle the problem of malaria across Africa. The Abuja Declaration endorsed RBM's goal and established a series of interim targets for the number of people having access to treatment, protective measures or, in the case of pregnant women, receiving intermittent preventive treatment to ensure that progress would be made towards the goal and malaria endemic countries and other RBM partners held responsible (WHO, 2000).

Combating malaria has also been set as a high priority within the United Nations' Millenium Development Goals (MDGs). In May 2002 the strategies for protecting children and pregnant women from malaria were also adopted by the UN which has also declared 2001-2010 the "Decade to Roll Back Malaria" in developing countries particularly in Africa. Current malaria preventive strategies include residual indoor spraying in malaria endemic areas, screening of residential dwellings, use of mosquito repellants, improving drainage systems, clearing surroundings, provision of prompt and

effective treatment and free long lasting insecticide treated nets (LLITNS) to expectant mothers and children aged less than five years. Unlike previous attempts to eradicate malaria, RBM emphasizes efficacious and cost-effective control strategies and promotes use of local capacities and health systems.

Many researchers argue that prevention of malaria is more cost-effective than treatment of the disease in the long run, but the capital costs required are out of reach of many of the world's poorest people. It has been argued that, in order to meet the Millennium Development Goals, money should be redirected from HIV/AIDS treatment to malaria prevention, which for the same amount of money would provide greater benefit to African economies. The distribution of funding varies among countries (Hull, 2006)

Brazil, Eritrea, India, and Vietnam have, unlike many other developing nations, successfully reduced the malaria burden. Common success factors included conducive country conditions, a targeted technical approach using a package of effective tools, data-driven decision-making, active leadership at all levels of government, involvement of communities, decentralized implementation and control of finances, skilled technical and managerial capacity at national and sub-national levels, hands-on technical and programme support from partner agencies, and sufficient and flexible financing (Barat, 2006)

The Kenya government designed a National Malaria Control Strategy 2001-2010 in response to the challenge (MOH, 2001). The Strategy which was rolled out in April 2001 assembles an evidence-based plan of action derived from Ministry of Health working papers and guidelines for case management, insecticide treated nets, malaria in pregnancy and malaria epidemics. It blueprints an enabling environment that is supposed to ensure coordinated, multilateral, national response that harnesses Roll Back Malaria and reflects Kenya's policies on health sector reforms and poverty alleviation. There are four strategic approaches that have been spelt out in the National Malaria Control Plan. These include: guaranteeing all people access to quick and effective treatment to significantly reduce illness and death from malaria, providing malaria prevention measures and treatment to pregnant women, ensuring use of insecticide-treated nets by at-risk communities to significantly reduce rates of disease and to improve epidemic preparedness and response (MOH, 2001).

According to the second National Health Sector Strategic Plan (NHSSPII) 2005-2010, malaria has been ranked as one of the high priority problems in the Kenya Essential Package for Health (KEPH). The Ministry of Health developed and launched a Community Strategy on 22 June 2006 in order to provide a policy guide for the delivery of the Essential Package at community level. The community-based approach set out in the Community Strategy is the mechanism through which households and communities can take an active role in health and health related issues. Through KEPH, it is envisioned that households and communities will be effectively involved and enabled to increase control over their environment in order to improve their own health status

(MOH, 2007b). This paradigm shift requires a fundamental change in the way things are governed and managed as well as how services are delivered

2.10.1 Vector Control

Before DDT, malaria was successfully eradicated or controlled also in several tropical areas by removing or poisoning the breeding grounds of the mosquitoes or the aquatic habitats of the larva stages, for example by filling or applying oil to places with standing water. These methods have seen little application in Africa for more than half a century (Killeen, 2002).

Efforts to eradicate malaria by eliminating mosquitoes have been successful in some areas. Malaria was once common in the United States and southern Europe, but the draining of wetland breeding grounds and better sanitation, in conjunction with the monitoring and treatment of infected people eliminated it from affluent regions. In 2002, there were 1,059 cases of malaria reported in the US, including eight deaths. In five of those cases, the disease was contracted in the United States. Malaria was eliminated from the northern parts of the USA in the early twentieth century, and the use of the pesticide DDT eliminated it from the South by 1951. In the 1950s and 1960s, there was a major public health effort to eradicate malaria worldwide by selectively targeting mosquitoes in areas where malaria was rampant (Gladwell, 2002). However, these efforts have so far

failed to eradicate malaria in many parts of the developing world and the problem is most prevalent in Africa.

Sterile insect technique is emerging as a potential mosquito control method. Progress towards transgenic, or genetically modified, insects suggest that wild mosquito populations could be made malaria-resistant. Researchers at Imperial College London created the world's first transgenic malaria mosquito (ICL, 2000). The first plasmodium-resistant species was announced by a team at Case Western Reserve University in Ohio in 2002 (Ito, 2002). Successful replacement of existent populations with genetically modified populations, relies upon a drive mechanism, such as transposable elements to allow for non-Mendelian inheritance of the gene of interest. However, this approach contains many difficulties and 34% of the malaria research and control community say that such an approach is not feasible. Furthermore, such an approach is at least 5 to 10 years away from introduction and the progress which has been made in developing a vaccine could influence further research in genetic modification of malaria mosquitoes negatively.

2.10.2 Indoor residual spraying

Indoor residual spraying (IRS) is the practice of spraying insecticides on the interior walls of homes in malaria affected areas. After feeding, many mosquito species rest on a nearby surface while digesting the blood meal, so if the walls of dwellings have been

coated with insecticides, the resting mosquitoes will be killed before they can bite another victim, transferring the malaria parasite.

The first and historically the most popular insecticide that has been used for IRS is Dichloro-diphenyl Trichoroathane (DDT). While it was initially used exclusively to combat malaria, its use quickly spread to agriculture. In time, pest-control, rather than disease-control, came to dominate DDT use, and this large-scale agricultural use led to the evolution of resistant mosquitoes in many regions. If the use of DDT was limited agriculturally, DDT could still be a more effective insecticide for controlling mosquitoes. The DDT resistance shown by *Anopheles* mosquitoes can be compared to antibiotic resistance shown by bacteria. The overuse of anti-bacterial soaps and antibiotics have led to antibiotic resistance in bacteria, similar to how over-spraying of DDT on crops have led to DDT resistance in Anopheles mosquitoes. During the 1960s, awareness of the negative consequences of its indiscriminate use increased ultimately leading to bans on agricultural applications of DDT in many countries in the 1970s. Though DDT has never been banned for use in malaria control and there are several other insecticides suitable for IRS, some advocates have claimed that bans are responsible for tens of millions of deaths in tropical countries where DDT had once been effective in controlling malaria. Furthermore, most of the problems associated with DDT use stem specifically from its industrial-scale application in agriculture, rather than its use in public health (Rosenberg, 2008).

The World Health Organization (WHO) currently advises the use of 12 different insecticides in IRS operations. These include DDT and a series of alternative insecticides (such as the pyrethroids, permethrin and deltamethrin) to both combat malaria in areas where mosquitoes are DDT-resistant, and to slow the evolution of resistance (WHO,2006). This public health use of small amounts of DDT is permitted under the Stockholm Convention on Persistent Organic Pollutants (POPs), which prohibits the agricultural use of DDT. However, because of its legacy, many developed countries discourage DDT use even in small quantities (Rosenberg, 2008).

One problem with all forms of Indoor Residual Spraying is insecticide resistance via evolution of mosquitoes. According to a study published on mosquito behavior and vector control, mosquito breeds that are affected by IRS are endophilic species which tend to rest and live indoors and due to the irritation caused by spraying, their evolutionary descendants are trending towards becoming exophilic species which tend to rest and live out of doors (Pates, 2005).

2.10.3 Mosquito nets

Mosquito nets help keep mosquitoes away from people, and thus greatly reduce the infection and transmission of malaria. The nets are not a perfect barrier, so they are often treated with an insecticide designed to kill the mosquito before it has time to search for a way past the net. Insecticide-treated nets (ITN) are estimated to be twice as effective as untreated nets (Hull, 2006) and offer greater than 70% protection compared with a situation where nets are not used (Bachou, 2006). Although ITN are proven to be very

effective against malaria, less than 2% of children in urban areas in Sub-Saharan Africa are protected by ITNs. Since the *Anopheles* mosquitoes feed at night, the preferred method is to hang a large "bed net" above the center of a bed such that it drapes down and covers the bed completely.

The distribution of mosquito nets impregnated with insecticide (often permethrin or deltamethrin) has been shown to be an extremely effective method of malaria prevention, and it is also one of the most cost-effective methods of prevention. These nets can often be obtained for around US$2.50 - $3.50 (2-3 euro) from the United Nations and the World Health Organization. Insecticide Treated Nets have been shown to be the most cost-effective prevention method against malaria and are actively part of World Health Organization’s achievement of Millennium Development Goals (WHO, 2006).

For maximum effectiveness, the nets should be re-impregnated with insecticide every six months. This process poses a significant logistical problem in rural areas. New technologies like Olyset or DawaPlus allow for production of long-lasting insecticidal mosquito nets (LLINs), which release insecticide for approximately 5 years, and cost about US$5.50. Insecticide Treated Nets (ITNs) have the advantage of protecting people sleeping under the net and simultaneously killing mosquitoes that contact the net. This has the effect of killing the most dangerous mosquitoes. Some protection is also provided to others, including people sleeping in the same room but not under the net (WHO, 1998).

Unfortunately, the cost of treating malaria is high relative to income, and the illness results in lost wages. Consequently, the financial burden means that the cost of a mosquito net is often unaffordable to people in developing countries, especially for those most at risk (Hull, 2006). Although shipped into Africa mainly from Europe as free development help, the nets quickly become expensive trade goods that are used for other purposes like fishing. Nets are also often distributed though vaccine campaigns using voucher subsidies, such as the measles campaign for children. Voucher subsidies are an effective way of getting protective nets to those who cannot afford them off the market. A study among Afghan refugees in Pakistan found that treating top-sheets and chaddars (head coverings) with permethrin has similar effectiveness to using a treated net, but is much cheaper (Rowland *et al*. , 1999).

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study design

This was a health- facility based descriptive study where four hundred and one (401) caretakers of children under five years of age and diagnosed with malaria illness were sampled and interviewed from the child welfare clinic and the outpatient departments of selected health facilities. On presentation to the clinic, history on the sickness was obtained and corroborated with the clinical presentation. Diagnosis and classification of the malaria was then done after a positive Rapid Diagnostic Test. The caretaker was then enrolled for interview. A pre-coded questionnaire was administered only to consenting caretakers in order to obtain both qualitative and quantitative data. Additional qualitative information was obtained through focused group discussions with groups of women who also comprised the Community Health Workers.

3.2 Study Variables

3.2.1 Independent Variables

Independent variables included age of care taker, marital status, education level, religion, occupation and estimated distance from home to the health facility.

3.2.2 Dependent Variables

The dependent variables included presence of illness in child, presenting clinical manifestations, laboratory confirmation of malaria, severity of illness, response of caretakers on recognition of illness, perceived access problems to health services, reasons for choice of source of help and malaria perceptions

3.3 Study location

Mbeere District is one of the twelve districts of Eastern Province,Kenya. It shares common borders with Embu District to the north-west, Tharaka-Nithi to the north, Mwingi District to the east, Machakos District to the South and south-east and Kirinyaga District to the west. The district lies between latitudes 0º 20’ and 0 º 50’ South and longitude 37 º 16’ and 37 º 56’ east. It has a total area of 2097 km square and is divided into four administrative divisions, fifteen locations and thirty sub-locations (Appendix 6). The administrative divisions include: Gachoka (806 sqkm), Mwea (508 sqkm), Evurori (419 sqkm) and Siakago (364 sqkm).

The district slopes in a north-west to south-east direction. Its altitude is around 1200 metres above sea level. The slope is however broken by existence of a few hills such as Kiambere, Kiangombe and Kianjiru which rise above this general height. The southern part of the district is covered by the Mwea plains. The district is served by five permanent rivers which include Tana, Rupingazi, Thuci, Thiba and Ena, all of which flow on a general south-easterly direction. It is also home to several hydro-electric power generating dams and the Mwea irrigation scheme. Based on the 1999 National Population Census, the district has a population of 196,173. The density of the districts population is estimated at 89 persons per square kilometre and it varies from one place to the other depending on the land productivity (DDP, 2007/2012).

There are 26 health facilities comprising of one district hospital one sub-district hospital, four health centres and twenty dispensaries. The top ten commonest diseases/conditions

in the district include: malaria, acute respiratory infections, diarrhoeal diseases, skin infections, intestinal worms, eye infections, pneumonia, ear infections, urinary tract infections and typhoid (as shown in table on outpatient morbidity of the year 2007/2008). The key health challenges include low uptake of intermittent presumptive treatment for malaria, inadequate prevention of maternal to child transmission/ voluntary counseling testing services, unmet target for the coverage of insecticide treated mosquito nets and low deliveries by skilled attendants.

Other challenges include inadequate postnatal- natal care services, low immunization coverage, high morbidity and mortality rate for under fives, inadequate comprehensive school health programmes, low vitamin A coverage and inadequate Community Based Rehabilitation coverage (HIS, 2007).

3.4 Study population

The study population comprised of caretakers of children under- five years of age and diagnosed with malaria at the selected health facilities. Women groups, majority of whom were in the reproductive age group of 15-49 years were also included in focused group discussions.

3.5 Sampling procedure

Study sites were identified from among the public health facilities within Mbeere District. The sampling frame consisted of all the public health facilities within the study area. The average monthly attendance of the OPD/MCH clinics in each facility was obtained. Selection of the study sites was then done through purposive sampling of the

facilities with the highest average attendance of children under five years in each administrative unit and their ability to carry out Rapid Diagnostic Testing for malaria.

After the selection of the study sites, each was allocated a proportionate number of study subjects based on the level of health care delivery system and the average client attendance in the past one month before embarking on the study. To minimize bias in selecting study subjects, every alternate caretaker who satisfied the inclusion criteria was selected for interview. Immediately after selection, the respondents were referred to a trained interviewer who interviewed the client using a semi-structured questionnaire. Only clients seeking curative services for their children with malaria were selected for interview. The day of going to the facility was randomly selected from amongst the five working days of these facilities. Entire selection and interviewing of study subjects was carried out over a period of five (5months).

3.6 Sample size

The sample size was determined by the formula shown below as used by Fischer *et.al.,(*1983) :

$$n = \frac{Z^2pq}{d^2}$$

Where n = desired minimum sample size of caretakers who were to be interviewed (when population is greater than 10,000);

Z = reliability coefficient at alpha (0.05) level of significance, which is 1.96

p = Prevalence of the issue under study (*in* this case the estimated proportion of caretakers seeking treatment for their children with

malaria illness) p was estimated to be 50% [0.5] in order to yield the highest sample size,

q = 1-p = 1 - 0.5 = 0.5

d = degree of precision desired (5%) =0.05

By substitution, therefore,

$$n = \frac{(1.96)^2 \times 0.5\,(1-0.5)}{0.5} \quad \frac{(1.96)^2 * 0.5\,(0.5)}{(0.05)^2} = 385$$

3.7 Eligibility criteria

The respondents included in the study were as follows ;

1) A caretaker of a child aged less than five years who tested positive for malaria parasite by use of Rapid Diagnostic Testing. The caretaker was defined as the parent (mother or father) or any other guardian of the child who was physically present with the child and seeking care for the same child at the health facility.
2) A caretaker who gave informed verbal consent to be interviewed after having been explained the nature and purpose of the study.

3.8 Data collection procedures

Data collectors were recruited from the district and the minimum qualification was successful completion of fourth form. They were trained on the aims and objectives of the study and data collection tools. The training principally consisted of a discussion on all survey tools and adjustments where necessary.

3.8.1 Piloting

After the training, the researcher and data collectors piloted the questionnaire at one of the health facilities (Kiambere Dam Dispensary). This health facility was subsequently excluded from the survey. The pre-test yielded a few sequencing issues that were corrected in the final tool.

3.8.2 Qualitative methods

To supplement the quantitative data from individual respondent interviews, five in-depth focus group discussions were conducted with women groups and community health workers in the proximity of each health facility selected. Each group consisted of between 8 and 10 participants with the principal investigator leading the discussions and another trained interviewer taking notes. A focus group discussion guide was used to lead the discussion.

3.8.3 Quality controls

The researcher was responsible for the overall coordination and conduct of the research. The researcher trained and supervised all interviewers in order to reduce errors and bias in data collection. All questionnaires were scrutinized for consistency and completeness before data entry.

3.9 Data analysis

Data entry and analyses were performed using EPI-info 6.04b, Microsoft Excel 7.0 and Statistical Package for Social Sciences (SPSS) Version 12.0. The descriptive results were presented in form of graphs, tables, figures, proportions and measures of central tendency including means and frequency distributions. Pearson's Chi-square tests of independence

was used to determine the level of associations between caretaker practices and severity of malaria at 95% confidence interval.

3.10 Ethical considerations

The initial proposal was also reviewed and approved by the Kenyatta University Board of Graduate Studies Committee. Overall permission to conduct the research was sought from the Government of Kenya through the Ministry of Science and Technology and further clearance given by the Ministry of Health.

Participants selected to participate in the research were requested to give a verbal consent for the interview. For those who declined to participate in the study, their views were respected and this did not negatively influence the quality of care given to their children in the health facility. To ensure confidentiality, participants were not required to indicate their names on the study tools. Only a field code was used to identify the study questionnaire. All the filled questionnaires were handed over to the researcher after data collection for safe storage, data entry and analysis.

CHAPTER FOUR: RESULTS

4.0 Introduction

A health facility-based descriptive cross-sectional study was carried out in Mbeere District (a malaria endemic area), where four hundred and one (401) consenting caretakers of children under- five years and diagnosed with malaria illness were interviewed to determine their socio-demographic characteristics, their health care practices during the child illness and how the practices influenced the severity of malaria. A total of five Focus Group Discussions with groups of women were also conducted to identify community perspectives on childhood malaria. Pearson's Chi-square tests of independence was used to determine the level of associations at 95% confidence interval. The study yielded the following results which are presented in form of narrative texts, tables, figures, charts and measures of central tendency.

4.1 Socio-demographic characteristics of the study population

4.1.1 Age distribution of the children

Table 4.1 Age distribution of children in months

Age of child in months	**Frequency**	**Percentage**
< 10 months	113	28.2
11-20 months	136	33.9
31 – 40 months	88	21.9
41 – 50 months	36	9.0
51 – 60 months	28	7.0
Total (n)	**401**	**100%**

Most of the children were in the age group 11-20 months (33.9%) followed by those in the age group less than 10 months (28.2%).The mean age was 21.4 months (SD±13.3 months). It is noted that the percentage of children with malaria decreased as the age increased (table 4.1)

4.1.2. Sex distribution of the respondents' children

Table 4.2: Sex distribution of the sick children

Sex of Child	**Frequency**	**Percent**
Female	200	49.9%
Male	201	50.1%
Total (n)	**401**	**100.0%**

The sex ratio of the children seen was almost equal, that is 50.1% were male while the females were 49.9% (Table 4.2).

4.1.3 Children's relationship with the respondents

The caretakers of the sick children brought to the health facility were found to be mainly mothers, 95.5% (n = 383). Only a small percentage of the caretakers reported being the grandmothers (0.7%), fathers (0.5%), siblings (0.5%), close relatives (0.2%) of the children they had brought to the health facility (table 4.3).

Table 4.3: Relationship of caretaker with child

Caretakers relations	Number	Percentage
Mother	383	95.5%
Close relative	6	1.5%
Father	4	1%
Grandmother	3	0.7 %
Others	3	0.7%
Sibling	2	0.5%
Total	401	100%

4.1.4 Age and gender distribution of the care- takers

The majority of respondents (61.6%) were aged between 20 -29 years followed by age 30-39 years (24.7%), 40-49 years (5.7%), less than 10 years (0.5%), 50-59years (0.5%) , above 60 years (0.2%) while 2.2% were non-committal about their age about a quarter of respondents (24.7%) were aged 30-39 years. Those that were non-committal about their age were 2.2% (figure 4.1). Regarding gender, majority of the caretakers were notably female that is 99.0% (n=397). Only 1.0% (n = 4) were males.

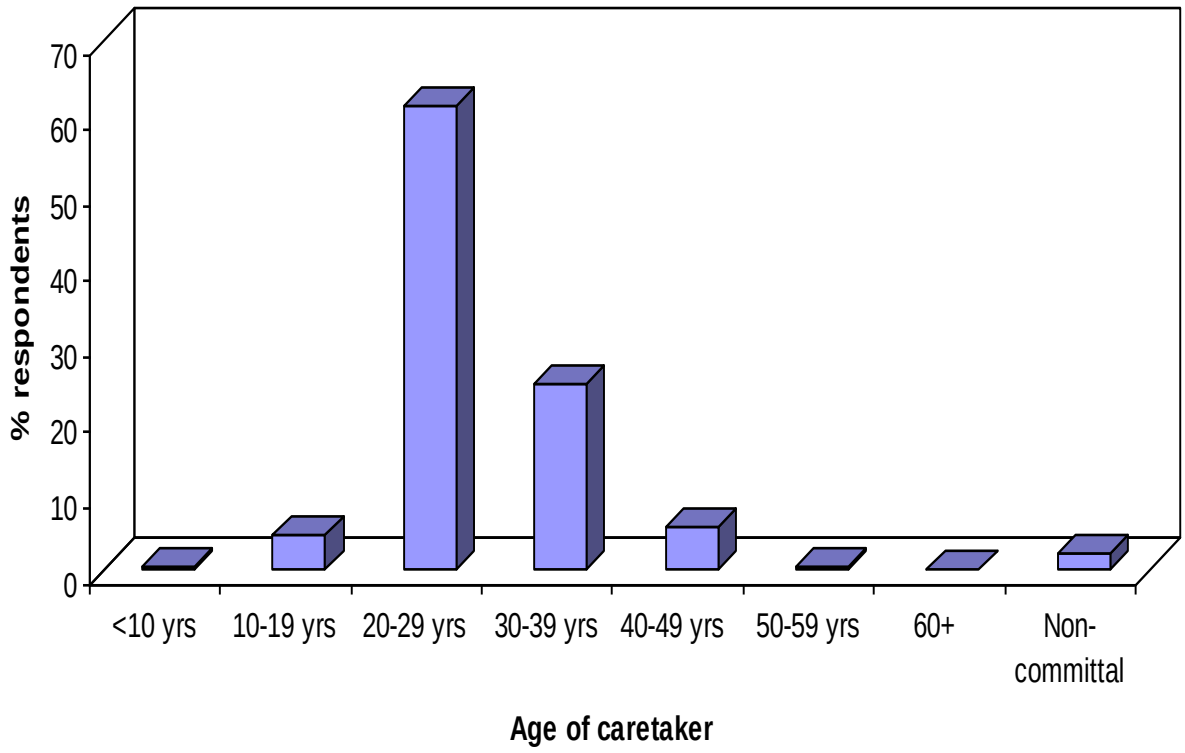


Figure 4.1: Age distribution of the care-takers

4.1.5 Marital status of the respondents

Table 4.4: Respondents' marital status

Marital Status of Care-taker	**Frequency**	**Percent**
Divorced	3	0.8%
Married	347	86.8%
Single	35	8.8%
Separated	9	2.3%
Widowed/widower	7	1.5%
Total	**401**	**100%**

Three hundred and forty-seven (86.8 %) of the caretakers were married, 8.8% (n = 35) were single, 2.3% (n = 9) were divorced, 1.5% (n = 6) were separated, and 0.8% (n = 3) were widows (table 4.4).

4.1.6 Education levels of the respondents

Most respondents (72.1%) had attained some primary school level education. Eighty respondents (20%) had attended secondary level education; six-teen (4%) had upper primary education while only 1.75% had attended college level education. Eight (2.2%) of respondents reported never having attended any formal schooling (figure 4.2).

There was also a notable significant association in the ages of the respondents to their education levels. Lowest levels of education or no formal education was in the older respondents ($\chi^2 = 129.532$, df = 35, $P < 0.05$).

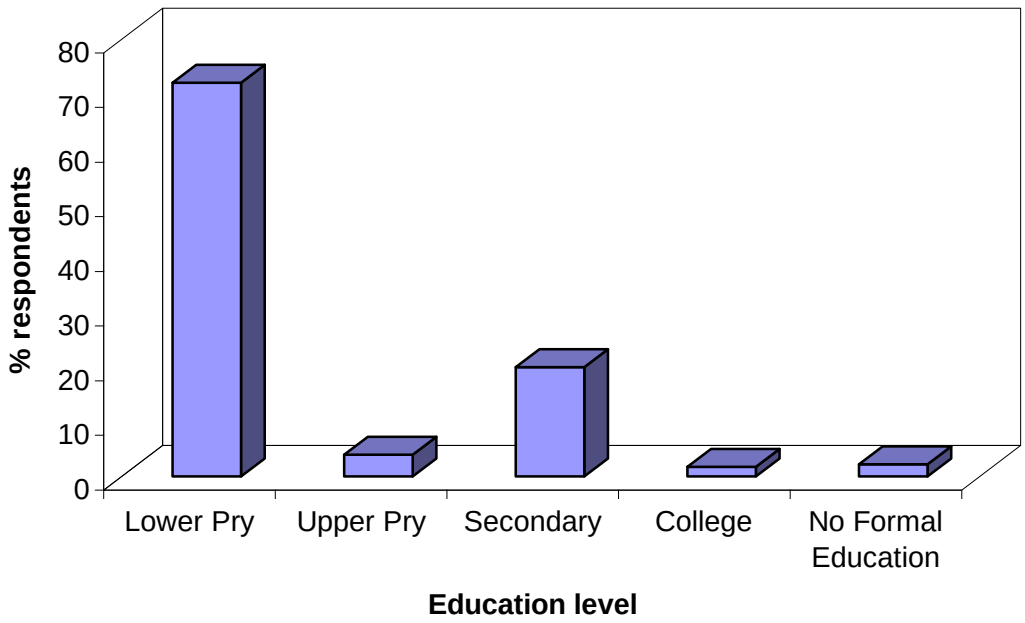


Figure 4.2: The highest education level achieved by respondents

4.1.7 Occupation status of the respondents

Table 4.5: Occupation status distribution of the respondents

Occupation	Frequency	Percent
Professionals	68	17.0
Skilled	81	20.3
Semi-skilled	145	36.3
Business	42	10.5
House-wives	64	16.0
Total	401	**100.0**

The respondents who were operating as semi-skilled persons were 36.3%, skilled were 20.3%, professionals were 17%, business were 10.5% while 16% were house-wives (table 4.5).

4.1.8: Religious background of the respondents

Table 4.6: Religious denomination of the respondents

Religion of caretaker	Frequency	Percent
Catholic	99	24.6
Protestant	237	59.4
Muslim	21	5.1
Akorino	24	5.8
Seventh Day Adventist	15	3.8
Non-committal	5	1.3
Total	**401**	**100.0**

A majority of respondents (59.4%) were of the protestant religion followed by Catholics (24.6%), Akorinos (5.8%), Muslims (5.1%) Seventh Day Adventist (3.8%) while those who were non-committal were (1.3%) (table 4.6).

4.1.9 Distances traveled by respondents to health facility

More than half of respondents (51.9%) reported living an estimated distance of between 1-10kilometres from the health facility. Those living less than 1kilometre were 21.9%, 11-20 kilometres (16.0%) while those above 20 kilometres were 10.2% (figure 4.3).

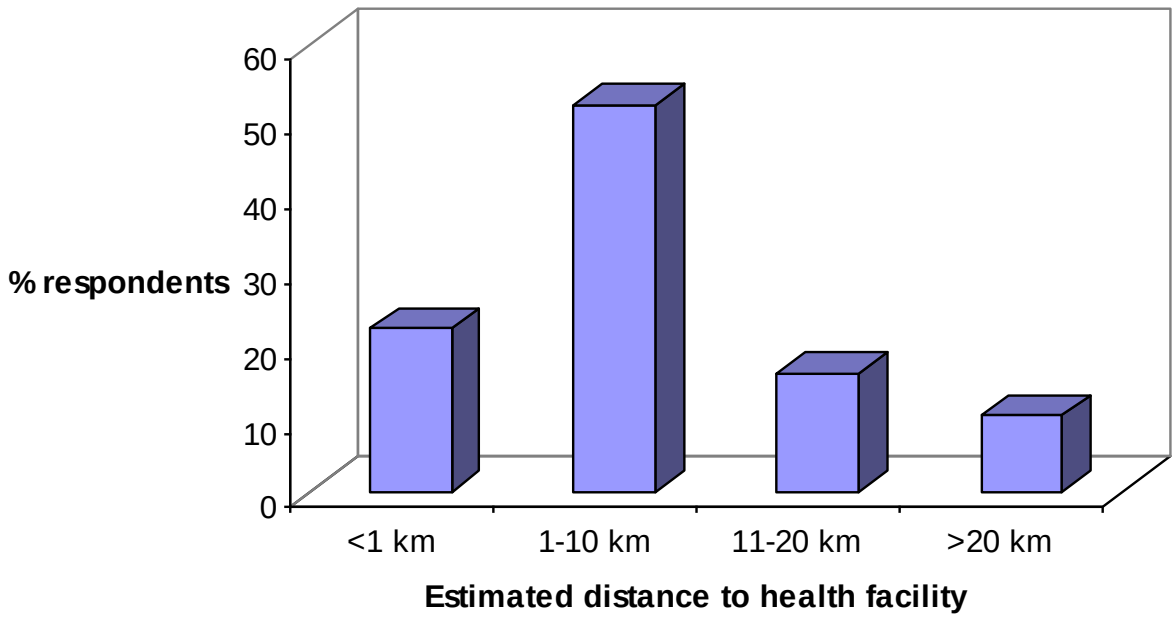


Figure 4.3: Estimated distance to health facility

4.2 Immediate actions taken by respondents on recognition of signs of illness

Two hundred and fifty-seven (64.1%) of respondents gave drugs upon realizing that the child was having signs of illness. Sixty-six (15.0%) removed the child's clothing, five (1.25%) gave fluids while three (0.75%) did tepid sponging. Seventy-six (19%) of respondents reported doing nothing on noticing the child's illness (figure4.4).

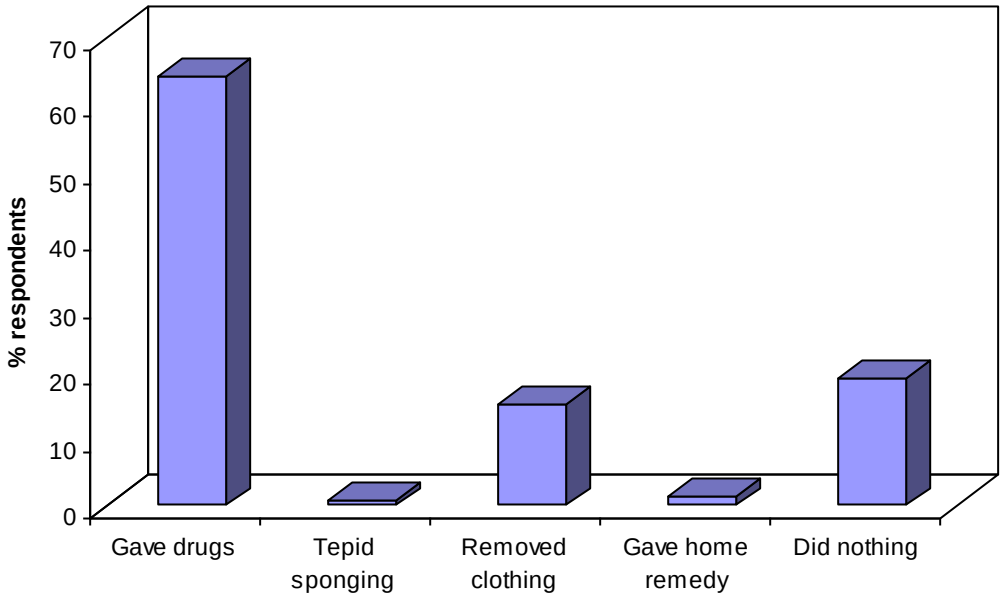


Figure 4.4: Actions taken on recognition of signs of illness

Actions taken by the care-takers on first notice that their children were unwell significantly differed (ANOVA result $F = 15.85$, $P < 0.05$). A post ANOVA test (Tukeys mean separation) showed that most of the caretakers (mean 70.35%) gave drugs to their children when they noticed the illness than any other action (table4.7).

Table 4.7: Immediate actions taken on first notice of signs of illness by mean percentage number of caretakers

Caretaker	Action taken by Caretaker on first notice of the child's illness					
	Gave drugs	**Tepid sponging**	**Remove excess clothing**	**Gave more fluids**	**Did nothing**	**Others**
Mean % **Caretaker**	70.35a	0.38b	22.75b	20.10b	18.35b	0.05b
Standard Deviation	16.65	0.94	20.75	23.66	15.26	0.12

NB; Mean percentage number of caretakers denoted by similar letters are not significantly different ($P \leq 0.05$)

4.2.1 Types of drugs given to the children

Whereas caretakers were not able to accurately identify the specific drugs they gave to the sick children, they were able to identify that the drugs were for a specific sign or symptom. Those who gave a drug to reduce fever were 63.81%, for pain were 23.35%, for treating malaria 8.17%, a home remedy 3.90% while those who did not know the kind of drug were 0.77%. Only 8.17% of the respondents reported having given an antimalarial drug at home (table 4.8)

Table 4.8: Types of drugs given to the children

N = 257

Drugs given to ill children at home	Frequency	Percentage respondents
Anti malarial	21	8.17
Antipyretics	164	63.81
Analgesics	60	23.35
Home made remedy	10	3.90
Unknown drug	2	0.77
Total	257	100

4.2.2 Sources of drugs given

The medicines given to the children were mainly obtained by the caretakers from the nearby chemist 21.9% (n = 88), health facility 19.0% (n = 76), shop 15.5% (n = 62) and the community health workers 7.5% (n=30) (figure 4.5). It is worthwhile noting that for those who said that they obtained the drugs from the health facility, it emerged that the drugs were mainly ‘leftovers’ that had been given for other illnesses in the past.

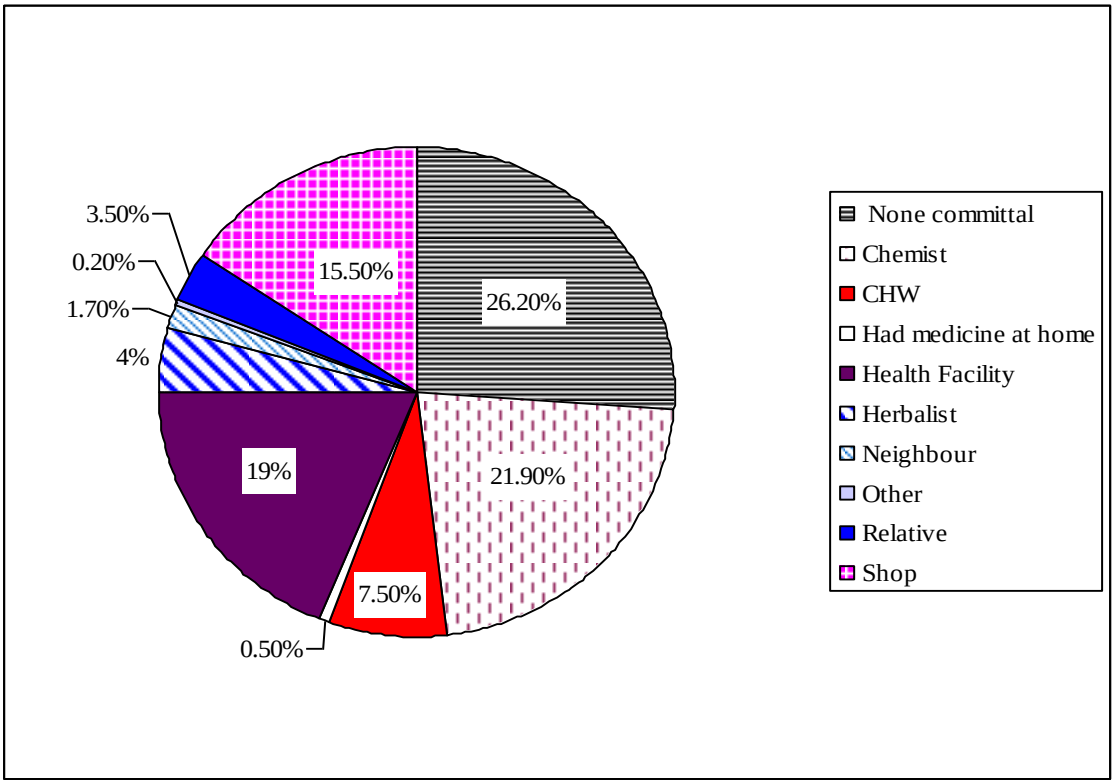


Figure 4.5: Sources of medicine used at home by caretakers

The variation on the caretakers' immediate action was also noted to be associated with the levels of education of the individual caretaker particularly in giving a drug (χ^2 = 15.900, P < 0.05), more fluids to the child (χ^2 = 4.322, P < 0.05) and doing nothing on first notice (χ^2 = 15.924, P < 0.05). All the caretakers with college education gave drugs on first notice that the child was unwell.

4.2.3 Duration taken before administering treatment

After the caretakers noticed the children's illness, most of them (50.9%) gave treatment on the same day 21.9% gave the next day, 5.2% gave two days later while 3.0% gave treatment three or more days later. A significant 19% of caretakers had done nothing by the time they brought the children to the health facility (table 4.9).

Table 4.9: Duration taken by the care takers to administer treatments.

Time taken	Frequency	Percentage
Same day	204	50.9
Next day	88	21.9
Two days later	21	5.2
Three days or more	12	3.0
Did nothing	76	19
Total	401	100

4.3 Feeding practices during the illness

4.3.1 Administration of fluids

For the duration the children had been unwell, 37.7% (n = 151) of caretakers mainly gave them fluids less frequently, 31.9% (n = 128) gave fluids more frequently than usual, 28.2% 99(n = 113) gave in the same frequency as before the illness while 2.1% (n = 9) of them either could not remember how they gave out the fluids or declined to reply (figure 4.6).

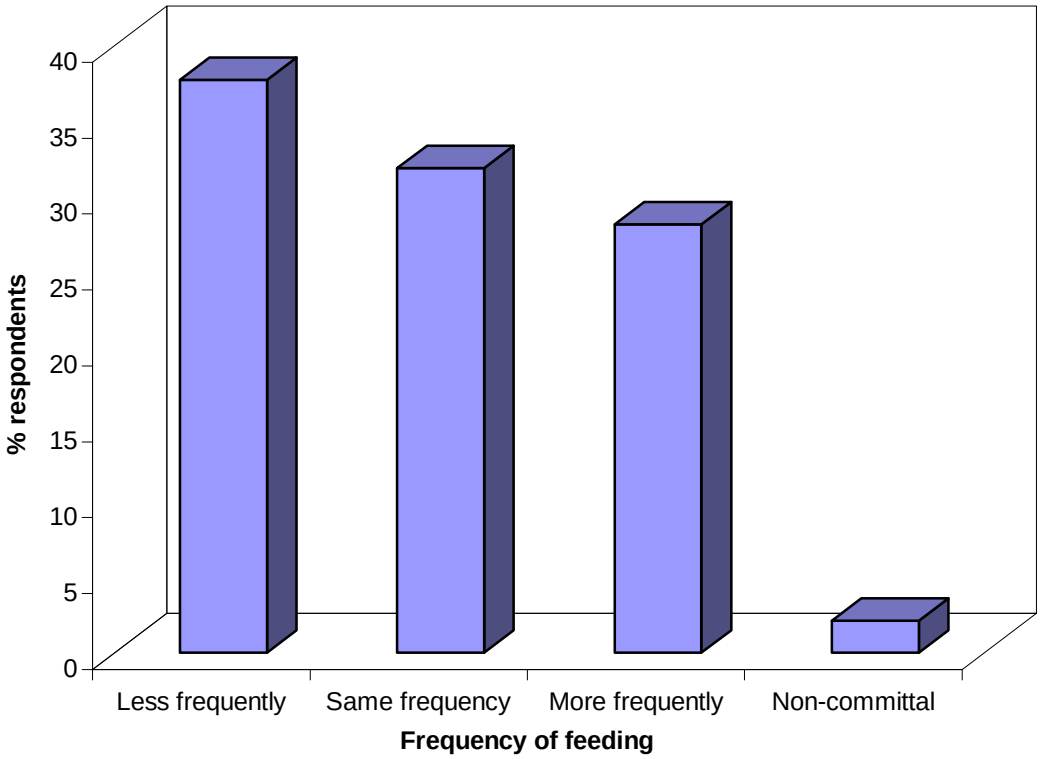


Figure 4.6: Frequency of fluids administration during the illness

4.3.2 Administration of food

Regarding food, 67.3% (n = 270) of caretakers mainly gave food less frequently, 25.4% gave in the same frequency as before the illness and only 4.5% gave more frequently Those who were either non-committal or did not remember how they fed were 2.7% (figure 4.7).

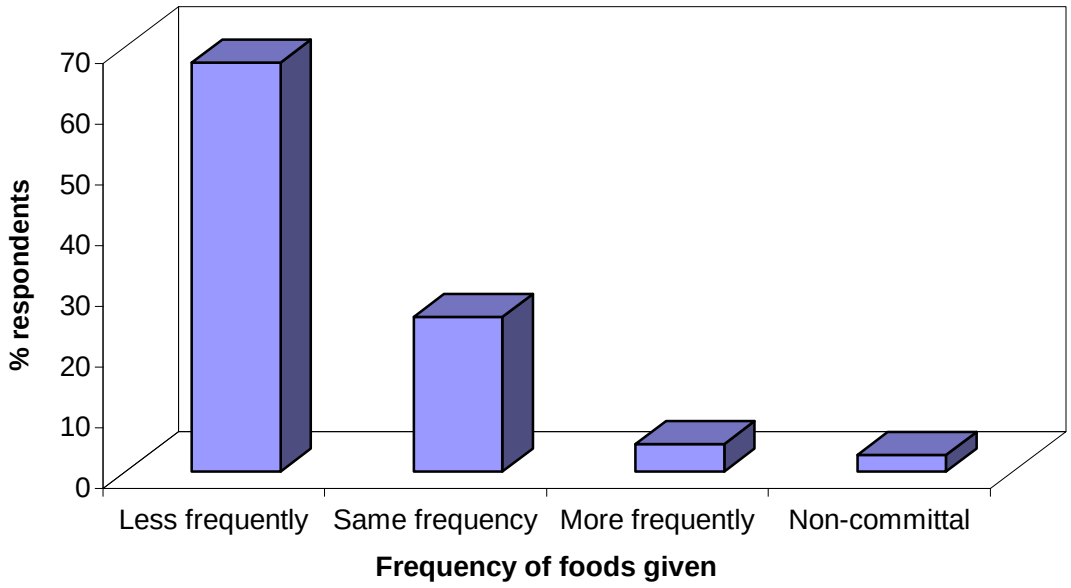


Figure 4.7: Frequency of foods given to the children during the illness

4.4 Decision making on health facility consultation

Table 4.10: Respondents' marital status versus decision-making

Marital Status	Decision to take child to health facility			Total
	Mother	Father	Both	
Married	59.6%	8.3%	32.2%	100.0%
Unmarried (Divorced/Separated/Widowed Single)	94.1%	2.0%	3.9%	100.0%
Total	28.5%	7.4%	64.1%	100.0%

Among respondents who were married, the decision to take the child to hospital was made by the mother in 59.6% of the cases, 8.3% by the father and 32.2% by both of the

child's parents (table 4.10). Among the unmarried respondents, the decision to take the child to health facility was made primarily by the mother. There was a statistically significant association between the marital status and the person who makes the decision to take the child to hospital. The decision to take the child to the health facility was mainly done by the child's mother ($\chi^2 = 23.0$, $p<0.00$)

4.5 Relationship of caretaker practices and severity of malaria

4.5.1 Clinical signs manifested by the children

The most common sign that the respondents reported in their sick children was fever (94.3%). One hundred and fifty–eight (39.4%) of respondents' children had vomiting, 27.4% had diarrhoea, 20.2% were not feeding while 8.5% had difficulty in breathing. No respondents reported seeing convulsions in their children (figure 4.8). The percentages do not add to 100% because some children presented with multiple clinical manifestations.

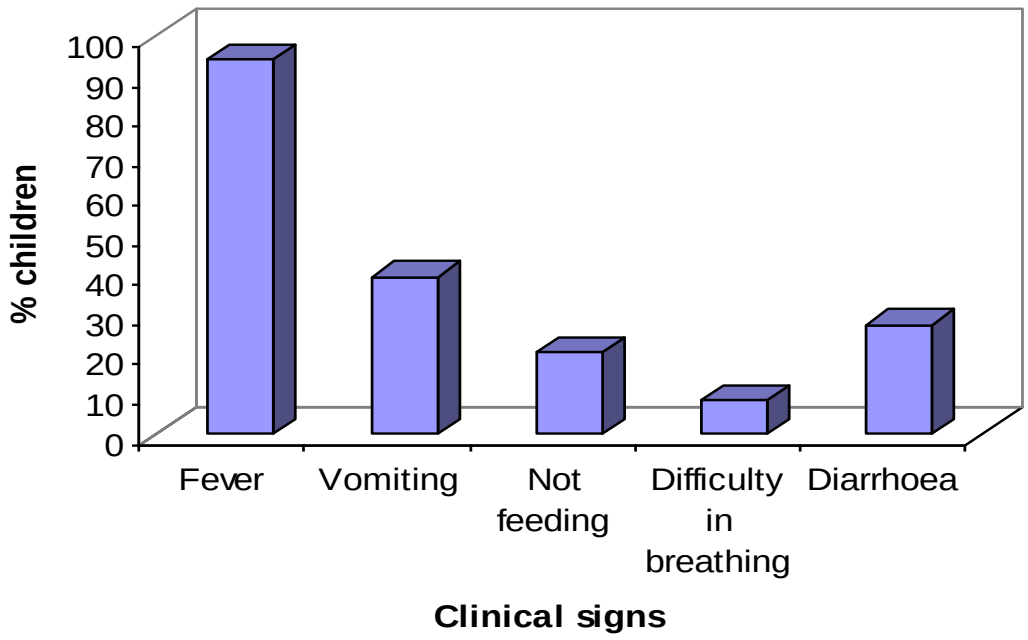


Figure 4.8: Presenting clinical manifestations

4.5.2 Duration of illness of illness prior to health facility visit

During the study, it was established that 35.41% of children had been unwell for one day, 41.40% for two days, 3.90% for three days while 9.22% were unwell for more than three days (figure 4.9). The duration of illness was counted with reference from onset of illness to the day of conducting the interview i.e. one day was regarded as the 24 hours preceding the time of interview. The mean duration of illness for children was 2.1 (S.D ±1.4) days.

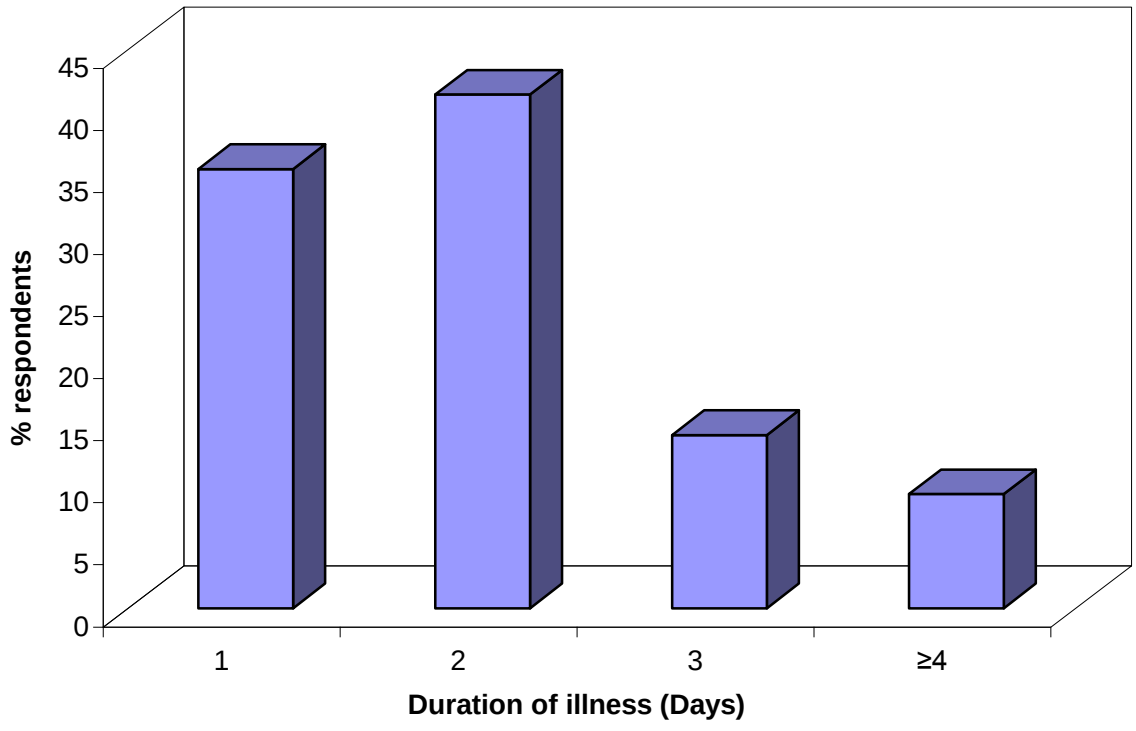


Figure 4.9: Duration of illness

Table 4.11: Mean duration of illness before health facility visit among age groups

Age of Child (months)	Mean duration of illness (days)
0-11 (n=113)	2.28 (SD 1.60)
12-23 (n=136)	1.86 (SD 0.94)
24-35 (n=88)	2.17 (SD 1.53)
36-47 (n=36)	1.94 (SD 1.22)
48-59 (n=28)	2.71 (SD 1.51)
Total (n)	**401**

There was no statistically significant difference between the mean duration of illness across the different age groups compared with the mean of the entire sample (table 4.11).

4.5.3 Severity of the illness in children seen

Two hundred and ninety-eight (74.3%) of respondents' children had uncomplicated malaria while ninety-six (23.9%) had complicated malaria (figure 4.10). Complicated malaria was defined as one where rapid diagnostic test was positive for malaria with any of the following clinical manifestations in addition to fever; altered level of consciousness or coma, child not able to feed, child having difficulty in breathing, history of convulsions and dehydration.

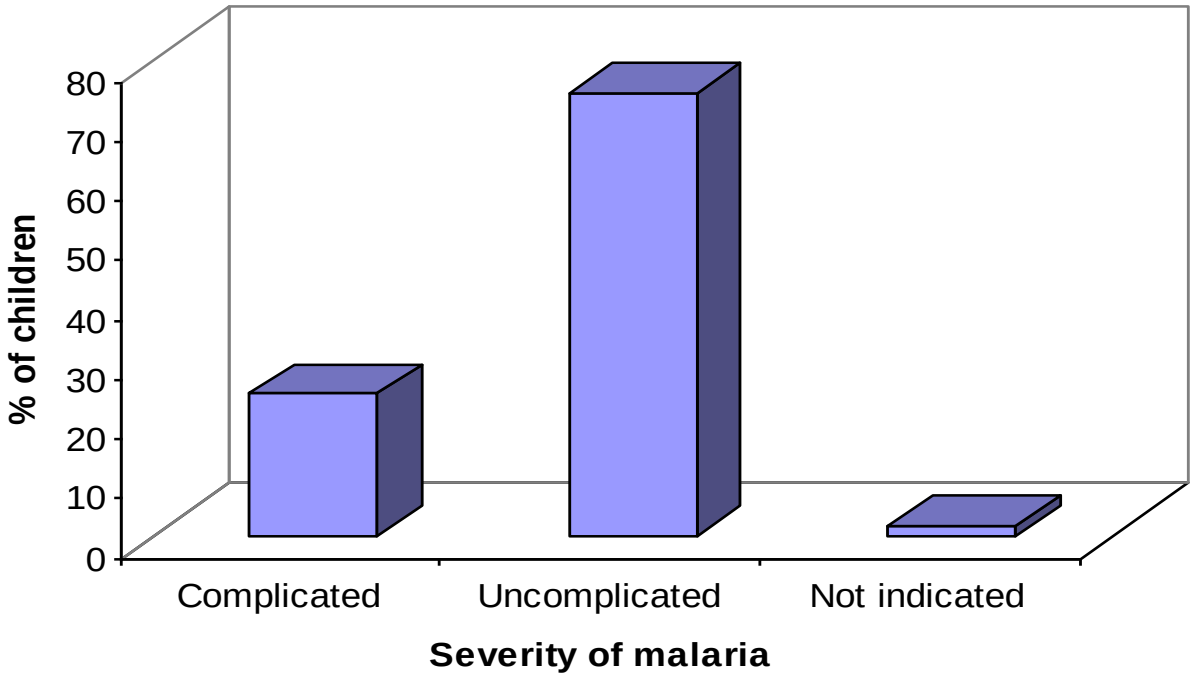


Figure 4.10: Severity of malaria in children

4.6 Relationship of socio-demographic characteristics with complicated malaria

Among the children with complicated malaria, 27.1% were in the age-group less than 10 months, 32.3% in the ages of 11 – 20 months, 27.1% were in the ages of 21 – 30 months, (8.3% were in the ages of 31 – 40 months and 5.2% were above 40months. There was a significant difference in severity of malaria among different age groups of children (χ^2 = 2.32, p=0.067) (Fig 4.11).

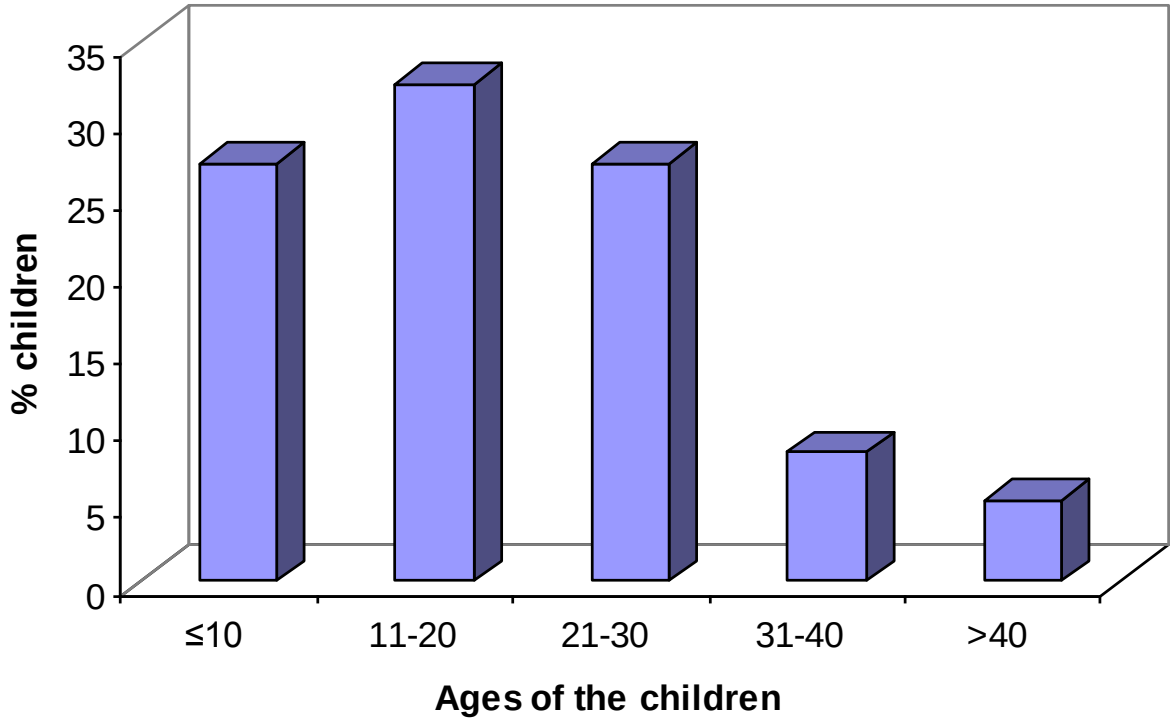


Figure 4.11: **Trends of malaria in various ages of children**

The results in figure 4.12 reveal that as caretakers advanced in age, the children under their care had less incidence of complicated malaria. However, no statistical difference among the caretaker age groups was recorded (χ^2 = 8.957, P = 0.834).

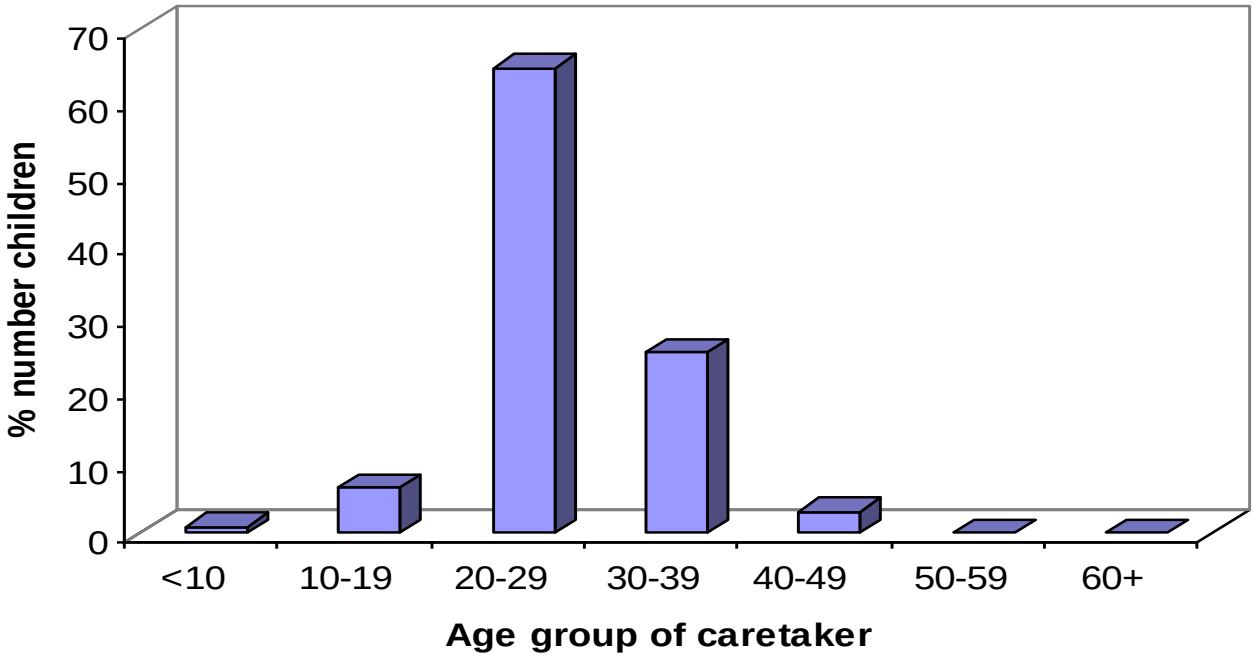


Figure 4.12: Caretakers' ages and malaria complication in the children

Table 4.12: Religion of caretaker and the severity of malaria

	Outcome variable	
	Complicated Malaria	
Religion	**(n = 386)**	$\chi^2 = 8.62$
Christians	81 (23.7%)	p = 0.01
Muslims	6 (35.3%)	
Akorino	13 (48.1%)	

The total numbers of caretakers in the various religious groups were analyzed. The Akorino's had the highest proportion of children diagnosed with complicated malaria (48.1%), followed by Muslims (35.3%) then Christians (23.7%) There was a statistically

significant association between the religion of the caretaker and the severity of malaria ($\chi^2 = 8.62$, p = 0.01) (table 4.12)

.

Table 4.13: Occupation of caretaker and severity of malaria

	Outcome variable Complicated Malaria	
Occupation of caretaker	**n = 385**	
Professional	10 (19.6%)	
Semi-skilled	30 (56.6%)	
Skilled	41 (39.8%)	$\chi^2 = 50.2$
Business person	7 (18.9%)	p = 0.001
Housewives	7 (14.9%)	

Among the various occupations, the proportion of those with complicated malaria was highest in semi-skilled caretakers (56.6%), followed by skilled (39.8%), professional (19.6%), business (18.9%) and house-wives (14.9%) (table 4.13). The occupation of the caretaker was strongly associated with the severity of malaria (p=0.001)

Table 4.14: Duration of illness versus malaria severity

Duration	**Malaria Severity**		**Total**
	Complicated	**Uncomplicated**	
1 day	19.6%	80.4%	100.0%
2 days	27.4%	72.6%	100.0%
More than 2 days	26.1%	73.9%	100.0%
Total	**23.9%**	**74.3%**	**100.0%**

$\chi^2 = 2.71$ p=0.25

Of caretakers who brought their children one day after initial symptoms, 19.6% of their children were diagnosed as having complicated malaria. A slightly higher proportion of children 27.4% and 26.1% were diagnosed to have complicated malaria for caretakers who brought their sick children 2 days and more than two days after start of initial signs and symptoms respectively (table 4.14). However, the observed difference was not statistically significant ($\chi^2 = 2.71$, p=0.25).

Table 4.15: Frequency of food and fluid intake and malaria severity

	Complicated Malaria	
Food intake	**(n = 384)**	$\chi^2 = 1.74$
Less frequently	**69 (25.8%)**	
Same frequency	**24 (24.0%)**	p = 0.42
More frequently	**2 (11.8%)**	
Fluid intake	**(n = 387)**	$\chi 2 = 16.68$
Less frequently	**52 (34.7%)**	
Same frequency	**26 (23.4%)**	p = 0.00
More frequently	**17 (13.5%)**	

For the children who were given food less frequently, 25.8% of them had complicated malaria, followed by those given in the usual frequency (24.0%) while those given more frequently had only 11.8% with complicated malaria. Among the children given fluids less frequently, 34.7% had complicated malaria, followed by those given in the same frequency (23.4%), while those given more frequently had only 13.5% with complicated malaria (table 4.15).

Table4.16: Decision-making dynamics and malaria severity

Person(s) making decision to take child to clinic	**Count (%)**	n = 384
Both parents	**40 (36.0%)**	
Child's father	**7 (23.3%)**	$\chi^2 = 11.51$
Child's mother	**47 (19.3%)**	p = 0.003

Among children where both parents made the decision to take the child to hospital, 36.0% of children had complicated malaria. Among children whose fathers had made the decision to seek health facility care, 23.3% of the children turned out to have complicated malaria while for children whose mothers had made the decision only 19.3% had complicated malaria (table 4.16). The difference was statistically significant ($\chi^2 = 11.51$, p=0.003).

4.7 Respondents' actions regarding prevention of malaria

When respondents were asked about the malaria prevention activities they carry out in their homes, 42.7% of respondents reported using insecticide treated nets in their homes while 16.7% reported using ordinary mosquito nets. About a quarter of respondents (24.9%) cited clearing bushes, 10.5% drained stagnant water while 3.0% reported spraying of houses. Only 2.0% reported use of malaria prophylaxis as a strategy in their homes (figure 4.13).

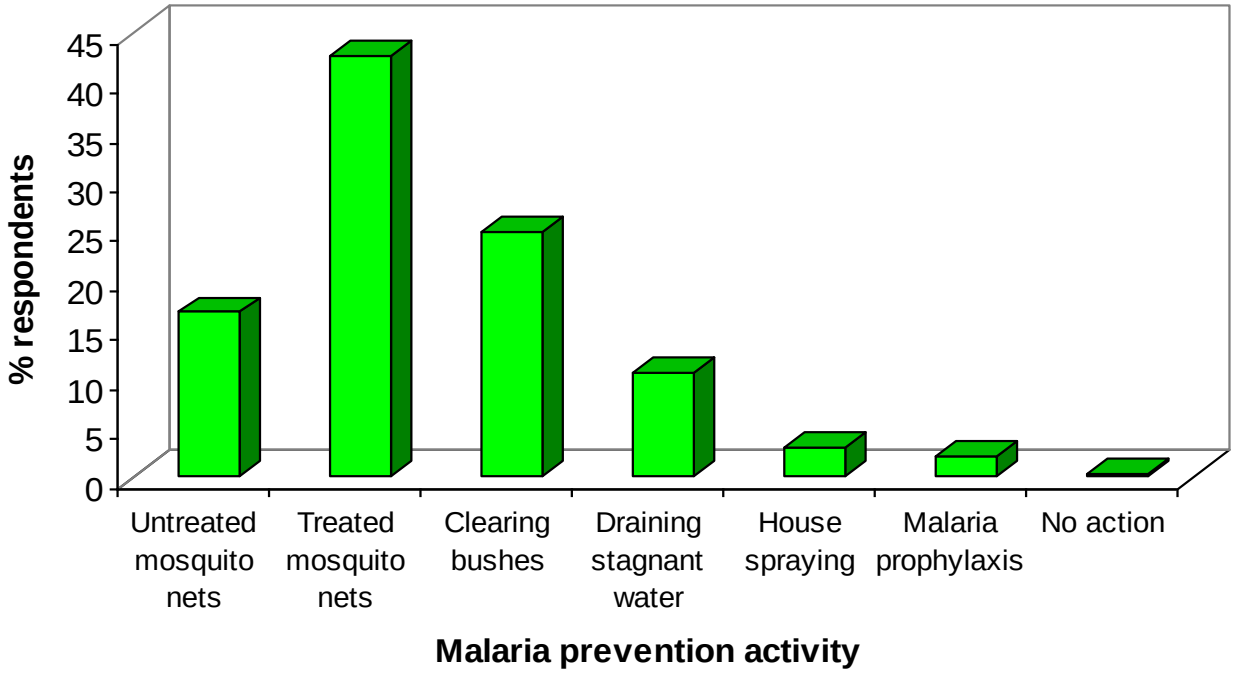


Figure 4.13: Type of malaria prevention activities carried out by respondents

Table 4.17: Use of mosquito nets by respondents

Family Member	Frequency	Percent
All family members	**344**	**85.8**
Children	**24**	**6.0**
Father of child	**1**	**0.2**
Mother and Child	**17**	**4.2**
Non-committal	**15**	**3.7**
Total	**401**	**100.0**

Among respondents who reported using mosquito nets and insecticide treated nets, a majority (85.8%) reported that all family members slept under a net. However, there is a

possibility that the use of nets was over-reported particularly because of the interview setting (table 4.17).

Table 4.18: Education level of respondents and malaria prevention activities

	Malaria prevention activity					
	Use of treated bed nets		**Clearing Bushes**		**House spraying**	
Education Level	**(n = 401)**					
Primary level	247(81.0%)	χ^2 = 7.16	75 (24.6%)	χ^2 = 0.698	9(3.0%	χ^2 = 0.270
Secondary &above	74 (84.1%)		24 (27.3%)		3(3.4%)	
None	3 (42.9%)	p = 0.03	1 (14.3%)	p = 0.71	0 (0%)	p = 0.87

Use of treated bed nets was significantly associated with the educational level of the care taker (χ^2 =7.16, p=0.03). Clearing of bushes and house spraying were not significantly associated with the educational level of the caretaker (table 4.18).

Table 4.19: Marital status versus malaria preventive action taken

Marital Status		Malaria Prevention action				Total
		Use of ITNs	Clearing Bushes	House Spraying	Prophy-laxis	
Married	%	73.3%	22.3%	2.3%	2.1%	100.0%
Unmarried (Divorced/Separated /Widowed/Never married)	%	71.7%	22.6%	5.7%	0.0%	100.0%

There was no statistically significant difference among married respondents and unmarried respondents in the type of malaria prevention activities that were carried out at home. A large proportion of each reported using insecticide treated mosquito nets (table 4.19).

4.8 Perceptions on malaria from focused group discussions.

From the focused group discussions in the five study sites, ability to recognize fever and associate it with malaria was very high amongst the women group members involved. They indicated that fever or hot body meant that a child has malaria. When participants were directly asked what caused malaria in under -five children, they knew that it was due to the mosquito but also mentioned non-fever causes. This included poor sanitation in the home, coldness, sleeping without a blanket, soaking in the rains, malnutrition, playing in the dust, not bathing the child, drinking dirty water, eating un-boiled food and consuming lots of mangoes. Pneumonia, immunization, headache, cough, sneezing,

teething, persistent crying, diarrhea, and respiratory infections were also mentioned as causes of fever in children.

The participants mentioned that apart from fever, vomiting, diarrhoea, lethargy, refusing to suck, refusing to eat, irritability, rash, rigors, coughing and groaning as signs and symptoms they consider to diagnose that a child has malaria**.** Most of them mentioned high fever, lethargy, refusing to eat/suck, frequent vomiting and diarrhea as major signs of malaria. There was general ignorance of danger signs of malaria as very few participants mentioned convulsions and coma as danger signs. Of all FGDs with the participants, only two had members who were able to link coma with malaria. Only one of the FGDs linked convulsions to malaria. Convulsions were also attributed to other causes, such as epilepsy and witchcraft respectively. Participants had their own way of categorizing malaria into mild and severe. In general, children with fever who are able to play were classified as having mild illness whereas febrile children who could not play were considered as having severe illness. Participants did not appreciate the potential harm of mild fever, hence the delay in starting appropriate treatment

Most participants reported that they manage fever at home by tepid sponging; bathing the child with cold water, giving water frequently, covering the child with warm clothes and giving antipyretics, such as paracetamol. Treatment with the recommended first line malaria treatment was only mentioned in one FGD. They acknowledged that treatment for malaria with any anti-malarial drug was mostly given after some days because in the first 24 hours antipyretics were given as first aid for fever and were viewed as effective treatment for the illness.

In all the FGDs, lack of access to anti-malarial drugs was mentioned as one of the problems that prevented caregivers from giving the needed drugs promptly. Financial constraints to buy antimalarials drugs, inadequate knowledge on the correct dosage, and fear of giving expired drugs from shops and distance to health facilities were some of the main reasons given for failing to provide an effective anti-malarial treatment within the home.

The participants indicated that public health facilities are usually far and have long queues due to high client load. The common mode of transport to facilities was through public transport (minivans and minibuses), which were not reliable and unavailable late in the evening or at night. Those living near the health facilities walk or use commercial motorcycles and bicycles to get to the health facility. The facilities also open late, and close for tea and lunch break, leaving behind a number of children unattended. Further, the facilities are closed during weekends and sometimes the medical personnel are not around.

CHAPTER FIVE: DISCUSSION

This study which was carried out in Mbeere District in Eastern Kenya was aimed at determining the child care practices by caretakers during malaria illness in children below five years of age and how the practices affect the severity of the illness. Primary data was obtained by interviewing caretakers who had brought their sick children to selected health facilities while additional qualitative information was obtained through focused group discussions with groups of women in the community. The results of the Mbeere study revealed that 23.9% of all children seen had complicated malaria while 74.3% had uncomplicated malaria. Caretakers' management practices at home constitute major determinants of the outcome of malaria and complicated malaria may result from poor home management. In sub-Saharan Africa, high child mortality due to malaria remains a major public health problem. Available data indicate that malaria, diarrhoea, and acute respiratory infections (ARI) account for the majority of child deaths (Manun'ebo *et al*; 1994 , Guerant *et al*; 1990, WHO, 1998). Most of these deaths can be prevented not with high technology medical equipment but with access to information regarding home care support and provision of basic supplies within easy reach.

Malaria severity in the children reduced with increase in age of the children. Most of the children (32.3%) were aged below 11-20 months of age. The mean age was 21.4 months (SD±13.3 months). This finding agreed with documented literature that indicated that younger children were more vulnerable to malaria. The finding may be attributed to the fact that during the first year of life, infants are still partially protected against

communicable diseases both through passive immunity from the mother during intra-uterine life and maternally acquired humoural exposure to disease- causing organisms while breast feeding. This protection starts wearing off after the first year of life for malaria.

Regarding gender, majority of the respondents interviewed were female (99.0%) out of whom a significant proportion (95.5%) of them were mothers of the children. Only 1.0% of the caretakers were male. Among married couples, the main decision maker regarding health facility consultation was the mother in 59.6% of the cases. Both mother and father caretaker participated in making the decision to bring the child to health facility for 32.2% of the children and only in 8.3% of cases was the father the sole decision-maker. This indicated that it was mainly the responsibility of the mother to physically bring the child to hospital. This finding was supported by other studies which suggested that in the vast majority of households, it was the mother in the family who carried the largest burden regarding health care-seeking for the children (Fleming *et al*., 2000). In Africa, the patriarchal culture and gender barriers have kept men away from care-giving as it is considered a woman's duty. A frequent explanation of the female's role in the treatment seeking behaviour for the children is that she spends most of the time with the children and will notice any changes in their behaviour hence identifying symptoms of disease before anyone else. This explanation fits well with the Mbeere study in which only 6.4% of children taken care of by housewives were diagnosed to have complicated malaria.

The role of mothers in reducing childhood mortality was clearly documented in a study carried out in Ethiopia. A reduction of as high as 40% in childhood mortality due to malaria was achieved by use of mother coordinators. The mothers were trained in early recognition and treatment of malaria. The trained mother coordinators passed on knowledge to the other mothers and this improved management of malaria (Kidane and Morrow, 2000). Success in reducing childhood mortality due to malaria therefore requires more than just the availability of adequate health services with well trained personnel. Since the mothers have a major responsibility of caring for their children at the early onset of illness, partnership between them and health care providers is required with support from their families and community.

Regarding the age of the caretakers, majority were in the age group 20-29 years and the findings portrayed that as caretakers advanced in age, the children under their care had less incidence of complicated malaria. Education of the caretakers was mainly at lower primary level of education. Health care providers need to ensure that young caretakers with low education status are empowered to provide adequate home care in order to support their sick children. Social equity is also related to educational opportunities with women generally having lower levels of education than men. The use of health care services is strongly associated with level of education. According to the Kenya Demographic and Health Survey of 1998 mothers with low level of education were six times less likely to utilize maternal and child health services as compared to those with secondary education (KDHS, 1998).

There was a statistically significant association between religion of caretaker and severity of malaria illness, with the Akorinos having the highest percentage of children with complicated malaria. Even where the biomedical model of disease causation is well known, studies show that religion is one factor that influences treatment decision making. For example, regardless of the level of acceptance of the biomedical etiology of malaria, Tanzanian women used local remedies such as herbal baths and teas when malaria was suspected. These practices were guided mostly by years of experience and religious affiliations

Occupation of caretaker was also found to be strongly associated with severity of malaria where majority of caretakers in semi-skilled labour had children with complicated malaria. The introduction of user fees in the public sector have made a shift in utilization of public health services, increasing the use of other treatment sources such as private health facilities, drug vendors and traditional healers. Self diagnosis was also been shown to be practiced more by poorer households. The Mbeere study however did not show any significant difference in severity of malaria between respondents who had consulted different sources of care.

In regard to distance traveled to the nearest health facility, most respondents reported living within a distance of 1-10 kilometres and the common mode of reaching the facility was walking or public transport. According to WHO (2000), clients were not wiling to walk more than 5 kilometres to a health facility in search of services. People living beyond the range of this distance were more likely to engage in self diagnosis and self

medication. It was widely acknowledged that access to quality treatment was insufficient in many settings with the poorest people often having least access to effective treatment (Victora *et al*., 2003) and the underlying causes of this situation have been increasingly debated. On a macro-level, the discussion on access to treatment often focused around the development of new drugs (Hoen, 2006) and global affordability issues, including pricing and patenting of drugs. International initiatives, such as Medicines for Malaria Venture, have increasingly financed and speeded up the development and introduction of new efficacious antimalarials (MVM, 2007). At community level, the situation is a lot more complex and availability and affordability of drugs are only few among a number of factors influencing prompt and effective treatment (McCombie, 2002). In many developing countries, weak health systems as well as lack of equipment and qualified staff lead to incorrect diagnosis and treatment (Nsimba *et.al*., 2002). Physical access may be impeded by long distances to the nearest point of care, inadequate logistics or inability to pay for secondary costs such as transport (Noor *et.al*., 2003). Further, malaria is a common and socially well accepted illness in endemic countries and its potential severity is often underestimated. Insufficient knowledge of the appropriate treatment or an understanding of the illness that differs from the bio-medical explanation can lead to the use of alternative treatment sources and non-adherence to recommended regimens (Tarimo *et. al*., 2000).

Several initiatives have attempted to address access questions on a local level, either by strengthening home-based management, by improving the involvement of commercial drug providers or through a general improvement of health system performance.

Information and education of caretakers and care providers has been useful in improving malaria case management and compliance at home and in drug selling shops (Afenyadu, *et. al*., 2005). Several models for improving case-management in health facilities have been tested and combined approaches were most likely to have a sustainable impact (Rowe *et al*., 2005).

The dominantly reported clinical manifestation of the children by the caretakers in the Mbeere study was fever followed by vomiting and diarrhoea. Although failure to feed was reported in 20.2% of the children signifying deteriorating condition, it was not a major worry to caretakers at all levels of education. However, children's difficulty in breathing was noted to be a major worry in less educated caretakers while vomiting was more worrying to the caretakers with younger children. Of all FGDs with the participants, only two had members who were able to link coma with malaria and only one of the FGDs linked convulsions to malaria. Although vomiting, diarrhoea and failure to eat, suck or drink were commonly recognized manifestations of the illness, they were not considered as indicators of danger signs. The reason given for the health facility consultation was mainly the fact that fever was not subsiding despite the interventions carried out at home. Poor discrimination of danger signs and causes of malaria by community members can prevent early intervention. During focused group discussions other non-malaria causes other than the mosquito were also mentioned. This included poor sanitation in the home, coldness, sleeping without a blanket, soaking in the rains, malnutrition, playing in the dust, drinking dirty water, eating un-boiled food and consuming lots of mangoes. An effective health education targeting parents/guardians,

decision-makers/advisors, and formal and informal care providers might be a prerequisite for successful introduction of an effective malaria control programme for children.

Studies show up to 90% of child illnesses are first perceived, defined and treated in the home, mostly by mothers before being referred to other care sectors (Kleinman, 2001). Illness recognition, definition and management depend on the general belief about health and illness within people's culture (Mwenesi, 1995; Kleinman, 2001). These processes often reflect different social class, age and levels of education (Blaxter and Peterson, 1999; Helman 1990). Literature further indicates that mothers' disease explanations need not form a coherent set of beliefs. They may explain illness in their children either generally or in relation to specific episodes, without strong model of causality (Cunningham, 1990). Mother's explanatory models often categorize illnesses into serious, mild and ordinary (Mwenesi, 1995). This categorization may lead to problems with illnesses such as childhood malaria that may present with symptoms considered ordinary such as cough, fever, headache and diarrhoea (Alonzo, 2002; Cunningham, 1990).

Multiple disease processes often coexist in a sick child. In areas in which malaria is endemic, the child with fever may be suffering from malaria, pneumonia, diarrhoea, measles, or a combination of these, in addition to malnutrition. At health-care facilities, the management of the sick child is generally based on symptoms, for example the Integrated Management of Childhood Illness (IMCI) algorithms, which recommend that

in high-transmission, malaria-endemic areas, all children aged less than 5 years ("under-fives") with fever be treated with antimalarials. In the absence of diagnostic laboratory facilities, some conditions like malaria are often indistinguishable, even for skilled health-care workers. It is unlikely therefore that identification of malaria in the community setting can be achieved by community health-care workers, shopkeepers, or caregivers unless they are given some skills in clinical diagnosis of the condition.

Prompt treatment for malaria is important as typically the mean duration between onset of symptoms and development of severe complications is 1.8 days and the mean duration between onset and death is 2.8 days (Greenwood *et al*; 2003). In the Mbeere study, the mean number of days between onset of illness and health facility visit was 2.1 days signifying that the caretakers' were taking some action at home during this time in the hope that the child's condition would improve. From the results of the study, 19.6% of children brought one day after start of illness had complicated malaria as compared to 27.4% of those brought after two days following onset of illness.

Treatment practices at home constitute major determinants of the outcome of the illness and complicated malaria may result from poor home management. In the Mbeere study, the commonest action taken by the caretakers at home on recognition of illness was administration of drugs. Other supportive forms of action included removal of excessive clothing, giving of a home remedy and tepid sponging. The drugs given at home were established to be mainly antipyretics (45.9%) and analgesics (12.2%). Only 8% of

caretakers indicated that they had given an antimalarial drug while 4.2% of them indicated that they had administered a herbal preparation. During focused group discussions it is only in one group where Coartem was mentioned as the recommended drug for first line management of malaria. Artemisinin based combination therapies are now advocated as treatment of choice in Africa in an effort to improve on drug efficacy following increasing failure rate of a number of other drugs (White *et.al*., 1999). The participants in the focused group discussions acknowledged that treatment for malaria with any anti-malarial drug was given after more than 48 hours, because in the first 24 hours antipyretics were given as first aid for fever and were viewed as effective treatment for the illness.

Regarding feeding practices during the illness, most respondents gave fluids and food less frequently and did not worry about vomiting and failure to suck, eat or drink. A higher proportion of children with complicated malaria was noted in those children given fluids and food less frequently. Respondents who did nothing upon noticing some signs and symptoms of illness were 19%. This could be an indicator that this group of caretakers failed to recognize the severity of the disease. According to Health Belief Model, caretakers need to recognize the vulnerability of young children to an illness like malaria in order to perceive the relative risk. The Model further states that caretakers need to recognize the seriousness of the disease for them to take appropriate health seeking measures (Becker and Maiman's, 1975).

Beliefs about the etiology of illness invariably dictate the type of therapy and health providers to be consulted. In a health facility based study in Busia district in eastern Uganda, 82% of the children seen had been given pharmaceutical medicines in the home before being taken to the health unit. Of these, 55% were given pharmaceutical medication within 24 hours of onset of illness. One in four (26%) of these children was first given antimalarials. One in five (19%) was given antimalarials within 24 hours of onset of illness (Kivumbi, 2004). The practice of self-medication can be an advantage as a shorter delay between onset of illness and effective treatment has been linked to lower risk of death (D'Alessandro, 1998). The antimalarial drugs used are not those suggested in the national guidelines and they are also given at sub-optimal dose (Djimbe *et. al*; 1998).

Studies done elsewhere show that malaria cases are managed outside formal health sector with drugs bought from shops or kiosks (Snow, *et. al*; 1995). This is especially true for uncomplicated malaria in poor low-literacy populations with inadequate health service (Mwenesi, *et al.,* 1995). Community surveys have also shown that a high proportion of presumed malaria cases receive some type of treatment. Figures ranged from 84% in Guinea (Dabis *et.al.,*2000) to 95% in Tanzania (Neuvians *et. al*; 2006). Many cases receive multiple treatments with patients and caretakers consulting a variety of sources for a single episode of illness.

In the Mbeere study, it was revealed that regardless of their education levels, the caretakers sourced for medicine and advice about child's management from all possible sources. The medicines given to the children were mainly obtained from a nearby chemist, health facility, shop or were leftovers from previous illness. The perception of malaria as a routine illness may promote overuse of antipyretics to alleviate the fever as an easy and adequate first response. Persons seeking treatment from herbalists may also delay health seeking from formal health institutions mainly because of the cost implication. Sixty-two (20.9%) of respondents received advice from shop owners, some of whom stock basic over-the-counter anti-malarial drugs. Shopkeepers are an easily accessible community resource that can be trained to identify and provide basic malaria prophylaxis and anti-malarial drugs to community members. Training of shopkeepers in basic dispensing of anti-malarials has been shown to be effective in reducing morbidity and mortality associated with malaria (Marsh, 1999). Other informal sources of information and advice also have the potential of being exploited to deliver relevant malaria prevention and treatment messages to the community.

Decision-making process also had a role to play in that a higher percentage of cases of complicated malaria were noted in cases where both parents were involved in the process. This is corroborated by focused group discussions where majority of women felt that they were not empowered to make own decisions independent of their husbands or other family members hence affecting positive health-seeking behaviour. They highlighted that the absence of family heads or other key decision makers from households often

contributed to delays in seeking care and that men only responded when a child's condition worsened.

According to Ministry of Health Kenya's Division of Malaria Control a practice gap was evident in the management and control of malaria (MOH, 2008). In Mbeere district, this gap was attributed to the issues raised by the participants during focus group discussions that included: public health facilities being far and with long queues due to high client load, shortage of drugs, lack of diagnostic capacity, lack of friendly reception by health workers and unreliable public transport system.

In order to promote community participation in malaria control, a locally adapted Community-Based Framework was recommended based on the findings and with ideas borrowed from the National Malaria Strategy and Community Strategy (MOH, 2001; MOH, 2007b). The recommended strategy took cognizance of the fact that community members need to be involved in all stages of the health care process. Identification of needs, selection of priorities, planning, implementation, monitoring and evaluation of activities can occur in close cooperation with the health sector, as well as other sectors concerned in the district. Community action for the health of the under-fives is critical in the suggested areas of intervention. The community will have a particularly strong role to play in strengthening linkages with health services, increasing awareness on malaria and in improving the quality of care. Increased knowledge of the community on malaria will result in increased action for health and increased participation in problem-solving to meet the health needs of the under-fives. The proposed Framework will be

operationalized through two main approaches: Creating public demand for appropriate malaria diagnosis and treatment in the community through a social marketing approach and strengthening of quality malaria case-management at health facilities, drug shops and households through training, quality management and improved supportive supervision.

Four main areas of intervention have been suggested in the Framework. As a first preparatory step in implementing community activities, local community leaders (political and religious leaders, leaders of social groups, non-governmental organizations and other key opinion leaders) will be informed about the malaria situation in the district and the activities to be carried out in order to gain their support and collaboration. The meetings will also provide opportunities for participants to share their views and concerns and to determine their own priorities, needs, and capabilities. Effective community entry will be based on a process of engagement that recognizes the need for the health care system to negotiate its way into the community agenda and care system as a way of addressing their health and development issues (NHSSPII, 2005). A social marketing approach will be chosen to increase knowledge and awareness of malaria and to promote prompt and appropriate treatment seeking from reliable sources. The design of the behaviour change communication strategy will be based on current knowledge of malaria and experiences from other projects in the district such as the Child Survival Programme. The main target audience of the campaign will be mothers and caretakers of children under five years of age and pregnant women. However, other household members and the general population will be secondary targets in order to achieve homogeneity of understanding in the population. Messages will stress the importance of prompt

recognition of malaria symptoms and immediate correct treatment with the recommended first-line drug (Coartem). Prevention methods, such as the use of ITNs and Intermittent Preventive Treatment in pregnancy (IPTp) will also be advocated. Special campaigns will be implemented in MCH clinics. They will target especially at pregnant women and mothers of young children. During special days, community health promoters and MCH clinic staff will inform mothers on malaria, its prevention and its proper treatment. The benefits of malaria prevention using ITNs and IPTp will be particularly emphasized (NHSSPII, 2005).

Health care services of good quality are a core element for the delivery of effective diagnosis and treatment for malaria. As a result of the social marketing, the demand for quality services will be expected to increase. In order to meet this demand, the health facility staff must be in the position and willing to deliver good quality of care. The Framework aims to improve quality of care with a focus on the following areas: Correct diagnosis through the proper use of the Integrated Management of Childhood Illnesses algorithm or with improved laboratory diagnosis, rational prescription of antimalarials, antipyretics and other drugs and appropriate advice on prescribed treatment and malaria prevention.

From the study findings, self-treatment at home is often the first and quickest response to a malaria episode and the private drug retail sector plays an important role in providing drugs for home-based management of fever or malaria. On the other hand, drug shops often leave patients with sub-standard malaria drugs and poor prescribing practices

leading to ineffective treatment and increasing drug resistance (MOH, 2007 b). Shop owners and dispensing staff will be provided with education for behaviour change and adherence to drug regulatory requirements.

The outcome of the activities under the framework will focus on treatment seeking behaviour of the caretakers, quality of case-management and most importantly on the overall health of the under-fives. Most health facilities have no formal mechanism for communities to provide regular feedback to the facilities and health workers on their perceptions of quality of the service and their suggestions for improvement in the services. Community inputs will be sought through group meetings and household surveys. A further step will be to set up regularly scheduled meetings with the community. A basic assumption in monitoring and evaluation will be that the malaria transmission and other relevant epidemiological parameters will remain largely unchanged during the period of implementation (MOH, 2007 b). The overview of the intervention areas, the activities involved and the anticipated outcomes have been presented diagrammatically in figure 4.17.

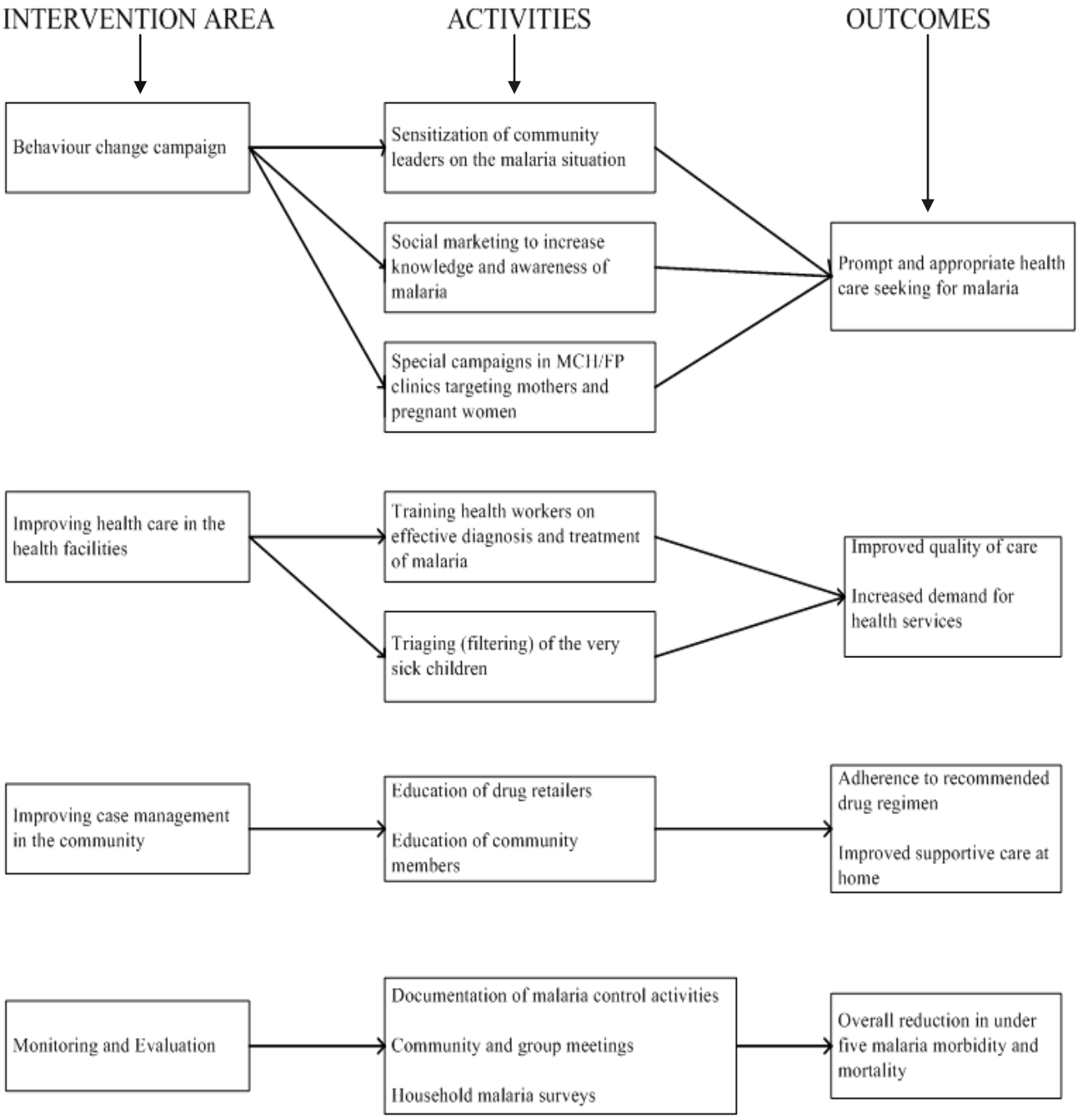


Figure 4.17: Diagrammatic presentation of the Framework Source: Ideas borrowed from National Malaria Strategy 2001-2010 and Community Strategy 2007

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

This study was designed to determine the practices of the caretakers during malaria illnesses in children under- five years of age and how they influence the severity of the illness. Of the four hundred and one (401) children seen in the study, 99% of them were accompanied by a female caretaker. Majority of the caretakers initially managed the children at home and within an average of 2.1 days shifted to the health facility if there was no improvement. The commonest form of intervention was administration of drugs to reduce fever. The frequency of giving fluids and food to the sick children was also reduced in the majority of cases. On diagnosis and classification of the illness at the health facility, 23.9% of all children seen had complicated malaria, 74.3% had uncomplicated malaria while 1.7% were not classified. There was no significant difference in severity of malaria among the different age groups of children ($\chi^2 = 2.32$, p=0.67). Analysis of actions taken at home showed that 81.3% of the caretakers had taken one or more actions at home while 18.7% never took any action. The action of giving drugs was the most common (64.1%) followed by removal of excessive clothing (16.5%). Although caretakers were not able to accurately identify the specific drugs they gave to the sick children, they were able to report that the drugs were for a specific sign or symptom like drug to reduce fever, pain, drugs to treat malaria etc. Only 8% of the respondents reported having given an antimalarial drug at home.

6.2 Conclusions

- Majority of caretakers initiated various actions at home some of which were inappropriate.
- Religion, occupation, feeding practices and decision making dynamics were significantly associated with incidence of complicated malaria.
- Majority of the caretakers gave antipyretics with only a small percentage giving antimalarial drugs.
- Community had some misconceptions on causes of malaria.
- The community experienced some barriers in accessing health services for childhood malaria management.

6.3 Recommendations

6.3.1 Action recommendations

- Public health education needs to be intensified by the existing health systems in order to provide reliable information and address practices that have a negative effect on outcome of childhood malaria.
- Most suitable behaviour change communication strategy on malaria to be initiated
- Diagnosis and rational treatment for malaria should be made available as peripherally as possible by the Ministry of Health.
- The Ministry of Health needs to review the Community-Based Strategy to strengthen participatory approaches in order to involve the community members in planning and implementation of health services that are more accessible, affordable and user-friendly to them.

6.3.2 Recommendation for further research

- There is need to explore men's perceptions on their contribution to child care during illness since 99% of the caretakers in this study were women.
- Similar studies need to be replicated in other parts of the country to enable generalization of the results.
- Follow-up study is required in order to determine the relationship of the caretaker practices with child mortality due to malaria.

REFERENCES

Afenyadu GY, Agyepong IA, Barnish G, Adjei S, (2005). **"**Improving access to early treatment of malaria: a trial with primary school teachers as care providers." *Trop Med Int Health* 2005, **10:**1065-1072.

Agyepong I, (2001) Malaria: Ethnomedical perceptions and practices in an Adangbe farming community and implications for its control. *Social Science and Medicine*. 35, 131

Agyepong I, (2002). Strategies to Improve Adherence to Recommended Chloroquine Treatment Regimens. A Quasi-Experiment in the context of Integrated Primary Health Care Delivery in Ghana. *Social Science and Medicine* Vol 55: 2215-2226

Ahorln C, Dunyo S, Afari E, Koran K, Nkurumah F (2001). Malaria-related beliefs and behaviour in southern Ghana. Implications for treatment, prevention and control. *Tropical Medicine and International Health* ; 2(5) : 488-99

Alonzo A.E.(2002). Everydy illness behaviour: a situational approach to health status deviations. *Social Science and Medicine.* 13(A), 397

A M D, (2008). African Malaria Day

Bachou H, Tylleskär T, Kaddu-Mulindwa DH, Tumwine JK (2006). "Bacteraemia among severely malnourished children infected and uninfected with the human immunodeficiency virus-1 in Kampala, Uganda". *BMC Infectious Disease.* **6**: 160.

Barat L (2006). "Four malaria success stories: how malaria burden was successfully reduced in Brazil, Eritrea, India, and Vietnam". *American Journal of Tropical Medicine and Hygiene* **74** (1): 12–6.

Baume C, (2002). Patterns of care for childhood malaria in Zambia. *Social Science Medicine* (2000) Nov. 51(10): 1491-1503.

Beare NA, Taylor TE, Harding SP, Lewallen S, Molyneux ME, (2006). "Malarial retinopathy: a newly established diagnostic sign in severe malaria". *American Journal of Tropical Medicine and Hygiene.* **75** (5): 790–7. PMID

Becker MH, Maiman LA, (1975): Socio-behavioral determinants of compliance with health and medical care recommendations, Med Care 33(1) : 1021

Blaxter M. and Paterson E.(1999). Consulting behaviour in a group of young families. *Journal of Royal College.* GPs 32, 657.

Bloland P.B, Boriga D.A, Ruebush TK, Mc Cormick J.B, Roberts J.M, Oloo A.J, Hawley W, Lal A, Nahlen B, and Campbell CC; (1999). Longitudinal Cohort study of the epidemiological of malaria infections in an area of intense malaria transmission. *American Journal of Tropical Medicine and Hygiene* 60(4) : 641-648

Boivin MJ (2002). "Effects of early cerebral malaria on cognitive ability in Senegalese children". *J Dev Behav Pediatr* **23** (5): 353–64.

Breman J (2001). "The ears of the hippopotamus: manifestations, determinants, and estimates of the malaria burden". *American Journal of Tropical Medicine and Hygiene* **64** (1-2 Suppl): 1–11c.

Brinkmann U and Brinkmann A (1999). Malaria and Health in Africa : the present situation and epidemiological trends. Tropical Medicine and Parasitology 42, 204-213

Carter JA, Ross AJ, Neville BG, Obiero E, Katana K, Mung'ala-Odera V, Lees JA, Newton CR (2005). "Developmental impairments following severe falciparum malaria in children". *Tropical Medicine and International Health* **10**: 3–10

Chris W (2008). Community Health Manual. The African Medical and Research Foundation. Third edition. 2008

Cunningham S.(1990). Mothers' beliefs about and perceptions in their children's illnesses. In *Readings in Medical Sociology* (Edited by Cunningham-Burley S. and McKeganey N.). Tavistock/Routledge, London.

D'Alessandro U.(1998). Antimalarial drugs resistance: Surveillance and molecular methods for National Malaria Control Programmes. Memorias Do Institute Oswaldo Cruz 93, 627-630.

Dabis F., Breman J.G., Roisin A.J., Haba F. (2000). "Monitoring selective components of primary health care. Methodology and community assessment of vaccination, diarrhoea and malaria practices in Conakry, Guinea". Bulletin of the World Health Organization 67(6): 675-84.

DDP, (2007). District Development Plan 2007/2012. Mbeere District.

Djimbe A., Plowe C.V., Diop S., Dicko A., Wellerns T.E. and Doumbo O.(1998). Use of antimalarials drugs in Mali: policy versus reality. American Journal of Tropical Medicine and Hygiene 59, 376-379.

Fischer A, Laing J, Stoeckel J. (1983). Handbook for family planning operations research design. 1st Edition. Library Congress; USA: 31-34

Flemming K., Priyanie H., Derika P., Wim V., Felix P. (2000). A village treatment center for malaria: community response in Sri Lanka. Social Silence and Medicine 50(2000) 879-889.

Gladwell M., (2002). "The Mosquito Killer". The New Yorker.

Greenwood B, Mutabingwa T (2002). "Malaria in 2002". *Nature* **415**: 670–2.

Greenwood B. M., Greenwood A.M., Bradley A.K., Byass P., Jammeh K., Marsh K., Tulloch S., Oldfield F., and Hayes R.(2003). Mortality and morbidity from malaria among children in a rural area of the Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and International Health.* 81, 478.

Greenwood BM, Bojang K, Whitty CJ, Targett GA (2005). "Malaria". *Lancet* **365**: 1487–1498.

Grover-Kopec E, Kawano M, Klaver R, Blumenthal B, Ceccato P, Connor S (2005). "An online operational rainfall-monitoring resource for epidemic malaria early warning

Guerrant RL, Hughes JM, Lima NL, Crane J (1990). Diarrhoea in developed and developing countries: magnitude, special settings, and etiologies. *Reviews of Infectious Diseases 1990;* 12 (Suppl. 1): S41-S50 systems in Africa". *Malaria Journal* **4**: 6.

Hansmann M, **Muela R,** (2008). Illness naming and home treatment practices for malaria : an example from Tanzania, People and Medicine in East Africa.

Hay SI, Snow RW (2006). "The Malaria Atlas Project: Developing Global Maps of Malaria Risk". *PLoS Medicine* **3** (12): e473

Health Information Systems ; Mbeere District, (2007)

Health Information Systems ; Mbeere District, (2008)

Helman C.(1990). Culture, Health and Illness, 2nd edn. Butterworth-Heinemann, Oxford.

Hoen E, (2006) “Report of the Commission on Intellectual Property Rights, Innovation and Public Health: a call to governments.” *Bull World Health Organ* 2006, **84:**421-423.

Holding PA, Snow RW (2001). "Impact of Plasmodium falciparum malaria on performance and learning: review of the evidence". *American Journal of Tropical Medicine and Hygiene.* **64** (1-2 Suppl): 68–75. PMID 11425179. 9

Hougvivatana T, (2004). Human behaviour and malaria. *South East Asian Journal of. Tropical Medicine and Public Health* 17:353

Hull K., (2006) "Malaria: Fever Wars". PBS Documentary

Humphreys M., (2001). Malaria: Poverty, Race, and Public Health in the United States. John Hopkins University Press. ISBN 0-8018-6637-5

Idro R., Otieno G., White S., Kahindi A., Fegan G., Ogutu B., Mithwani S., Maitland K., Neville B.G., Newton C.R. (2006). "Decorticate, decerebrate and opisthotonic posturing and seizures in Kenyan children with cerebral malaria". *Malaria Journal* **4** (57): 57

Imperial College, London, "Scientists create first transgenic malaria mosquito", 2000-06-22.

Ito J, Ghosh A, Moreira LA, Wimmer EA, Jacobs-Lorena M (2002). "Transgenic anopheline mosquitoes impaired in transmission of a malaria parasite". *Nature* **417**: 387–8.

Jones G, Steketee R, Black R, Bhutta Z, Morris S, (2003). Child Survival Study Group 2003: 65-71.

Kaufman T, Rúveda E (2005). "The quest for quinine: those who won the battles and those who won the war". *Angew Chem Int Ed Engl* **44** (6): 854–85.

Keiser J, Utzinger J, Caldas de Castro M, Smith T, Tanner M, Singer B (2004). "Urbanization in sub-saharan Africa and implication for malaria control". *American Journal of Tropical Medicine and Hygiene* **71** (2 Suppl): 118–27

Kenya Demographic and Health Survey, 2003.

Kenya Demographic and Health Survey, 1998.

Kidane G; Morrow R,(2000). Teaching mothers to provide home treatment on Malaria in Tigray, Ethiopia : a randomized trial. Lancet (356): 550-555

Killeen G, Fillinger U, Kiche I, Gouagna L, Knols B (2002). "Eradication of Anopheles gambiae from Brazil: lessons for malaria control in Africa?". *Lancet Infect Dis* **2** (10): e192

Kivumbi G.W.(2004). Practices and patterns of treatment seeking for children with severe malaria in rural Uganda. Danish Medical Bulletin No.3 September 2004. Vol. 51 page 435.

Kleinman A.(2001). On illness meanings and clinical interpretations: not "rational man", but rational approach to man the sufferer-man the healer. Cultural Medicine and. Psychiatry.*5, 378.*

Layne S, (2007). "Principles of Infectious Disease Epidemiology /" (PDF). *EPI 220*. UCLA Department of Epidemiology.

Lindblade K, Oneill D, Mathanga D, Katungu J, Wilson M, (2003) : Treatment for clinical malaria is sought promptly during an epidemic in a highland region of Uganda. *Tropical Medicine and International Health* ; 5(12) 865-7

Lipowsky R; Kroeger A and Vasquenz M (2002). Sociomedical aspects of malaria control in Colombia. *Social Science Medicine* 34, 625

Rowe AK, de Savigny D, Lanata CF, Victora CG, (2005). **"**How can we achieve and maintain high-quality performance of health workers in low-resource settings?" *Lancet* 2005, **366:**1026-1035.

Manun'ebo MN, Haggerty PA, KalangaieM, Asworth A, Kirkwood BR (1994). Influence of demographic, socio-economic and environmental variables on childhood diarrhoea in a rural area of Zaire. *Journal of Tropical Medicine and Hygiene 1994;* **97**:31-38.

Marsh V, (1999). Changing home treatment of childhood fevers by training of shopkeepers in rural Kenya. Tropical Medicine and International health (4): 383-389

Marcucci C, Madjdpour C, Spahn D (2004). "Allogeneic blood transfusions: benefit, risks and clinical indications in countries with a low or high human development index". *Br Med Bull* **70**: 15–28.

District Development Plan, Mbeere District 2007/2012

McCombie S.C, (2000). Treatment seeking for malaria. A review of recent research. *Social Science and Medicine* 43; 933-945

McCombie S.C, (2002): Self-treatment for malaria: the evidence and methodological issues. Health Policy Plan 2002**, 17:** 333-344.

MVM, (2007). Medicines for Malaria Venture http://www.mmv.org Retrieved on 1st October 2009.

Mockenhaupt F, Ehrhardt S, Burkhardt J, Bosomtwe S, Laryea S, Anemana S, Otchwemah R, Cramer J, Dietz E, Gellert S, Bienzle U (2004). "Manifestation and outcome of severe malaria in children in northern Ghana". *American Journal of Tropical Medicine and Hygiene* **71** (2): 167–72.

MOH, (2008). Kenya's Division of Malaria Control Report, 2008.

MOH, (2007a). Health Information System Report (Unpublished) 2007.

MOH, (2007b). The Kenya Essential Package for Health at Level 1

MOH (2003). National Guidelines For Diagnosis, Treatment and Prevention of Malaria

MOH, (2001). National Malaria Strategy 2001-2010

Mwenesi H, (1995). Mothers' definition and treatment of childhood malaria on the Kenyan Coast. Final Report, WHO/TDR/SER.

NCAPD. 2004 **National Coordinating Agency for Population and Development**. Where are we now? Kenya's progress in implementing. The International Conference on Population and Development Programme of Action, 1994-2004.

NCAPD (2005) National Coordinating Agency for Population and Development [Kenya], Ministry of Health (MOH), Central Bureau of Statistics (CBS), ORC Macro. 2005. Kenya Service Provision Assessment Survey 2004. Nairobi, Kenya: National Coordinating Agency for Population and Development, Ministry of Health, Central Bureau of Statistics, and ORC Macro.

NCPD (1994) National Council for Population and Development Central Bureau of Statistics (CBS) (Office of the Vice President and Ministry of Planning and National Development [Kenya]), and Macro International Inc. (MI). 1994. Kenya Demographic and Health Survey 1993. Calverton, Maryland: NCPD, CBS, and MI.

NCPD (1999) National Council for Population and Development (Central Bureau of Statistics (CBS) (Office of the Vice President and Ministry of Planning and National Development) [Kenya], and Macro International Inc. (MI). 1999. Kenya Demographic and Health Survey 1998. Calverton, Maryland: NDPD, CBS, and MI.

NHSSP, (2005). National Health Sector Strategic Plan, Kenya

Neuvians D., Mtango F., and Kielman A., (2006). Failure to participate in a malaria chemosuppression programme: North Mara, Tanzania. *Journal of Tropical Medicine and Hygiene* 86(3): 99-107.

Noor AM, Zurovac D, Hay SI, Ochola SA, Snow RW, (2003) **"**Defining equity in physical access to clinical services using geographical information systems as part of malaria planning and monitoring in Kenya." *Trop Med Int Health* 2003, **8:**917-926.

Nsimba SED, Massele AY, Eriksen J, Gustafsson LL, Tomson G, Warsame M, (2002). "Case management of malaria in under-fives at primary health care facilities in a Tanzanian district." *Trop Med Int Health* 2002, **7:**201-209.

Pagnoni F; (1997). A community-based programme to provide prompt and adequate treatment of presumptive malaria in children. *Transactions of the Royal Society of Tropical Medicine and International Health* (91) : 512-517

Para M.E; (1991). Identification of plasmodium falciparum Histidine-Rich Protein 2 in the plasma of Humans with Malaria. J. Clin. Microbiol.,29, 1629-1634

Pates, H & Curtis, C (2005**)**. "Mosquito behavior and vector control", page 53-70. Annual Review on Entomology, 50.

Redd S, Kazembe P, Luby S, Nwanyanwu O, Hightower A, Ziba C, Wirima J, Chitsulo L, Franco C, Olivar M (2006). "Clinical algorithm for treatment of Plasmodium falciparum malaria in children". *Lancet* **347** (8996): 80.

Rooth I, Bjorkman A, (2002). Fever episodes in a holoendemic malaria area of Tanzania : parasitological and clinical findings and diagnosis aspects related to malaria. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 86 : 479-82

Rosenberg T, (2008**)**. ""What the world needs now is DDT"". http://query.nytimes.com/gst/fullpage.html?sec=health&res=9F0DEEDA1738F932A25757C0A9629C8B63. Retrieved on 3 November 2008.

Rosenstoch I; (1974). Historical origin of the health belief model, Health Educ. Monogr 2: 334

Rowland M, Durrani N, Hewitt S, Mohammed N, Bouma M, Carneiro I, Rozendaal J, Schapira A (1999). "Permethrin-treated chaddars and top-sheets: appropriate technology for protection against malaria in Afghanistan and other complex emergencies" *Transactions of the Royal Society of Tropical Medicine and Hygiene*. **93** (5): 465–72

Ruebush T.K, (2005). Bull World Health Organ. 73 (2). 229-36

R B M, (2005). Global Strategic Partnership for Roll Back Malaria 2005-2015

Sachs J, Malaney P (2002). "The economic and social burden of malaria". *Nature* **415**: 680–5

Sirima S.B, Konate.A, Tiono A.B, Convello N, Consensus S, (2003). Early treatment of childhood fevers with pre-packaged antimalarial drugs in Burkina Faso. *Tropical Medicine and International Health* 2003; 8. 1-7

Snow R; Peshu N; Forster D; Mwenesi H and Marsh K (1995). The role of shops in the treatment and prevention of childhood malaria on the Kenyan Coast. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 86,237

Tanner M, **Vlassoff,** (1998). Treatment seeking behaviour for malaria. A typology based on endemicity and gender. *Social science and Medicine* 46 523-532

Tarimo D S, Lwihula GK, Minjas JN, Bygbjerg IC, (2000). **"**Mothers' perceptions and knowledge on childhood malaria in the holendemic Kibaha district, Tanzania: implications for malaria control and the IMCI strategy. " *Trop Med Int Health* 2000, **5:**179-184.

Trampuz A, Jereb M, Muzlovic I, Prabhu R, (2003). "Clinical review: Severe malaria". *Critical Care* **7** (4): 315–23

Trung H, Van Bortel W, Sochantha T, Keokenchanh K, Quang N, Cong L, Coosemans M, (2004). "Malaria transmission and major malaria vectors in different geographical areas of Southeast Asia". *Tropical Medicine and International Health* **9** (2)

Van Benthem B, Vanwambeke S, Khantikul N, Burghoorn-Maas C, Panart K, Oskam L, Lambin E, Somboon P, (2005). "Spatial patterns of and risk factors for seropositivity for dengue infection". *American Journal of Tropical Medicine and Hygiene* **72** (2): 201–8

Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP, (2003)**. "**Applying an equity lens to child health and mortality: more of the same is not enough. "*Lancet* 2003, **362:**233-41.

White NJ, Nosten F, Looareesuwan S, Watkins WM, Marsh K, Snow RW, Kokwaro G, Ouma J, Hien TT, Molyneux ME (1999): Averting a malaria disaster. *Lancet* 1999, **353:**1965-1967.

Woodcrow C, Harnes R.K, Krishna S, (2006). Artemesinins. *Postgraduate Medical Journal* 2006;5: 73-84

WHO, (1998) The World Health Report 1998. Life in the 21st Century, a vision for all. Geneva: WHO.

WHO, (1998). Roll Back Malaria: a global partnership. WHO:1998

WHO, (1998). World Fact Sheet No.94

WHO, (2000). The African Summit on Roll Back Malaria WHO/CDS/RBM/2000. 17

WHO, (2000). WHO Expert Committee on Malaria, WHO Technical Report Series No. 892

WHO, (2006). Roll Back Malaria. "Economic costs of malaria''

WHO, (2008). African Malaria Day Fact Sheet. http://www.rbm.who.int/docs/AMD, May 2008

WHO, (2008) World Malaria Report

APPENDICES

Appendix 1: Questionnaire

CHILD HEALTH CARE PRACTICES BY CARE –TAKERS DURING MALARIA ILLNESS IN CHILDREN 0-5 YEARS OF AGE.

INSTRUCTIONS

i. This questionnaire focuses on household practices by caretakers during malaria illness which will form a basis of improving care of children with malaria.

ii. Any information given will be treated with utmost confidentiality.

iii. The interview will take place in the MCH and OPD departments of the health facility

iv. The interviewer will introduce self to the respondent and explain the purpose of the interview.

v. For every respondent an informal consent will be obtained before proceeding with the interview.

vi. The respondent will be requested to respond to all questions sincerely.

vii. The interviewer will thank the respondent at the end of the interview.

DATE OF INTERVIEW _____

QUESTIONNAIRE NO _____

NAME OF HEALTH FACILITY _____

INTERVIEW SETTING

1. MCH ☐
2. OPD ☐
3. PAEDIATRIC WARD ☐
4. COMMUNITY/HOUSEHOLD ☐

SECTION 1- SICK CHILD INFORMATION

1. Sex of child

1. Male ☐
2. Female ☐

2. Age of child in months

0-11 ☐

12-23 ☐

24-35 ☐

36-47 ☐

48-59 ☐

3. Presenting signs and symptoms (tick in the box for all that applies)

1. High fever ☐
2. Vomiting ☐
3. Not feeding ☐
4. Difficulty in breathing ☐
5. History of convulsion ☐

6. Diarrhoea ☐
7. Not responding/coma ☐
8. Others (specify)----------

4. Blood slide positive
1. positive ☐
2. negative ☐

5. Malaria category
1. Complicated ☐
2. Uncomplicated ☐

SECTION 2 – CARE- TAKER INFORMATION

6. Name of respondent (optional)_____

7. Who usually cares for this child during the day?

1. Mother ☐
2. Father ☐
3. Sibling ☐
4. Close relative ☐
5. Others (specify)----------

8. Sex of care- taker
1. Male ☐
2. Female ☐

9. Age of care-taker on the last birthday in years

☐☐

10. Marital status of care-taker
1. Married ☐
2. Never married ☐
☐

3. Widowed/widower
4. Divorced ☐
5. Separated ☐

11. Class care-taker last attended in school

1. Lower primary ☐
2. Upper primary ☐
3. Secondary ☐
4. College ☐
5. Never ☐

12. Religious denomination

1. Catholic ☐
2. Protestant ☐
3. Seventh Day Adventist ☐
4. Muslim ☐
5. Akorino ☐
6. Others (specify)_____

13. Occupation

1. Professional ☐
2. Skilled ☐
3. Semi-skilled ☐
4. Business ☐
5. Housewife ☐

6. Others(specify)_____

SECTION 3- HEALTH SEEKING BEHAVIOUR AND CARE OF THE SICK CHILD

14. Approximately how far is the nearest health facility from your home?

1. Less than 1.0 km ☐
2. 1.1 – 10.0 km ☐
3. 10.1 – 20.0 km ☐
4. More than 20.0km ☐

15. For how long has this child been unwell with this illness? (in days)

1. One ☐
2. Two ☐
3. Three ☐
4. Four ☐
5. Five ☐
6. Six ☐
7. Seven ☐
8. Over one week ☐

16. When you first noticed that the child was unwell what did you do at home?

1. Gave drugs ☐
2. Did tepid sponging ☐
3. Removed excessive clothing ☐
4. Gave more fluids ☐

☐

5. Did nothing

6. Others (specify)----------

17. If drugs are mentioned in Q.16 above, probe for the kind of drugs given

1. Anti malarial ☐
2. Antipyretics ☐
3. Analgesics ☐
4. Herbs ☐
5. Unknown drug ☐
6. Others (specify)----------

18. How long after you noticed the illness did you give the treatment / management at home?

1. Same day ☐
2. Next day ☐
3. Two days later ☐
4. Three or more days later ☐
5. Can't remember ☐
6. Don't know ☐

19. From where did you obtain the medicine /advice about the child's management at home?

1. Relative ☐
2. Neighbor ☐
3. Shop ☐
4. Community health worker ☐
5. Chemist /drug shop ☐
6. Health facility ☐

7. Traditional healer/herbalist ☐

8. Other (specify)----------

20. Who made the decision that the child should be brought to the health facility

1. Child's mother ☐
2. Child's father ☐
3. Both mother and father ☐
4. Community health worker ☐
5. Community member ☐
6. Other (specify)----------

21. What were the most worrying signs that made the child to be brought to the health facility?

1. Vomiting ☐
2. Unable to drink ☐
3. Fever ☐
4. Convulsions ☐
5. Coma ☐
6. Diarrhoea ☐
7. Extreme weakness ☐
8. Difficulty in breathing ☐
9. Others (specify)----------

22(a) For the time the child has been sick, have you given fluids?

1. More frequently ☐
2. Less frequently ☐
3. Same frequency ☐
4. Non-committal ☐

22(b) How about food?

1. More frequently ☐
2. Less frequently ☐
3. Same frequency ☐
5. Non-committal ☐

SECTION 4- MALARIA PREVENTION PRACTICES

23. Please tell me what you have done to prevent malaria attacks in the family

1. Use of mosquito bed net ☐
2. Use of treated mosquito bed net ☐
3. Clearing of bushes ☐
4. Draining of stagnant water ☐
5. House spraying ☐
6. Malaria prophylaxis ☐
7. Nothing ☐
8. Others(specify)----------

24. If use of mosquito net is mentioned in question 18 above, probe for who sleeps under net

1. Children ☐
2. Mother of child ☐
3. Father of child ☐
4. All family members ☐

25. From whom did you receive advice on malaria prevention and management?

1. Health facility worker ☐
2. Community health worker ☐
3. Women group meeting ☐
4. Community leaders ☐
5. Village health talk ☐
6. Radio/TV/Paper ☐
7. Drama /songs /poem ☐
8. Schools ☐
9. Others (specify)----------

---------- **END** ----------

THANK YOU VERY MUCH FOR PARTICIPATING

NAME OF DATA COLLECTOR…….…… **DATE……**

Appendix 2: Question Guide 0n Focus Group Discussion With Women Groups

Q1. Have you heard of malaria disease?

Q2. Is malaria a common illness among children in this area?

Q3. What explanations are usually given for the causes and transmission of malaria in this area?

Q4. What signs and symptoms are associated with malaria?

Q5. How is fever/malaria in children managed in the community?

Q6. What are the problems associated with childhood malaria management in the community?

Q7. When is malaria illness in children considered severe to warrant consultation of alternative help?

Q8. Are there problems you encounter in utilization of health facilities while seeking care for children with malaria in terms of the following:

Transport

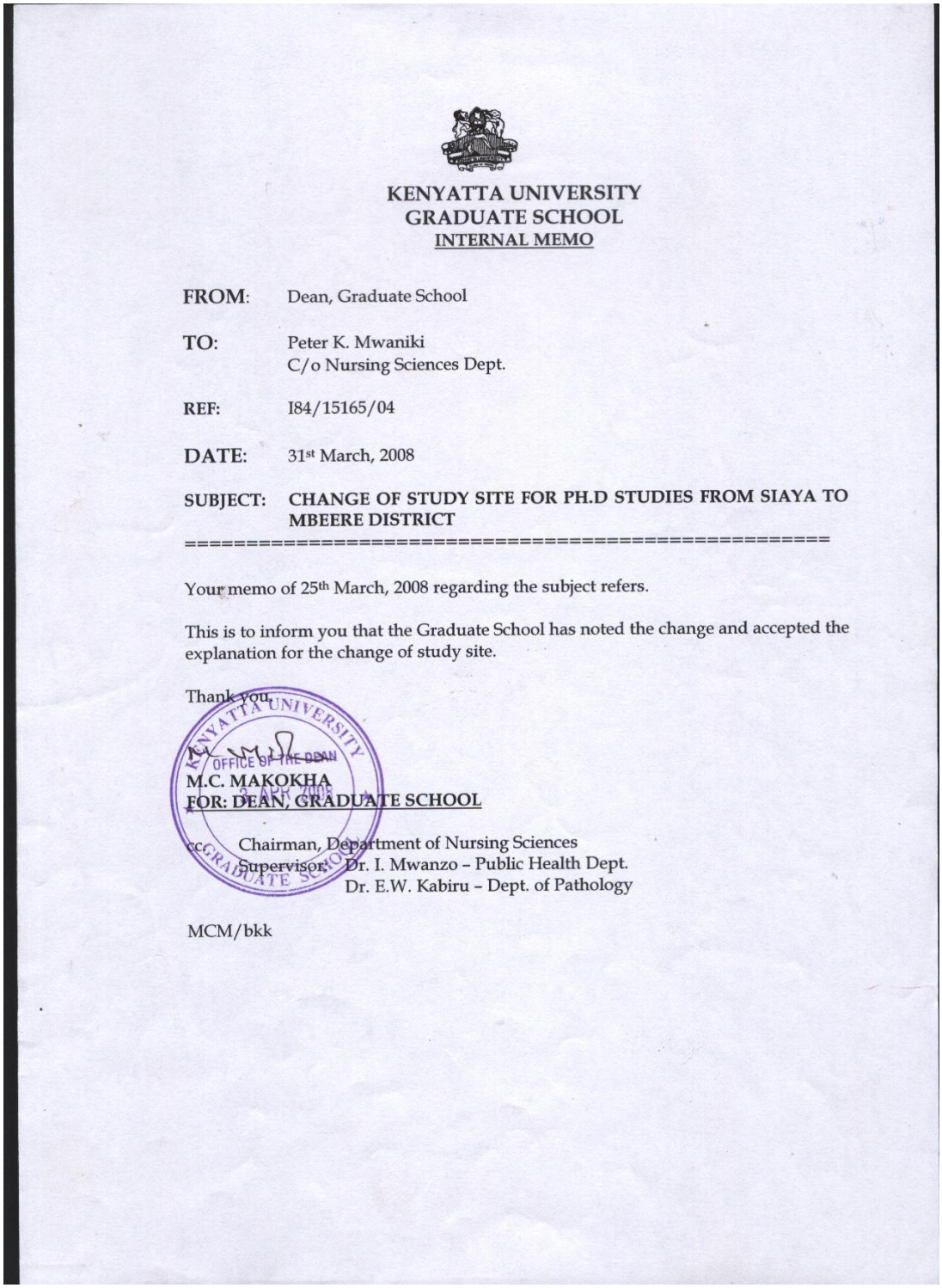
Services available

Waiting time

Cost

Q9. What suggestions/recommendations do you have on how malaria prevention and treatment can be improved in this area?

Appendix 3: Kenyatta University Graduate School Approval



KENYATTA UNIVERSITY
GRADUATE SCHOOL
INTERNAL MEMO

FROM: Dean, Graduate School

TO: Peter K. Mwaniki
C/o Nursing Sciences Dept.

REF: I84/15165/04

DATE: 31st March, 2008

SUBJECT: **CHANGE OF STUDY SITE FOR PH.D STUDIES FROM SIAYA TO MBEERE DISTRICT**

==========

Your memo of 25th March, 2008 regarding the subject refers.

This is to inform you that the Graduate School has noted the change and accepted the explanation for the change of study site.

Thank you.

KENYATTA UNIVERSITY OFFICE OF THE DEAN 2 APR 2008 GRADUATE SCHOOL

M.C. MAKOKHA
FOR: DEAN, GRADUATE SCHOOL

cc. Chairman, Department of Nursing Sciences
Supervisor: Dr. I. Mwanzo – Public Health Dept.
Dr. E.W. Kabiru – Dept. of Pathology

MCM/bkk

Appendix 4: Ministry of Science and Technology Approval

REPUBLIC OF KENYA

MINISTRY OF SCIENCE & TECHNOLOGY

Telegrams: "SCIENCE TEC", Nairobi
Telephone: 02-318581
E-Mail:ps@scienceandtechnology.go.ke

JOGOO HOUSE "B"
HARAMBEE AVENUE,
P.O. Box 9583-00200
NAIROBI

When Replying please quote
Ref. MOST 13/001/ 38C 703/2

5th April 2008

Peter Kabanya Mwaniki
Kenyatta University
P.O. Box 43844
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on, ***'Child Heath Care Practices and their Impact on Outcome of Malaria in Children 0-5 Years of Age; A Case of Mbeere District Kenya'***

I am pleased to inform you that you have been authorized to carry out research in Mbeere District for a period ending 30th July, 2008.

You are advised to report to the District Commissioner, District Education Officer and the Medical Officer of Health Mbeere District before embarking on your research project.

On completion of your research, you are expected to submit two copies of your research report to this office.

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to:

The District Commissioner
Mbeere District

The District Education Officer
Mbeere District

The Medical Officer of Health
Mbeere District

Appendix 5: Ministry of Health Approval

MINISTRY OF HEALTH

Telephone: 068-21040
Fax: 068 - 21257
Telegrams:MOH. Siakago

When replying please quote our reference
Ref. No M.21/VOL.II/08(13)

OFFICE OF THE
MEDICAL OFFICER OF HEALTH
MBEERE DISTRICT
P.O. BOX 81
SIAKAGO

Date 7/5/08

THE OFFICERS INCHARGE;

- ***MBEERE .D. HOSPITAL***
- ***ISHIARA .S.D. HOSPITAL***
- ***KIRITIRI H/C***
- ***GATEGI H/C***
- ***KIAMBERE DAM DISP***

RE: MR. PETER KABANYA MWANIKI
RESEARCH WORK

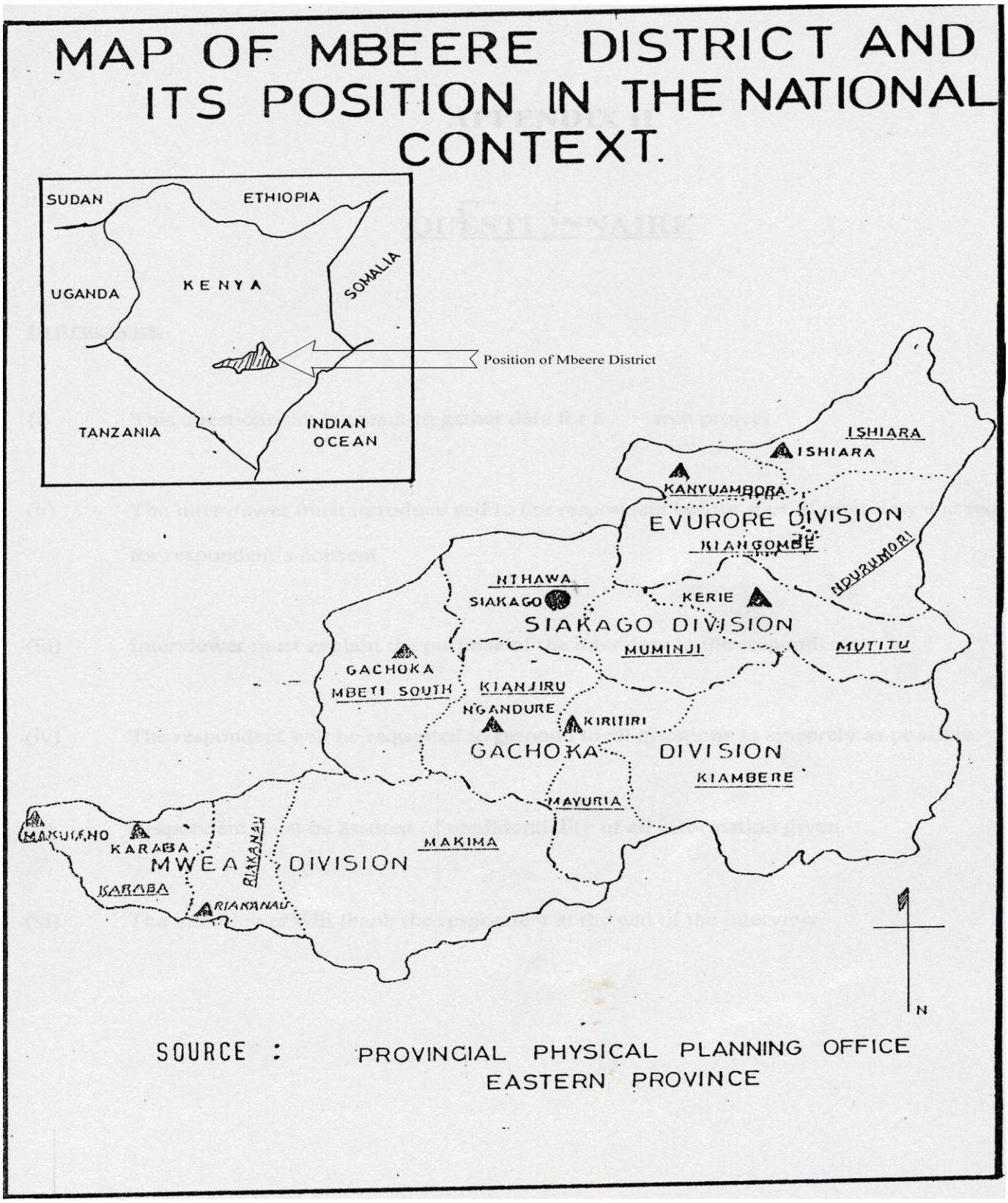
Above named has been authorized to undertake research work on **"Child Health care practices and their impact on outcome of malaria in children 0-5 yrs of age"** in Mbeere District.

He will use your facilities for the said research.

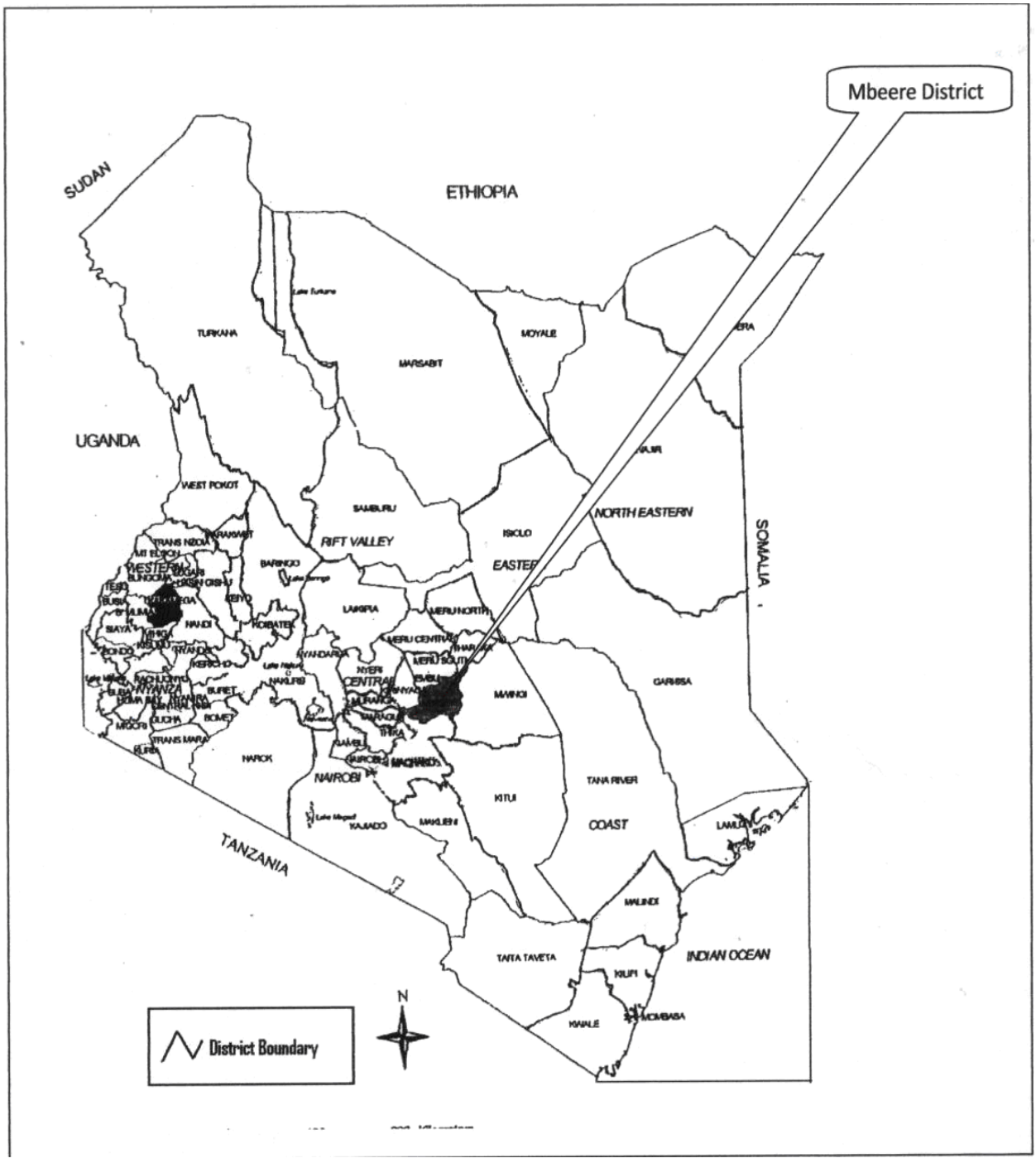
Please accord him assistance in any way possible to facilitate his work.

DR. KANIARU
DMOH-MBEERE

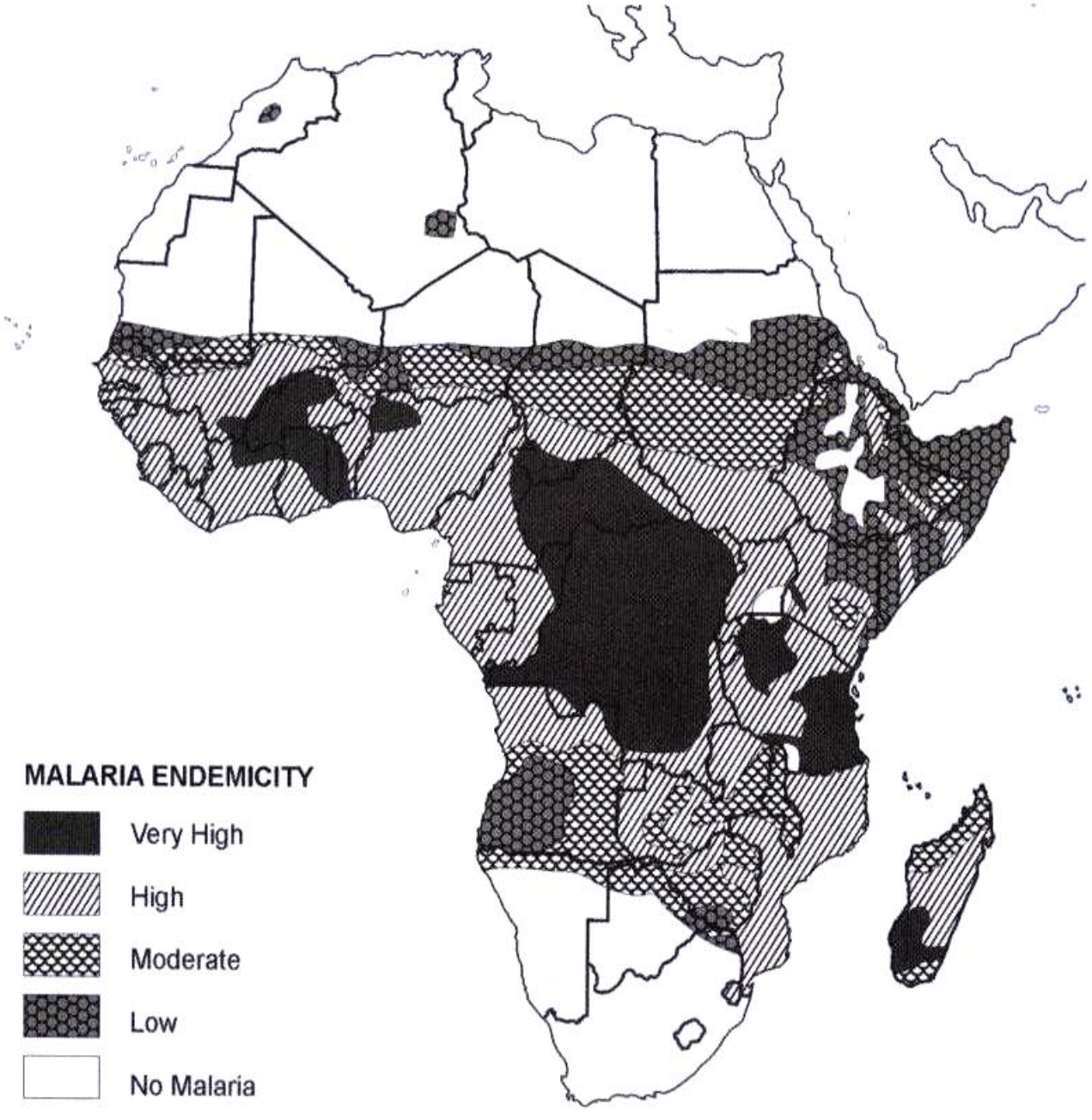
Appendix 6: Map of Study Area



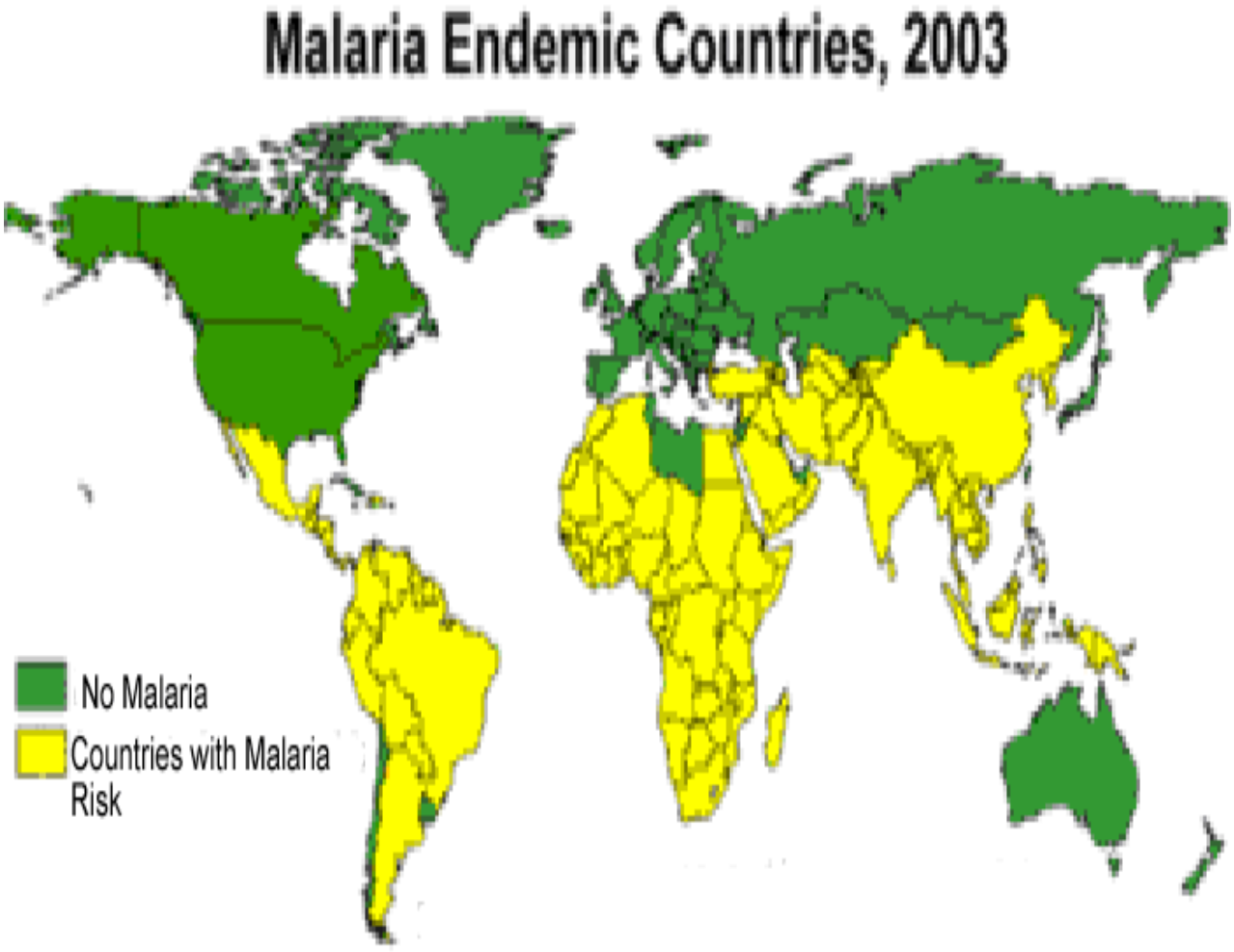
Appendix 7: Map of Kenya Showing Position of Mbeere District



Appendix 8: Map of Africa Showing Malaria Distribution



Appendix 9: Malaria Endemic Countries, 2003



Appendix 10: Outpatient morbidity summary Mbeere District year 2007/2008

	YEAR 2007						YEAR 2008					
DIAGNOSIS	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Diarhoeal Disease	636	776	1102	776	636	404	672	959	893	533	814	692
Tuberculosis	9	13	14	5	9	4	9	26	17	22	7	8
Chicken Pox	58	108	138	224	219	92	39	66	61	53	44	123
Measles	6	34	23	10	5	3	2	3	1	2	8	0
Infectious Hepatitis	2	2	2	0	1	1	1	1	0	0	3	0
Mumps	408	269	159	168	222	186	148	174	226	214	1065	128
Malaria	12988	10835	12643	12321	9562	7902	9100	16361	12698	11570	13269	14282
Gonorrhea	42	70	23	39	44	37	39	67	47	51	573	47
Urinary Tract Infection	342	328	325	401	263	228	408	380	406	383	653	429
Bilharzia	6	1	35	2	2	27	3	82	0	0	200	43
Intestinal Worms	2930	2402	2285	2201	1408	1583	2429	2851	3381	2304	2849	2815
Malnutrition	12	8	23	5	10	1	0	6	12	9	272	8
Anemia	46	23	20	29	14	16	13	38	15	24	123	110
Eye Infection	539	505	419	537	295	202	435	489	463	446	502	467
Cataract	26	21	21	3	0	2	1	19	9	4	105	42
Ear Infection	297	338	219	223	193	139	217	235	222	211	221	259
Dis of Circulatory System	68	399	94	52	58	244	63	70	67	72	284	333
Dis of Respiratory System	9535	7420	8197	6658	5447	4422	5924	9220	7509	7003	7820	8949
Pneumonia	1635	861	714	1216	799	677	850	1791	1344	1359	1987	1480
Abortion	18	15	14	354	14	14	73	15	6	8	56	10
Dis of Peuperium	24	17	12	38	13	11	14	16	14	15	87	14
Neoplasms	3	0	3	2	0	0	2	3	1	5	1	2
Dis of Blood	7	11	5	1	0	3	1	3	6	2	8	8
Mental Disorders	54	29	41	55	26	21	29	54	44	27	32	28
Dental Disorders	309	309	208	303	97	130	281	258	301	237	150	292
Dis of the Skin	1847	1465	1745	1577	1235	1046	1838	2119	1722	1731	2348	1757
Rheumatism, Joint Pains	567	572	357	364	292	166	516	503	370	452	354	398
Congenital Anomalies	2	33	1	61	0	0	19	54	37	75	0	0
Pyrexia of unknown origin	6	29	54	13	4	4	3	7	10	14	5	8
Poisoning	20	56	9	13	3	3	8	14	5	8	10	6
Accidents	639	485	485	471	419	312	386	587	530	474	534	620
Typhoid Fever	773	290	349	227	281	235	422	846	349	607	480	408
All Other Diseases	2650	2432	2391	3625	2174	1878	2478	4955	2681	2876	2902	3425
Total New Cases	22629	20922	27350	26770	20681	12992	22893	42385	29703	30730	37793	32410
Re-attendancies (Re-visits)	6454	4260	6044	7491	4764	3384	1175	9996	4175	8437	9688	6920
Referals	309	167	101	859	788	60	567	380	894	135	243	1081
No. of First Attendances	14928	13033	15561	14008	11225	7332	13238	33386	16179	17279	19705	15383

Source: Health Information Systems Mbeere District, (2007/2008)