DETERMINANTS OF UTILIZATION OF MALARIA PREVENTION STRATEGIES IN MARIAKANI, KILIFI COUNTY, KENYA

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Determinants of Utilization of Malaria Prevention Strategies in Mariakani, Kilifi County, Kenya

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DECLARATION

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

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DEDICATION

To my husband John Gitonga and our daughter Faith, sons Eric, David, and my friend Dr. Mary Ochola for their encouragement and support throughout the study. Glory be to God!

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ABBREVIATIONS AND ACRONYMS

A/L	Artemisinin-Lumefantrine
ACT	Artemisinin-based Combination Therapy
ANC	Schedule of Antenatal Care
CDC	Centers for Disease Control
DDT	Dichlorodiphenyltrichloroethane
DIC	Disseminated Intravascular Coagulation
ITN	Insecticide Treated Net
IPT	Intermittent Preventive Treatment
IPT_i	Intermittent Preventive Treatment during infancy
IPT_p	Intermittent Preventive Treatment during pregnancy
IRS	Indoor Residual Spraying
KDHS	Kenya Demographic Health Survey
LBW	Low Birth Weight
LLIN	Long Lasting Insecticides Nets
MiP	Malaria in pregnancy
MoH	Ministry of Health
MOPHS	Ministry of Public Health and Sanitation
NMCP	National Malaria Control Program
NMS	National Malaria Strategy
RBM	Roll Back Malaria
RDTs	Rapid Diagnostic Tests
RCC	Research Coordination Committee
SP	Sulphadoxine – Pyrimethamine
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

DEFINITION OF TERMS

***Plasmodium*:** A type of protozoa, a single- celled organism responsible for causing malaria fever.

Protozoa: Any of a large group of single, usually microscopic organisms such as amoebas, ciliates, flagellates and protozoan.

Malaria: An infectious disease characterized by cycles of chills, fever and sweating, caused by a protozoan of the genus Plasmodium in blood cells, which is transmitted to humans by the bite of an infected female anopheles mosquito

First line treatment: This the combination of drugs that a person is given at the beginning of treatment

Second line treatment: This is the subsequent treatment given when the first line has failed or the side effects are intolerable

Intermittent Preventive Treatment: A public health intervention aimed at treating and preventing malaria episodes in infants (IPTi), children (IPTc) and pregnant women (IPTp).

Insecticide Treated Net: A bednet that has been treated with insecticide to protect against mosquitos and malaria.

Case Management: A strategy of early recognition, prompt diagnostic testing and appropriate treatment of malaria.

ABSTRACT

In Kenya, an estimated 27 million people (about 70% of the population) are at risk of infection by *Plasmodium falciparum* parasite which causes malaria. In Kilifi County, the disease accounts for 31.5% of all first outpatient visits to hospitals. Understanding the utilization patterns of various malaria prevention strategies is therefore important since it will provide a basis for designing specific and targeted interventions to reduce malaria incidences in this area. The main objective of this study was to establish the determinants of malaria prevention strategies in Mariakani area of Kilifi County, Coastal Kenya. This study was conducted in November 2016 and it was a descriptive cross sectional study design with a sample size of 384 households heads in Kadzonzo, Mitangoni and Township administrative locations. Cluster sampling technique was used to select villages while simple random sampling was used to select household heads. Data obtained from 327 household heads using structured questionnaires was cleaned, coded, summarised and processed using ms excel and exported to spss version 21 for analysis using descriptive statistics and inferences drawn using Chi-square and logistic regression at 5% level of significance. Study findings were presented using frequency table's graphs and charts. Ethical considerations was sort from pwani ethical review committee. The findings indicated that 86.5% of the participants had suffered from malaria in the past. The findings also showed that 91% of those who suffered from malaria received treatment from hospital due to perceived better facilities. Among the participants who went to hospital, 97.7% had their blood tested for malaria parasites and completed the prescribed dose with 100% recovery. Majority (96.9%) reported that mosquitoes were the source of malaria. On malaria prevention strategies, 94.8% of the participants had used Insecticide Treated Nets, 36.9% had used Intermittent Preventive Treatment during pregnancy, while 31.2% had used IPT for children (IPTi). The study also established that 96.9% of the participants knew that mosquitoes were the source of malaria while and 20.5% knew that using drugs from the hospital was the best way to treat malaria. On prevention of mosquito bites, 79.5% indicated sleeping under ITNs and clearing of surrounding bushes, while 4.3% indicated use of vaccines. Chi square analysis showed significant associations between ITN use and sex (p=0.014), age (p=0.000), occupation (p=0.022), past malaria experience (p=0.000), source of treatment for past malaria experience (0.004), knowledge of ITNs (p=0.015) and past use of ITN (p=0.000); IPTp use and level of education (p=0.000), occupation (p=0.025), malaria past experience (p=0.015), source of malaria (p=0.001), and knowledge of IPTp (p=0.000); IPTi and sex (p=0.039), age (p=0.001), marital status (p=0.000), occupation (p=0.004), malaria past experience (p=0.001), source of malaria (p=0.030), and knowledge of IPTi (p=0.000); case management and recent malaria attack (p=0.029). Regression analysis showed that the significant determinants for ITN utilization were mainly sex, age, malaria past experience, source of treatment for past malaria experience, knowledge of ITN and past use of ITN. Female participants were 2.104 times more likely to use ITNs compared to male participants (p = 0.023); participants who were aged between 26 and 35 years were 1.146 times more likely to use ITN compared to those aged between 18 and 25 years (p= 0.037). The odds of ITN utilization among participants who had no past experience with malaria, had sought treatment from chemist, had not heard of ITN and had not used ITN in the past (AOR = 0.275, p =

0.047; AOR = 0.566, p = 0.046; AOR = 0.194, p = 0.048; AOR = 0.214, p = 0.001), were less compared to those who experienced malaria in the past, had sought treatment from hospital, had heard about ITN and ad used ITN in the past respectively. For IPTp utilization, significant determinants were level of education, occupation, past malaria experience, source of malaria treatment, knowledge of IPTp and source of malaria. The odds of IPT uptake during pregnancy among participants who had no past experience with malaria, had sought treatment from chemist, did not perceive mosquitoes as the source of malaria and had not heard of IPT (AOR = 0.080, p = 0.036; AOR = 0.008, p = 0.043; AOR = 0.239, p = 0.001; AOR = 0.316, p = 0.002), were less compared to those who had past experience with malaria, had sought treatment from hospital, perceived mosquitoes as the source of malaria and had heard of IPT respectively. In addition, female participants were 1.896 times (p = 0.034) more likely to use IPT for children compared to male participants. The odds of IPT uptake for children among participants aged 26 to 35 years, 36 to 45 years, 46 to 55 years, and 56 to 65 years (AOR = 4.455, p = 0.000; AOR = 1.674, p = 0.038; AOR = 2.326, p = 0.006; AOR = 2.250, p = 0.018), were more compared to participants aged 18 to 25 years. On the other hand, the odds of IPT uptake for children among participants aged 66 to 75 years and 76 to 85 years was less (AOR = 0.215, p = 0.011; AOR = 0.231p = 0.011 respectively), compared to participants aged 18 to 25 years. The odds of IPT uptake for children among participants who had no past experience with malaria, did not perceive mosquitoes as the source of malaria and had not heard of IPT (AOR = 0.190, p = 0.001; AOR = 0.242, p = 0.001; AOR = 0.449, p = 0.041), were less compared to those who had past experience with malaria, perceived mosquitoes as the source of malaria and had heard of IPT respectively. Residents of Mariakani, Kilifi County are aware of malaria infection and prevention. The factors which were significantly associated with utilization of malaria prevention strategies in this region included age, sex, marital status, level of education, occupation, knowledge and attitudes on transmission and prevention of malaria, and experience and practice of malaria treatment. The study recommends that the Medical Officer in the Department of Health in Kilifi County, together with other stakeholders should enhance sensitization on IPT while continuing to promote compliance in the use of ITNs in order to reduce the risk of infection.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Malaria is one of the most common infectious diseases and a great public health problem worldwide, particularly in Africa and south Asia (Guyatt & Snow, 2001). Globally, malaria has morbidity of between 300 to 500 million and mortality of at least one million people annually (World Health Organisation [WHO], 2012). Ninety percent (90%) of the mortality due to malaria occurs in sub-Saharan Africa in children under the age of five years (World Malaria Report, 2012). Malaria is a heavy burden for the national health system in countries where the disease is endemic.

Malaria in pregnancy (MiP) exerts major public health concerns worldwide, particularly in malaria-endemic settings, and results in adverse health outcomes for both the woman and foetus (Menendez *et al.,* 2010). The MiP national bureau of statistics of 2010 documented low birth weight (LBW), infant mortality, maternal anemia, spontaneous abortion, and stillbirth as devastating health consequences of *Plasmodium falciparum* (Menendez *et al.,* 2010). About 11% of neonatal mortality in malaria-endemic African countries is attributable to LBW that results from MiP. In sub-Saharan Africa, MiP reportedly accounts for 26% of severe maternal anaemia and up to 200,000 infant mortality annually due to LBW. Some 10,000 maternal deaths are recorded each year due to malaria-related anaemia (Guyatt & Snow, 2004).

In Kenya, malaria is a major public health problem and a socio-economic burden with an estimated 27 million people (about 70% of the population) being at risk of infection .In areas with high transmission, the most vulnerable groups are young children, who have not developed immunity to malaria yet, as well as pregnant women whose immunity has been decreased by pregnancy The disease is a leading cause of morbidity and mortality in Kenya (WHO, 2012) accounting for 16% to 20% of all deaths in children under five

years (Oruko *et al.*, 2011), 30 to 50% of all outpatient attendance, and 20% of all admissions to health facilities (National Malaria Control Programme [NMCP], 2009).

Malaria is an important disease in foci located in irrigation-based agricultural areas, forested areas semi-arid areas and regions located along or near water bodies (Githeko *et al.*, 1993). In these foci, *Anopheles* mosquitoes easily proliferate and spread to malaria free areas **(**Mwangangi *et al.*, 2007; Himeidan & Rayah, 2008). Kenya may be divided into four malaria ecozones, namely; stable malaria zone (Nyanza, Coast, and Western Regions), seasonal malaria zone (Central, Eastern, and North Eastern Regions), highlands prone to malaria epidemics (mainly in Rift Valley and some parts of Nyanza Regions), and malaria free zone (Nairobi Area and some parts of Central Region). The Kenyan coastline is characterized by humid and warm tropical climate with the total precipitation varying from 900 to 1500 mm per annum along the coastal belt (Mbogo *et al*., 2003). Long rains and intermittent rain with long spells of sunshine provide a suitable environment for mosquito vector proliferation (Martens *et al*., 1999). This type of climate favours breeding of a variety of malaria vectors along the coastline (Mwangangi *et al*., 2007; Imbahale *et al*., 2010).

In Kilifi County, the disease accounts for 31.5% of all first outpatient visits (United States Agency for International Development [USAID], 2011). The downward trend in hospital admission with malaria reached its nadir in 2009 and then slowly started to increase again, an observation which is not limited to Kilifi (von Seidlein & Knudsein, 2016), has caused concern. In areas with stable malaria transmission, malaria parasitaemia is commonly asymptomatic during pregnancy (Oruko *et al.*, 2011). However, the adverse consequences of malaria infection can be substantial among both symptomatic and asymptomatic women.

Effective prevention strategies and case management of malarial illness are the foundation of malaria control. Globally, vector-based malaria control programs have played an essential role in reduction of malaria infections in most malaria endemic regions, including Kenya. This is still indispensable in malaria control initiatives in

endemic foci, especially if integrated with other control strategies like intermittent preventive treatment (IPT) and effective case management (Githeko *et al*., 1994; CDC, 2013). Examples of vector-based programs are the use of insecticide treated mosquito bed nets (ITNs), long lasting insecticide-treated nets (LLINs) and indoor residual spraying (IRS) in areas of seasonal transmission. Current interventions in Kenya include the use of LLINs, IRS, and IPT with Sulphadoxine-pyrimethamine for expectant mothers, and Artemisinin-based.

The upsurge of malaria has resulted to increased national and international funds channelled to boosting such strategies as Insecticide Treated Mosquito Nets. About half of African countries have waived taxes and tariffs on mosquito nets, netting material and insecticides. Since 2002, African countries started scaling up free of charge or highly subsidized provision of mosquito nets for under-5 years and pregnant women in rural areas. As a result, there has been a substantial increase in mosquito net coverage in African countries (UNICEF, 2003). Despite this increased coverage, effective utilization rates are still poor.

The success of such interventions requires a good knowledge of vector populations, particularly their susceptibility status to the main insecticide used for such control programs in order to detect and monitor resistance to these insecticides. However, the impact of the investment in malaria control over the past ten years and the gains made in reducing morbidity and mortality are difficult to measure within the routine health system as nearly all fevers are diagnosed and treated as malaria (WHO, 2012). This situation has made it necessary to conduct periodic household surveys. The surveys have indicated that effective, safe, and proven prevention and control interventions made possible by global support and national commitment has shown that the impact of malaria on residents of malaria-endemic countries can be dramatically reduced when these are used together in integrated malaria control programs. This study therefore intended to determine the factors affecting utilization of malaria prevention strategies in Mariakani area in Kilifi County, an endemic malaria zone.

1.2 Statement of the Problem

About 30% to 40% of all fevers seen in health centers in Africa are due to malaria with huge seasonal variability between rainy and dry season (WHO, 2007). Malaria in pregnancy (MiP) exerts major public health pressure, particularly in malaria-endemic settings, and results in adverse health outcomes for both the woman and foetus (Menendez *et al.,* 2010). More than three quarters of global malaria deaths occur in under five children living in malarious countries in sub-Saharan Africa where 25% of all children below age five are affected, with malaria

In Kenya, malaria is the leading cause of morbidity accounting for 19% of hospital admissions and between 30 - 50% of outpatient cases in public health institutions. It is also the leading cause of mortality in children under five years and a significant cause of adult mortality. It is the leading cause of workdays lost due to illness with recent estimates showing that upto 170 million working days are lost annually in Kenya due to malaria (KDHS, 2009; , 2014).

In Kilifi County, a downward trend in hospital admission with malaria reached its lowest in 2009 and then slowly started to increase again, an observation which is not limited to Kilifi, and has caused concern (Daniels *et al*., 2015; von Seidlein & Knudsen, 2016). There is doubt whether established control measures no longer work or resistance against insecticides and antimalarials could be cancelling earlier gains, with malaria morbidity and mortality returning to previous levels. The increase in the mean age of children admitted with *P. falciparum* infections increased gradually from 20.2 months in 1990 to 45.3 months in 2014 (von Seidlein & Knudsen, 2016). In Mariakani area, there is an upsurge of malaria despite the accessibility and adequacy of many other malaria management strategies and the disease accounts for 31.5% of all first outpatient visits (USAID, 2011).

Several factors associated with inadequate utilization of malaria prevention strategies and case management such as late ANC initiation, multi-gravidity and lack of

knowledge of adverse consequences of MiP have been reported (Nganda *et al.*, 2007). Systemic factors, namely; workforce shortage, inadequate or erratic drug supply, poor skills of providers, and skewed access to ANC services have been identified as well. Unless these factors are addressed, the aim of achieving universal health and elimination of malaria by the year 2030 (WHO, 2012).

Generally, research to document factors influencing both partial and optimal use of malaria prevention strategies and case management for malaria control in Kilifi County is limited, and even more so, for Mariakani area. This gap creates need for a study in malaria endemic regions to determine factors affecting utilization of malaria prevention strategies and case management.

1.3 Justification of the study

Understanding the complex nature of challenges affecting the utilization of malaria prevention strategies would contribute to the existing pool of knowledge as well as act as a critical source of information for the stakeholders concerned in the management of malaria infections, especially non-Governmental Organizations, governments' Ministry of Health and private entities. If appropriate, the malaria prevention strategies established to be preferred by the members of the community in the area of study would provide an effective way of focusing prevention efforts by the stakeholders, through identification of the gaps. This will enable planning and implementation of action towards malaria prevention strategies. This assessment of utilization of malaria prevention strategies will therefore be vital in reducing the malaria infection rates in Mariakani, Kilifi County.

1.4 Objectives

1.4.1 General Objective

The main objective of this study was to determine factors affecting utilization of malaria prevention strategies among residents of Mariakani, Kilifi County.

1.4.2 Specific Objectives

i. To determine the socio-economic and demographic factors affecting utilization of ITN, IPT and case management in the prevention of Malaria in Mariakani, Kilifi County.
ii. To establish the level of self-reported malaria infection between the population utilizing and not utilizing ITN, IPT and case management in Mariakani, Kilifi County.
iii. To determine the knowledge, attitude and practices towards ITN, IPT and case management in the prevention of malaria in Mariakani, Kilifi County.

1.5 Research Questions

The study was guided by the following research questions;

1. What are the socio-economic and demographic factors affecting utilization of ITN, IPT and case management in the prevention of malaria in Mariakani, Kilifi County?
2. What is the level of self-reported malaria infection between the population utilizing and not utilizing ITN, IPT and case management in Mariakani, Kilifi County?
3. What is the knowledge, attitude and practices towards ITN, IPT and case management in the prevention of Malaria among inhabitants of Mariakani, Kilifi County?

1.6 Conceptual Framework

Based on the objectives of the study, the conceptual framework was developed to propose how different variables (dependent and independent variables) influence utilization of malaria prevention strategies (Figure 1.1).

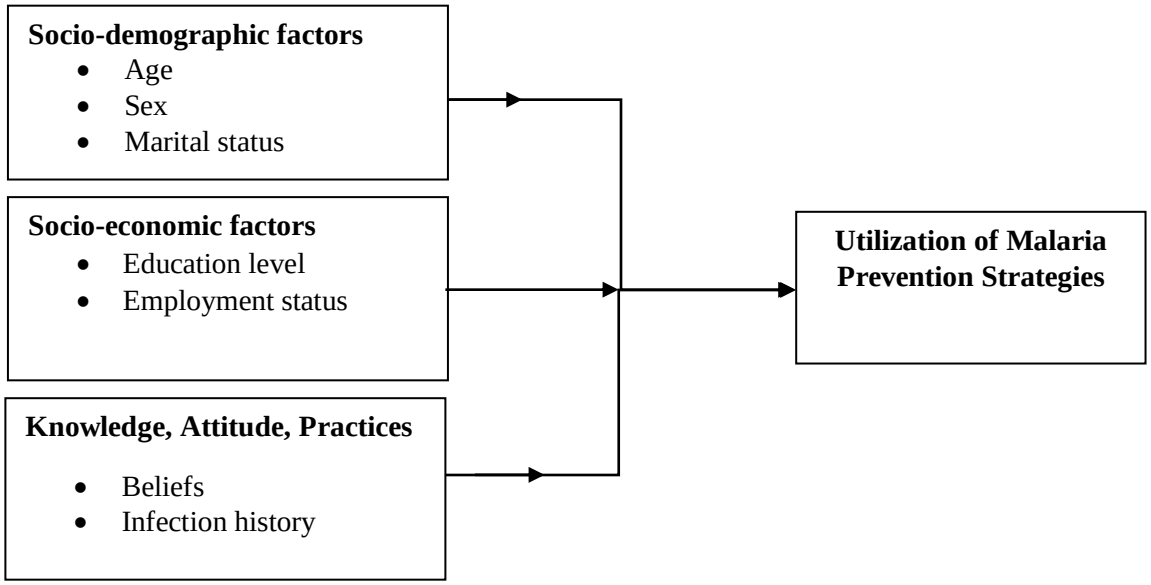

Figure 1.1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter looks at the theoretical review and empirical review of literature related to the subject of study in order to identify gaps to be filled by the current study. The relationships established by the review of literature to enable the researcher make meaningful conclusions.

2.2 Theoretical Framework

According to the health belief model developed by Rosenstock, Strecher and Becker (1994), an individual's actions to treat and prevent disease depends on four central variables (Figure 2.1). First is the individual's perceived susceptibility to disease whereby individuals will seek preventive health services if they believe that they are susceptible to the disease. The second is the individual's perception of illness severity whereby if the individual does not perceive the illness to be serious, he/she will not seek treatment/prevention; when perceived serious the person seeks treatment. This is followed by the individual's rational perception of benefits versus costs. At this point, the individual will not take action unless the treatment or prevention is perceived as having greater benefits than costs. The model finally ends with the individual's cues to action whereby the media, friends, family, or community can provide an impetus for prevention. According to this model, the absence of cues to action will reduce the likelihood of prevention. Thus, the individual's choice to utilize health services is contextually dependent (Rebhan, 2009).

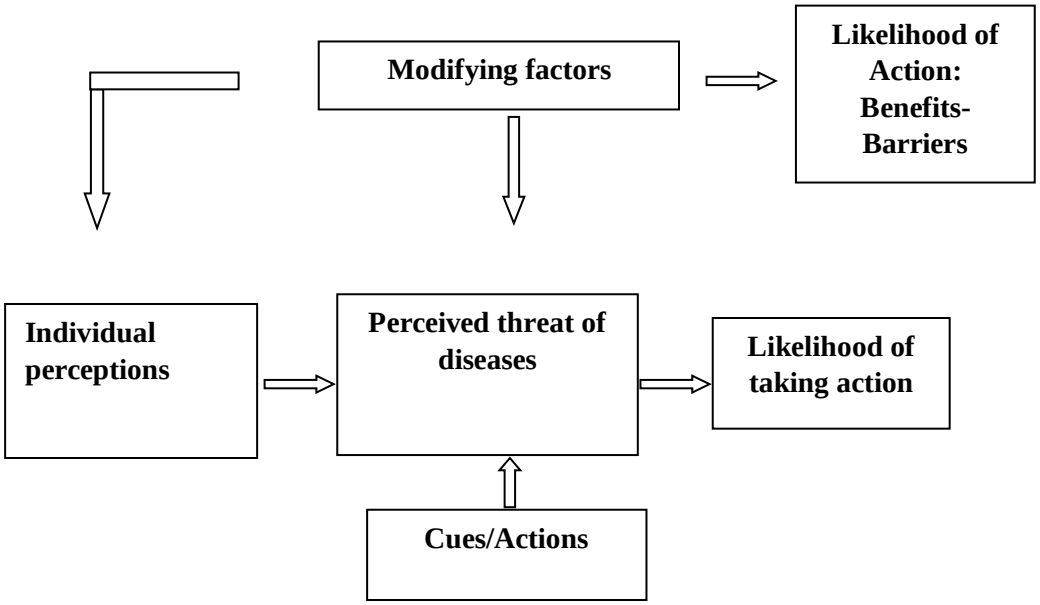

Figure 2.1: Rosenstock's Health Belief Model, 1994;

(Source: Adapted from Rebhan, 2009)

Similar to the health belief model, the practice of malaria preventive measures has been related to the level of knowledge and belief of people (Sutt *et al.,* 2007). The understanding of the possible causes, modes of transmission and decision about adoption of preventive and control measures vary from community to community and among individual households (Guyatt & Snow, 2004).

The emphasis on malaria control is centred on community-based strategies (Malisa *et al.,* 2011). In order to prepare for a successful malaria control program it is necessary to evaluate the level of awareness, attitudes and practices of people living in an at risk area (Wells *et al.,* 2007). This will help to find ways to improve collaboration with the public health sector and also involve the full participation of the community in surveillance and control activities such as the use of ITNs, LLITNs, IPT, and case management (Snow *et al.,* 1999).

2.3 Malaria and its aetiology

Malaria is a vector-borne infectious disease caused by a protozoan parasite in the genus *Plasmodium* (WHO, 2008). *Plasmodium falciparum* causes the most dangerous form of malaria and is transmitted by a bite of an infected mosquito species belonging to the *Anopheles* genus and only by females of those species (Snow *et al.*, 2009). Other malaria causing species are *P. vivax*, *P. ovale*, *P. malariae* and *P. knowlesi* (WHO, 2015). People who get malaria are typically very sick with high fevers, shivering chills, and flu-like illness (Greenwood *et al.*, 2005). Malaria occurs mostly in poor tropical and subtropical areas of the world. In many of the countries affected by malaria, the disease is a leading cause of illness and death.

2.4 Burden of Malaria

About three billion people globally are at risk of infection with malaria in 109 countries (Breman *et al.*, 2004). Malaria infects approximately 150 million people each year (Wells *et al.*, 2007), with an estimated 660, 000 deaths, mostly children and pregnant women in Africa (Olsen & Richardson, 2005). Children are most vulnerable because they have not acquired immunity to the disease, while maternal susceptibility to malaria infection during pregnancy may be related to the physiological immunosuppression that occurs during gestation (Wells *et al.*, 2007). In children less than 5 years, 41% of deaths are due to malaria (Olsen & Richardson, 2005), with a child dying of malaria globally every minute (Okwaro *et al.*, 2009). If malaria is appropriately prevented, the individual, family and the state will save lots of resources that will improve the standards of living of the general population.

In Kenya, 25 million out of a population of 34 million Kenyans are at risk of infection with malaria. This disease is the leading cause of morbidity accounting for 19% of hospital admissions and between 30 and 50% of outpatient cases in public health institutions (KDHS, 2009). It is also the leading cause of mortality in children under five years, a significant cause of adult mortality, and the leading cause of workdays lost due

to illness. Estimates show that 170 million working days are lost annually in Kenya due to malaria (KDHS, 2009).

Approximately 1.5 million women become pregnant in Kenya each year. Majority of these women live in areas of moderate to intense transmission of malaria. Malaria infection poses a risk to the unborn child since it may lead to adverse outcomes such as abortion, stillbirth, congenital infection, LBW, prematurity and intra-uterine growth retardation. To the mother it leads to malaria illnesses and mortality (MoH, 2007). Pregnancy related maternal mortality is estimated at 414/100,000 pregnant women (KDHS, 2003). Severe anaemia manifests in approximately 6,000 primigravida women (MoH, 1998). Haemorrhage complicating malaria related anaemia during pregnancy contributes significantly to maternal mortality.

Approximately 2 to 15% of severe maternal anaemia, 8 to 14% LBW, 8 to 36% to pre-term LBW, 13 to 70% of intrauterine growth retardation –LBW, and 3 to 8% increased infant mortality are attributable to malaria each year (MoH, 1998). It is estimated that 26000 children die from malaria every year (Weber & Laumann, 2010). With the current trend, the ambitious goals set by programs to reduce the burden of malaria in the near future appear unlikely to be met. Hence, the need to research on determinants of utilization of malaria prevention strategies.

2.5 Malaria Prevention Strategies and Case Management

There is a growing international agreement on how best to use prevention and treatment methods available against malaria (Guyatt & Snow, 2001). Most of the malaria control strategies used today focus on vector control by ITNs and Insecticide Residual Sprays (IRS), Intermittent Preventive Treatment (IPT) and case management by use of artemisinin-based Combination Therapy (ACTs) (Gutman *et al.,* 2007). However, rapid expansion of resistance to what were once effective insecticides and anti-malarial drugs has made the battle against malaria even more urgent in the twenty-first century (Atieli *et al.,* 2011). This situation makes it necessary to conduct periodic household surveys to

assess the utilization of these strategies which might contribute to the development of resistance to both the vectors and the parasites (Ankomah *et al.,* 2012).

2.5.1 Insecticide Treated Mosquito Bed Nets

The most effective prevention measures include the use of mosquito bed nets treated with long-lasting insecticides to avoid the mosquito bites and to kill the mosquitoes, and spraying the inside walls of houses (Insecticide Residual Sprays - IRS) with similar insecticides to kill malaria-carrying mosquitoes (Smith *et al*., 2010).

A series of trials in Africa have shown that proper use of mosquito net reduces malaria incidence among children by anywhere from 14% to 63% With ITN use, all malaria mortality in children has been shown to decline by 25% in Gambia, 33% in Kenya, and 17% in Ghana (Benjamin *et al.,* 2011).

Based on findings such as these, the promotion of ITN use has become a central element of national and international efforts against malaria (Ankomah *et al.,* 2012). A study on the prevalence and prevention of malaria in pregnancy in Edo State, Nigeria indicated that use of ITN, Sulphadoxine - Pyrimethamine (SP) and ITN + SP were observed to be highly effective in reducing the episodes of malaria among the pregnant women. Meanwhile, the combination of ITN + SP was found to be most efficacious of the devices used in protecting the pregnant women (Roll Back Malaria, 2005) than either the ITN or SP alone. Randomized controlled trials in Ghana, Nigeria, the Gambia and Burkina Faso have also demonstrated that wide scale use of ITNs can reduce child mortality by around one-fifth, saving an average of 6 lives for every 1,000 children aged 1-59 months protected each year (Lengeler, 2002). In an area of intense perennial transmission in Western Kenya, ITN use reduced episodes of clinical malaria and anaemia in infants by greater than 60% (Karuiki *et al.,* 2003) and reduced by nearly one third the incidence of sick child visits to peripheral health facilities.

2.5.2 Intermittent Preventive Treatment

Prompt and effective malaria case management can prevent progression to severe disease and death (WHO, 2012) and reduce the risk of anaemia from chronic infection. The WHO guidelines for the prevention of malaria during pregnancy recommend use of Intermittent Preventive Treatment during pregnancy (IPTp) with SP, and sleeping under an ITN (Degarege *et al.,* 2009). Intermittent preventive treatment during pregnancy with SP is defined as provision of treatment doses of SP to asymptomatic individuals living in malaria endemic regions, regardless of malaria parasitaemia status, and the current recommendation is that, at least 2 doses of SP should be administered after the first trimester during antenatal care (ANC) (Deressa *et al.,* 2002). Use of IPTp is estimated to reduce the occurrence of low birth weight by 42%, neonatal death by 38%, placental malaria by 65% and antenatal parasitaemia by 26% (Degarege *et al.,* 2009).

Research has shown that IPTp with two doses of SP protects pregnant women from maternal anaemia and malaria placental infection, and also reduces the incidence of LBW (CDC, 2013). Current evidence reveals further that exposure to IPTp with SP (IPTp-SP) and ITNs are associated with reductions in both neonatal mortality and LBW (Eisele *et al*., 2012). Under trial conditions, IPTp-SP was acknowledged to be effective in reducing neonatal mortality (Menéndez *et al.,* 2010). A meta-analysis on the effectiveness of IPT in preventing adverse maternal and fetal outcomes in Africa among pregnant women living in areas with endemic malaria concluded that the use of IPT during pregnancy reduced placental malaria by 23%, reduced fetal loss by 32% and improved birth weight by 33 grams (Oruko *et al.,* 2011).

The World Health Organization recommends IPTp-SP for all pregnant women at each schedule of antenatal care, with the first dose administered as early as possible during the second trimester of gestation, and that the subsequent dose is given at least one month after the first. It is clarified further that the last dose can be administered up to the time of delivery, with no safety concerns (WHO, 2010). Sulphadoxine-pyrimethamine is used for IPTp in many sub-Saharan African countries. In Tanzania where neonatal

mortality remains one of the challenging public health concerns, the national policy stipulates provision of SP to all pregnant women during ANC visits between 20 and 24 weeks gestation for the first dose and between 28 and 32 weeks gestation for the second dose to properly prevent malaria (Roll Back Malaria, 2004).

2.5.3 Malaria Case Management

According to WHO (2012), malaria case management involves treatment of the infected individual with anti-malarials. Timely treatment of malaria with appropriate anti-malarial medicines is one of the two closely related curative interventions utilized in malaria control. At the population level, appropriate case management might curtail malaria transmission by reducing the human parasite reservoir and preventing emergence of drug resistant parasite strain (Malisa *et al*., 2011). Preventive treatment of pregnant women with anti-malarial drugs can reduce the harmful effects of malaria both on the mother and on the unborn child (CDC, 2011). Improving malaria case management may also contribute to improved treatment of non-malaria febrile illness, which are often misdiagnosed and treated presumptively as malaria (Malisa *et al*., 2011).

The most effective preventive strategy for malaria consists of using a combination of several anti-malarial drugs, one of which is a derivative of Artemisinin (Rao *et al.*, 2013). Hence, introduction of ACT has improved malaria case management substantially. However, development of ACT resistance may have drastic consequences for the recent control achievements. For this reason, it has become increasingly important to change from symptom-based presumptive treatment to parasitological confirmation of malaria infection before initiation of anti-malaria treatment, and also provide an opportunity for other causes of fever to be identified and appropriately treated (Benjamin *et al.*, 2011). Therefore, WHO recommends that anti-malarial treatment be confined to laboratory confirmed cases only (WHO, 2011). The availability of rapid diagnostic tests (RDTs) offers a good opportunity to extend parasitological confirmation of malaria infection to peripheral areas where quality microscopy cannot be guaranteed (Lubell *et al.*, 2008).

2.6 Utilization of Malaria Prevention Strategies and Case Management

While the evidence based on the effectiveness of preventive strategies and case management in reducing malaria transmission has grown rapidly in recent years, utilization rates in most African countries have not. In most malaria endemic regions, fewer than 10% of children or pregnant women regularly sleep under ITNs (Bashinyora, 2010). In Africa, a survey in several countries found that the use of any net for children less than five years old was less than 40% overall in all but The Gambia, Guinea-Bissau and Sao Tome and Principe (Monasch *et al*., 2004). The survey found that in 23 countries, ITN use for children less than five years old was at or less than 5%.

Another survey carried out in four African countries showed that less than 20% of women use a prophylactic regimen close to the WHO recommendations (Steketee *et al*., 1996). A cross-sectional survey in Nigeria on utilization of insecticide-treated nets by under-five children found the net household ownership of nets to be at 23% while for ITNs was 10.1% (Oresanya *et al.,* 2008). This study demonstrated that ITN utilization among children under five years of age in Nigeria is still far from the Abuja targets.

In Burkina Faso, a cross sectional survey on malaria preventive measures indicated that households owned at least one insecticide treated net (98%). Among households that used ITN, 53.8% used other methods; the majority of households paid nothing for malaria prevention since most of the households received bed nets and other preventive methods for free (Bocoum *et al.,* 2014). Studies in Eritrea have shown that the greatest benefit of nets is realised when there is one ITN per two people based on the assumption that on average, two people share one bed (Macintyre *et al.*, 2006).

In the early part of the new millennium, the Government of Kenya committed to increasing the use of ITNs according to the targets set by the Roll Back Malaria initiative. At the beginning of the year 2000, the United Nations declared the years 2001 – 2010 to be the United Nations decade to Roll Back Malaria (WHO, 2005). The long-term vision of the Ministry of Health Insecticide Treated Nets Strategy 2001 - 2006 was

to ensure that within 10 - 20 years ITN use would become a social norm in most parts of Kenya affected by malaria (MoH, 2001a). According to the World Malaria Report (2013), ITNs were by far the greatest item of the Kenyan government expenditure in 2012. Furthermore, the government planned to double the amount spent on malaria prevention strategies by 2017 compared to the amount spent on case management (MOPHS, 2009).

The proportion of pregnant women using insecticide treated nets in Kenya rose from 4.4% in 2003 to 39.7 % in 2007 while the proportion of women who received at least two doses of IPT rose from 4% in 2002 to 24.5% in 2006 in sentinel districts and to 13% in all malaria endemic districts in 2007, and fifteen million ITNs and LLITNs were distributed between 2001 and 2009. ITN use by children under 5 years rose from 4.6% in 2003 to 50.2% in 2006 after a free mass ITN distribution targeting 3.4 million children under five years (MOPHS, 2009). The mass distribution of ITN in 2006 corrected the inequity against the poor in ITN ownership. However, the current ITN ownership of 0.8 per household in Kenya is far from universal access defined as 2 nets per household.

2.7 Factors affecting Utilization of Malaria Prevention Strategies and Case Management

2.7.1 Socio-demographic factors

Age and sex are important demographic variables and are the primary basis of demographic classification (KDHS, 2009; KDHS, 2014). The mean household size has implication for the pattern of household expenditure. It affects the healthcare status of a household in terms of nutrition, as well as affordability and accessibility of healthcare necessities such as drugs and mosquito nets (Ministry of Public Health and Sanitation, 2011). A study on malaria prevention in Nigeria found some significant differences between rural and urban locations, those with at least secondary education and those

without, such that the ones with higher level of education had less likelihood of using an ITN/LLIN (Adebayo *et al.,* 2015).

Religion also is key in malaria prevention. A study done in Southeast Nigeria indicated that religious bodies influence exposure to prevention, control and treatment of malaria for the community listens and believes in religious leaders more than other groups (Dike *et al.,* 2006).

2.7.2 Socio-economic factors

Education holds the key to a sustainable response to malaria prevention and the probability of dying from malaria is inversely related to income and education (WHO, 2007; Tusting *et al.,* 2013). Levels of education may affect malaria treatment seeking and prevention behaviors. A study conducted in south east Nigeria by Dike *et al*. (2006) found that higher levels of education were associated with improved knowledge and practices in relation to appropriate prevention and treatment strategies.

Poverty can increase the risk of malaria since those in poverty do not have the financial capacities to prevent or treat the disease (WHO, 2014). A Nigerian community-based survey in four states suggested a heavier malaria burden on the poor than on the rich; individuals with a mean income of below N3000/day were less likely to perceive malaria as a preventable disease, more likely to report having fever presently, and suffered significantly more bouts of malaria per month compared with individuals earning greater than N3000 per day (Wardlaw *et al*., 2003). Similar results were obtained in Lao PDR, where pregnant women in a remote district hospital showed a difference in malaria prevalence between socio-economic groups (Sychareun *et al.,* 2000).

Employment is a source of income and presents an opportunity for one to purchase drugs for malaria preventing and ITNs. A study done by Dako-Gyeke and Kofie *(*2015*)* in urban slums of Southern Ghana found that the participants' economic conditions (employment status and income earning status) are significant factors for malaria

prevention. Also, a statistically significant relationship was found between malaria infection and participants' employment status. The study also found a statistically significant relationship between economic conditions of pregnant women and their prevention of malaria. Similar results on knowledge and practices of malaria prevention in two rural communities in Wakiso District, Uganda were found by the Ministry of Health (2014) where participants who were employed and had an income were more likely to own a net in their household.

2.7.3 Knowledge, Attitude and Practice

Knowledge, attitudes and beliefs affect malaria control. Failure to consider community's knowledge, attitude, and practice about malaria is thought to contribute to the inability of programs to achieve sustainable control (Tyagi *et al.,* 2005). People's native logic and rationality make sense within the realities and limitations of their local circumstances (Heggenhougen *et al*., 2003).

2.7.3.1 Effect of Knowledge on Malaria prevention strategies

A study by Akaba *et al.* (2013) involving pregnant women presenting for booking at the antenatal clinic of University of Abuja Teaching Hospital - Gwagwalada, between the months of May and August 2010 indicated that 92.6% clients had knowledge that malaria was caused by mosquito bites and 94.8% clients accepted that malaria was harmful in pregnancy while only 5.2% disagreed. Most (95.5%) of the clients knew that malaria was a preventable disease. The use of ITN was the most common malaria preventive measure known to the clients (74.9%) while 53.1% acknowledged the use of drugs as a malaria preventive measure. Majority (84.4%) were aware of IPT against malaria, while the rest were not (Akaba *et al.*, 2013).

Similarly, a study by Fawole and Onyeaso (2008) showed that even among health workers in Ibadan, Southwest Nigeria, knowledge of malaria preventive strategies was poor. However, this finding is at variance with the conclusions of Oyewole and Ibidapo

(2007) who showed that the general knowledge about malaria prevention among urban residents in Southwest Nigeria was good.

A study on drug combinations adequate for the stage of the pregnancy by National Malaria Control Program (NMCP) in Kenya indicated that good knowledge of malaria symptoms was key to seeking early treatment resulting in reducing maternal and infant morbidity and mortality from malaria. Most of the clients accepted that malaria was harmful in pregnancy. This is consistent with the findings of a previous study by Enato *et al.* (2007) but, unfortunately, the knowledge of the harmful nature of malaria in pregnancy did not translate to an outstanding increased use of malaria preventive measures by the clients.

A study in northern Nigeria by Musa *et al.* (2009) found that about 96% of the study population compared to 36% agreed that malaria was a preventable disease and ITN was the most common preventive measure known. Akaba *et al.* (2013) found that awareness of the Federal capital clients about IPT was higher than that found for pregnant women at antenatal booking in a clinic in northern State in Nigeria. This is similar to the findings at an antenatal clinic in Kenya where 86.9% had adequate knowledge (Akaba *et al.,* 2013). Challenges to the non-use of IPT included inadequate knowledge of the fact that the women didn't need to be sick before taking the drugs and fear of loss of pregnancy. This study emphasised education and information for understanding of safety of IPT in pregnancy.

Another study in North-Western Nigeria showed a high level of awareness and ownership of ITNs but a low level of utilization (Isaiah & Nwobodo, 2009). The findings of this study suggest the need for more efforts toward reaching their National Strategic Plan 2009-2013 of the National Malaria Control Programme ensuring that at least 80% of the pregnant women sleep under ITN by 2010 and sustain coverage until 2013.

2.7.3.2 Effect of Attitude, beliefs and Practice on Malaria prevention strategies

Studies have shown that in sub Saharan Africa barriers to malaria control were general healthcare system issues such as drugs stock outs and user fees, health facility issues from poor organisation leading to poor quality of care, poor healthcare provider performance including confusion over the timing of each IPTp dose, and women's poor antenatal care (Hill *et al*., 2013; Jenny *et al*., 2013).

A study in Nigeria by Akinleye *et al*. (2009) found that IPTp use among pregnant women was very low, coupled with poor adherence to the Directly Observed Therapy (DOT) scheme. Other factors reported included availability of the drugs, supervision by health worker, lack of adherence to the drug during the index pregnancy, wanting to use their own drinking cups, possible adverse effect of SP on their pregnancies and periodic shortages of SP in the clinics.

In Kenya, a number of factors negatively affecting use of bed nets have been identified including; being too hot under the net, there being no mosquitoes, disruption of sleeping arrangements, the child's net being used by another person, forgetting to put up the net, the child being sick, the child usually being at another house, the child fearing that ants would climb up the net, there being no room to hang the child's net, house reconstruction affecting net use, the net being too small for the bed or mat, the roof leaking so the net could not be spread out, the child's net being mended, the net being torn, the net being washed and the net being lost or stored (Alaii *et al*., 2003).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

The study was carried out in 3 rural locations within Mariakani, Kilifi County (Figure 3.1) namely Mitangoni, Kadzonzo and Mariakani urban area. Mitangoni Location hosts Highway, Weighbridge and Kafichoni villages, while Kadzonzo Location hosts Kakuna, Kwajuri and Kaptuku villages and finally, Mariakani Urban area hosts Njoro, Jakaba, Majengo and Makaburini villages. Mariakani is situated in Coastal Kenya at 3° 52' 0" South and 39° 28' 0" East.

The Kenyan coastline is characterized by humid and warm tropical climate. The total precipitation varies from 900 to 1500 mm per annum along the coastal belt (Mbogo *et al*., 2003). Long rains and intermittent rain with long spells of sunshine provide a suitable environment for mosquito vector proliferation (Martens *et al*., 1999). This type of climate favours breeding of a variety of malaria vectors (Mwangangi *et al*., 2007).

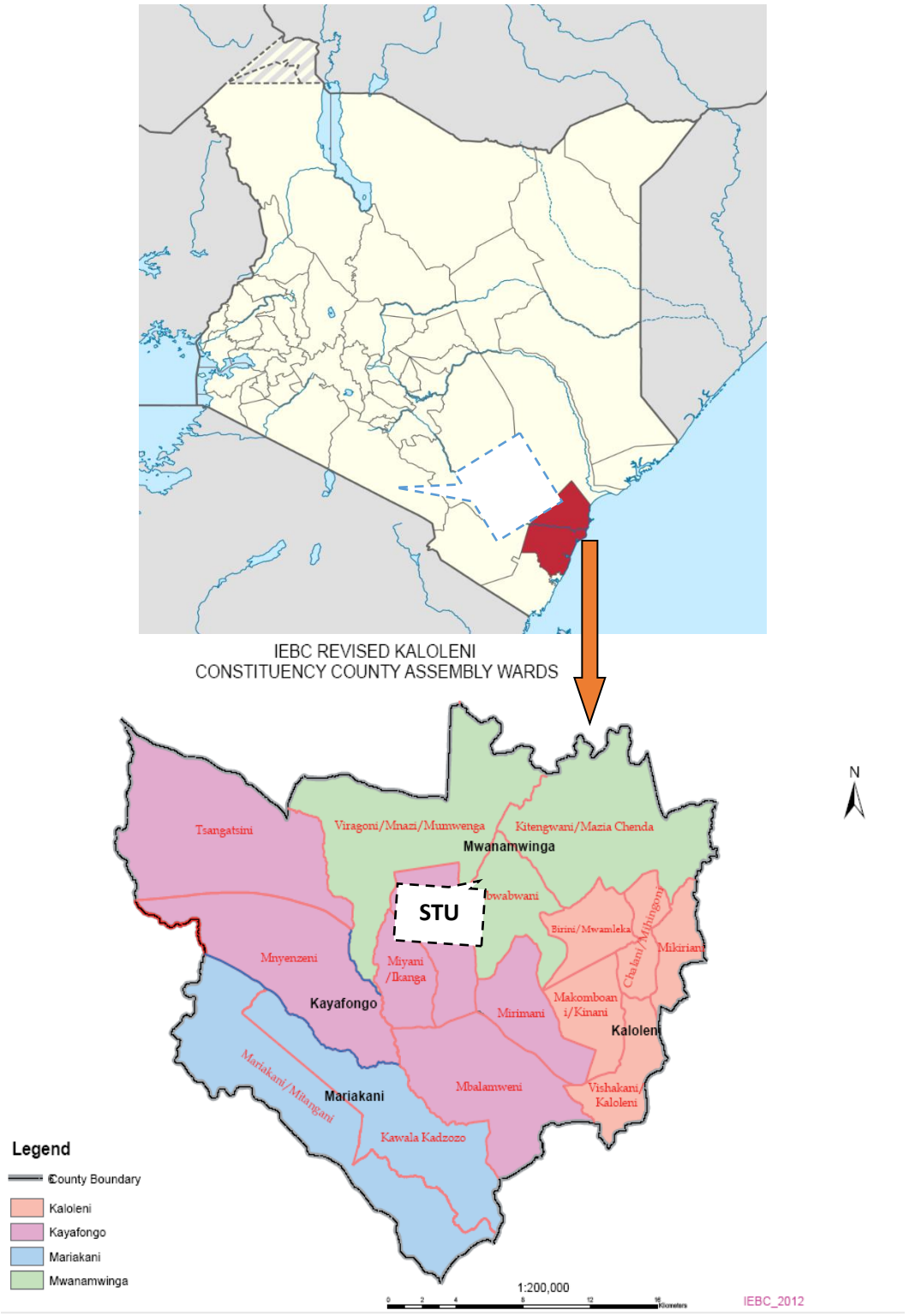

Figure 3.1: Map of Study Site (Source: IEBC, 2012)

3.2 Study Design

The study adopted a descriptive cross sectional study design. According to Kothari (2004), a descriptive cross sectional study design is concerned with describing the characteristics of a particular individual or a group. This design was also preferred due to the fact that the study involved studying different households and household heads. The household heads would give a quick picture of the utilization patterns of various malaria prevention strategies by the residents of the study area.

3.3 Study Variables

The dependent variable was utilization of malaria prevention strategies while the independent variables were socio-economic and demographic factors, and knowledge, attitude and practices of WHO??? on malaria control strategies (case management) and malaria prevention strategies (utilization of IPT, ITN).

3.4 Study Population

The study population consisted of adults household heads (aged 18 years and above) who were residents in the rural areas of Mitangoni and Kadzonzo, and Mariakani urban area.

3.4.1 Inclusion Criteria

All consenting household heads aged 18 and above who had resided in the area for a period of more than one year were included in the study

3.4.2 Exclusion Criteria

All non-consenting household heads above age 18 and inhabitants under 18 years were excluded from the study.

3.5 Sample Size Determination

To calculate the desired sample size, the statistical formula for population survey used in the social science research (Fisher *et al*., 1993), cited in Mugenda and Mugenda (2003) was used:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where:

n = minimum sample size required when target population is greater than 10,000

Z = Standard normal deviation (1.96) with confidence level of 0.95

p = proportion of household heads above 18 years of age in the rural areas of Mitangoni and Kadzonzo, and Mariakani urban area.

q =1-p (proportion of household members below 18 years of age in the rural areas of Mitangoni and Kadzonzo, and Mariakani urban area)

d = maximum tolerable error = 5%

Hence,

$$n = \frac{(1.96)^2 \times (0.5 \times 0.5)}{(0.05^2)} = 384.16 \approx 384$$

3.6 Sampling Techniques

According to the Kenya Population Census of 2009, Mariakani had 67984 households. The number of households in each village were: Mitangoni - 24,950 households, Kadzonzo - 21, 619, and Mariakani Township – 21. 415. The sample for each location

was calculated as proportion to size as shown in Table 3.1 below. Cluster sampling was used to select villages within locations in order to factor in the disparities in the populations of the selected locations. Within each location, simple random sampling was then used to select the households. The houses in the village were visited and the household heads selected with the guidance of village elders. This was necessary so that all participants got an equal opportunity to participate in the study.

Table 3.1: Sample Distribution

Location (Stratum)	**Cluster Size**	**Proportionate Sample Size** *(cluster Size /Population Size) x Sample Size).*	
		(n)	**Percentage (%)**
Mitangoni	24,950	141	36.7
Kadzonzo	21,619	122	31.8
Mariakani	21,415	121	31.5
Total	**67984**	**384**	

Source: Kenya National Census (2009)

3.7 Data Collection Tools

Primary data was collected from household heads using researcher-guided structured questionnaire (Appendix 1) on social demographics, malaria vector control strategies (utilization of ITNs, IRS), Intermittent Prevention Strategies (utilization of IPTp and IPTi as well as a malaria case management (utilization of ACTs). An observation checklist (Appendix 2) was used to assess the environment.

3.8 Pre-Testing of Data Collection Tools

Pre-testing was conducted amongst 15 participants drawn from three villages, Shangazini, Munyazini and Ziwa La Ngombe in Mariakani, a different area from the study location but in the same geographical area. It was aimed at detecting problems, reducing error possibility and testing research process and protocol. Pre-testing was also aimed at identifying confusing or misleading questions, to train study assistants to ensure adequate and relevant data collection. Permission was sought from the chief who introduced the researcher to the village elders. The researcher and/or research assistants with the help of the village elders then visited households during the day and the head of the household sought. Consent was sought before administering the study tool. Analysis was done and necessary corrections made to the questionnaire.

3.9 Data Collection Procedure

Before administering the questionnaire, two field assistants were trained for three days on how to administer the questionnaire. During data collection, permission was sought from the chief of each location, who introduced the researcher to the village elders. The researcher and/or research assistants with the help of the village elders then visited households during the day and the head of the household sought. The researcher and/or research assistants then introduced themselves and the objective of study explained. The benefits and risks of the study were also explained and consent was sought (Appendix 3) before administering the research tool. After consenting, the participants were guided through the questionnaire (Appendix 1) and the responses recorded. Observations were also made around the household as per the observation checklist (Appendix 2).

3.10 Data Management and Analysis

Data was cleaned, coded and entered in MS-Excel spreadsheet 2013. It was then exported to statistical software for social scientists (SPSS) for Windows, Version 21.0 (IBM Corp, 2012). The exported data was analyzed at three levels, including univariable

analysis using descriptive statistics, bivariable analysis using Chi-square test and multivariable analysis using logistic regression. To test for significance of interaction on various variables, the level of significance was set at 5%. The study findings were then presented using tables, graphs and charts.

Data was stored in password protected computer hard disk while the raw data was stored in lockable safes to ensure their security.

3.11 Ethical Considerations

After study was approved by Jomo Kenyatta University of Agriculture and Technology (JKUAT) (Appendix 4), ethical approval was obtained from the Ethical Review Committee (ERC) of Pwani University (Appendix 5) and Kilifi County Department of Health (Appendix 6). Research assistants were required to sign a statement of confidentiality (Appendix 7) before being engaged for data collection.

During data collection, participants' informed consent was sought before administering the questionnaires. It was made clear to the participants that their participation was voluntary and where they agreed to participate, they had to sign an informed consent form (Appendix 3). Confidentiality of the information was assured and maintained as the interviews were conducted in a private setting within the participants' household. Their names were not recorded on the questionnaire, the questionnaires were kept in a safe custody after data collection, and all personal identifiers removed from the data during and after analysis.

The main benefit of participation in the survey was that the participants would contribute to knowledge on determinants of utilization of malaria prevention strategies which would be valuable in reducing malaria while the risk was that there was the possibility of temporary discomfort during the discussion of sensitive information around reproductive history and child survival.

CHAPTER FOUR

RESULTS

4.1 Introduction

The organization of this chapter is structured following the objectives of the study, presenting the results of the descriptive analysis followed by Chi-square tests, and finally regression analysis.

4.1.1 Response Rate

The study was conducted in 2016 with the main objective of establishing the determinants of malaria prevention strategies in Mariakani, Kilifi County. Data was collected from 327 (85.2%) participants out of the anticipated sample size of 384 due to incomplete responses from some study participants, and non-availability of study participants. According to Mugenda and Mugenda (2003), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a rate of 70% and over is excellent. Based on this assertion, the response rate was excellent.

4.2 Socio-demographic characteristics of the study participants

4.2.1 Distribution of the study participants by gender, age and religious affiliation

The study findings are presented in Table 4.1 below. The study participants included 33.6% males and 66.4% females. The age range of the participants was 18 years to 80 years, with a majority (31.8%) aged 26-35 years, followed by 18-25 years (26%); the mean age was 37±16 years.

Majority (63.3%) of the participants were Christians, while Muslims were 35.2%. Only 1.5% of the participants were not able to affiliate themselves to a specific religion.

Table 4.1: Distribution of study participants by sex, age and religious affiliation

Demographic characteristic	Number of participants (n)	Percentage (%) distribution
Sex (N = 327)		
Male	110	33.6
Female	217	66.4
Age (N = 327)		
18-25	85	26
26-35	104	31.8
36-45	43	13.1
46-55	33	10.1
56-65	41	12.5
65 and above		6.5
Religion(N=327)		
Christian	207	63.3
Muslim	115	35.2
None	5	1.5

4.2.2 Distribution of the study participants by marital status and number of children

Results presented in Table 4.2 indicate that more than three quarters (76.8%) of the participants were married with the remaining participants being unmarried.

Most (61.5%) of the participants had less than four (4) children with the average number of children in each household being three (3) (SD=2.6). The largest number of children born in a household of the participants interviewed was thirteen (13).

Table 4.2: Distribution of the study participants by marital status and number of children

Characteristic	Number of participants (n)	Percentage (%) distribution
Marital Status (N=327)		
Unmarried (*Single, widowed, Divorced &Cohabiting*)	79	24.2
Married	248	75.8
Number of Children (N=327)		
1-3	201	61.5
4-7	107	32.7
8-11	18	5.5
12-14	1	0.3

4.3 Socio-economic characteristics of the study participants

Table 4.3 shows that most (38.5%) of the participants had attained only primary level of education and 32.1% had no formal education. Those who attained secondary and post-secondary level of education were 22.4% and 7% respectively.

Most of the participants (47.8%) were engaged in some form of employment. These included salaried employment (9.2%), casual labour (29.7%) and trading (8.9%). The other participants were unemployed (22.0%), farmers (21.7%) or students (28.6%).

Table 4.3: Distribution of participants by Level of education and Employment Status

Characteristic:	Number of Participants (n)	Percentage (%) distribution
Highest Level of Education Attained (N=327)		
None	105	32.1
Primary	126	38.5
Secondary	73	22.4
Post-Secondary	23	7
Employment Status(N=327)		
Farmer	71	21.7
Employed (Salaried, casual, trader)	156	47.8
Unemployed	72	22.0
Student	28	8.5

4.4 Prevalence of Self-Reported Malaria Infections in the Population Using and Not Using Preventive Strategies

4.4.1 Prevalence of Malaria Infections among Study Participants

In determining the recent malaria infection history, the participants were first asked whether or not they had ever suffered from malaria. It was established that 86.5% of the participants had suffered from malaria at some point in their life. The remaining 13.5% of the participants interviewed had never suffered from malaria.

The participants were asked whether or not they had recently suffered from malaria. It was established that 86.5% of the participants had suffered from malaria in the last one year while only 13.1% had suffered malaria in the last one month before the study.

Among those who had suffered malaria in the past one year, 27.9% had suffered malaria in the past one month while 60.5% had suffered malaria in the past one week (Figure 4.1).

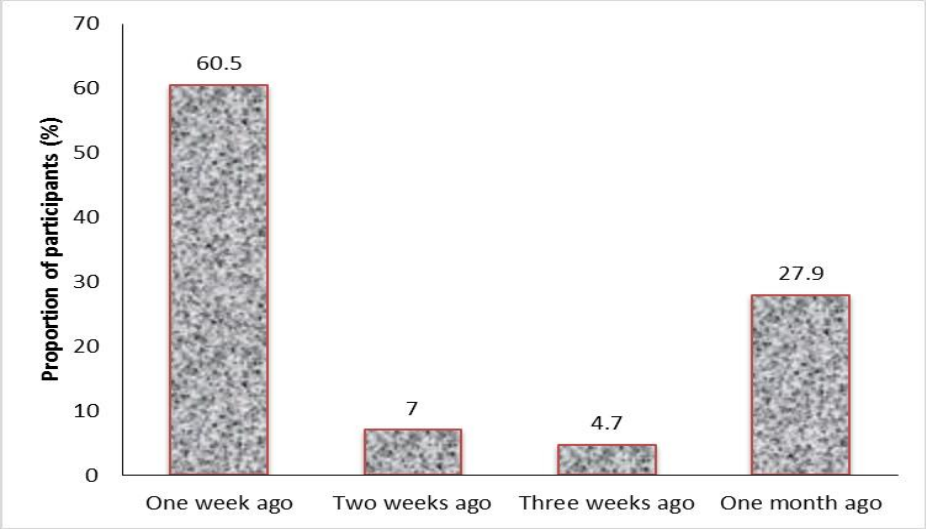

Figure 4.1: Proportion of participants who had suffered malaria in the last one month

4.4.2 Utilization of Malaria Prevention Strategies among Study Participants

When the participants were asked if mosquitoes were the source of malaria, 96.9% said that mosquitoes were the source of malaria as opposed to 3.1% who felt that it was not.

When participants were asked about ways in which mosquito bites could be prevented, many of the participants had more than one response. However, 10.7% indicated use of mosquito repellents, 98.5% indicated sleeping under treated mosquito nets, while 55.0% (180) indicated cutting surrounding bushes. For the women, a majority (58.1%) of the participants had used ITNs during pregnancy, a few (22.3%), while 19.6% had used IPT pregnancy.

4.4.2.1 Utilization of ITN and Malaria Infections among Study Participants

The results of the use of ITNs by participants in Table 4.4 indicated that 94.8% of the participants either used an ITN themselves or their family members in the last one year, with 72.3% of these not experiencing any cases of malaria. As for the participants who had never used an ITN, 70.6% had suffered from malaria (Table 4.4).

Table 4.4: Malaria Prevalence among Participants who had Used ITNs and those that had not

Used ITN in the last one year		**Proportion suffered from Malaria**	
Response	**Proportion**	**Yes**	**No**
Yes	310 (94.8%)	90 (29.0%)	220 (71.0%)
No	17 (5.2%)	13 (76.5%)	4 (23.5%)
Total	**327 (100%)**	**103 (31.5%)**	**224 (68.5%)**

4.4.2.2 IPT Utilization during Pregnancy and Malaria Infection among Study Participants

Participants were asked if they used IPT during pregnancy. Out of 309 participants who responded to this question, only 36.9% of the participants reported using IPT during pregnancy Out of the 36.9% participants who reported using IPT during pregnancy only 15.8% had suffered from malaria while using IPT (Table 4.5).

Table 4.5: Malaria Prevalence among Participants who had Used IPT during pregnancy and those that had not

Used IPT in the last one year		**Proportion suffered from Malaria**	
Response	**Proportion**	**Yes**	**No**
Yes	114 (36.9%)	18 (15.8%)	96 (84.2%)
No	195 (63.1%)	173 (88.7%)	22 (11.3%)
Total	**309 (90.4%)**	**191 (61.8%)**	**118 (38.1%)**

4.4.2.3 IPT Utilization for Children and Malaria Infections among Study Participants

Out of 91 (31.2%) participants who had used IPT for children only 12.1% reported their children to have suffered from malaria while using IPT. Out of 68.8% who reported not to have used IPT for children, majority (88.7%) had experienced their children suffering from malaria as shown in Table 4.6.

Table 4.6: Malaria Prevalence among Participants who had Used IPT for Children and those that had not

Used IPT in the last one year		**Proportion suffered from Malaria**	
Response	**Proportion**	**Yes**	**No**
Yes	91(31.2%)	11 (12.1%)	80 (87.9%)
No	201 (68.8%)	158 (78.6%)	22 (21.4%)
Total	**292 (89.2%)**	**169 (57.8%)**	**102 (34.9)**

4.4.3 Malaria Case Management among Study Participants

The participants who had recently suffered from malaria were asked where they received treatment from. The results are shown in Figure 4.2. It was established that of the 86.5% participants who had suffered from malaria, 91.0% had received treatment from a hospital facility, 8.0% took drugs bought from a local dispensing chemist while 1.0% depended on herbal medicine as their source of treatment.

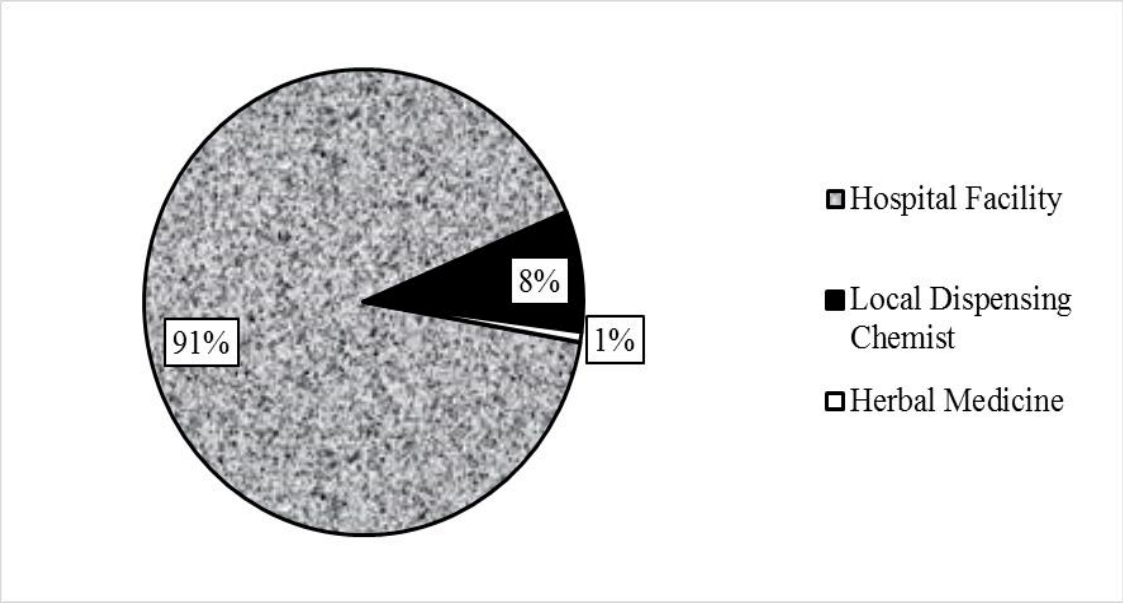

Figure 4.2: Proportion of participants who had suffered from malaria and source of treatment

The study also showed that 97.7% of the participants who had suffered from malaria had their blood tested for malaria parasites and a similar proportion had completed the prescribed treatment. All the participants (100%) who had the blood tests done and put on treatment recovered from malaria.

4.5 Knowledge, Attitude and Practice towards Malaria, Malaria Prevention Strategies, and Case Management among Study Participants

4.5.1 Sources of malaria known by Participants

When the participants were asked if mosquitoes were the source of malaria, 96.9% said that mosquitoes were the source of malaria as opposed to 3.1% who felt that it was not.

4.5.2 Malaria prevention strategies known by Participants

Table 4.7 below shows that majority (79.5%) of the respondents reported that clearing surrounding bushes and using ITNs prevented malaria infections. Only a few reported using drugs from the hospital and vaccination as other ways of preventing malaria. Some of the participants gave more than one response.

Table 4.7: Malaria Prevention strategies known by participants

Strategy	Number of Participants (n)	Percentage (%) of participants
Drugs from hospital when one has malaria	67	20.5
Clearing surrounding bushes	260*	79.5
Vaccination	14	4.3
Insecticide Treated Nets (ITNs)	260*	79.5

* Some participants had multiple answers

4.5.3 Malaria prevention strategies at Pregnancy known by Participants

Regarding knowledge on malaria prevention strategies at pregnancy, 58.1% knew about ITNs while 22.3% knew about malaria drugs. The other 19.6% of the participants could not mention any malaria prevention strategy at pregnancy.

Participants were asked if they knew any drugs used to prevent malaria in pregnancy. A majority of them (62.2%) could not mention any drug. Drugs mentioned by a few mentioned included quinine, Fansidar, Metakelfin, Amodiaquin and Mefloquine.

Table 4.8: Malaria drugs used to prevent malaria at pregnancy

Malaria Drugs Known to be used during pregnancy:	**Number of Participants (n)**	**Percentage (%) of participants**
Fansidar	17	9.9
Metakelfin	11	6.4
Amodiaquin	11	6.4
Quinine	23	13.4
Mefloquine	3	1.7
Could not tell the name	107	62.2

4.5.4 Sources of information on malaria prevention strategies known by participants

Participants were asked if they had heard about ITNs and IPT. Majority reported about ITNs only. When asked about their source of information on ITNs, a majority had heard about it over the radio (58.7%), from community health workers (37.0%) and the clinic (35.2%). A few had heard from other sources such as chief's *baraza*, television and church (Table 4.9).

Table 4.9: Source of information related to ITNs

Source	Number of Participants	Percentage (%) of participants
Community Health Worker (CHW)	121	37.0
Chief's meeting (baraza)	61	18.7
Church	13	4.0
Clinic	115	35.2
Radio	192	58.7
Television	42	12.8

4.5.5 Attitude and Practice of participants in malaria prevention strategies

Participants were asked about reasons for using or not using known malaria prevention strategies. A majority (72.3%) used ITNs to prevent malaria while a few (27.7%) used them for protection from mosquito bites.

The reasons given by participants who were at the time of the study not using ITNs are presented in Table 4.10. The major reasons were non-availability of ITNs (40%) and lack of a place to hang them in the house (30%). Misuse of the ITNs observed included caging for young chicks, substitutes for ropes, and fences for vegetable gardens.

Table 4.10: Reasons for not using insecticides treated bed nets by participants

Reasons for not using ITN	Number of Participants (n)	Percentage (%) of participants
Nets are not available	131	40
There is no place to hang them in the house	98	30
It is too hot	49	15
Nets are only for children	49	15

4.5.6 Attitude and Practice of Malaria case management by participants

Participants who had suffered malaria were asked about reasons for their treatment choices. Majority (76.4%) sought treatment from hospital as they were assured of better facilities, while a few (18.2%) said they had access to quality and cheaper malaria drugs. Others said they were too sick and so were only assured of getting treatment from the hospital.

For those who received treatment by using drugs from the local dispensing chemist, the main reasons given for choosing that method of treatment was that it was a cheaper alternative (54.2%), or it was the only available option (33.3%). There were only three participants who had used herbal medicine and it was because the choice was cheaper compared to the other treatment alternatives.

Table 4.11: Reasons for the malaria treatment alternatives used by participants during cases of malaria

Reason for choice	Source of malaria treatment					
	Hospital		Drugs from Chemist		Herbal Medicine	
	No.	%	No.	%	No.	%
Better facilities	197	76.7	-	-	-	-
Cheaper	-	-	13	56.5	3	100
Only option	2	0.7	8	30.4	-	-
Quality and cheaper drugs	47	18.3	-	-	-	-
Was Very Sick	11	4.3	3	13.0	-	-

4.6 Determinants of Utilization of Malaria Preventive Strategies

4.6.1 Association between socio-demographic characteristics and malaria preventive strategies

4.6.1.1 Use of Insecticide Treated Bed Nets

Bivariate analysis of socio-demographic characteristics at 5% level of significance revealed that sex and age of participants were significantly associated with current use of ITNs (sex: $\chi^2_{(1)} = 6.087$, p=0.014; age: $\chi^2_{(6)} = 113.276$, p=0.000) (Table 4.12). Hence, twice as many females (67.6%) as males (32.4%) were using ITNs together with their family members. Similarly, a significant proportion of participants aged between 18 and 35 years (59%) were also using ITNs at the time of the study compared to those aged above 35 years (Table 4.12).

Table 4.12: Association between Socio-demographic characteristics and use of ITNs

Socio demographic characteristics	Proportion of participants who used ITNs		Chi Square Test of significance
Sex	**Yes (n=315)**	**No (n=12)**	
Male	32.4% (102)	66.7% (8)	$\chi^2_{(1)} = 6.087$, p=0.014*
Female	67.6% (213)	33.3% (4)	
Age in Years	**Yes (n=309)**	**No (n=12)**	
18-25	26.9% (83)	16.7% (2)	$\chi^2_{(6)} = 113.276$, p=0.000*
26-35	33% (102)	16.7% (2)	
36-45	13.9% (43)	0.0% (0)	
46-55	9.7% (30)	25.0% (3)	
56-65	13.3% (41)	0.0% (0)	
66 above	3.2% (10)	41.7% (5)	
Marital status	**Yes (n=238)**	**No (n=8)**	$\chi^2_{(1)} = 1.193$, p=0.279
Married	57.6% (137)	62.5% (5)	
Unmarried	42.4% (101)	37.5% (3)	

** = significant at 0.05; Figures in parenthesis are number of participants*

4.6.1.2 Use of Intermittent Preventive Treatment during pregnancy and for Children

The study established that the associations between utilization of IPT during pregnancy and socio-demographic factors, namely sex, age and marital status, were not significant (Table 4.13).

Table 4.13: Association between Socio-demographic characteristics and use of IPT during pregnancy

Socio-demographic characteristic	Proportion of participants Who used of IPT		Chi Square test of significance
Sex	**Yes (n=88)**	**No (n=147)**	χ^2 (1) = 1.395, p=0.238
Male	27.3% (24)	34.7% (51)	
Female	72.7% (64)	65.3% (96)	
Age in Years	**Yes (n=88)**	**No (n=143)**	χ^2 (6) = 5.121, p=0.401
18-25	21.6% (19)	23.8% (34)	
26-35	40.9% (36)	31.5% (45)	
36-45	17.0% (15)	14.0% (20)	
46-55	9.1% (8)	11.2% (16)	
56-65	10.2% (9)	14.7% (30)	
66 and above	1.1% (1)	4.9% (8)	
Marital status	**Yes (n=88)**	**No (n=145)**	χ^2 (1) = 1.958, p=0.217
Married	69.3% (61)	67.6% (98)	
Unmarried	30.7% (27)	32.4% (47)	

Figures in parenthesis are number of participants

Chi square analysis on socio-demographic characteristics and use of IPT for children established significant associations with sex, age and marital status of the participants (sex: $\chi^2_{(1)} = 4.260$, p=0.039; age: $\chi^2_{(6)} = 23.779$, p = 0.001; marital status: $\chi^2_{(1)} = 12.905$, p=0.000) (Table 4.12). Hence, about three times more females (73.6%) as males (26.4%) had their children given IPT drugs from a health facility to prevent malaria. Participants aged between 26 and 35 years had most of their children (46.2%) given IPT to prevent malaria from a health facility compared to any other age group. In terms of marital status, about 93.4% of single, widowed, divorced or cohabiting residents of Mariakani had their children given IPT to prevent malaria (Table 4.14).

Table 4.14: Association between Socio-demographic characteristics and use of IPT for children

Socio-demographic characteristic	**Proportion of participants Who used of IPT**		**Chi Square test of significance**
Sex	**Yes (n=91)**	**No (n=201)**	
Male	26.4% (24)	38.8% (78)	$\chi^2_{(1)} = 4.260$,
Female	73.6% (67)	61.2% (123)	p=0.039*
Age in completed Years	**Yes (n=91)**	**No (n=195)**	
18-25	8.8% (8)	28.2% (55)	
26-35	46.2% (42)	28.2% (55)	
36-45	11% (10)	15.9% (31)	$\chi^2_{(6)} = 23.0$
46-55	16.5% (15)	9.2% (18)	p=0.001*
56-65	16.5% (15)	13.3% (26)	
66 and above	1.1% (1)	5.3% (10)	
Marital status	**Yes (n=91)**	**No (n=197)**	
Married	6.6% (6)	24.4% (48)	$\chi^2_{(1)} = 12.905$,
Unmarried	93.4% (85)	75.6% (149)	p=0.000*

** =significant at 0.05; Figures in parenthesis are number of participants*

4.6.2 Association between socio-economic characteristics and malaria preventive strategies

4.6.2.1 Use of Insecticide Treated Nets

Bivariate analysis of socio-economic characteristics at 5% level of significance revealed that only occupation of participants were significantly associated with current use of ITNs ($\chi^2_{(2)}$ = 7.678, p=0.022). Almost twice as many employed people (48.6%) as unemployed people (29.2%) and farmers (22.2%) were using ITNs at the time of the study (Table 4.15).

Table 4.15: Association between socio-economic characteristics and ITN use

Socio demographic characteristic	Proportion of participants Who used ITNs		Chi Square Test of significance
Level of education	**Yes (n=235)**	**No (n=8)**	
None	31.5% (74)	37.5% (3)	
Primary	37.0% (87)	62.5% (5)	χ^2 (3) = 3.934, p=0.269
Secondary	24.3% (57)	0.0% (0)	
Post – Secondary	7.2% (17)	0.0% (0)	
Occupation	**Yes (n=315)**	**No (n=12)**	
Unemployed	29.2% (92)	66.7% (8)	$\chi^2_{(2)}$ = 7.678, p=0.022*
Employed	48.6% (153)	25% (3)	
Farmer	22.2% (70)	8.3% (1)	

** Significant at 0.05*

4.6.2.2 Use of Intermittent Preventive Treatment (IPT) during pregnancy and for children

Chi square analysis of socio-economic characteristics of participants and IPT use among pregnant women revealed that level of education and occupation were significantly associated with use of IPT among pregnant women (Level of education: $\chi^2_{(3)} = 26.555$, p=0.000; Occupation: $\chi^2_{(2)} = 7.416$, p=0.025). Twice (57.9%) as many participants with at least primary level of education were using IPT for women during pregnancy than those who had never attended school (26.3%). For occupation, also as twice (46.5%) the participants with employment were using IPT to prevent malaria during pregnancy than those who were unemployed (23.7%) and farmers (29.8%) (Table 4.16).

Table 4.16: Association between socio-economic characteristics and IPT use during pregnancy

Socio-economic characteristic	Proportion of participants Who used IPT		Chi Square test of significance
Level of education	**Yes (n=114)**	**No (n=190)**	
None	26.3% (30)	37.4% (71)	$\chi^2_{(3)} = 26.555$, p=0.000*
Primary	57.9% (66)	31.6% (60)	
Secondary	15.8% (18)	21.6% (41)	
Post – Secondary	0% (0)	9.5% (18)	
Occupation	**Yes (n=114)**	**No (n=195)**	
Unemployed	23.7% (27)	36.4% (71)	$\chi^2_{(2)} = 7.416$, p=0.025*
Employed	46.5% (53)	44.6% (87)	
Farmer	29.8% (34)	19% (37)	

** = significant at 0.05; Figures in parenthesis are number of participants*

Chi square analysis for socio-economic characteristics (level of education and occupation) established significant associations between utilization of IPT for children and occupation (Table 4.17). Participants who were employed were more likely to use IPT for children compared to those who were not and those who were farmers (p = 0.004; n = 72, $X^2_{(2)} = 11.229$).

Table 4.17: Association between socio-economic characteristics and IPT use in Children

Determinant	**Proportion of participants Who used IPT**		**Chi Square test of significance**
Highest level of education attained	**Yes (n=72)**	**No (n=143)**	
None	41.7% (30)	30.1% (43)	χ^2 (3) = 3.955, p=0.266
Primary	38.9% (28)	40.6% (58)	
Secondary	12.5% (9)	21.0% (30)	
Post – Secondary	6.9% (5)	8.4% (17)	
Occupation	**Yes (n=72)**	**No (n=148)**	
Unemployed	15.3% (11)	33.1% (49)	χ^2 (2) =11.229, p=0.004*
Employed	50.0% (36)	48.6% (72)	
Farmer	34.7% (25)	18.2% (27)	

** = significant at 0.05; Figures in parenthesis are number of participants*

4.6.3 Association between Knowledge, Attitudes and Practices and Malaria Preventive Strategies

4.6.3.1 Use of Insecticide Treated Nets

The study established significant associations between utilization of ITNs and several KAP factors, namely; past malaria experience, source of treatment for past malaria experience, awareness of ITN and past usage of ITN (Table 4.18). Participants who had past experience with malaria (88.3%) were more likely to use ITN compared to participants who had no experience (11.7%) (n = 327, $X^2_{(1)}$ = 21.544, p = 0.000). Similarly, participants who had heard about ITNs (96.8%) were more likely to use them compared to those who had not (3.2%) (n = 315, $X^2_{(1)}$ = 5.953, p = 0.015). Those who had used ITNs before were equally more likely to use them than those who had never used them (1.6%) (n = 315, $X^2_{(1)}$ = 227.16, p = 0.000).

Table 4.18: Association between Knowledge, Attitudes and Practices of ITN use

Determinant	Proportion of participants Who used ITN		Chi Square Test of Association
Past Malaria Experience	**Yes (n = 315)**	**No (n=12)**	$\chi^2_{(1)}$ = 21.544,
Yes	88.3% (278)	41.7% (5)	
No	11.7% (37)	58.3% (7)	p = 0.000*
Source of treatment for past malaria experience	**Yes (n=276)**	**No (n=7)**	$\chi^2_{(2)}$ = 10.938,
Hospital	92% (254)	57.1% (4)	
Drugs from chemist.	7.6% (21)	42.9% (3)	p = 0.004*
Herbal Medicine	0.4% (1)	0% (0)	
Has heard about ITNs	**Yes (n = 315)**	**No (n=12)**	$\chi^2_{(1)}$ = 5.953,
Yes	96.8% (305)	41.7% (5)	
No	3.2% (10)	58.3% (7)	p = 0.015*
Family or self has ever used ITNs	**Yes (n=315)**	**No (n=12)**	$\chi^2_{(1)}$ = 227.160,
Yes	98.4% (310)	16.7% (2)	p = 0.000*
No	1.6% (5)	83.3% (10)	

** = significant at 0.05; Figures in parenthesis are number of participants*

4.6.3.2 Use of Intermittent Preventive Treatment

The study established significant associations between utilization of IPT during pregnancy and past malaria experience, source of treatment for past malaria experience, perception of mosquitoes as the source of malaria, and awareness of IPT (Table 4.19). Participants who had experienced malaria in the past (92.1%) were more likely to use IPT during pregnancy compared to those who had not (7.9%) (n = 309, $X^2_{(1)} = 5.955$, p = 0.015). In addition, participants who had heard about IPT (91.2%) were more likely to use it during pregnancy compared to those who had not (8.8%) (n = 309, $X^2_{(1)} = 50.100$, p = 0.000).

Table 4.19: Association between Knowledge, Attitudes and Practices of IPT Use during Pregnancy

Determinant	Proportion of Participants Who used IPT		Chi Square test of significance
Past Malaria Experience	**Yes (n=114)**	**No (n=195)**	χ^2 (1) = 5.955, p=0.015*
Yes	92.1% (105)	82.1% (160)	
No	7.9% (9)	17.9% (35)	
Source of treatment for past malaria experience	**Yes (n=104)**	**No (n=161)**	χ^2 (2) = 13.974, p=0.001*
Hospital	100% (104)	87.6% (141)	
Drugs from chemist.	0% (0)	11.8% (19)	
Herbal Medicine	0% (0)	0.6% (1)	
Thinks mosquitoes are the source of malaria	**Yes (n=114)**	**No (n=195)**	χ^2 = 17.677, p=0.000*
Yes	91.2%(104)	83.1% (162)	
No	8.8%(10)	16.9% (33)	
Has heard about IPT	**Yes (n=114)**	**No (n=195)**	χ^2 = 50.100, p=0.000*
Yes	91.2%(104)	76.4% (149)	
No	8.8%(10)	23.6% (46)	

** = significant at 0.05; Figures in parenthesis are number of participants*

Similarly, the study established significant associations between utilization of IPT for children and past malaria experience, perception of mosquitoes as the source of malaria**,** and awareness of IPT (Table 4.20). Participants who had past experience with malaria (79.1%) were more likely to use IPT for children compared to those who had no malaria experience (20.9%) (n = 292, $X^2_{(1)}$ = 10.499, p = 0.001). In addition, participants who had heard about IPT (97.8%) were more likely to use IPT for children compared to those who had not (2.2%) (n = 292, $X^2_{(1)}$ = 62.320, p = 0.000).

Table 4.20: Association between Knowledge, Attitudes and Practices of IPT for children

Factor	**Proportion of Participants Who used IPT**		**Chi Square test of significance**
Past Malaria Experience	**Yes (n=91)**	**No (n=201)**	χ^2 = 10.499, p=0.001*
Yes	79.1%(72)	92.0% (185)	
No	20.9%(19)	8.0% (16)	
Source of malaria treatment for past malaria experience	**Yes (n=104)**	**No (n=161)**	χ^2 = 2.682, p=0.262
Hospital	91.3%(95)	90.7%(146)	
Drugs from Chemist	7.7%(8)	9.3%(15)	
Herbal Medicine	1%(1)	0.0%(0)	
Thinks mosquitoes are the source of malaria	**Yes (n=91)**	**No (n=201)**	χ^2 = 4.688, p=0.030*
Yes	100%(91)	76.6% (154)	
No	0.0%(0)	23.4% (47)	
Has heard about IPT	**Yes (n=91)**	**No (n=201)**	χ^2 = 62.320, p=0.000*
Yes	97.8%(89)	79.6% (160)	
No	2.2%(2)	20.4% (41)	

** = significant at 0.05; Figures in parenthesis are number of participants*

4.7 Association between Knowledge, Attitudes and Practices and Malaria Case Management

For case management, the only factor that significantly influenced completion of malaria treatment was recent malaria experience ($\chi^2 = 4.786$, p=0.029) (Table 4.21).

Table 4.21: Utilization of case management in malaria treatment

Variable/ Factor	Response	Case Management Chi Square Value			
		Proportion Blood test conducted	**χ^2 and p-value**	**Treatment course completed**	**χ^2 and p-value**
Has ever suffered from malaria	**Yes**	100%(273)	-	100%(273)	-
	No	0.0%(0)		0.0%(0)	
Has suffered from malaria recently	**Yes**	12.5%(34)	χ^2= 0.851, p=0.356 *ns*	37(13.6%)	χ^2 = 4.786, p=0.029*
	No	(87.5%(239)		236(86.4%)	
Thinks mosquitoes are the source of malaria	**Yes**	90.5%(247)	χ^2 = 0.243, p=0.622 *ns*	96.3%(263)	χ^2= 0.266, p=0.606 *ns*
	No	9.5%(26)		3.7%(10)	

** = significant at 0.05; ns = not significant; Figures in parenthesis are number of participants*

4.8 Determinants of utilization of Malaria Preventive Strategies and case management

4.8.1 Determinants of ITN use among participants

Logistic regression established that the key predictors of ITN usage among the study participants were socio-demographic characteristics (age and sex), socio-economic factors (education, occupation), knowledge, attitude and practices (past malaria experience, source of treatment for past malaria experience, awareness of ITN and past usage of ITN). The detailed results are presented in Table 4.22.

Female participants were 2.104 times more likely to use ITN compared to male participants (p = 0.023; 95% C.I. = 0.117 – 7.937). Participants who were aged between 26 and 35 years were 1.448 times more likely to use ITN compared to those aged between 18 and 25 years participants (p = 0.037; 95% C.I. = 0.712 – 2.946).

For socio-economic factors, the employed participants were 1.146 times more likely to use ITN compared to unemployed participants (p = 0.023; 95% C.I. = 0.117 – 7.937). Farmers were 0.008 less likely to use ITNs (p = 0.999).

Regarding knowledge, attitudes and practice, the participants who had no past malaria experience were significantly less likely to use ITNs than those who had suffered (p = 0.047, AOR = 0. 275, 95% C.I. = 0.063 – 1.204), those who bought drugs from the Chemist were significantly less likely to use ITNs than those who went to hospital (p = 0.046, AOR = 0.566, 95% C.I. = 0.033 – 1.629), those who had not heard of ITNs were significantly less likely to use them compared to those who had heard about them (p = 0.048, AOR = 0.194, 95% C.I. = 0.038 – 0.987), and those who had not used ITNs in the past were significantly less likely to use them (p = 0.001AOR = 0.214, 95% C.I. = 0.113 – 0.658).

Table 4.22: Regression Analysis for ITN among Participants

Determinant							95% C.I for EXP(B)	
	B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Sex								
Male (Reference)	1.00							
Female	0.744	0.828	5.191	1	0.023*	2.104	0.117	7.937
Age in Years								
18-25 (*Reference*)	1.00							
26-35	0.370	0.362	1.045	1	0.037*	1.448	0.712	2.946
36-45	-0.386	0.648	0.355	1	0.551	0.680	0.191	2.420
46-55	-17.808	11147.524	0.000	1	0.999	0.000	0.000	
56-65	-18.775	5419.619	0.000	1	0.997	0.000	0.000	
66-75	-17.997	9748.227	0.000	1	0.999	0.000	0.000	
76-85	-1.354	0.678	2.837	1	0.587	0.253	0.071	1.351
Occupation								
Unemployed (*Reference*)	1.00							
Employed	0.136	0.744	0.034	1	0.854	1.146	0.267	4.922
Farmer	-4.804	3402.893	0.000	1	0.999	0.008	0.000	.[c]
Past Malaria Experience								
Yes (*Reference*)	1.00							
No	-1.291	0.753	2.935	1	0.047*	0.275	0.063	1.204
Source of treatment for past malaria experience								
Hospital (*Reference*)	1.00							
Drugs from chemist	-0.569	0.889	0.155	1	0.046*	0.566	0.033	1.629
Herbal Medicine	-18.775	5419.619	0.000	1	0.997	0.000	0.000	
Has heard about ITNs								
Yes (*Reference*)	1.00							
No	-1.641	0.831	3.905	1	0.048*	0.194	0.038	0.987
Family or self has ever used ITNs in the past:								
Yes (*Reference*)	1.00							
No	-1.589	0.563	11.430	1	0.001*	0.214	0.113	0.658

** = significant at 0.05*

4.8.2 Determinants of IPT use during Pregnancy

Logistic regression established that the key predictors of IPT usage in pregnancy among the study participants were socio-economic factors (level of education, occupation), and knowledge, believes and practice (past malaria experience, source of treatment for past malaria experience, perception of mosquitoes as the source of malaria and awareness of IPT) (Table 4.23).

Participants who had primary and secondary level of education were 2.217 times significantly more likely to use IPT during pregnancy compared to participants with no education (p = 0.002; 95% C.I. = 0.328 – 6.132),while those with secondary education were 1.167 times significantly more likely to use IPT during pregnancy compared to participants with no education (p = 0.041; 95% C.I. = 0.657 – 2.074). Participants who were employed were 1.618 times significantly more likely to use IPT during pregnancy compared to those who were unemployed (p = 0.005; 95% C.I. = 0.384 – 7.348).

Participants who had no past malaria experience were significantly less likely to use IPT during pregnancy than those who had suffered malaria (p = 0.036; AOR = 0.080, 95% C.I. = 0.001 – 0.356). Participants who had bought drugs from chemist were significantly less likely to use IPT during pregnancy than those who sought treatment from hospital (p = 0.043; AOR = 0.008, 95% C.I. = 0.000 – 0.176). Participants who had not heard of IPT were significantly less likely to use IPT during pregnancy than those who had heard (p = 0.002; AOR = 0.316, 95% C.I. = 0.152 – 0.653), while participants who did not perceive mosquitoes as the source of malaria were significantly less likely to use IPT during pregnancy than those who believed so (p = 0.001; AOR = 0.239, 95% C.I. = 0.105 – 0.544).

Table 4.23: Regression Analysis for use of IPT during Pregnancy among Participants

Determinant	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Level of Education								
None (*Reference*)	1.00							
Primary	0.796	0.251	10.052	1	0.002*	2.217	0.328	6.132
Secondary	0.155	0.293	0.278	1	0.041*	1.167	0.657	2.074
Post – Secondary	-0.928	1.496	0.385	1	0.837	0.395	0.021	7.420
Occupation								
Unemployed (*Reference*)	1.00							
Employed	0.481	0.172	7.875	1	0.005*	1.618	0.384	7.348
Farmer	0.111	0.519	0.046	1	0.830	1.118	0.404	3.092
Past Malaria Experience								
Yes (*Reference*)	1.00							
No	-2.526	0.424	35.441	1	0.036*	0.080	0.001	0.356
Source of treatment for past malaria experience								
Hospital (*Reference*)	1.00							
Drugs from chemist	-4.804	0.677	0.911	1	0.043*	0.008	0.000	0.176
Herbal Medicine	-13.651	3939.621	0.000	1	0.997	1.179E-06	0.000	.[c]
Has heard about IPT								
Yes (Reference)	1.00							
No	-1.153	0.371	9.648	1	0.002*	0.316	0.152	0.653
Thinks mosquitoes are the source of malaria								
Yes (*Reference*)	1.00							
No	-1.430	0.419	11.664	1	0.001*	0.239	0.105	0.544

4.8.3 Determinants of IPT use in Children

Further analysis using logistic regression established key predictors of IPT uptake for children among the participants to be sex, age, past malaria experience, perception of mosquitoes as the source of malaria and awareness of IPT. Female participants were 1.896 times (95% C.I. = 0.284 – 3.352, p = 0.034) more likely to use IPT for children compared to male participants. The odds of IPT uptake for children among participants aged 26 to 35 years, 36 to 45 years, 46 to 55 years, and 56 to 65 years (AOR = 4.455, 95% C.I. = 0.187 – 9.032, p = 0.000; AOR = 1.674, 95% C.I. = 0.534 – 3.250, p = 0.038; AOR = 2.326, 95% C.I. = 0.966 – 5.600, p = 0.006; AOR = 2.250, 95% C.I. = 0.481 – 4.570, p = 0.018), were more compared to participants aged 18 to 25 years. On the other hand, the odds of IPT uptake for children among participants aged 66 to 75 years and 76 to 85 years was less (AOR = 0.215, 95% C.I. = 0.066 – 0.702, p = 0.011; AOR = 0.231, 95% C.I. = 0.075 – 0.713, p = 0.011), compared to participants aged 18 to 25 years. The odds of IPT uptake for children among participants who had no past experience with malaria, did not perceive mosquitoes as the source of malaria and had not heard of IPT (AOR = 0.190, 95% C.I. = 0.072 – 0.502, p = 0.001; AOR = 0.242, 95% C.I. = 0.104 – 0.568, p = 0.001; AOR = 0.449, 95% C.I. = 0.209 – 0.966, p = 0.041), were less compared to those who had past experience with malaria, perceived mosquitoes as the source of malaria and had heard of IPT respectively. The results are shown in Table 4.24.

Table 4.24: Regression Analysis for use of IPT for children among Participants

Determinant	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Sex								
Male (Reference)	1.00							
Female	0.640	0.178	12.858	1	0.034	1.896	0.284	3.352
Age in Years								
18-25 (Reference)	1.00							
26-35	1.494	0.334	20.049	1	0.000*	4.455	0.187	9.032
36-45	0.515	0.583	0.782	1	0.038*	1.674	0.534	3.250
46-55	0.844	0.448	3.543	1	0.006*	2.326	0.966	5.600
56-65	0.811	0.601	1.821	1	0.018*	2.250	0.481	4.570
66-76	-1.535	0.603	6.481	1	0.011*	.215	0.066	0.702
76-86	-1.466	0.575	6.492	1	0.011*	.231	0.075	0.713
Marital status								
Married (Reference)	1.00							
Unmarried	0.368	0.331	1.238	1	0.266	1.445	0.755	2.765
Occupation								
Unemployed (*Reference*)	1.00							
Employed	0.801	0.391	8.192	1	0.041*	1.449	0.209	3.966
Farmer	0.717	0.434	5.660	1	0.001*	1.242	0.104	3.568
Past Malaria Experience								
Yes (Reference)	1.00							
No	-1.660	0.496	11.230	1	0.001*	0.190	0.072	0.502
Has heard about IPT								
Yes (Reference)	1.00							
No	-.801	0.391	4.192	1	0.041*	0.449	0.209	0.966
Thinks mosquitoes are the source of malaria								
Yes (Reference)	1.00							
No	-1.417	0.434	10.660	1	0.001*	0.242	0.104	0.568

4.8.4 Determinants of Case Management Usage among Study Participants

The study did not establish any significant associations between utilization of case management and socio-demographic factors, socio-economic factors, and knowledge, attitudes and practices of case management.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussions

Malaria prevention strategies were categorized into three, namely case management, use of ITNs (sleeping under treated bed nets), and use of IPT (use of anti-malarial drugs for prophylaxis among participants). Case management was considered preventive only to the extent that treating these cases would reduce the exposure of non-cases to the risk of contracting malaria which is spread from an infected person to a non-infected person by the female Anopheles mosquito (vector).

5.1.1 Socio-demographic and Socio-economic Characteristics on Malaria Prevention Strategies and Case Management

The study participants included 66.4% females and 33.6% males. This could be attributed to the fact that most of the women were housewives while men went out for work. These findings are similar to findings by Atieli *et al*. (2011) where more female participants were available for the study. Nationally, one-third of households are headed by women and a higher proportion of rural than urban households are headed by women (KDHS, 2014).

The mean age of the participants was 37 years within a range of 18 years to 80 years. Hence, most of the participants were of the middle age and old enough to make rational decisions about malaria prevention strategies. According to KDHS (2014), 37% of women and 39% of men are aged 15-24 years, 34% of women and 32% of men are in the 25-34 age group, while 29% of both women and men are aged 35-49 years. Age and sex are important demographic variables and are the primary basis of demographic classification (KDHS, 2014). They are important in decision making process.

More than three quarters (76.8%) of the participants were married and the average number of children per household was three (3) children, with a range of 0 -13 children across the households. The mean household size has implication for the pattern of household expenditure. It affects the health care status of a household in terms of nutrition, as well as affordability and accessibility of health care necessities such as drugs and mosquito nets (MOPHS, 2009).

In addition, a higher proportion of the participants affiliated themselves to a particular religion, Christians being the majority (63.3%) followed by Muslims (35.2%). The majority of Kenyans are Christians with only 7% being Muslims and only a few (6%) with no religion (KDHS, 2014). Religion influences the use of malaria preventive strategies as majority who were affiliated to a particular religion would listen to their religious leader.

In terms of level of education, a majority (67.1%) had some level of education, those with primary, secondary and post-secondary level of education being 39.1%, 22.7% and 5.6% participants respectively, but 32.6% had no formal education. The urban-rural difference in level of education is pronounced for women on either end of the educational attainment scale (KDHS, 2014). Nine percent (9%) of rural women compared with 4% of urban women have no education; however, 34% of rural women have some primary education compared to 14% of urban women. The study site is a rural area where education standards are still low, thereby affecting the understanding and importance of malaria prevention strategies. This is in agreement with malaria fact sheet 2015 (WHO, 2016). Education holds the key to a sustainable response to malaria prevention and the probability of dying from malaria is inversely related to income and education (Tusting, 2013).

Most of the participants (47.8%) were engaged in either casual, salaried or self-employment; some were farmers (21.7%) and others were unemployed (30.5%). Those with no education were less likely to employed (KDHS, 2014). This implies that the

unemployed were unable to afford drugs and ITNs or malaria prevention drugs for their families, leading to low utilization of malaria prevention strategies.

5.1.2 Level of self-reported malaria cases

The study established that 86.5% of the participants had suffered from malaria in the past while only 13.1% had suffered malaria in the last one month. Hence, most of the inhabitants in Mariakani, Kilifi County, were aware of the effects of malaria since they had ever suffered from the infection.

Among the participants who had suffered from malaria, majority (91%) had received treatment from a hospital facility, while a few took drugs bought from a local dispensing chemist (8%) or depended on herbal medicine (1%) as their source of treatment. The participants who had sought treatment from hospital said that in the hospitals they were assured of better facilities while those who received treatment by using drugs from the local dispensing chemist said it was a cheaper alternative.

The study findings indicated that 20.5% of the participants knew that using drugs from the hospital was one of the ways of preventing malaria, and that 97.7% of the participants who had suffered from malaria had their blood tested for malaria parasites and had completed the prescribed treatment. All the participants who had the blood tests done and put on treatment recovered from malaria. The participants had good knowledge on malaria treatment. This is in agreement with findings of Ajayi *et al.* (2008) and Mazigo *et al*. (2010).

Knowledge regarding malaria transmission and prevention has contributed significantly to the low number of malaria cases in the most recent past (13.1%). This means that the participants were knowledgeable that effective malaria treatment was from the hospital. This is in agreement with a study done in Tanzania (Mboera *et al*., 2007), Eritrea and Sudan (Humphrey *et al*., 2010).

5.1.3 Knowledge, Attitude and Practice towards Malaria and Malaria Prevention Strategies, and Case Management

The study established that 96.9% knew that mosquitoes were the source of malaria. On ways in which mosquito bites could be prevented, 10.7% indicated use of mosquito repellents, 98.5% indicated sleeping under treated mosquito nets, 79.5% indicated cutting surrounding bushes while 4.3% said that vaccination prevented malaria.

The study established that 96.8% of the participants knew about ITNs for prevention of malaria 98.4% of the participants had used ITNs to prevent malaria infections. Among those who had used an ITN, only 27.7% had suffered from malaria while 70.6% of the participants who had never used an ITN had suffered from malaria. This means that those who were not using ITNs were exposed and had a higher chance of suffering from malaria infections. ITNs protect from mosquito bites and reduces morbidity and mortality (Lengeler, 2004; Fegan *et al*., 2007). Those who used ITNs and still suffered from malaria may have not been consistent or compliant in using ITNs or the ITNs were not well maintained. Studies on non-compliance to ITN use have been reported in Western Kenya (Atieli *et al.,* 2011) and Lake Victoria region (Larson *et al*., 2014). This was attributed to age of participant, sex, purpose (protection during pregnancy and infancy) and time of distribution, sleeping arrangement (Larson, *et al*., 2014). Utilization decreases with time of distribution, males were less likely to use ITNs than females, while utilization of ITN for protection of infants reduces as the age of the infant advances (Larson *et al.,* 2014). Key determinants of ITN coverage in Kenya were found to be employment status, education, knowledge about malaria/ITNs, age, and marital status (Choonara *et al.,* 2015).

The study established that 80.0% of the participants had heard about ITNs meaning that the participants' knowledge of ITN was high. However, majority (58.7%) had heard about it over the radio, from community health workers (37.0%) and the clinic (35.2%); and a few from television (12.8%), chief's meetings (8.7%), and church (4.0%). This means that the mass media played a significant role in information dissemination. The

study revealed that some participants were not using ITNs because they did not have them (40%), had no place to hang them (30%), it was too hot (15%) or said nets are for children (15%). This indicates either insufficient knowledge or negative attitude towards ownership and utilization of ITNs. In addition, the study established significant associations between utilization of ITN and several factors, namely sex, age, occupation, past malaria experience, source of treatment for past malaria experience, awareness of ITN and past usage of ITN. Female participants were more likely to use ITN compared to their male participants. Participants who were aged between 26 and 35 years were more likely to use ITN compared to those aged between 18 and 25 years. Participants who reported were employed were also more likely to use ITN compared to unemployed participants. Similarly, participants who had no past malaria experience or heard an ITN were less likely to seek medication from a hospital.

Mogeni *et al*. (2016) showed that in Kilifi County, ITNs were highly protective and children who live in communities with high bednet use were less likely to present with *P. falciparum* infections compared to children in communities with low bednet usage. Howevr, Otieno (2010) found that information about ITNs has not been passed effectively to the people in the rural areas and people prefer local radio stations and verbal communication through health officials. CHWs have been shown to be effective in delivering control, treatment and behavior measures, especially promoting the use of ITNs and in malaria prevention in children (Kaseje *et al*., 1987).

Misuse of the ITNs observed included caging for young chicks, substitutes for ropes, and fences for vegetable gardens. Reported non-compliance was due to heat in the houses and that ITNs were for children. This means poor attitudes towards utilization of ITNs in the study area. The indoor climate in the typical African home in the hot–humid zone is uncomfortable. The only relief comes from the occasional breeze; hence, ventilation is crucial. Bednets reduce airflow by more than 60% (von Seidlein, 2012) and uncomfortable room will become unbearable by hanging up a bednet. The residents have to choose between the discomfort caused by bednets or mosquito bites. Under these circumstances, the continued distribution of additional bednets is unlikely to increase

bednet usage as hoped. Njoroge *et al*. (2009) found high knowledge on malaria illness and ITNs but low good attitude on ITNs use. One approach that offers potential for overcoming this challenge is to train local villagers as community health workers, who can be the ones to implement a malaria control program in their villages (Otieno, 2010).

The study established that 91.2% of the participants had heard about IPTp but only 36.9% reported using IPT during pregnancy, and only 15.8% of these had suffered from malaria while using the drugs. Among those who reported not to have used IPT during pregnancy, majority (88.7%) had experienced malaria. The few number of participants who were using IPT during pregnancy could have resulted from lack of knowledge about IPTp, lack of drugs in the clinic or fear of outcomes. Utilization of IPTp has assisted in reducing malaria infection and enhanced birth outcomes (Parise *et al.,* 1998). However, the reliability of self-reported use of IPTp has been doubted (Namusoke *et al*., 2012).

Significant associations between utilization of IPT during pregnancy and several factors, including level of education, occupation, past malaria experience, source of treatment for past malaria experience, perception of mosquitoes as the source of malaria and awareness of IPT. Participants who had primary and secondary level of education were more likely to use IPT during pregnancy compared to participants with no education. Employed participants were more likely to use IPT during pregnancy compared to unemployed participants, while participants who had no past experience with malaria were less likely to visit a hospital for treatment. Previous studies found that key determinants of IPTp coverage in Kenya were education, knowledge about malaria/IPTp, socio-economic status, parity, and number and timing of antenatal clinic visits (Choonara *et al*., 2015).

The study established that 97.8% of the participants had heard about IPTi but utilization was limited to only 31.2% of the participants, of whom 12.1% had their children suffer from malaria. It was established that 52.6% of the participants knew at least an IPTi drug. The study also established significant associations between utilization of IPT for

children and several factors, including sex, age, marital status, past malaria experience, perception of mosquitoes as the source of malaria and awareness of IPT. However, logistic regression analysis established that all the factors except marital status were key predictors of IPT uptake for children among the participants. It has been established that IPTi reduces malaria infection incidences (Schellenberg *et al*., 2001; O'meara *et al*., 2005; Odhiambo *et al*., 2010).

5.2 Conclusions

Most of the inhabitants of Mariakani, Kilifi County, are aware of malaria, malaria effects, prevention strategies and case management. Utilization of ITNs was higher compared to IPT despite some households experiencing shortage of ITNs. The treatment from a hospital facility is more preferred a Dispensing Chemist and herbal medicine were found to be other options for treatment. The residents of Mariakani mainly depend of the radio and community health workers for information and education on malaria prevention which had contributed significantly to the low number of malaria cases in the area in the most recent past.

Several factors were significantly associated with utilization of malaria preventive strategies. The factors included, sex, age, marital status, level of education, occupation, knowledge, attitudes and practice. Some households failed to use malaria prevention strategies due to their economic status, poor knowledge, or negative attitudes (as a result of poor education). This derails the efforts of curbing malaria in the area.

5.3 Recommendations

- The Medical Officer in the Department of Health in Kilifi County, together with other stakeholders should enhance sensitization on IPT while continuing to promote the use of ITNs.
- ITNs to be provided for the inhabitants who are not covered in this area, and promote compliance in order to reduce the risk of infection.

- The community to be encouraged to seeking and complete treatment from hospital in case of infection with malaria.
- Community volunteers to be involved as Community Health Workers, and mass media.
- This study focused on the determinants of utilization of malaria preventive strategies and case management. More studies on malaria related infections such as Chikungunya, integration of malaria prevention strategies methods such as repellents, vaccination, reasons for non-compliance in order to identify effective ways of reducing the incidence of malaria.

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APPENDICES

Appendix I: Questionnaire for Households

Location: ……
Please answer the questions below by ticking (√) the appropriate answer or writing your answer in the space provided. Your answers will be treated with confidentiality and used the purpose of the study only.

Qs. No	Question	Range/Code	Choice
SOCIO DEMOGRAPHIC CHARACTERISTICS			
	English/ *Swahili*	**English/ *Swahili***	
1	Gender of respondent/ *Jinsia la muhojiwa*	Male/*mme*	1
		Female/*mke*	2
2	Age / *umri*	Age in complete years/ *miaka kamili*	…
3	What is your marital status? *Hali yako ya ndoa ni ipi?*	Single/ *hajaoa*	1
		Married/ *ameoa*	2
		Widowed/ *mjane*	3
		Divorced/separated/ *Talakiana/ tengana*	4
		Living together/cohabiting *Wanaishi pamoja*	5
		No response /*Hakuna jawabu*	6
4	How many children do you have? *Je, una watoto wangapi?*		…
5	What is your religion? *Je wewe ni wa dini gani?*	Christian/ *Mkristo*	1
		Muslim /*Mu Islamu*	2
		Others (specify) / *Dini zingine (itaje)*	3
6	What is your highest level of education? *Kiwango chako cha elimu cha juu ni kipi?*	No education hakuna elimu	1
		Primary education *Elimu ya msingi*	2
		Secondary education / *Elimu ya sekondari*	3
		Post secondary education? *Elimu ya chuo mbele ya sekondari*	4
		Vocational education/ *Elimu ya ufundi*	5
7	What is your occupation? *Je, unafanya kazi gani?*	Farmer / *Mkulima*	1
		Salaried/Kazi ya kilipwa kila mwezi	2
		Casual worker/ *Kibarua*	3
		Retired /*Staafu*	4

		Trade/self employed *Biashara/ ajira binafsi*	5
		Unemployed / *Hajaajiriwa*	6
		Student/ *Mwanafunzi*	7
		Others (specify) *Nnyenginezo (itaje)*	8
CASE MANAGEMENT			
8	Have you ever suffered from malaria in the last one year? *Ushawahi ugua ugonjwa wa malaria mwaka mmoja uliopita?*	Yes/ *Ndio*	1
		No/ *La*	2
9	Have you ever suffered from or witnessed anybody suffering from malaria? *Ushawahi pata malaria au kushuhudia mtu akiugua ugonjwa wa malaria?*	Yes/ Ndio	1
		No/ *La*	2
10	If you have suffered from malaria, where did you get treatment from? *Kama uliwahi kuugua ungojwa wa malaria, ulipata matibabu wapi?*	Hospital/ *Hospitalini*	1
		Bought drugs from chemist / *Nilinunua dawa kutoka kwa duka la dawa*	2
		Used herbal medicine, *Nilitumia dawa za kienyeji*	3
11	Where did the person you witnessed suffering from malaria get treatment from? *Je, uliyemshuhudia akiuguza malaria alipata matibabu wapi?*	Nowhere/*Hakuna*	1
		Hospital/ *Hospitalini*	2
		Drugs from Chemist/ *Duka la dawa*	3
		Herbalist, dawa za kienyeji	4
		Others (specify), tiba zinginezo (taja)	5
		I don't Know, Sikumbuki/Siju	6
12	What was the reason for your choice of place of treatment? *Ni kwa sababu gani ulichagua mahali pale ulipata matibabu?*	Sipitali wachunguzwa vizuri / miti ni dawa.	1 2
13	Did you have blood tests done? *Je, ulipimwa damu?*	No/ *La*	2
14	Did you finish the course of treatment? Je, ulimaliza matibabu (kumeza dawa)?	Yes/ *Ndio*	1
		No La	2
15	Did you recover from	Yes Ndio	1

	malaria? Je, ulipona malaria?	No La	2
16	Have you suffered malaria in the last one month? Je, umeshawahi kuugua malaria mwezi mmoja uliopita?	Yes Ndio	1
		No La	2
17	If yes, when? Kama Ndio, lini?	One week ago, wiki moja iliyopita	1
		Two weeks ago, wiki mbili zilizopita	2
		Three weeks ago, wiki tatu zilizopita	3
		One month ago, mwezi mmoja uliopita	4
KNOWLEDGE, ATTITUDE AND PRACTICE			
18	Do you think mosquitoes are the source of malaria? Je,unafikiria kuwa mbu ndio chanzo cha malaria?	Yes Ndio	1
		No La	2
19	What are the ways of preventing mosquito bites? Je, kuna njia gani za kuzuia kuumwa na mbu?	Mosquito repellants, Kutumia dawa inayofukuza mbu	1
		Sleeping under treated mosquito nets, Kulala ndani ya neti zilizotiwa dawa	2
		Cutting bushes Kusafisha misitu karibu na nyumba	3
20	Do you think using insecticides treated mosquito nets prevents malaria? Je, unadhani neti zilizo tiwa dawa zinazuia malaria?	Yes Ndio	1
		No La	2
21	What are the ways of preventing malaria? Kuna njia zipi za kuzuia malaria?	Use malaria drugs from hospital when one has malaria, Kutumia madawa ya kutibu malaria	1
		Clear bushes in the surroundings Usafi wa Mazingira	2
		Malaria vaccination, Chanjo za malaria	3
		Use of Insecticide Treated Nets (ITNs) Kulala ndani ya neti zilizotiwa dawa	4
22	Have you ever heard about	Yes Ndio	1

	ITNs (insecticides treated nets)? Je, ushawahi kusikia kuhusu neti zilizotiwa dawa?	No La	2
23	Where did you get the information from? Ulipata wapi habari kuhusu neti zilizo tiwa dawa (ITNs)?	Community service worker, Wafanyi kazi wa Afya	1
		Chiefs meeting Baraza ya Chifu	2
		Church Kanisani	3
		Clinic Kliniki	4
		Radio Redio	5
		Television Runinga	6
24	Have you and your family ever used ITNs? Je,wewe na familia yako mshawahi kutumia neti zenye dawa (ITNs)?	Yes Ndio	1
		No La	2
25	If yes, have you ever suffered from malaria while using these nets? Kama ndio, ushawahi kuugua malaria wakati unatumia neti hizi?	Yes Ndio	1
		No La	2
26	If no, have you ever suffered from malaria? Kama la,ushawahi kuugua malaria wakati huo?	Yes Ndio	1
		No La	2
27	Do you and your family use TREATED mosquito nets? Je, wewe na familia yako mnatumia neti za mbu sasa hivi?	Yes Ndio	1
		No La	2
28	If yes, what are your reasons? Kama ndio, kwa nini mnatumia neti za mbu?	To prevent malaria, kuzuia malaria	1
		To protect from mosquito bites, kuzuia kuumwa na mbu	2
		I do not know.	3
29	If no, what is your reason? Kama la, kwa nini hamutumii neti za mbu?	Nets are not available, Neti hazipatikani	1
		There is no place to hang them in the house, hakuna pahali pa kuziwekwa nyumbani	2
		It is too hot, kuna joto nyingi sana	3
		They are only for children, ni za watoto pekee	4
30	Have you heard about IPT	Yes Ndio	1

	(Intermittent Preventive Treatment)? Je, ushawahi kusikia kuhusu matibabu ya dawa za kuzuia malaria (IPT)?	No La	2
31	Have you/your partner/spouse received IPT malaria drugs in hospital/clinic? Je wewe au mpenzi/bibi yako mshawahi kupata dawa za kuzuia malaria hospitalini, zahanati au kliniki?	Yes Ndio	1
		No La	2
32	Have your children received drugs to prevent malaria? Je watoto wako wanapewa dawa ya kuzuia malaria?	Yes Ndio	1
		No La	2
33	How is prevention of malaria during pregnancy done? Je, kuna njia gani za kuzuia malaria wakati wa ujauzito?	Use treated nets, Kutumia neti zilizo tibiwa	1
		Covering self with blanket, Kujifunika blanketi	2
		Taking drugs for malaria, Dawa za malaria	3
		I do not know, Sijui	4
34	Do you know the drugs used for malaria prevention in pregnancy? Je unajua dawa zinazozuia malaria kwa wajawazito?	Yes Ndio	1
		No La	2
35	If Yes, which ones do you know? Kama ndio, unajua dawa gani?	Fansidar,	1
		Metakelvin,	2
		Amodiaquin	3
		Quinine.	4
		Mefloquine.	5

Thank you for your time and co-operation.

Appendix II: Observation Checklist

1. Is the environment swampy with stagnant water

☐ Yes,

☐ No

2. Is there dumping site in the compound

☐ Yes

☐ No

3. Are there over grown vegetation around the house

☐ Yes

☐ No

4. Are the house having windows and ventilation?

☐ Yes

☐ No

5. Are the windows and ventilations protected with wire mesh to prevent mosquitoes to access the house?

☐ Yes

☐ No

6. What evidence is available for methods and practice of malaria prevention?

- Treated mosquito nets in houses
- Untreated mosquito nets in houses
- Mosquito coils in houses.
- Insecticides spraying in houses,

- Malaria preventive/treatment medicine,
- Mosquito repellents creams/ointments
- Draining of mosquito breeding sites.

7. Availability of medical facility?

- Hospital
- Clinic
- Chemist
- Herbal

8. What are other uses for mosquito bed nets observed?

Appendix III: Consent Form

Hello, my name is Mary Wambeti Nthiga, an MPH student at JKUAT. I'm here to collect information for the research on malaria prevention and control. The purpose of the study is to understand the community's level of utilization on available recommended measures for malaria prevention in Mariakani.

Participation is based on your willingness besides; you can withdraw from the study anytime. However, your keen participation is appreciated. In addition, no personal identification will be written and we assure you that whatever information you are providing will only be used for the research purpose and the data will be handled only by the research team.

Are you willing to participate in the study?

Agreed _____

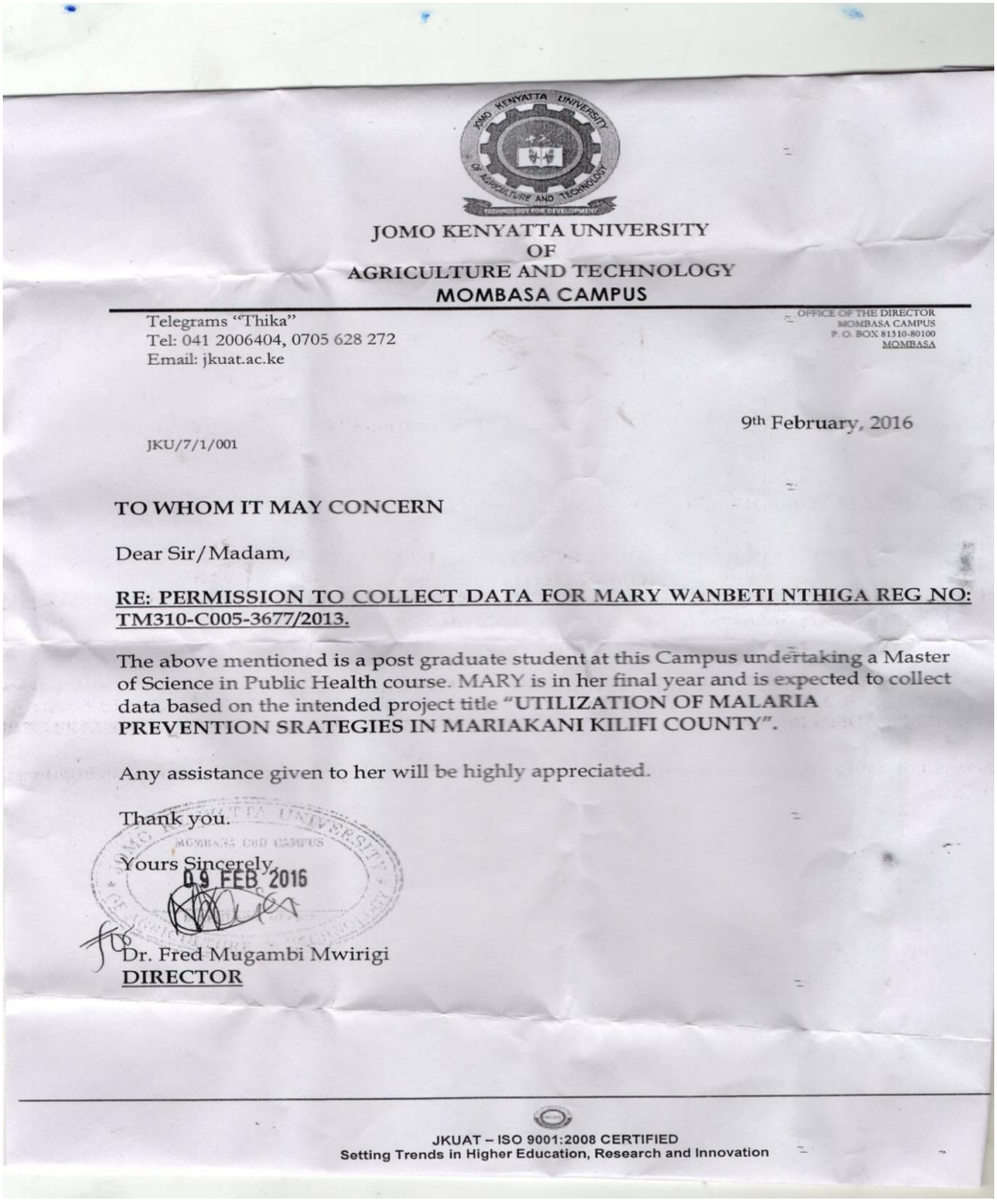
Not Agreed _____

Participant's Signature or Thumb Print _____

Thank you

Name of Data collector _____Signature _____Date_____

Appendix IV: Permission from JKUAT to Collect Data



JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
MOMBASA CAMPUS

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OFFICE OF THE DIRECTOR
MOMBASA CAMPUS
P. O. BOX 81310-80100
MOMBASA

9th February, 2016

JKU/7/1/001

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: PERMISSION TO COLLECT DATA FOR MARY WANBETI NTHIGA REG NO: TM310-C005-3677/2013.

The above mentioned is a post graduate student at this Campus undertaking a Master of Science in Public Health course. MARY is in her final year and is expected to collect data based on the intended project title "UTILIZATION OF MALARIA PREVENTION SRATEGIES IN MARIAKANI KILIFI COUNTY".

Any assistance given to her will be highly appreciated.

Thank you.

Yours Sincerely,

09 FEB 2016

Dr. Fred Mugambi Mwirigi
DIRECTOR

JKUAT – ISO 9001:2008 CERTIFIED
Setting Trends in Higher Education, Research and Innovation

Appendix V: Ethical Review Clearance Certificate

NACOSTI ACCREDITED

ERC/MSc/039/2014

Pwani UNIVERSITY

ETHICS REVIEW COMMITTEE

ACCREDITTED BY THE NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI, KENYA)

CERTIFICATE OF ETHICAL APPROVAL

THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

MARY WAMBETI NTHIGA

REFERENCE NO:
ERC/MSc/039/2014

ENTITLED:
Utilization of malaria prevention strategies in Mariakani Sub-County, Kilifi County

TO BE UNDERTAKEN AT:
KILIFI COUNTY, KENYA

FOR THE PROPOSED PERIOD OF RESEARCH

HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE

AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA

ON THE **9th DAY OF MARCH 2015**

CHAIRMAN SECRETARY LAY MEMBER

PTO

Pwani UNIVERSITY
Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: r.thomas@pwaniuniversity.ac.ke, tell: 0719 182218.
The ERC, Giving Integrity to Research for Sustainable Development

Appendix VI: Approval / Clearance from Kilifi County Director of Health

THE COUNTY GOVERNMENT OF KILIFI

RESEARCH CO-ORDINATING UNIT, DEPARTMENT OF HEALTH SERVICES

Telephone: 0729210383
0721843015
0721359983
Email: langat.eva@gmail.com
aceobonyo@gmail.com
kazunguwilfred@hotmail.com

P.O. BOX 519-80108
KILIFI, KENYA

Date 16 October 20185

When Replying/Telephoning quote
REF: DOH/KLF/RESCH/VOL.I/37

Mary Nthiga

Dear Madam,

RE: AUTHORIZATION TO CARRY OUT A STUDY IN KILIFI COUNTY

The Research Unit has received your request to conduct a study "Utilization of Malaria Prevention Strategies in Kaloleni Sub-County, Kilifi County". I am pleased to grant you institutional authorization to proceed with your research. Upon completion of you research, you are required to submit a written report to the Unit detailing the findings, conclusion and recommendations of your study.

I wish you the very best as you conduct your research.

Regards,

Elangat

Evaline Langat
Research Coordinator
KILIFI COUNTY HEALTH RESEARCH CO-ORDINATING UNIT

Appendix VII: Statement of Confidentiality

Confidentiality is the treatment and maintenance of information that an individual has disclosed in a relationship of trust and with the expectation that it will not be divulged to others in ways that are inconsistent with the understanding of the original disclosure (the consent form) without permission. As a research assistant you will have access to confidential information pertaining to the research study. Many participants will only reveal information because the researcher has assured participants that every effort will be made to maintain confidentiality. That is why it is of the upmost importance to maintain full confidentiality when conducting the research study. *Below is a list of expectations you will be required to adhere to as a research assistant. Please carefully review these expectations before signing this form.*

In order to maintain confidentiality, I agree to:

1. Keep all research information that is shared with me (e.g. flash drives, notes, transcripts, data, etc.) confidential by not discussing or sharing this information verbally or in any format with anyone other than the researcher of this study;
2. Ensure the security of research information while it is in my possession. This may include:
    - Keeping any printed documents and/or data related to the research study in a secure location such as a locked filing cabinet;
    - Permanently deleting any digital communication containing documents and/or data related to the research study.
3. Not make copies of documents and/or data related to the research study unless specifically instructed to do so by the researcher;
4. Give all research information/data and research participant information/data back to the researcher upon completion of my duties as a research assistant;

5. After discussing it with the principal researcher, erase or destroy all research information that cannot be returned to the researcher upon completion of my duties as a research assistant.

Name: **Sign:** **Date:**

Title of the Study:

Name of Researcher:

By signing this form I acknowledge that I have reviewed, understand, and agree to adhere to the expectations for a research assistant described above. I agree to maintain confidentiality while performing my duties as a research assistant.