THE FACULTY OF CLINICAL MEDICINE AND DENTISTRY

BACHELORS DEGREE IN MEDICINE AND SURGERY

KAMPALA INTERNATIONAL UNIVERSITY

THE PREVALENCE OF MALARIA AMONG CHILDREN ATTENDING NKOARANGA LUTHERAN HOSPITAL BETWEEN JUNE 2016- JUNE 2017

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BMS/0107/33/DF

NOVEMBER 2018

DECLARATION

I declare that this, is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Name

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Signature

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APPROVAL OF SUPERVISOR.

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Writing a report is never an easy task, it is collaborative effort of many people whether mentioned by name or not. I cannot take the ultimate credit in this work, as it is a shared responsibility. I therefore want to thank all people whose names and titles are not specifically mentioned for their invaluable support in both word and indeed.

The ultimate credit goes to God Almighty, the savior and guide of my life. To him be glory both in heaven and earth, forever and ever amen.

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Fourthly, I wish to extend my sincerest thanks to Mr. Nelson Akyoo for his support and guidance all the time I needed help on what to write and guiding me in report writing. He gave me encouragement whenever I was about to give up.

DEDICATION

I dedicate this study to my Family THE MUGARULAS who showed love and for their continuous encouragement. Without them I would not be the person I am today. God bless you much.

ABSTRACT

Introduction - The purpose of the study was to investigate the PREVALENCE OF MALARIA IN CHILDREN AT NKOARANGA HOSPITAL. Malaria is a parasitic disease which kills many people each year, 75% of these are children. Our aim is to study malaria in children admitted at Nkoaranga Lutheran Hospital, which is remotely situated in the Meru district in northern Tanzania.

Method - The study involved interviews. Respondents were selected through purposive sampling technique. The researcher visited the respective 100 respondents between December 2017 to January 2018 and collected data through interviews. After collection, data was organized and analyzed using SPSS.

Results – From December 2017 to January 2018 a total of 100 patients presented to the hospital with a history of fever, headache and body weakness. Of these attendants 44(44%) were included in this study, 21(48%) were women and 23(52%)were men. The results indicated tttt poverty contributed in a great percentage in the prevalence of malaria.

Conclusion - After analysis of data, it was concluded that large family size; domestic issues and tension among the family members; low socio-economic status and many more can make our societies more vulnerable. Based on the findings, it was recommended that parents should be educated on the importance of using insecticides treated bed nets and other preventive measures of Malaria.

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LIST OF ACRONYMS AND ABBREVIATION

ACTs Artemisinin Based Combination Therapy

IPTp Intermittent Preventive Therapy in pregnancy

IRS Indoor-Residual Spraying

ITNs Insecticide-Treated Mosquito nets

MOHsw Ministry of Health and Social Welfare

MOP Malari Operational Plan

NIMR National Institute of Medical Research

NMCP National Malaria Control Programme

NMTSP Natinal Malaria Medium Term Strategic Plan

RBM Roll Back Malaria

RDTs Rapid Diagnostic Tests

TDHS Tanzania Demographic health survey

WHO World Health Organization

KEY DEFINITIONS

Stable malaria transmission: Areas with a stable transmission have a persistent transmission and hence prevalence of infection.

Unstable malaria transmission: In areas with an unstable malaria transmission the prevalence of infection varies highly over time and space

Holo-endemic: endemic at a high level in a population, affecting most of the children and so affecting the adults in the same population less often.

Hyper- endemic: - an area exhibiting a high and continued incidence—used chiefly of human diseases.

Endemicity: The quality or state of being endemic

Epidemic: Affecting or tending to affect an atypically large number of Individuals within a population, community, or region at the same time.

A malaria epidemic: Defined as an abrupt increase in Malaria transmission that exceeds by far the inter-seasonal variation normally experienced in a given area and often associated with Increased morbidity and mortality.

CHAPTER ONE

1.0. INTRODUCTION

This chapter introduces background of the study, statement of the problem, research objectives and research questions and consists of justification of the study and the conceptual background.

1.1. Background of the Study

Malaria is a parasitic disease which kills somewhere between 0.5 to 3.0 million people each year, 75% of these are children under the age of five. The most affected region is sub-Saharan Africa. Our aim is to study malaria in children admitted at Nkoaranga Lutheran Hospital, which is remotely situated in the Meru district in **northern Tanzania**. The hospital covers an area with around 10,000 people and malaria is endemic in this area.

Febrile illness due to malaria remains a public health challenge in resource-poor countries despite concerted control efforts so as to establish a baseline database of *P. falciparum* distribution among febrile patients treated with chloroquine, fansidar and quinine in Arusha.

Malaria prevalence was significantly ($p<0.01$) dependent on age, sex and season. *P. falciparum* pre-dominated (78.2%) malaria patients treated with chloroquine, fansidar and quinine. This may serve as a database for prospective evaluation of malaria prevalence in the same location. Socio-demographic and poor socio-economic status significantly ($p<0.01$) influenced malaria spread in Arusha. The cause of *P. falciparum* malaria persistence among the studied population despite treatment warrants further investigation.

The World Health Organization (WHO) ambitiously made a proposal for the eradication of malaria worldwide in 1955. The strategies were based insecticides, anti-malaria drugs treatment and surveillance. They had a four step plan; preparation, attack, consolidation and maintenance. In some nations malaria was eradicated, but in most countries the eradication goal had to be given up. Most of Sub-Saharan Africa was never even in the eradication

program. Many factors made the campaign against malaria difficult; drug resistance, resistance to insecticides, wars, population movements, lack of funding and lack of community participation.

Roll Back Malaria is an international alliance of more than 90 organizations including WHO, UNICEF and the World Bank. It was initiated in 1998 and their goal was to half malaria mortality by the year 2010 (3). The tools to achieve this goal are bed nets, effective combination treatments based on artemisinin and insecticides. WHO plays a key role in the way this alliance is organized. WHO coordinate the economy, knowledge, research, supervision etc. In 2005, seven years after the RBM was formed, the malaria rates have increased. The RBM has been a dysfunctional organization which have had trouble making decisions and therefore losing credibility from the international community, this and lack of proper funding from the donors are the main reasons why RBM has been a failure so far.

Malaria parasites

Genetic evidence suggests that malaria parasite arise more than 500 million years ago. These "parasites" acquired at an early stage in their evolution an asexual form of reproduction called schizogony. Schizogony is a form of reproduction where the parasite forms a number of daughter cells within one host cell. About 150 million years ago the "malaria parasite" adapted to Diptera insects, which is the ancestor to today's Anopheles mosquito. There are today more than 25 named plasmodium species which infect primates. Four of the species are human parasites; P. falciparum, P. vivax, P. malaria and P. ovale.

P. ovale is known to solely infect humans. P. malaria on the other hand has been found to infect other primates, and P. vivax has infected monkeys in south-southeast Asia. Evidence from human genetic data suggests that the origin of P. falciparum is in West Africa within a thousand years ago, due to the agrarian revolution

The vector

The mosquitoes of the anopheles genus are the vector which carries the parasite. Of the approximately 400 anopheles species, 30-40 transmit malaria. Anopheles gambiae is the best known, because it is an important vector of P. falciparum.

Bizimana, J. P., Twarabamenye, E., & Kienberger, S. (2015), asserted that, outside of Africa mosquito vectors prefer to feed on animals rather than on humans. In most parts of the world the probability of the vectors blood meal being human is less than 10-20%. In Sub-Saharan Africa the probability is 80-100%. If a vector takes 1/10 of their blood meal from humans they will transmit the disease 100 times less frequently than mosquitoes taking all their blood from humans. Entomological inoculation rate (infective bites per year) is high in Africa, especially in sub-Saharan Africa. This contributes to higher incidence in general and very high incidence among children

Epidemiology

It is estimated that more than a third of the world's population live in malaria-endemic areas. Estimates suggest that one billion people are infected with the parasite at any given time. Plasmodium falciparum is the most dangerous specie; it is responsible for most of the deaths caused by malaria. 95% of the malaria cases are caused by either falciparum or vivax.

Malaria causes 0.5 – 3.0 million deaths each year. 75% of these deaths occur in African children under the age of five (11). 20% of the total deaths in children in Africa are due to malaria, and malaria constitutes 10% of the total disease burden in Africa. It is estimated 200-450 million cases of fever in children infected by malaria parasites each year in Africa. The most affected regions in the world are Sub-Saharan Africa and Southeast Asia.as per WHO, report of 2017

Malaria in pregnancy is believed to account for up to 25% of the severe maternal anemia cases, and could account for 10-20% of neonatal and infant deaths based on effects of low birth weight.

Pathophysiology

According to WHO report of 2017,the female Anopheles mosquito requires blood as nutrition for reproduction, and this blood is drawn from people. When one mosquito bites a malaria-infected person, the mosquito becomes a carrier for the parasite and is able to transmit the disease to the next person on the mosquito's menu. Normally it takes a number of bites from different carrier mosquitoes for a person to get infected, depending on the mosquito and the immunity of the victim.

1. The infected anopheles mosquito feed on a human being. The parasite is injected into the blood of the human host. The infectious stage of the parasite is called sporozoites.

2. The sporozoites go with the blood to the liver where they enter the liver cells. They multiply inside the liver cells and the daughter cells of the sporozoite are called merozoites. The infected liver cells rupture and thousands of merozoites are released into the blood.

3. The merozoites invade red blood cells where they multiply until the red blood cell rupture and release more merozoites. These merozoites invade more red blood cells.

4. Some merozoites develop into sexual stages, the male and female gametocyte. These gametocytes can be transmitted to a feeding mosquito.

5. In the gut of the mosquito the gametocytes goes through different stages to form an oocyst. Inside the oocyst, sporozoites develop and these sporozoites infect the salivary glands of the mosquito.

Symptoms and signs of malaria in children

The main symptom of uncomplicated malaria in children is fever. The fever is normally recurrent and irregular.

Other symptoms in infants are irritability, poor feeding, vomiting, jaundice and splenomegaly. Older children may present with headache, backache, chills, myalgia and fatigue. Between attacks, the patient may look quite well. The clinical manifestations vary according to strain and host immunity.

The symptoms and signs of severe malaria are coma, acidosis, severe anemia, renal failure, pulmonary edema, hypoglycemia, hypotension, bleeding, convulsions, hemoglobinuria, impaired consciousness, extreme weakness, hyperparasitemia and jaundice. In children anemia, convulsions, hypoglycemia, coma and metabolic acidosis are the most common signs of severe malaria, in adults jaundice, renal failure and pulmonary edema are most often present.

Diagnosis

The signs and symptoms of malaria are non-specific. The main symptom is fever. WHO guidelines have the following recommendations:

In general, in settings where the risk of malaria is low, clinical diagnosis of uncomplicated malaria should be based on the degree of exposure to malaria and a history of fever in the previous 3 days with no features of other severe diseases.

In settings where the risk of malaria is high, clinical diagnosis should be based on a history of fever in the previous 24 h and/or the presence of anaemia, for which pallor of the palms appears to be the most reliable sign in young children. Parasitological diagnosis is important because over-diagnosis has become a major issue.

Microscopy

Light microscopy has high sensitivity and specificity. The parasites asexual form is demonstrated on stained peripheral blood smears. The Giemsa stain is preferred, but Wright's, Field's or Leishman's stain can also be used. Thin and thick blood smear is examined. The thick smear has high sensitivity. Examination of the thin smear under oil immersion at x1000 magnification can reveal the plasmodium specie and determine the parasite density. The number of parasitized erythrocytes is counted per 1000 red blood cells or per 200 white blood cells. A predominance of more mature P. falciparum parasites indicates a bad prognosis in severe malaria (15).

Rapid Diagnostic Tests

Several rapid diagnostic tests based on antigen-capture techniques have high sensitivity and specificity. In endemic areas many healthy people have parasitaemia, and therefore will have a negative test rule out malaria, but a positive test does not prove that malaria is the cause of the illness. Rapid diagnostic tests are relatively expensive. However, they are easy to use, give a fast result and is useful in areas where microscopy is not available.

Treatment

General

WHO has developed guidelines that will secure sufficient treatment for the patient and prevent further drug resistance by the parasite. The use of monotherapies is still widely

spread, but to prevent further resistance of P. Falciparum and to increase the effectiveness of the therapy WHO now recommend combinations of antimalarias. The treatment does not only become more effective, but in the rare cases of the parasite being immune to one of the drugs, it will be killed by the other. Artemisinin Based Combination Treatment (ACT) has now been added to the recommended treatment of uncomplicated and severe falciparum malaria for adults and children, in adults in addition to quinine.

Treatment of uncomplicated malaria

The ACT treatment mainly consist of two different tablets (exept artemether-lumefantrine), and is combined to get the wanted effect. Co-formulated tablets are being developed, and when arriving on the market it will make it easier to give the correct treatment to the patients.

A. Artemether-lumefantrine is currently available as a tablet containing 20 mg Artemether and 120 mg as a co-formulation. Dosing schedule is shown in the figure below.

Figure 6. Dosing schedule for artemether-lumefantrine.

Table 1. **Dosing schedule for artemether-lumefantrine**

Body weight in kg (age in years)		No. of tablets at approximate timing of dosing[a]					
		0 h	8 h	24 h	36 h	48 h	60 h
5–14	(< 3)	1	1	1	1	1	1
15–24	(≥ 3–8)	2	2	2	2	2	2
25–34	(≥ 9–14)	3	3	3	3	3	3
> 34	(> 14)	4	4	4	4	4	4

[a] The regimen can be expressed more simply for ease of use at the programme level as follows: the second dose on the first day should be given any time between 8 h and 12 h after the first dose. Dosage on the second and third days is twice a day (morning and evening).

These ACTs can also be used:

B. Artesunate + amodiaquine

C. Artesunate + sulfadoxine-pyrimethamine

D. Artesunate + mefloquine

TREATMENT OF SEVERE MALARIA

A randomized clinical trial with 103 children aged 6 months to 5 years in Uganda showed that rectal artemether could be used as treatment for cerebral malaria. Artesunate (i.m./ i.v.), artemether (i.m.) or Quinine (i.m./ i.v.) are all recommended in the treatment of severe malaria. Despite different clinical trials made, rectally artemisinins should only be used when parenteral treatment is not available.

Supportive treatment

Coma (cerebral malaria): Maintain airways, exclude other treatable causes for coma (hypoglycemia/meningitis), avoid corticosteroids, heparin and adrenaline, Intubate when necessary

Hyperpyrexia: Keep body temperature below 38.5° Celsius, fanning/cooling blanket/sponging, Paracetamol/Ibuprofen

Convulsions: I.v. or rectal diazepam or i.m. paraldehyde

Hypoglycemia: Treating the underlying cause is the best cure, in acute face treat with i.v. glucose.

Anaemia: Blood transfusions when <5 Hb. Apart from that the best treatment is to lower parasite number.

Acute pulmonary oedema: Patient placed with upper body in a 45° angle, O2, diuretic and stop intravenous fluid, Intubate

Acute renal failure: Exclude pre-renal causes, Check fluid balance and urine electrolytes, haemodialysis or haemofiltration (or peritoneal dialyses)

PREVENTION

Bed Nets: Widespread use of insecticide treated bed nets can reduce overall mortality by about 20% in Africa.

Insecticides: Dicophane (DDT) was successful in controlling malaria in the 50s and up to the 70s when it was banned in most countries due to increased health and environmental concerns. WHO is now recommending the use of indoor residual spraying, not only in epidemic areas, but also in areas with constant and high rates of transmission of malaria, which include all of Africa.

Vaccine: Vaccine against malaria is an area of malaria prophylaxis with great potential. There are three types of malaria vaccine; vaccines against the invading sporozoite or the parasite's development in the liver cells (pre-erythrocytic stage), vaccines directed against the parasite's invasion of and development in the red blood cells(blood stage) and vaccines directed at the fertilisation process in the mosquito(transmission blocking).

1.2 Statement of the Problem

Malaria control and interventions have been implemented and in the recent past and intensified as an effort to attain the World Health Assembly, Roll Back Malaria, and Millennium Development universal targets with the aim of reducing and interrupt disease transmission in sub Saharan Africa. Arusha Region is a malaria endemic area in which malaria control measures such as the use of Artemisinin Based Combined Therapy (ACT), the use of insecticide treated bed nets (ITNs), indoor residual spraying of insecticide (IRS), and Intermittent Preventive Treatment (IPTp) for pregnant women and children have been

implemented. Despite of all these efforts yet the overall prevalence of malaria infection remains high among children: 49-53.3%.

This verifies that there could be several reasons for this situation including the deficiencies in the Health system that leads to lack of access to malaria control interventions and low effectiveness of these interventions than expected. Thus it is very essential that operational research is conducted to identify the gaps. Therefore this work involves a community approach first to confirm the prevalence of malaria in children, coverage of ITNs, IRS as well assessing of malaria prevalence among children, determining the coverage of ITN use among community members, as well as assessing the factors associated with malaria prevalence in Meru district.

1.3. Objectives of the Study

1.3.1 General Objective

The aim of the study is to determine the factors associated with the prevalence of Malaria infection among children below five years attending Nkoaranga Lutheran Hospital in Meru District.

1.3.2 Specific Objectives

i) To determine the prevalence of malaria among children under five years attending Nkoaranga Lutheran Hospital between June 2016- June 2017**.**

ii) To elucidate the factors (socio-economic, physical, environmental, demographic factors) associated with malaria among children under five years attending Nkoaranga Lutheran Hospital.

iii) To assess the outcomes of children less than five years admitted with malaria at Nkoaranga Lutheran Hospital between June 2016- June 2017

1.4 Research Questions

i) What is the prevalence of malaria in children under five years that are brought in Nkoaranga Lutheran Hospital?

ii) Is there an association between a child developing a malaria infection and factors (socio-economic, physical, environmental, demographic factors) that can contribute to development of malaria in a child?

iii) What are the outcomes of children less than five years admitted with malaria at Nkoaranga Lutheran Hospital between June 2016- June 2017?

1.5 Scope of the Study

1.5.1 Time scope

The study will be done in two months' time frame from December 2017-January 2018.

1.5.2 Geographic Scope

The study will be carried out at Nkoaranga Lutheran Hospital located in Meru District in Arusha Region in Tanzania.

1.5.3 Content scope

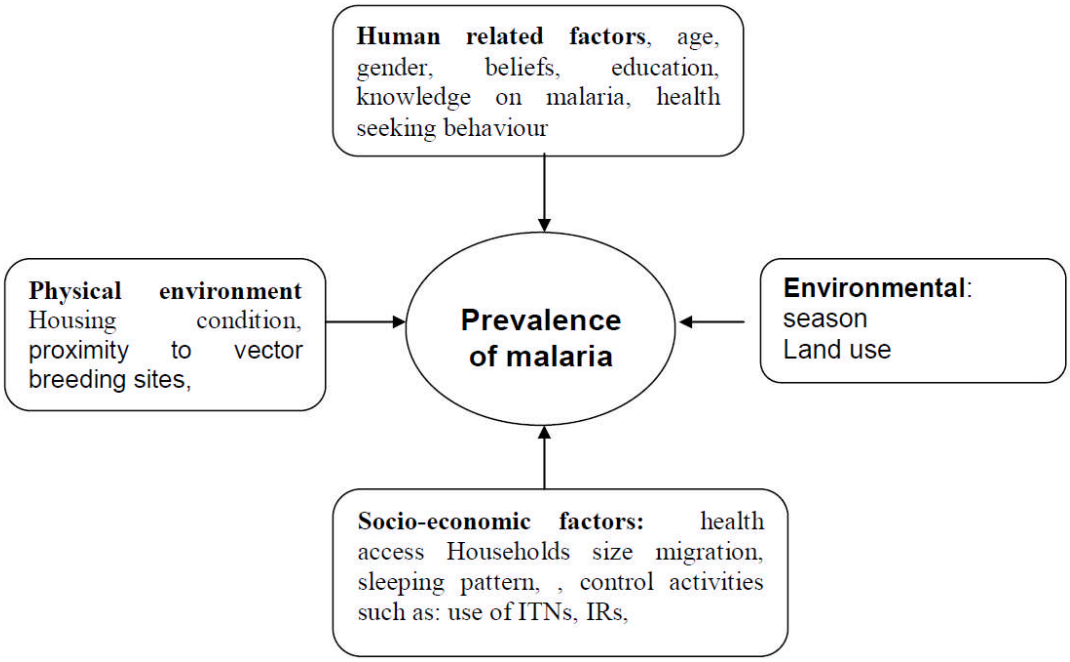
The study will be focused on the prevalence Malaria infection among children and associated factors in Meru District.

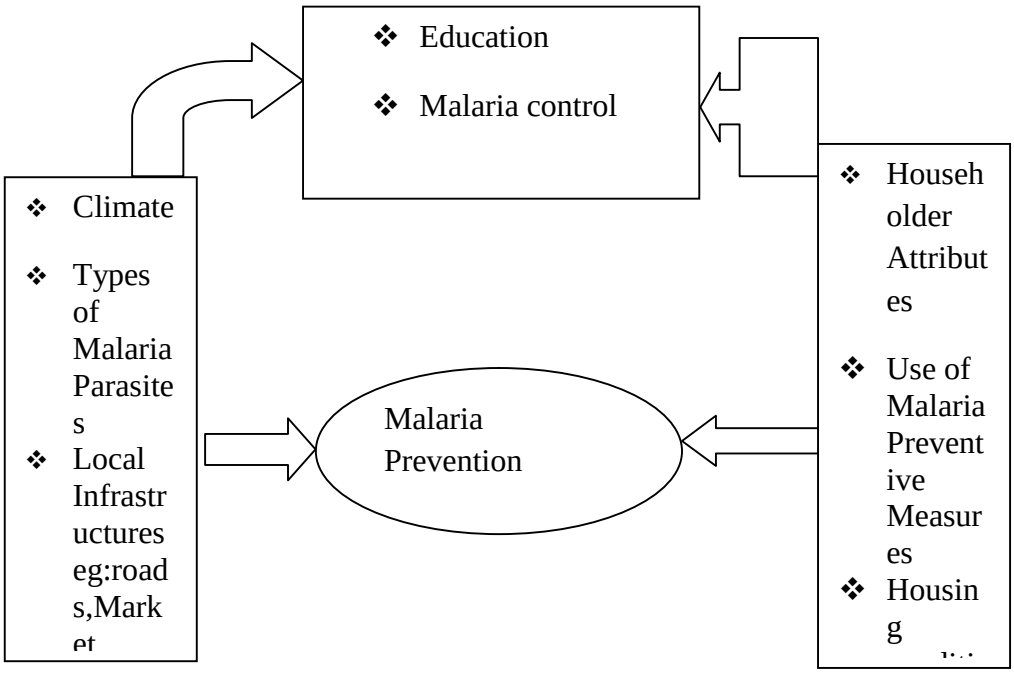
1.6 Justification of the Study

The findings from this study will be useful to reinforce the existing guidelines, complement the existing body of knowledge and may be used to generate the mechanism of implementing the policy that can cater for reduction of prevalence of malaria in children so as to improve child health, growth and development. The information also can be used as a stepping stone for further studies.

1.7 CONCEPTUAL FRAMEWORK

The conceptual framework represents a relationship between factors that influence the prevalence of malaria among the children in Meru District.





CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

2.1Prevalence of malaria in less than five years

2.1.1 Globally

Malaria causes a quarter of all childhood deaths in Sub-Saharan Africa. (Dramowski *et al.*, 2013). Children under 5 years of age are one of most vulnerable groups affected by malaria. There were an estimated 446 000 malaria deaths around the world in 2015, of which an estimated 303 000 (70.6%) were in children under 5 years of age. (WHO, 2017)

In high transmission areas, partial immunity to the disease is acquired during childhood. In such settings, the majority of malarial disease, and particularly severe disease with rapid progression to death, occurs in young children without acquired immunity. Severe anaemia, hypoglycemia and cerebral malaria are features of severe malaria more commonly seen in children than in adults. (WHO, 2017)

In South East Asia, a study was conducted to assess the prevalence of malaria infection amongst forest dwelling tribal children under the age of five residing in malaria endemic regions of the Andhra Pradesh and Chhattisgarh states of India. A total of 5,801 children attended seven outpatient mobile clinics in 2012. Of them, 2,123 children had a history of fever and were screened for malaria with a Rapid Diagnostic Test (RDT). About 37% of children had a history of fever. Of them, 34% children were diagnosed with malaria. The majority (66%) of children with a positive RDT had a mixed malaria infection of both *Plasmodium falciparum* and *P. vivax*, followed by single infections of *P. falciparum* (18.9%) and *P. vivax* (14.2%). (Qureshi *et al.*, 2014)

2.1.2 Sub-Saharan

In some counties of Africa like Sudan, malaria is a leading cause of morbidity and mortality with an annual estimate of 7.5 million cases and 35,000 deaths. This represents 50% and 70% of the WHO/Eastern Mediterranean Region cases and deaths respectively. Malaria is the main cause of fever in children less than 5 years of age. (Ali et al., 2015)

The prevalence of malaria parasitaemia among children under the age of five years increased from 28% in 2012 to 33% in 2014 ($p > 0.05$). Likewise, the proportion of children using long-lasting insecticide-treated net (LLIN) increased significantly from 54% in 2012 to 65% in 2014 MIS ($p < 0.05$). The proportion of households that had used indoor residual spraying (IRS) was 9% for both surveys. In multivariate analysis, use of LLIN significantly predicted for malaria parasitaemia in the 2012 MIS but not in the 2014 MIS. Older children and those coming from the poorest families were significantly associated with having malaria parasites in both surveys (Zgambo *et al.*, 2017)

2.1.3 East Africa

One study in Rwanda was conducted among a total of 749 children below five years of age including 545 randomly selected from 24 villages, 103 attending the health centre in charge, and 101 at the referral district hospital. Clinical, parasitological, haematological, and socio-economic data were collected results shows that *Plasmodium falciparum* infection (mean multiplicity, 2.08) was identified by microscopy and PCR in 11.7% and 16.7%, respectively; 5.5% of the children had malaria. PCR-based *P. falciparum* prevalence ranged between 0 and 38.5% in the villages, and was 21.4% in the health centre, and 14.9% in the hospital (Gahutu *et al.*, 2011)

In Uganda, Malaria is the leading cause of morbidity with 90–95 % of the population at risk and it contributing to approximately 13 % of under-five mortality.

Similar study was done to investigate the relationship between the malaria status of children under the age of 5 years old in Uganda and selected socio-economic, demographic and environmental factors, as well as to identify significant risk factors associated with malaria. (Roberts *et al.,* 2016)

This study made use of data collected from the 2014 Malaria Indicator Survey conducted in Uganda. Two test procedures for malaria in children under the age of 5 years old were carried out. Due to the complex survey design, a generalized linear mixed model was used to test for associations between several independent variables and the response variable, which was whether a child tested positive or negative for malaria according to the microscopy results showed that of those 4939 children recruited, 974 tested positive for malaria, resulting in an observed malaria prevalence of 19.7 %. The socio-economic factors closely related to the risk of malaria were main floor material, main wall material and availability of electricity in the household. The event of indoor residual spraying (IRS) significantly reduced a child's risk of malaria. An older child was associated with a higher risk of malaria, however their risk decreased with an increase in cluster altitude and an increase in their caregiver's education level (Roberts *et al.,* 2016).

In Tanzania especially the study area the prevalence studies have not been documented.

2.2 Factors associated with the occurrence of malaria in children under five years

A study was conducted to assess malaria infection in relation to age, altitude, rainfall, socio-economic factors and coverage of control measures in a representative sample of 11 437 people in Amhara, Oromia and SNNP regions of Ethiopia in December 2006–January 2007. Surveys were conducted in 224 randomly selected clusters of 25 households (overall sample of 27 884 people in 5708 households).

Malaria prevalence was positively associated with peak monthly rainfall in the year before the survey (OR peradditional10mmrain = 1.10; 95% CI 1.03–1.18). People living above 2000 m and people of all ages are still at significant risk of malaria infection. (Graves *et al.,2009*).

Ayele *et al.,* 2012 Conducted, a baseline malaria indicator survey in Amhara and showed that the prevalence of malaria for households with clean water found to be less. Malaria rapid diagnosis found to be higher for thatch and stick/mud roof and earth/local dung plaster floor. Moreover, spraying anti-malaria to the house was found to be one means of reducing the risk of malaria. Furthermore, the housing condition, source of water and its distance, gender, and ages in the households were identified in order to have two-way interaction effects (Ayele *et al.,* 2012)

A study was conducted to determine Prevalence and risk factors of malaria among children in southern highland Rwanda using a combined community-and facility-based survey on *Plasmodium* infection in 2010. *Plasmodium falciparum* infection (mean multiplicity, 2.08) was identified by microscopy and PCR in 11.7% and 16.7%, respectively; 5.5% of the children had malaria. PCR-based *P. falciparum* prevalence ranged between 0 and 38.5% in the villages, and was 21.4% in the health centre, and 14.9% in the hospital. Independent predictors of infection included increasing age, low mid-upper arm circumference, absence of several household assets, reported recent intake of arthemeter-lumefantrine, and chloroquine in plasma, measured by ELISA. (Gahutu *et al*.,2011)

Malaria risk factors in north-east Tanzania were established by Winskill *et al.,* (2011) and found out that Using an insecticide-treated mosquito net of any type proved to be highly protective against malaria (OR 0.75, 95% CI 0.59-0.96). Children aged five to thirteen years were at higher risk of having malaria than those aged under five years (OR 1.71, 95% CI 1.01-2.91). The odds of malaria were less for females when compared to males (OR 0.62, 95% CI 0.39-0.98). (Winskill *et al.,* 2011)

Bizimana *et al*.,(2015) Assessed the social vulnerability to malaria in Rwanda and found out that The most influential susceptibility indicators to increase malaria are population change ($r = 0.729$), average number of persons per bedroom ($r = 0.531$), number of households affected by droughts and famines ($r = 0.591$), and area used for irrigation ($r = 0.611$). The bed net ownership ($r = -0.398$) and poor housing wall materials (0.378) are the lack of resilience indicators that significantly correlate with malaria incidence (Bizimana *et al.*,2015)

In addition to the above , Kateera *et al.,* (*2015*) showed that Efforts to further reduce transmission and eventually eliminate malaria locally should focus on investments in programmes that improve house structure features (that limit indoor malaria transmission), making insecticide-treated bed nets and indoor residual spraying implementation more effective. (Kateera *et al., 2015*)

However these efforts may be jeopardized by some misconceptions of the cause of malaria and misuse of preventive strategies in the communities. Poverty is also a contributing factor to malaria transmission, with suggestions that improvement of living conditions for poor families might help malaria reduction furthermore, people may demonstrate willingness to contribute to malaria elimination especially in children below five years and this require constant education, sensitization and mobilization towards malaria control in general. (Ingabire *et al.,* 2014)

2.3 0utcomes of children less than five years admitted with malaria

Tanwar *et al.,* (2011) described the clinical features of PCR-confirmed cerebral malaria owing to *P. vivax* mono-infection and its clinical-laboratory profile in Bikaner, Northwest India ,they demonstrated that of the thirteen children with *P. vivax* cerebral malaria studied, eight of whom (61·5%) had multi-organ (two or more organs) dysfunction.

Other associated severe manifestations included severe anemia, hepatic dysfunction, renal dysfunction, bleeding manifestation, respiratory distress, metabolic acidosis, shock(one) Thrombocytopenia and hyponatraemia. Hypoglycemia was not observed in any patient. There was no evidence of neurological sequelae. (Tanwar *et al.*, 2011)

Malaria complications result from haemolytic anaemia and microvascular obstruction with subsequent tissue ischemia. Features of severe or complicated malaria include respiratory distress, acidosis (pH <7.3), hypoglycaemia (<2.2 mmol/l), elevated aminotransferases, severe anaemia (Hb <5 g/dl), and high parasitaemia (defined as >5%–10% infected erythrocytes or more than 500 000 infected erythrocytes per microliter). (Schumacher *et al.*, 2012)

Early treatment failure, Late treatment failure, Adequate clinical response, Resistance, Mortality and Morbidity were also some of the outcomes of malaria in children that were studied by Ahmed (Ahmed *et al.*, 2011)

Ahmed *et al.*, 2011 also showed that Mean age of patients with complications was 4.38 ± 1.69 years. Common overlapping features present in most patients with complications were cerebral malaria, severe anaemia and thrombocytopenia and jaundice whereas renal failure and malnutrition emerged as clinical feature present only in mortality group. Clinical outcomes observed in terms of treatment failure, adequate response and complications were Shock, hepatic involvement, renal failure and cerebral malaria. (Ahmed *et al.*, 2011)

In addition to the above, Acidosis, cerebral involvement, renal impairment, and chronic illness are key independent predictors for a poor outcome in African children with severe malaria. Mortality is markedly increased in cerebral malaria combined with acidosis. (Von Seidlein *et al.*, 2012)

Lavstsen *et al.,* 2012 showed that the clinical outcome of *Plasmodium falciparum* infections ranges from asymptomatic parasitemia to severe malaria syndromes associated with high mortality and that the virulence of *P. falciparum* infections is associated with the type of *P. falciparum* erythrocyte membrane protein 1 (PfEMP1) expressed on the surface of infected erythrocytes to anchor these to the vascular lining (Lavstsen *et al.*,2012)

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter deals with description of methods used in carrying out this research study. Research methodology is a systematic approach through which research is undertaken. The chapter covers the research design, data collection methods, population and sampling procedures and data analysis and interpretation processes, reliability and validity as well as ethical considerations.

3.1. Research Design

Basically, a case study is an in depth study of a particular situation rather than a sweeping statistical survey. It is a method used to narrow down a very broad field of research into one easily researchable topic. Whilst it does not answer a question completely, it gave some indications and allows further elaboration and hypothesis creation on a subject. The case study research design is also useful for testing whether scientific theories and models actually work in the real world. For example; you may come out with a great computer model for describing how the ecosystem of a rock pool works but it is only by trying it out on a real life pool that you can see if it is a realistic simulation.

Kothari (2004), views Research design as the conceptual structure within which the research is conducted.

Moreover, Yin (2003) said that the research design constitutes the print for the collection, measurement and analysis of data, a logical plan for getting from here to there where here means the initial questions to be answered and there is some set of conclusion about those questions.

This study is descriptive research design which involves qualitative approach. The qualitative approach suggests grounded propositions, provides explanations to extend understanding of the phenomena and promote opportunities for informed social action. It may also contribute to theory, educational practices, policy making and social consciousness.

Qualitative research design is inquiry by nature where by a researcher collect data in face to face situation by interacting with selected persons in their settings. Qualitative research describes and analyzes peoples' individual and collective social actions, beliefs, thoughts and perceptions. The researcher interprets phenomena in terms of the meaning that people assign to them.

The researcher intended to use a case study design. Medina (2000), says that, in case study approach the data analysis focuses on one phenomenon which the researcher select to understand in depth regardless of the number of sites or participants for the study. The one may be for example, one administrator, one group of students, one program or one policy implementer. The advantage of the case study research design is that the researcher can focus on specific and interesting cases. This may be an attempt to test a theory with a typical case or it can be a specific topic that is of interest. Research will be thorough and note taking will be meticulous and systematic.

The first foundation of the case study is the subject and relevance. In a case study, the researcher is deliberately trying to isolate a small study group, one individual case or one particular population.

For example, statistical analysis may have shown that birthrates in African countries are increasing. A case study on one or two specific countries becomes a powerful and focused tool for determining the social and economic pressures driving this.

3.2 Study Population

Study population is the total number of units from which data can be collected, such as individuals, artifacts, events or organizations. Burns and Grove (2003) describe population as all the elements that meet the criteria for inclusion in a study. The study population will be divided into two groups:

(1) Children who will be checked for malaria parasites using the MRDT,

(2) Head of households/mother/guardians with children or their representative when the head of households is not around at the time of the study.

3.3 Sampling Procedures and Sample Size.

Sampling is a process of selecting a group of people, events or behaviour with which to conduct a study (Burns and Grove 2003).

Polit et al. (2001) confirm that in sampling a portion that represents the whole population is selected. Sampling is closely related to generalizability of the findings.

The study will employ Probability Sampling and Non Probability sampling and random sampling will be used to select respondents for qualitative. Random sampling design will be employed as the sampling method. Study villages will be selected using a multistage random sampling procedure and a cluster sampling procedure as the final stage. Selection will be made with the assistance of village heads.

In the first stage, names of divisions will be obtained from the office of DMO where by two divisions will be selected from four divisions of Meru district. Out of the randomly selected divisions one ward from each division will be selected randomly. Each ward may comprise two to three villages. In the third stage a list of villages in each ward is listed from records obtained from the district medical officer's office. In the fourth stage, out of the two randomly

selected villages, two sub-villages will be randomly selected making a total of four sub villages.

In the final stage, level of parasitemia among the children in the selected households will be ascertained during surveys using a rapid diagnostic test (mRDT-SD/bioline) with the aid of a well-trained laboratory technician. Consent to draw blood from the children will be asked from their parents/guardian.

3.4 Sample Size

Sweeney and Williams (2002) defined sample as a small group of respondents from a population that the researcher is interested in obtaining information about. Sample size was calculated basing on the prevalence of malaria among the children in Arusha region (41%) (MOP 2009). Using the formula below and after an adjustment for non-response, estimated sample size was 100 study participants.

The sample size is calculated using the following formula:

N= z2p(1-p) /d2

Where:

N- Total number of subjects required in the sample

Z= a standardized normal deviate value equal to 1.96

P= estimate of prevalence of malaria in children

d= margin of error which correspond to the level of precision of results desired

N= {0.95* 0.95*0.41*(1-0.41)}/ {0.05*0.05}

N=**87.3259**

N= **100 patients**

3.5 Data Collection and analysis Procedures.

Data was collected by using interview method. There are various phases of data collection which are interwoven and can occur in overlapping cycle. Phase one of data collection is called planning, phase 2, 3, 4 is called actual data collection and phase 5 is called completion phase. In phase one the researcher located and gained permission to use the site or network of persons. In phase 2, the researcher obtained data primarily to become oriented to the environment. In phase 3, basic data collection, the inquirer began to hear and see what is occurring which goes beyond just listening and looking. In phase 4, closing data collection, the researcher left the field by conducting the last interview. Also he checked the richness of the collected data. In phase 5, the compilation process began. As we know that qualitative data are in the form of text, written words phrases or symbols describing or representing people actions and events in social life, the data analysis was precise, logically and systematically arranged.

Neuman (2006, p. 467) states that data analysis has the objective "of examining, sorting, categorizing, evaluating, comparing, synthesizing, and contemplating the coded data as well as reviewing raw and coded data." Furthermore, Patton (1990, p. 485) endorses the idea that qualitative research tends to use an inductive analysis of data, which simply means that themes emerge out of the data.

The researcher inferred from the empirical details to social life. To infer means to pass a judgment, to use reasoning and to reach a conclusion based on evidence. The process of data analysis in this study based on coding and concept formation. The researcher analyzed data by organizing them into categories on the basis of themes, concept or similar features. The researcher also developed new concepts, formulate conceptual definitions and examine relationships among concepts.

Also the researcher organized the raw data into conceptual categories and creates themes or concepts. A good thematically code was done to capture the qualitative richness of the phenomenon.

Open coding was done during the first pass through recently collected data. The researcher located themes and assigned initial codes in the first attempt to condense the mass of data into categories. The researcher kept on reading field notes and other valuable field resources and write preliminary concepts.

The second step is called axial coding where the researcher linked concepts with research objectives. Under this section there was dropping of some ideas which were given out by respondents but in some ways they were not corresponding to the need of the researcher.

Finally the researcher scanned all data by looking selectively for concepts that illustrate the intended themes.

The table below gives a summary of the data analysis process and shows the six steps which were used to arrive at the findings. It should be noted that the steps are not distinct in themselves and that there is a lot of overlapping between and within the entire cycle of steps.

Table 1. **Steps of Data Analysis**

Step 1.	General review of literature which led to generation of research objectives and research questions.
Step 2.	Development of structured interview questions based on the real African family environment.
Step 3.	Transcription of the interview responses and development of themes and categories.
Step 4.	Checking for the emerging themes to determine overlaps by listening audio files.
Step 5.	Comparing categories with one another to develop central theme which represent live experience.
Step 6.	Drawing conclusion recommendations and suggestions for further study.

Source: Adapted from Weadon, 2007, p.76.

3.6 Ethical consideration

The approval to carry out research was obtained from the Hospital Executive Director of Nkoaranga Lutheran Hospital before data is collected. Data be coding adhered to privacy and confidentiality of the patient's life .Before data collection, the objectives of the study was fully explained to the attendant of the patient to ensure his/her permission.

Furthermore, for a researcher to obtain the required information from his respondents, he ensured the trustworthy and confidentiality of whatever information given by the respondents. Every gathered data was treated with confidence and respect. Also respondents were free to accept or deny the chance of participating in the study as none of them would be accused in either way.

Furthermore, the researcher ensured that in interview questions there is no hidden agenda apart from the one stated in the introductory part of the interview sheet. And the researcher ensured that there would neither be psychological harassment nor intimidation done to respondents. Furthermore, the following are some ethical principles which was adhered by a researcher:

Honesty: the researcher strived for honesty in all communication. The researcher wouldn't falsify or fabricate or misinterpret data given by his respondents.

Objectivity: the researcher strived to avoid any form of biasness in any level of conducting his research. Respondents' personal decision was honored; personal testimonies as well as not disclosing any personal or individual interests that would affect the research work.

Integrity: this involved keeping the promise and agreements made between the researcher and his respondents

Carefulness: the researcher strived to avoid errors and negligence as well as keeping good records of whatever response which would be provided by his respondents.

3.7 Study limitation

This study was limited by several factors during the field work. Some of those limitations includes: lack of mutual cooperation from some respondents and fear to expose the real magnitude of malaria impacts in their communities.

Also the volume of qualitative data analysis was time consuming. Furthermore, some respondents didn't give accurate information. All these hindered the successful progress of the work.y actor some of

Financially**,** the researcher met some constraints due to the fact that collection of some data required much finance and the researcher wasn't capable of meeting them all.

3.8 Dissemination of results

Copies of the final results will also be shared with Nkoaranga Lutheran Hospital administration. Additional copies will be submitted to:

i) KIU TH library for future reference

ii) Personal copy for reference and further dissemination of results in seminars, meetings and workshop.

CHAPTER FOUR

4.0 DATA ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter deals with analysis, presentation and discussion of the key findings originating from primary data. Findings presented in this chapter are the result of responses from 100 respondents according to the sampling procedures explained in the previous chapter.

The first section of this chapter deals with analysis of data obtained through observation of the real environment where sample respondents are living as well as interviewing them.

Table 2. **Details of Participants**

	Female participants	Male participants	Total	Education level			
				Pr	Sec.	Coll.	O.S
Single	07	08	15	10	04	03	0
Married	09	11	21	03	3	02	1
divorced	3	01	04	1	2	1	0
separated	02	02	03	0	1		0
widow	00	01	01	0	0	0	0
Overall total	21	23	44	14	10	06	01

Source: Self compiled.

The background information indicates that the total number of participants was forty four where 21 were women and 23 were men. Although the researcher tried to avoid gender imbalance, it wasn't possible. The background data also shows that the education level of the participant ranged from primary school to college level.

In order to conform to research ethics, the study doesn't disclose the identity of any participant and instead he uses symbols. Participants were assigned numbers and gender. For example **(P1M**) where **P** stands for Participant, **1**-number one, **M**-male and **F**-female. For example, **P1M** denotes Participant 1, who was male and **P3F** denotes Participant 3 from who was female.

4.2 Research Findings

The aim of the study is to determine the factors associated with the prevalence of Malaria infection among children below five years attending Nkoaranga Lutheran Hospital in Meru District. The data generated is analyzed and presented according to three research questions.

i) What is the prevalence of malaria in children under five years that are brought in Nkoaranga Lutheran Hospital?

Response to the above question, respondents revealed that in poor countries, tragically, people die unnecessarily. This is a concept known and recognized throughout the world that the inhabitants of more developed and rich countries have a better life expectancy compared to the poorest countries. The reasons are not only linked to health care costs that often reflect health systems most technologically advanced and rich resources. Over the past two to three decades, our understanding of poverty has broadened from a narrow focus on income and consumptions to a multidimensional notion of education, health, Social and political participation and rights, personal security and freedom, and environmental quality.

Thus poverty encompasses not just low income, but lack of insecurity, voicelessness and powerlessness. Multidimensional poverty is a determinant of health risks, health-health outcomes. An estimated 70% of the poor are women who are care takers of children. Similarly, in the Western party of Nkoaranga , gender inequality is a significant determinant of health outcomes. In the fight against malaria we must keep in mind a number of issues other than simple lack of economic resources. One respondent suggested that we should initiate the program to "Rool Back Malaria" and in order for it to succeed; we must program interventions that improve the living conditions of access services, resources and skills, vulnerability, seeking behavior, health care access and fighting against poverty.

Malaria and Poverty.

Inequalities in Incidence. An estimated 58% of malaria deaths occur among the poorest 20% of the world's population Nkoaranga inclusive. The inequality of this distribution is higher than that for any other disease of public health importance. In a very recent study from Ghana,10 1496 children presenting to the hospital were examined for malaria parasites and interviewed with a standardized questionnaire. The information of eleven indicators of the family's housing situation was reduced by a Principal Component Analysis (PCA) to a socioeconomic score, which was then classified into three socioeconomic statuses: poor, average and rich. Their influence on the malaria occurrence was analyzed together with malaria risk co-factors, such as sex, parent's educational and ethnic background, number of children living in a household, applied malaria protection measures, place of residence and age of the child and the mother. The socioeconomic situation is significantly associated with malaria even in endemic rural areas where economic differences are not much pronounced.

Low Household Income. Low income and consumption are important aspects of poverty. Poor households and individuals are prevented from consuming goods and services that otherwise would protect them against malaria.

Housing. For the poor, living conditions are often characterized by inadequate housing and overcrowding, which can increase the risk of malaria. Dwellings that are hastily constructed, or made of readily available materials, might allow mosquitoes to enter more easily than well-constructed housing with screened windows, thus increasing vector contact. Some evidence suggests that overcrowding might increase the risk of malaria, because mosquitoes are attracted by the higher concentration of carbon dioxide and other chemicals in crowded houses. Family living space also might not be adequately separated from domestic animals, and the animals' body temperature might attract mosquitoes. In a recent survey in Nkoaranga on children health, about 16% of children reported having fever in the two weeks preceding the survey. The prevalence of fever was highest among children from the poorest households (17%), compared to 15.8% among the middle households and lowest among the wealthiest (13%).

Malnutrition and Concurrent Infections. Individuals dwelling in poor households are often malnourished. Malnutrition encompasses not just protein-energy malnutrition, but also deficiencies in micro nutrients such as iron, vitamin A, iodine and zinc, in particular. Underweight has been identified as a contributing factor in 60% of all child deaths in Nkoaranga. Underweight is believed to increase the susceptibility of children contracting malaria for various reasons, including reduced immunity. Evidence strongly suggests that micronutrient deficiencies and general under nutrition increase the burden of malaria morbidity and mortality. Individuals in poor households are more likely than those in better-off households to suffer from concurrent infectious and parasitic diseases in addition to malaria.

Low Education and Knowledge. A general lack of health information and awareness among poor.

Knowledge of malaria might be lower among poor than non-poor households for several reasons. Information, education and communication (IEC) material for malaria might not reach poor people. Illiterate people and those with low levels of education might be unable to understand written health education materials, such as posters and flyers. Poor households might not have access to radios or television, thereby missing health messages broadcast through these media. Women and ethnic minorities might have even less access to mass media: women tend to be less educated and literate than men, while ethnic minorities can have limited command of the official language of the area or country. Thus, although health information on the cause, transmission and appropriate treatment for malaria might be available in health centers and within villages, such information might not be of any benefit to poor and marginalized groups. Health education delivered through outreach workers likewise might not reach poor households in remote rural villages. In this way, low levels of education can lead to low knowledge of malaria. In turn, such knowledge and perception of malaria is an important factor in determining acceptance and use of malaria prevention and control measures.

Socio-Cultural Barriers. Traditional beliefs and practices also can influence whether communities accept and adopt malaria prevention measures and seek treatment. Ethnic minorities traditionally use bed nets, while those in other places traditionally do not. The introduction of bed nets into Nkoaranga area was more difficult. For example in a nearby village, people reportedly used bed nets because of the “nuisance” biting of mosquitoes and other insects, or because they are a status symbol, even though they did not appear to understand the connection between malaria and mosquitoes one respondent revealed.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapter provided a presentation and analysis of the qualitative data and discussed the themes and subthemes that emerged from the data. This chapter will provide an overview of the entire study. Firstly a concise summary of the literature review will be given. This will be followed by a summary of the empirical study and a section on the synthesis of the research findings. It will highlight the similarities and contradictions between the literature review and the empirical study. Then a conclusion to the study will be drawn based on the research questions. The limitations of the study will be explained and finally the chapter will conclude with recommendations and suggestions for further research.

DEFINING THE PROBLEM

The outlook for malaria control is grim. The disease, caused by mosquito-borne parasites, is present in 102 countries and is responsible for over 100 million clinical cases and 1 to 2 million deaths each year. Over the past two decades, efforts to control malaria have met with less and less success. In many regions where malaria transmission had been almost eliminated, the disease has made a comeback, sometimes surpassing earlier recorded levels. The dream of completely eliminating malaria from many parts of the world, pursued with vigor during the 1950s and 1960s, has gradually faded. Few believe today that a global eradication of malaria will be possible in the foreseeable future.

Worldwide, the number of cases of malaria caused by Plasmodium falciparum, the most dangerous species of the parasite, is on the rise. Drug-resistant strains of Plasmodium falciparum are spreading rapidly, and there have been recent reports of drug resistance in people infected with Plasmodium vivax, a less virulent form of the parasite.

Furthermore, mosquitoes are becoming increasingly resistant to insecticides, and in many cases, have adapted so as to avoid insecticide-treated surfaces altogether.

In large part because of the spread of drug and insecticide resistance, there are fewer tools available today to control malaria than there were 20 years ago. In many countries Tanzania inclusive, the few remaining methods are often applied inappropriately. The situation in many places such Nkoaranga is particularly dismal, exacerbated by a crumbling health infrastructure that has made the implementation of any disease control program difficult.

Malaria cases among tourists, business travelers, military personnel, and migrant workers in malarias areas have been increasing steadily in the last several years, posing new concerns that the disease will be introduced to currently non malarious areas. Recent epidemics have claimed tens of thousands of lives in Africa, and there is an increasing realization that malaria is a major impediment to socioeconomic development in many countries. Unless practical, cost-effective strategies can be developed and successfully implemented, malaria will continue to exact a heavy toll on human life and health around the world.

Although often considered a single disease, malaria is more accurately viewed as many diseases, each shaped by subtle interactions of biologic, ecologic, social, and economic factors. The species of parasite, the behavior of the mosquito host, the individual's immune status, the climate, human activities, and access to health services all play important roles in determining the intensity of disease transmission, who will become infected, who will get sick, and who will die.

For the hundreds of Nkoaranga dwellers who live into the forest along the forest region border, malaria is the cost of doing their day to day activities. These young men are exposed to aggressive forest mosquitoes, and within sometimes they get malaria.

Recommendations:

The prevalence of malaria among children under five years attending Nkoaranga Lutheran Hospital between June 2016- June 2017.

Physician recommends that it is good to take antimalarial medications as a preventive measure, but a significant number do not. But some people who have never been exposed to malaria, have never developed protective immunity, are at great risk for contacting severe disease. Ironically, it is not the infection itself that poses the biggest danger, but the chance that treatment will be delayed because of misdiagnosis upon the individual's carelessness is another traumatic danger.

Recommendations to health providers:

A 24-year-old pregnant Meru woman from Nkoaranga visited the village health clinic monthly to receive prenatal care. While waiting to be seen by the health provider, she and other women present listened to health education talks which were often about the dangers of malaria during pregnancy, and the need to install screens around the house to keep the mosquitoes away, to sleep under a bed net, and to take a chloroquine tablet once a week. Toward the end of her second trimester of pregnancy, the woman returned home from her prenatal visit with her eight tablets of chloroquine wrapped in a small packet of brown paper. She promptly gave the medicine to her husband to save for the next time when he or one of their children fell ill. The next week she developed a very high malarial fever and went into labor prematurely. Unfortunately, the six-month-old fetus was born dead.

Malaria is a part of everyday life in Africa especially in south of the Sahara. Its impact on children is particularly severe. Mothers who bring unconscious children to the hospital often report that the children were playing that morning, convulsed suddenly, and have been unconscious ever since. These children are suffering from the most frequently fatal

complication of the disease and cerebral malaria. Other children succumb more slowly to malaria, becoming progressively more anemic with each subsequent infection.

By the time they reach the hospital, they are too weak to sit and are literally gasping for breath. Many children are brought to hospitals as a last resort, after treatment given for "fever" at the local health center has proved ineffective. Overall, children with malaria account for a third of all hospital admissions. A third of all children hospitalized for malaria die. In most parts of Africa, there are no effective or affordable options to prevent the disease, so children are at high risk until they have been infected enough times to develop a partial immunity.

To guide the implementation of the activities outlined above, the researcher has provided specific advice on several components, including an approach to evaluating malaria problems and designing control strategies (the paradigm approach), program management, monitoring and evaluation, and operational research.

Paradigm Approach

Given the complex and variable nature of malaria, the committee believes that the epidemiologic paradigms developed in conjunction with this study, may form the basis of a logical and reasoned approach for defining the malaria problems and improving the design and management of malaria control programs.

The researcher recommends that the paradigm approach be field tested to determine its use in helping policymakers and malaria program managers design and implement epidemiologically appropriate and cost-effective control initiatives.

To elucidate the factors (socio-economic, physical, environmental, demographic factors) associated with malaria among children under five years attending Nkoaranga Lutheran Hospital.

The researcher recognizes that various factors, including the local ecology, the dynamics of mosquito transmission of malaria parasites, genetically determined resistance to malaria infection, and patterns of drug use, affect patterns of malaria endemicity in human populations and need to be considered when malaria control strategies are developed. In most endemic countries, efforts to understand malaria transmission through field studies of vector populations are either nonexistent or so limited in scope that they have minimal impact on subsequent malaria control efforts. The researcher recognizes that current approaches to malaria control are clearly inadequate. The researcher believes, however, that malaria control strategies are sometimes applied inappropriately, with little regard to the underlying differences in the epidemiology of the disease.

The researcher recommends that support for malaria control programs include funds to permit a reassessment and optimization of antimalarial tools based on relevant analyses of local epidemiologic, parasitologic, entomologic, socioeconomic, and behavioral determinants of malaria and the costs of malaria control.

Recommendations to the Management of Nkwaranga ward.

Poor management has contributed to the failure of many malaria control programs. Among the reasons are a chronic shortage of trained managers who can think innovatively about health care delivery and who can plan, implement, supervise, and evaluate malaria control programs. Lack of incentives, the absence of career advancement options, and designation of responsibility without authority often hinder the effectiveness of the small cadre of professional managers that does exist. The researcher recognizes that management

technology is a valuable resource that has yet to be effectively introduced into the planning, implementation, and evaluation of most malaria control programs.

The researcher recommends that funding agencies utilize management experts to develop a comprehensive series of recommendations and guidelines as to how basic management skills and technology can be introduced into the planning, implementation, and evaluation of malaria control programs.

Monitoring and Evaluation of ant Malaria ProgramsTo assess the outcomes of children less than five years admitted with malaria at Nkoaranga Lutheran Hospital between June 2016- June 2017

Monitoring and evaluation are essential components of any control program. For malaria control, it is not acceptable to continue pursuing a specific control strategy without clear evidence that it is effective and reaching established objectives.

The researcher recommends that support for malaria control programs include funds to evaluate the impact of control efforts on the magnitude of the problem and that each program be modified as necessary on the basis of periodic assessments of its costs and effectiveness.

Recommendations for further study:

At the outset of any malaria prevention or control initiative and during the course of implementation, gaps in knowledge should be identified and problems should be identified. These matters should be addressed through clearly defined, short-term, focused studies. Perhaps the most difficult aspects of operational research are to identify the relevant problem, formulate the appropriate question, and design a study to answer that question. But the researcher recommends that a problem-solving (operational research) component be built into all existing and future funded malaria control initiatives and that support be given to enhance the capacity to perform such research. This effort will include consistent support in the design

of focused projects that can provide applicable results, analysis of data, and dissemination of conclusions.

Recommendations for Training The researcher concludes that there is a need for additional scientists actively involved in malaria-related research in our country. To meet this need, both short- and long-term training must be provided.

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APPENDIX I:

CONSENT FORM

KAMPALA INTERNATIONAL UNIVERSITY
WESTERN CAMPUS
PUBLICATIONS INFORMED CONSENT FORM

ID-NO_____

Consent to Participate in INTERVIEW
Hallo!
My name is **Mechtilda Emmanuel Mugarula** and I am working on this research project with the objective of investigating the prevalence of malaria among the children and factors influencing the use of ITN in Meru district.

Purpose of the study
The study is intended to collect information about the use of ITNs from parents/head of the house in Meru District. Findings from the study will help the investigators intending to improve the current situation affecting the community due to malaria.

What Participation Involves
If you agree to participate in the study, you will be required to answer questions and if possible to allow me to draw blood from the children if she/he is available in the family so as to investigate the presence of malaria parasite.

Confidentiality
All collected information we will be entered into computers with only the identification number. Unauthorized persons will have no access to the data collected.

Rights to Withdraw and Alternatives
Participation in this study is completely your choice. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits.

Benefits
If you agree to take part in this study, the information you will provide will help us to understand and know the magnitude of ITNs use and ownership in the District, and the findings will be disseminated to health planners so as to help in addressing the problem. And you may receive assistance to any problem(s) which may be known during the study period including being given the anti-malaria if your child will be found with the malaria parasite immediately.

Contact

If you ever have questions about this study, you may contact:

1. Researcher; **Mechtilda Emmanuel Mugarula,** Kampala Interanional University. P. O. Box 8264 Arusha**.**
2. The Supervisor of this study; **Ass.Prof. Pwaveno H. Bamaiyi, PhD(Director/Associate Professor of Public Health)**

Signature:…….

Participant agrees……Participant does not agree ……

I……have read/listened the contents in this form. My questions have been answered. I agree to participate in this study with my child.

Signature of participant ……

Signature of researcher……....

Date of signed consent……

APPENDIX II:

QUESTIONNAIRES

Part I: IDENTIFICATION

1. Division……..

2. Ward……

3. Village…….

4. Sub-village……

Part II Socio-demographic factors Sehemu ya II: Taarifa binafsi

5. Sex: male [ ] female [ ]

6. Age:…….

7. Marital status: single [ ] married [ ] divorced [ ] separated [ ] widow[ ]

8. Level of education: primary school [ ] secondary school [ ] college [ ]

Others (please specify)……..

9. Employment status [ ] public service [ ] self employed. [ ] private sector [ ] others…….

10. No. of children……

No.	age	weight

11. Have you ever seen or heard of mosquito nets treated with insecticide YES [ ] NO [ ] don‘t know [ ]

12. Do you own one? YES [ ] NO [ ] if No then answer No 21.

13. How many ITNs do you have in the household? ……

14. The current situation of the available ITN: in good order[ ] torned [ ]

15. Is your ITN treated with insecticide? Yes [ ] No [ ] don‘t know [ ]

16. Are they currently being used -Currently used [ ] Not used [ ] if they are not in use please aswer the question number 22

17. Did you use it last night? YES [ ] NO [ ]

18. Frequency of mosquito net use; always [ ] not always [ ]

19. How did you get them? Free from the government source,[ ] voucher system, [ ] others/specify [ ]

20. Date when an ITNs supplied : < 6 months [ ], ≥6 months [ ]

21. Reasons for unavailability of ITNs /not owning the ITNs

a) Not available

b) Cost/affordability

c) Lost/stolen

d) Used for other purposes

e)
Others……
…….

22. Reasons for not using the available ITNs

a) Housing structure affects net use

b) Absence of bed

c) Nets do not prevent malaria

d) Afraid of its toxicity

e) weather

f) Other (specify)……
……

23. Do the Children sleep under ITN in the previous night: Yes [ ] No [ ]

24. What do you think are the advantages of children sleeping in the nets

a) reduce the burden of malaria on them [ ]

b) help save money [ ]

c) child sleeps better [ ]
25. In case you did not receive an ITN from the hospital, can you afford one? Yes [ ] No [ ]

Knowledge on malaria / The influence of health seeking behaviour

26. Within the past six month did your child had episodes of fever? Yes [ ]No[ ]

27. Was she/he taken to the hospital? Yes [ ] no [ ]

28. If the answer is no explain why! ……

29. Was she given the anti-malaria? Yes [ ] No [ ]

30. If the answer is yes, mention the name of the drugs that was given …… …….

31. what causes malaria

a) ……..

b) ……

32. Can you mention signs and symptoms of malaria?

a) Fever

b) Headache

c) Feeling cold

d) With a tendency of bask in the sun

e) General body weakness

f) Body/joint pains

g) Vomiting

h) Abdominal pain/Diarrhoea

i) Convulsion

j) Don‘t know

33. What are preventive measures of malaria

a) Use ITN

b) Environmental cleanliness

c) Destroying the breeding sites

d) Use of anti-malarials

e) Use traditional remedies

f) Fumigants

g) Use insecticide sprays

h) Using repellents

i) Other……

34. Normally what do you usually do when another member of the house/ under-five contract malaria, where do you go for treatment

a) Hospital

b) Traditional herbalist

c) Self medication

d) Others…….

Housing environment

35. Housing environment

a) Proximal to breeding sites: old tires, containers, ponds

b) Clean environment

c) Farming activities,

36. Are the windows screened with the mosquito wire gauze .Yes [ ] no [ ]

37. Does the house have separate bed room? Yes [ ] No [ ]

38. What is the structure of the room?

a) Such that bottoms can be put up for hanging the nets [ ]

b) Such that there is no space for putting up bottoms for hanging the nets[ ]

c) Such that the rooms are so small there is hardly any space [ ]

39. In which season of the year does the family use the ITNs

a) Rain

b) Dry

c) Throughout

d) Don‘t know

40. What are the reason for ITNs use specifically in the above mentioned season …… ……

APPENDIX III:
BUDGET

ESTIMATED RESEARCH BUDGET FOR 30DAYS			
AT MERU DISTRICT			
ITEM	**QTY**	**EACH ITEM**	**COST**
RESEARCH ASSISTANT	1	5,000.00	150,000.00
TRANSPORT	30	4,000.00	120,000.00
PRINTER PAPER A4	2	6,000.00	12,000.00
DAILY MEALS	30	15,000.00	450,000.00
MOTEL	30	10,000.00	300,000.00
STATIONARIES		20,000.00	20,000.00
		TOTALS	**1,052,000.00**

MAP OF TANZANIA

MAP OF ARUMERU DISTRICT