THE PREVALENCE OF COMPLICATED MALARIA IN CHILDREN UNDER FIVE YEARS IN TIRIRI HEALTH CENTRE IV - SOROTI DISTRICT .

BY

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A RESEARCH REPORT SUBMITED TO THE FACULTY OF CLINICAL MEDICINE AND DENTISTRY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF MEDICINE AND BACHELOR OF SURGERY OF KAMPALA INTERNATIONAL UNIVERSITY

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DECLARATION

I, **Atai Alice**; declare that this is my own original work to the best of my knowledge and ability and has not been presented to any University or Institution for the award of a degree.

Signed:_____

Date:_____

APPROVAL

I certify that this research report has been written under my guidance and supervision and I therefore recommend for its submission to the faculty of medicine and dentistry for fur consideration.

Certified by:

Name: _____

Signature: _____

SUPERVISOR

Date: _____

DEDICATION

I dedicate this research report to my parents Mr. and Mrs. Anyumel Faustino R. Without their commitment, patience, understanding, support and most of all love, the completion of this report would have not been possible.

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The success and completion of a piece of work like this study is usually the result of efforts of many people. I may not be able to mention all the names, but all I can say is that the contribution of everybody who has helped me in one way or the other is highly appreciated.

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The supervisor of this research deserves more thanks than what I can express here. Mr. Okali Daniel gave me real professional guidance and was a real light in my path to completion of this work. He continuously guided me right from the proposal until the final report was complete.

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I am grateful to my husband Mr. Olaki Simon for the parental care, love and above all the financial support he gave to me that finally got this research study done. A midst his busy schedules he gave a helping hand in guiding the study, proof reading the report as well as editing all grammatical errors. The guidance he gave motivated me and gave me an insight into research procedures and methodologies.

Finally in a special way I would like to thank my dear beloved daughters Olga, Tronella, Daniella and Allen for their patience and cooperation when I have been away for studies.

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LIST ABBREVIATIONS

ACT	-	Artemesinin Combination Therapy
AIDS	-	Acquired Immuno Deficiency Syndrome
CNS	-	Central Nervous System
CSF	-	Cerebral Spinal Fluid
DHO	-	District Health Officer
DNA	-	Deoxy-rybos Nucleic Acid
Hb	-	Haemoglobin
HIV	-	Human ImmunoVirus
IL	-	InterLeukin
KIU	-	Kampala International University
MO	-	Medical Officer
MoH	-	Ministry of Health
PCR	-	Polymerase Chain Reaction
RBC	-	Red Blood Cell
RDT	-	Rapid Diagnostic Test
TNF	-	Tissue Necrotic Factor
VHT	-	Village Health Team
WBC	-	White Blood Cell

EXECUTIVE SUMMARY

The research study was carried out in Tiriri Health Centre IV, Katine Sub County in Soroti District. The researcher opted to identify the factors contributing to severe malaria among children aged 0 – 5 years, in which interventions can be directed to alleviate these factors for a lasting solution.

Soroti is one of the districts in Uganda surrounded by several wetlands and swamps, people therefore live around swampy areas most affected by moist land with water logs. This kind of village backgrounds provide good habitant for mosquitoes to bread hence encouraging the continuous high prevalence of malaria in the district.

Tiriri Health Centre IV serves the communities of Katine, Tubur, Kamuda, Arapai, Asuret, Gweri and Soroti Sub Counties respectively.

The major objective of the study therefore was to assess the complications of malaria in children aged 5years and below who attend health care service in Tiriri health centre1V, Soroti District. The researcher also sought to address the following specific objectives: - to determine the common complications of malaria in children under five years who receive treatment in Tiriri health centre IV, to identify common risk factors contributing to complicated malaria in children aged 5 years and below and to determine the outcome of complicated malaria for children aged 5 years and below as seen in Tiriri health centre IV in Soroti district.

The research study looked into related literature extracted from health centre records from both out-patients and in-patients registers. It also spelt out review of work done by other researchers on assessment of malaria disease, causes and spread. It highlighted the cause, control measures, prevention and treatment plus knowledge of people and attitude towards control of malaria particularly in children less than five years of age.

The research used a retrospective cross sectional study in which the researcher followed the available records backwards. Patients files, registers for in-patients, health facility monthly report forms, weekly surveillance forms for notifiable diseases and other available documents that gave information concerning malaria as a source of information. A data collection form to suit the study was designed.

The study found out that there was need to maintain regular health education to the community, need for insecticide treated mosquito nets to all pregnant mothers and children under five. It further identified male children as being more susceptible to complicated malaria. The researcher also found out the need for care givers to be educated on clinical presentations of malaria in children under five. The research found at that government needs to employ more health workers, organize seminars for health workers in order to provide more knowledge on how to deal with malaria in children under five.

CHAPTER ONE

1.0 Introduction

1.1 Background Information

Over 40% of the world's children live in malaria-endemic countries (WHO 2000). Of the one million malaria deaths each year, 75% occur among African children under five years of age. The rapid spread of resistance to ant malarial drugs, coupled with widespread poverty, weak health infrastructure and, lack of knowledge has led to increased cases of complicated malaria among children under five years. (Campbell, 2002), and Ministry of Health/ malaria consortium Uganda (2002)

Approximately 7% of children, with complicated malaria are left with permanent neurological problems. These include spasticity, blindness, speech problems and epilepsy. Recent evidence suggests that some children who appear to have made a complete neurological recovery from complicated malaria may later develop significant cognitive problems (attention deficits, difficulty with planning and initiating tasks, speech and language problems), which can adversely affect school performance (Malaria consortium and CDC Uganda, 2002).

The word malaria was coined to denote intermittent fever believed to be contracted by breathing bad air from the marshes (Latin- Mal = bad, aria = air). Malaria is one of the oldest infestations known to mankind and referred to in ancient writings in Egypt, India & China. Charles Louis Alphonse Laveran, a French army surgeon stationed in Constantine, Algeria, was the first to notice parasites in the blood of a patient suffering

from malaria. This occurred on the 6th of November 1880. For his discovery, Laveran was awarded the Nobel Prize in 1907 (MOH, 2000)

Malaria is a parasitic disease caused by plasmodium falciparum, plasmodium vivax, plasmodium ovale, plasmodium malarie and recently discovered plasmodium knowelesi.

Majority of infestations are due to p. falciparum and p. vivax whilst majority of deaths are due to plasmodium falciparum due to its ability to destroy both young and mature red blood cells and high multiplication rate among other factors of adaptations (WHO). These parasites are transmitted by the female anopheles mosquito. Mixed infections occur in 5-7% of infections (Eijk, 2003**)**

P. falciparum is predominantly found in Uganda in Africa, Haiti, Papua New Guinea , P. vivax is found in Central and South America, North Africa, Middle East, Indian subcontinent; rare in Sub-Saharan Africa, P. ovale is found in West Africa, P. malaria is found in parts of Africa, Life cycle of malaria parasites in humans and mosquitoes. The malaria parasites (in form of sporozoites) are injected from the salivary glands of the mosquito into the blood when an infested mosquito bites a person.

The parasites (sporozoites) enter the liver cells, to form merozoites they form a collection known as liver schizonts. For P. vivax and P. ovale some of the malaria parasites remain dormant for some time and are known as hypnozoites. The rupture of the liver schizonts releases merozoites into blood where they enter red blood cells to begin asexual reproduction. Within the red blood cells, the malaria parasites first assume a form called

trophozoites and then multiply to become many merozoites. The collection of merozoites within the red blood cell is called an erythocytic schizont. The rupture of the erythrocytic schizont releases many merozoites which then infect other red blood cells. This cycle is repeated indefinitely. Eventually some merozoites differentiate into sexual forms called gametocytes within the red blood cells that are taken up by mosquito. The red blood cells containing the gametocytes are lysed in the gut of the mosquito to free the gametocytes that develop in gametes. These gametes fertilize to form a zygote known as oocytes (non motile). The resulting zygotes become ookinetes (motile forms) which penetrate the midgut wall of a mosquito and multiply to form to form sporozoites.

These anopheles mosquitoes are: Anthropophagic (prefer to feed mainly on humans) endophilic (prefer to rest indoors), endophagic (prefer to feed mainly indoors)

1.2 Complicated Malaria

This is a life threatening manifestation of malaria, and is defined as the detection of P. falciparum in the peripheral blood in the presence of any of the clinical or laboratory features (singly or in combination) listed below:

1.3 Features and definitions of complicated malaria

Prostration (inability or difficulty to sit upright, stand or walk without support in a child normally able to do so, or inability to drink in children too young to sit) , Alteration in the level of consciousness (ranging from drowsiness to deep coma) ,Cerebral malaria, Respiratory distress ,Multiple generalized convulsions ,Circulatory collapse, Pulmonary

oedema ,Abnormal bleeding, Jaundice , Haemoglobinuria ,Acute renal failure, Severe anaemia ,hypoglycaemia, Hyperparasiteamia, and Hyperlactataemia (Malaria consortium, 2002).

Diagnosis

- Microscopy - "Gold standard" for diagnosis of malaria
- Thick smear: used for screening purposes to detect malaria.
- Thin smear: used for species identification and quantifying malaria.

  Staining methods used include: Leishman stain, Field's stain, Giemsa stain, & Wright's stain

  Blood stages of parasite identifiable on smear exam: trophozoite, schizont, and gametocyte
- Malaria rapid diagnostic tests (RDTs)
- Para check Dipstick test: detects the antigen, histamines rich protein-2 (HRP-2)
- Optimal Assay: detects the plasmodia enzyme lactate dehydrogenase (PLDH)

Other diagnostic tests:

- Indirect Fluorescent Antibody test (IFA) - Uses fluorescent staining techniques to detect malaria parasites
- Polymerase Chain Reaction (PCR) - Use of DNA probes for malaria diagnosis (verhoeff, 1999)

Severe malaria treatment

The primary objective of anti-malarial treatment in severe malaria is to prevent death. Prevention of recrudescence and avoidance of minor adverse effects are secondary. In treating cerebral malaria, prevention of neurological deficit is also an important objective. (Wafula, AMREF, 2008)

1.4 Statement of the Problem

Malaria is Africa's leading cause of mortality in children under 5years and accounts for 20%, contributes to 10% of the continent's overall burden of disease (WHO 2008). Malaria is more rampant in the tropics due to: resistance to chemotherapy, resistance of vector to insecticides, ecologic and climatic changes and lastly population migration.

In Uganda, the groups of the population most vulnerable to complicated malaria are: Children aged 6 months to 5 years, prime gravid, and travellers' from non-endemic areas, people living with HIV/AIDS and sickle cell disease patients (MOH Uganda 2008.)

In Uganda the burden of malaria accounts for 9-14% of in-patient deaths and of these deaths 20-23% is among admitted children below the age of 5 yrs (MOH Uganda). Malaria contributes to poor academic performance due to neurological and cognitive squealed in some children who recover from cerebral malaria and this may affect their learning abilities. Malaria remains high in people at risk due to reduced immunity and some of the following factors: Mixed infections or other illnesses, inaccessibility to health facilities and insufficient treatment and malnutrition. (WHO 2010)

The research therefore intends to identify the factors contributing to severe malaria in this age group in which interventions can be directed to alleviate these factors for a lasting solution.

Soroti is one of the districts in Uganda surrounded by several wetlands and swamps, people therefore live around swampy areas most affected by moist land with water logs. This kind of village backgrounds provide good habitant for mosquitoes to bread hence encouraging the continuous high prevalence of malaria in the district.

1.5 General Objective

To assess the complications of malaria in children aged 5years and below who attend health care service in Tiriri health centre1V, Soroti District.

1.6 Specific Objectives

(i) To determine the common complications of malaria in children under five years attended to in Tiriri health centre IV in Soroti district.

(ii) To identify common risk factors contributing to complicated malaria in children aged 5 years and below who are getting health care services in Tiriri health centre IV Soroti district.

(iii) To determine the outcome of complicated malaria for the children aged 5 years and below as seen in Tiriri health centre IV in Soroti district.

1.7 Research Question

(i) What are the common complications of malaria in children under five years of age treated in Tiriri health centre IV in Soroti district?

(ii) What common risk factors contribute to complicated malaria in children less than 5 years of age who receive health care services in Tiriri health centre VI, Soroti district?

(iii) What are the outcomes of complicated malaria in children aged 5 years and below who receive treatment in Tiriri health centre IV, Soroti district?

1.6 Scope of the Study

The study ran from February 2014 to May 2014. The study was carried out at Tiriri health centre IV records Department. Tiriri health centre IV is a health facility in North Eastern Uganda. The heath centre is located in Soroti District in Katine Sub County. The health centre serves patients from Katine, Tubur, Asuret, Kamuda, Gweri, Arapai and Soroti Sub counties. This was a retrospective cross sectional study and the use of patients' files, patients registers for in- patients, health facility monthly report forms, weekly surveillance forms for notifiable diseases and available document that gave information concerning malaria as a source of information. The content of the research was restricted to only complications, risk factors and outcomes of malaria to only those children who were from the above listed Sub Counties of Soroti County, Soroti District.

1.7 Justification

Despite the government's efforts to provide health education, treated mosquito nets, seminars, workshops and outreaches to step up prevention of malaria, the prevalence of malaria in

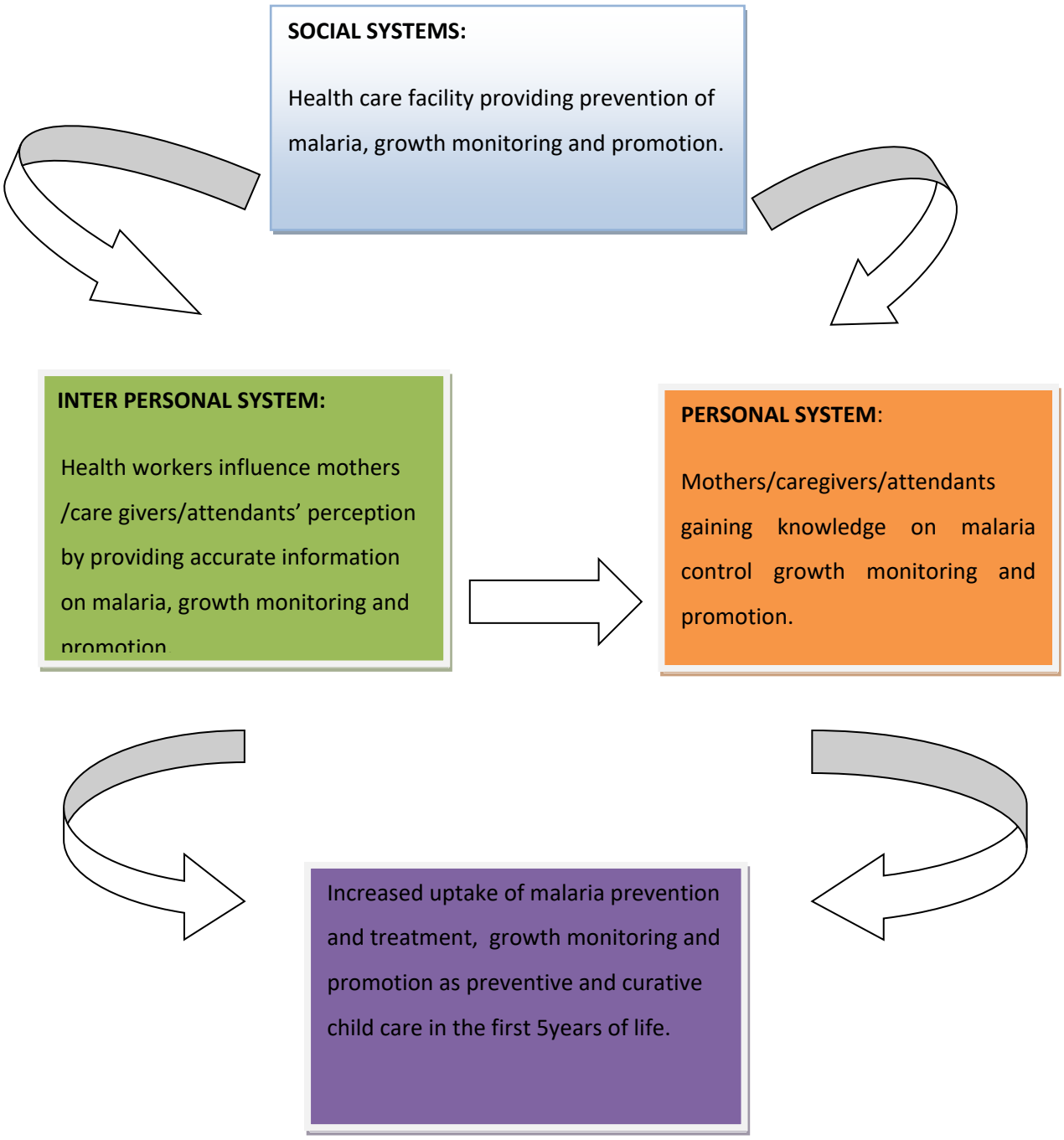
children is still increasing and yet these children are an integral part of the future development, socially and economically.

The study supplemented the current efforts being used to fight malaria both at community and health facility levels. It provided baseline information that was used by other researchers.

Despite the health education, proper care, and management by the health workers malaria still remained the leading cause of death and complications among people. So this research is intended to help the community, health workers and other researchers be able to identify the remaining invisible gaps.

The research study, further intended to enable health workers to understand and improve the knowledge of care and prevention of malaria, educate about the causes, identification, management, prevention and to reduce malaria burden of disease in Soroti district and Uganda as a country and this is also a prerequisite for the award of bachelor for the researcher.

1.8 CONCEPTUAL FRAMEWORK



Diagrammatic representation adopted from Imogene Kings open system model. Source; (Polit and Beck2006).The conceptual framework promotes active integration of both health workers by giving accurate information to mothers/caregivers/attendants and

patients to understand the importance of early health seeking behaviours in any ill health. Especially in the under fives on both prevention and curative care and this include; recognising the signs and symptoms of malaria, and preventive measures such as use of mosquito nets etc. However there is also a need for services to be accessible to promote the above.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter spells out a review of work done by other researchers on assessment of malaria disease, causes and spread. It highlight the cause, control measures, prevention and treatment plus knowledge of people and attitude towards control of malaria particularly in the children less than five years of age.

2.1 Complications of Malaria

Most of the 1-3 million people who die each year from malaria are children, mainly in Africa, which is hyper endemic for malaria. In older children, malaria has a similar course as in adults. However, in children below the age of 5 years, particularly infants, the disease tends to be atypical and more severe. In the first two months of life, children may not contract malaria or the manifestations may be mild with low-grade parasitemia, due to the passive immunity offered by the maternal antibodies. (Alessandro,1999).

In endemic and hyper endemic areas, the parasite rate increases with age from 0 to 10% during first three months of life to 80 to 90% by one year of age and the rate persists at a

high level during early childhood. The mortality rate is highest during the first two years of life. By school age, a considerable degree of immunity would have developed and asymptomatic parasitemia can be as high as 75% in primary school children (CDC Tororo Uganda). In Africa, on an average about 1 in 20 children die from malaria, and in worst affected areas, even 1 in 5 or 6 die from malaria and its related diseases (e.g., anaemia).

Every year malaria kills more than 80000 people of all ages in Uganda most of them being children under five years of age. On average a child under five years of age in Uganda has malaria six times in a year missing fifty two days of school (malaria consortium Uganda). The morbidity and mortality due to malaria in children tends to be very high. (Steketee, 1996)

Malnutrition does not increase susceptibility to severe falciparum malaria. In fact, it has been observed that well-nourished children are more likely to develop severe disease than those with malnutrition. However, when severe malaria does occur, malnourished children have a higher morbidity and mortality.

Haemoglobin types in the newborn and the susceptibility to malaria: It has been observed that congenital malaria and malarial parasitemia in new-borns are very rare, in spite of significant maternal parasitemia and sequestration of the parasites in the placenta. The reasons for this are not fully understood. Passive immunity due to maternal antibodies, retarded and resistance for parasite growth in old red cells with Haemoglobin F may be the causes.

Children with heterozygous sickle cell trait have lower parasite rates and less fatal infections compared to normal children (however, homozygous sickle cell disease does not protect against fatal infection). Thalassemias may also confer some protection, may be due to higher levels of HbF. Glucose 6-phosphate dehydrogenase deficiency has been found to have a protective effect against malaria which is associated with increased oxidative substances in cells, according to some studies. (Verhoeff, 1999)

Severe falciparum malaria in children

Severe falciparum malaria is the commonest cause of death in infants and children in areas endemic and hyper endemic for malaria. Inadequate immunity results in rapid increase in the parasite count and development of complications. Delay in diagnosis and treatment also contributes to mortality (Kuile,2003).

Clinical features of severe disease should be given utmost priority. History of travel to malaria endemic area, history of previous ant malarial therapy, history of vomiting, diarrhoea, fluid intake, urine output, convulsions etc. should be obtained from parents. Physical examination should include assessment of hydration and of complications of falciparum malaria. Rectal temperature should be measured in infants and small children. All children should be weighed on admission.

Thick and thin films for malaria, haematocrit and haemoglobin, blood glucose (by finger prick) should be done in all cases. If the report is likely to be delayed, presumptive anti-

malarial treatment should be started. Parasite count should be done in all positive cases of falciparum malaria and a parasite count of >2% indicates impending problems and >5% should be considered as severe infection. All cases with severe falciparum malaria should be managed as a medical emergency (MOH Uganda, 2008).

Cerebral malaria: CNS manifestations are common in children and they can be due to the following causes: Severe infection and cerebral malaria, severe infection and hypoglycaemia, hypoglycaemia induced by quinine, severe anaemia, high grade fever and drug induced behavioural changes. Therefore CNS dysfunction may not always indicate cerebral malaria and it is very important to differentiate between the various causes.

Clinical features of cerebral malaria: The earliest symptoms of cerebral malaria in children include high-grade fever (37.5-410C) and failure to eat and drink. Vomiting and cough are common. (Verhoeff, 1999)

Febrile convulsions are common in children aged 6 months to five years and it may be difficult to differentiate from cerebral malaria. If coma persists more than 30 minutes after a convulsion in a child with falciparum malaria, then cerebral malaria should be suspected. Deep breathing, cold, clammy skin with some children may have associated shock, with the systolic pressure below 50 mm Hg. Some children may present with extreme opisthotonus ('bent-like-a-bow') posture, mimicking either tetanus or meningitis (Kuile, 2003).

Neurological signs include features of symmetrical upper motor neuron and brain stem disturbances including disconjugate gaze, decerebrate and decorticate postures. In children with profound coma, corneal reflex and 'Doll's eye' movements may be absent. Retinal haemorrhages. In all comatose children, lumbar puncture must be done to rule out other causes. CSF examination in cerebral malaria is usually normal; possible increase in pressure, protein level and cell-count (mostly lymphocytes, 50cells/ml) may be seen (Luxemburger, 1997).

Treatment: The management of cerebral malaria in children.

A single intramuscular injection of phenobarbitone sodium, 10-15mg/kg of body weight can be given prophylactically to prevent convulsions in all cases of severe falciparum malaria. When convulsions do occur, they can be controlled immediately with diazepam or paraldehyde. With effective antimalarial chemotherapy, children generally regain consciousness in 2-3 days; however, sometimes the coma may last as long as one week despite the reduction in fever and parasitemia. (Hammerich, 2002)

Severe anaemia: Anaemia is the commonest complication of malaria in children. The rate of development and degree of anaemia depend on the severity and duration of parasitemia. In some children, repeated untreated episodes of malaria can result in normocytic anaemia. Children with severe anaemia may present with symptoms and signs of cardiac failure- dyspnoea, tachycardia, gallop rhythm, basal crackles,

hepatomegaly, raised jugular pressure etc. Severe anaemia can also cause confusion, restlessness, retinal haemorrhages and even coma. (Fleming, 1989)

Treatment: Children with a haematocrit of less than 15% (Haemoglobin less than 5g%) should be given blood transfusion. 10ml/kg of packed cells or 20 ml/kg of whole blood can be given by slow transfusion Hb. concentration should ideally be maintained above 7g/dL (haematocrit above 20%).

Bleeding disorders: Bleeding tendencies with prolonged clotting time, thrombocytopenia and decreased coagulation factors may occur in falciparum malaria. Spontaneous bleeding from various sites, including the upper GI tract may occur.

Pulmonary oedema: Children with cerebral malaria, severe anaemia and high parasitemia may develop acute pulmonary oedema. It may also be due to fluid overload. Tachypnoea is the earliest sign of impending pulmonary oedema. (Mutabingwa, 1993)

Treatment: Pulmonary oedema is managed with stringent fluid management, propped up position, oxygen inhalation, diuretics and venesection and letting of blood. If needed, patient has to be started on mechanical ventilation with positive end expiratory pressure.

Hypoglycaemia: This is also less common in children compared to the adults. It may be associated with lactic acidosis in severe falciparum infections. It may present with convulsions, or impairment in the level of consciousness.

Treatment: Intravenous 50% dextrose, 1 ml/kg, should be given followed by intravenous infusion of 10% dextrose. Recurrent hypoglycaemia may occur even during administration of 10% dextrose. Further episodes of drug induced, hyperinsulinemic hypoglycaemia can be prevented by administration of somatostatin analogue octreotide. However, it is very expensive.

Fever: In children, high-grade fever itself can cause various problems and hence should be managed energetically. Fanning and tepid sponging should be used regularly. Paracetamol injection can be used in hyperpyrexia (Sirima, 2003).

2.2 Risk Factors to Malaria

Beyond age, a number of factors influenced the presence of infection or malaria. In explorative univariate analysis, socio-economic parameters, self-reported bed net use, previous treatment which is in adequate or wrong, and infection with drug resistant strains of P. falciparum species, low educational level, absent father, absence of several household assets, a low family income, lacking use of a bed net, intake of Alcohol within the preceding two weeks as been associated with reduction of resistance in an individual and definitely the care of the child as a duty of the parents fails (Saba Ahmed, Yusuf Yahiya, Department of Paediatrics, Dow University of Health Sciences, Karachi).

Malaria can be prevented, diagnosed and treated with a combination of available tools and sustained financing. A comprehensive approach consisting of protective nets, indoor spraying with insecticide, preventive treatment for pregnant women, diagnostic tests, effective drugs, education, research and advocacy is needed to combat malaria. Factors associated with P. falciparum infection and malaria. Malaria also has a devastating economic and social effect as it perpetuates poverty. It is both a root cause and consequence of poverty, burdening endemic countries and contributing to the cycle of poverty. Malaria affects the most isolated groups, such as poor women and children, in the most aggressive manner (Comparative features and outcome of malaria at a tertiary care hospital in Karachi).

2.3 Outcomes of Malaria.

Pathogenic Mechanisms: Disease is usually due to the effects of parasite in blood stream. As the parasites feed they destroy red blood cells and this contributes to anaemia, thrombocytopenia splenic and liver enlargement. The destruction of red blood cells induces pro-inflammatory cytokines such as TNF-α, IL-1 from macrophages.

This cause chills, fever and stimulates further red blood cell destruction. As the parasites multiply they accumulate in the microvasculature of large organs. Red blood cells with mature parasites also adhere to each other and to uninfected red blood cells, leading to the formation of rosettes. Resetting may encourage cyto adherence by decreasing flow leading to anaerobic glycolysis, because of low oxygen, nutrients, low pH facilitates adherence of infected RBCs to venular endothelium. (Steketee, 1996)

Multiplication Capacity: Hepatic merozoites released are approximately 105-6. These invade RBCs. P.falciparum has large capacity to multiply leading to very high parasitemia

Presence of parasitemia in semi-immune individuals as determined by epidemiological surveys requires laboratory techniques possible to recognize also levels of parasitemia in vivo test for therapeutic efficacy as well as in vitro testing to assess intrinsic sensitivity of plasmodium falciparum treatment points to further roles of laboratory in the control of Malaria (Verhoeff, 1999).

Treatment of malaria depends on presentation. That is uncomplicated or complicated malaria. In cases of complicated malaria 1st and 2nd line treatment is used and possible routes include intravenous, intramuscular and oral. There are three principal ways in which malaria can contribute to death in young children. First an overwhelming acute infection, which frequently presents as seizures or coma (cerebral malaria), may kill a child directly and quickly. Second repeated malaria infections contribute to the development of severe anaemia, which substantially increases the risk of death. Third, low birth weight is the major risk factor for death in the first month of life. (MOH 2002) In addition, repeated malaria infections make young children more susceptible to other common childhood illness such as diarrhoea and respiratory infections and thus contribute indirectly to mortality. Children who survive malaria may suffer long term consequences of the infection (Kuile, 2003). The first line drug treatment for malaria has

changed from fansidar to COARTEM' based combination therapy which was to be available in clinics by the year 2005. Hence the MOH recommended the use of amodiaquine where children were to take small amounts than adults (MOH Kenya 2004).

CHAPTER THREE

METHODOLOGY AND MATERIALS

3.0 Introduction

This chapter describes the area of study in geographical terms, location and different tribes of people within the study area, study design and the different methods in which the study was done.

3.1 Study Design

This was a retrospective cross sectional study in which the researcher followed the available records backwards. The following were used, patients files, patients registers for in-patients, health facility monthly report forms, weekly surveillance forms for notifiable diseases and other available document that gave information concerning malaria as a source of information. However the researcher designed a data collection form to suit the study.

3.2 Study Site

The study was carried out in Tiriri health centre IV records department. Tiriri Health Centre IV is a health facility in Soroti district, north eastern Uganda. The health centre is a 100 bed health facility serving a population of approximately 120,000 patients per year and it receives both the inpatient and outpatient cases.

The heath centre is located in Katine Sub County, Soroti County, Soroti district and it is about 28 kilometres along Soroti - Lira road.

Soroti district has a population of about 738,353, 51% female, about 178,987(24.2%) are children under five year of age. The district has an annual growth of 3% (cherryle 1999). Soroti has equatorial climate with heavy rainfall and dry season from the months of May to August each year. The main economic activities are growing crops like Cassava, millet, sorghum, groundnuts and cattle keeping.

The health centre serves patients from Soroti district and it works more like a district hospital. It receives patients from other health centres like Kamuda HC III, Asuret HC III, Dakabela HC III, Gweri HC III and Tubur HC III. Most of the children attending Tiriri Health Centre IV are from families of low socio-economic status mainly comprising of peasant, casual labourers and small scale business people.

3.3 Study population.

The target population were children below 5 years of age coming from different communities within Soroti district who come to seek treatment provided at the health centre. All files which passed the inclusion criteria between May 2013 to May 2014, were collected and counted as the study population. Therefore the number of children with complicated malaria within the twelve months period was taken as the study population base.

3.4 Selection criteria

Files were selected systematically from all the available files that were kept in the health facility store and those that were required were randomly selected while those that were not wanted were left out.

3.5 Inclusion criteria

All files in Tiriri Health Centre IV records department with complete records of children below 5 years with malaria as a main diagnosis.

3.6 Exclusion criteria

All files with incomplete data and Children above 5 years were not included in the study.

3.7 Sample Size determination

Kesh and Leslie formula was used to determine the sample size for the given population greater than 10000. That is; $N = Z^2PQ/D^2$

N = desired sample size when population is greater than 10,000.

Z = Reliability coefficient for 95% confidence level set at 1.96

P = proportion in the target population estimated on characteristic being measured at 50%.

Q = 1-p, = 1-0.5 = 0.5.

D = level of statistical significance set at 0.5.

N = $(1.96)^2(0.5x0.5)/(0.5)^2$.

N = 384.

Due to limited time and resources the study population sample was reduced to 200. Hence file numbers became 200.

3.8 Sampling technique

Systematic random sampling was used to pick the files for the study population using the formula N= (population size/sample size). Where N represents the file picked.

3.9 Ethical considerations:

A letter of introduction to the district stake holders written by the Dean of Faculty of Clinical Medicine and Dentistry was delivered to both the district health officer and the medical officer in-charge Tiriri Health Centre IV seeking clearance and permission to carry out the field study. Issues of plagiarism were put in consideration in order to avoid such offenses and therefore reference to various authors were made for whatever piece of information in this work that was not the authors own work.

Dissemination of findings: Copies of the research report will be presented to Kampala International University Faculty of Clinical Medicine and Dentistry. A copy will also be sent to the in- charge Tiriri Health Centre IV and findings will be presented in conferences and published in journals of biomedical sciences. Confidentiality was

observed on all information gathered. References were made to the exact authors with all their due respect accorded.

3.10 Data collection tools

A designed data form was used to collect data. The form was used to extract raw data from the file records. This form contains the patients' age, gender, complications of malaria, weight of the child; laboratory diagnosis, immediate outcome, prevention methods and the prognosis of complicated malaria (refer to appendix.)

3.11 Data Generation procedure

After seeking permission from the Tiriri records department, all files stored within the twelve months of May 2013 – May 2014 were separated. Files which met the required inclusion criteria were selected for the study. The relevant data from the selected files was entered into the data form until the required sample size was met.

3.12 Data Analysis and presentation

Data was entered into EpiData and was exported to Microsoft excel and SPSS for analysis. Relationship between the risk factors and severe malaria was tested using CHI square. Results were presented inform of tables, charts and figures. A $P< 0.05\%$ was regarded as significant. Correlation between the data was determined using Pearson's correlation.

3.13 Study limitations

Bureaucracy in having access to patients' files, Poor information retrieval system hindered the quality of data. The data obtained could not help to predict the current prevalence and incidence rate and Poor records keeping techniques could hinder data collection.

3.14 Delimitations

The delimitations were overcome by proper training of the four (4) research assistants and pretesting of the data collection form on twelve (12) respondents which was then looked at and seen whether the data collection tool would give eligible data. To overcome the accessibility to Tiriri Health Centre IV the introductory letter was given from the Dean Faculty of Clinical Medicine and Dentistry seeking for permission to access the district premises and Health Centre for the information collection.

CHAPTER FOUR

RESEARCH FINDINGS

4.0 Introduction

This chapter consists of results of data collection, which were analyzed in tables, pie charts and bar graphs. It involved editing, coding and tabulation of data .The data form was edited to ensure completeness, all errors, mismatch, and irrelevancies during data collection and processing were corrected with the help of probing and recalls of files.

Table I: Distribution of the study population

Age groups	1 year	48
	2 years	36
	3 years	72
	4 years	15
	5 years	9
Gender	-Male	121
	-Female	79
Parents' occupation	Peasant farmers.	110
		53
	Casual Labourers.	21
	Small scale-business.	16
	Orphans.	
Preventive measures	Yes	127

No	73

The most affected age group that was received in Tiriri Health Centre IV were children of age range of 1 year to 4 years with those of 3 years being the modal age group. Males were more affected than female and were from caretakers of poor social economic status as most of them were peasants as seen in the table above.

Table II: Distribution of Prevalence of complicated and uncomplicated malaria

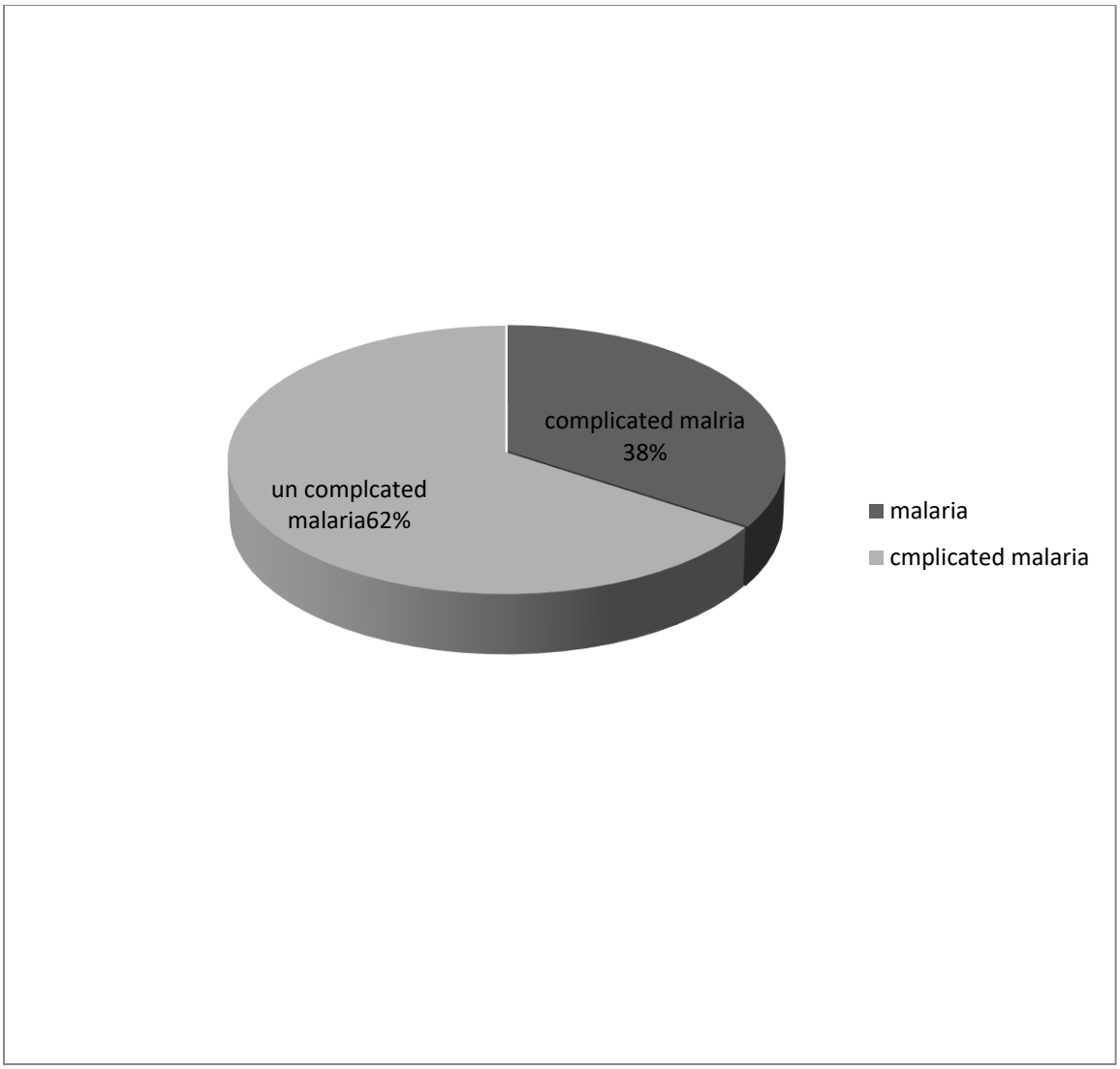
Category of malaria	Total number	Percentage (%)
Complicated malaria	76	38
Uncomplicated malaria	124	62

The table above shows the number of children who presented with complicated malaria in single or combined features like anaemia, convulsions, coma, jaundice and others.

The researcher then compounded these features as a syndrome of complicated malaria for easy data entry and analysis.

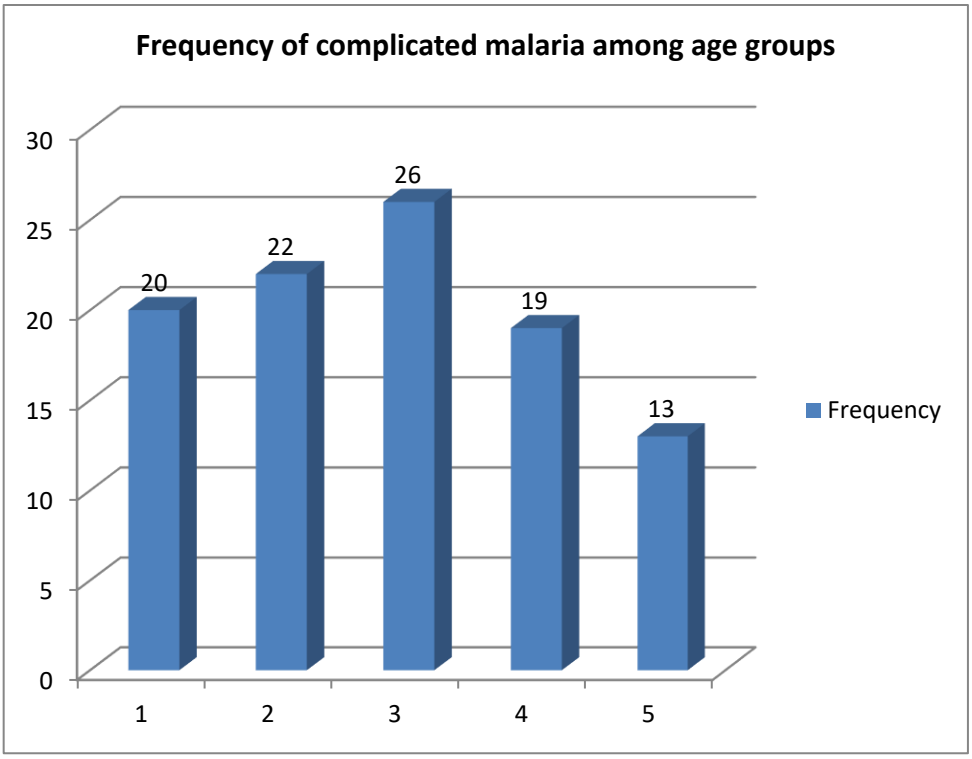
Seventy six (76) children of age five years and below contributing 38% had complicated malaria and 124 suffered uncomplicated malaria. This then represented the prevalence of complicated malaria in Soroti district

FigureI: prevalence of uncomplicated and complicated malaria in Tiriri



The prevalence for complicated malaria in Soroti district as per records of Tiriri Health Centre IV is 38% while that of uncomplicated malaria is 62%.

Figure II Frequency distribution of age

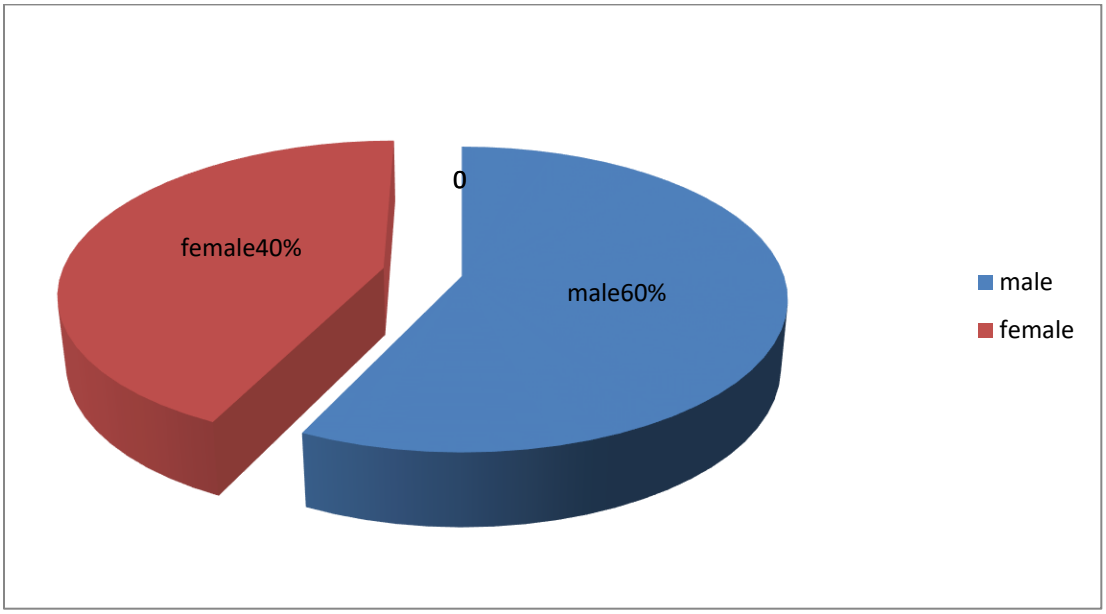


Age					
	Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1	40	24.0	24.0	24.0
	2	44	18.0	18.0	42.0
	3	52	36.0	36.0	78.0
	4	38	07.5	07.5	85.5
	5	26	14.5	14.5	100.0

	Total	200	100.0	100.0	

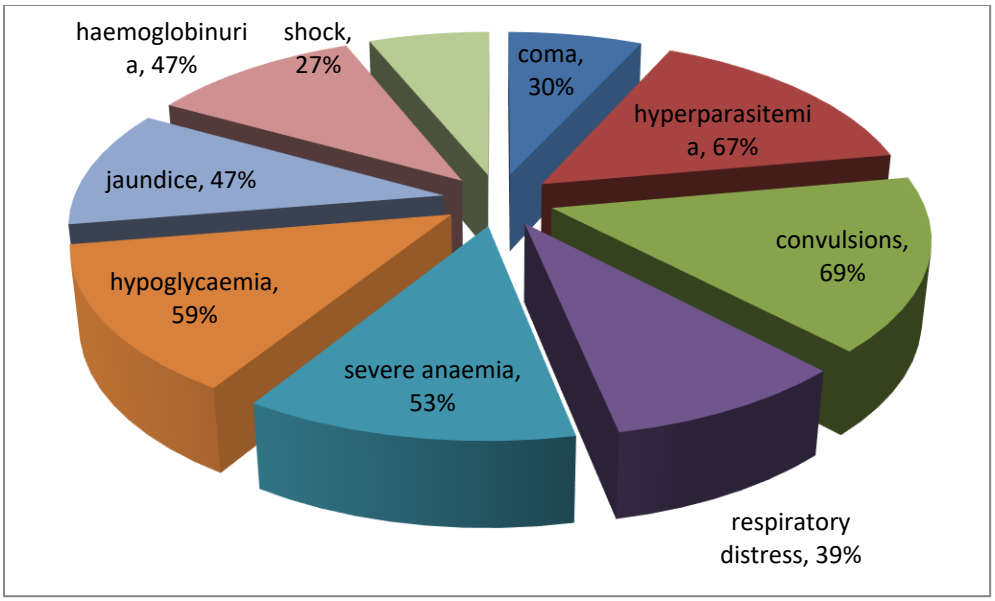
In figure 3 the highest frequency is of malaria (36%) was seen in children around the age of 3years and 24% in children aged 1 year, 18% in those aged 2 years,14.5% for age 5years while the lowest was 7.5% in children of 4years of age.

Figure III: Gender distribution of the cases



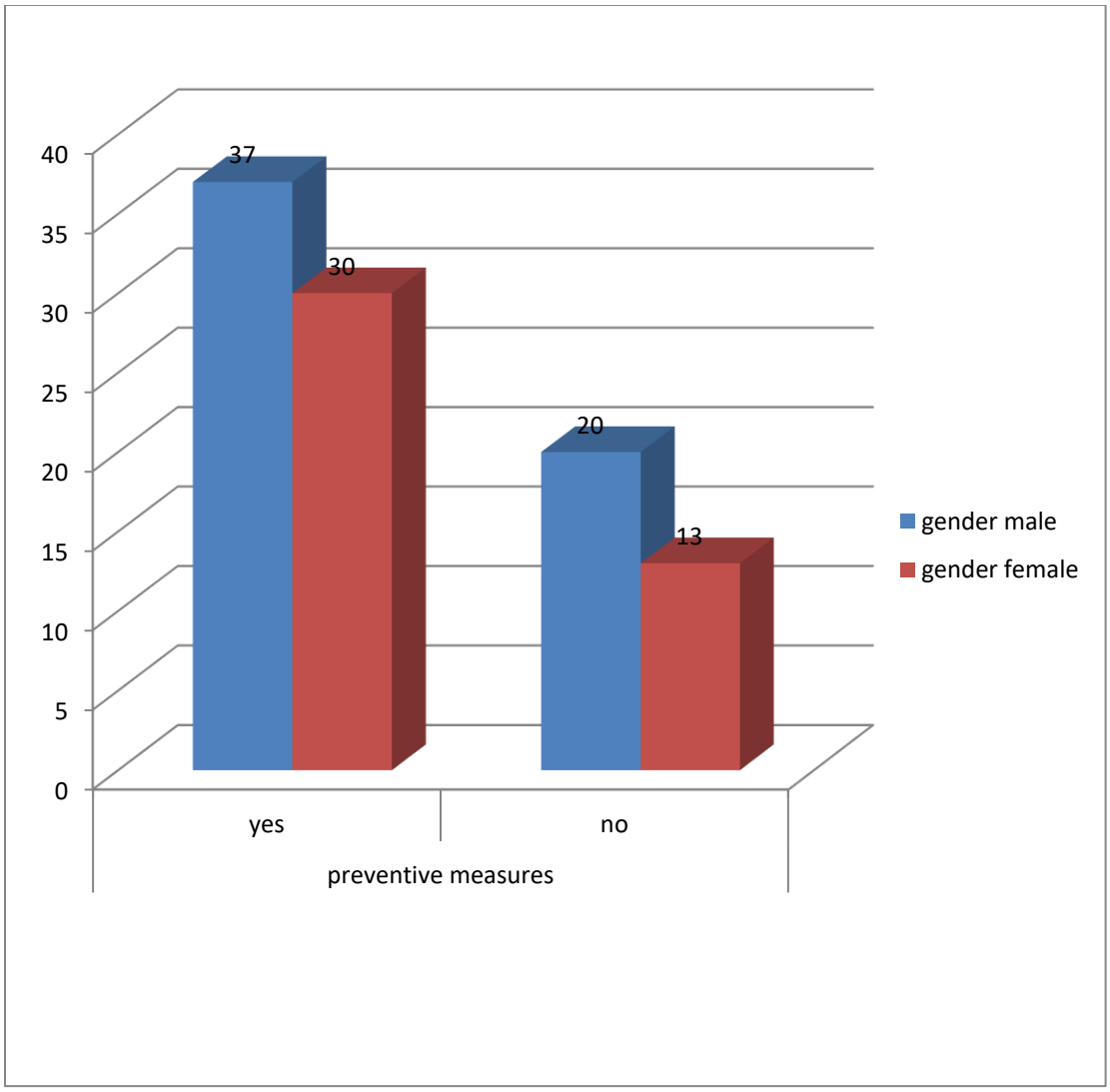
Boys were more affected than girls that is: 60% versus 40% respectively.

FigureIV Frequency of features of complicated malaria



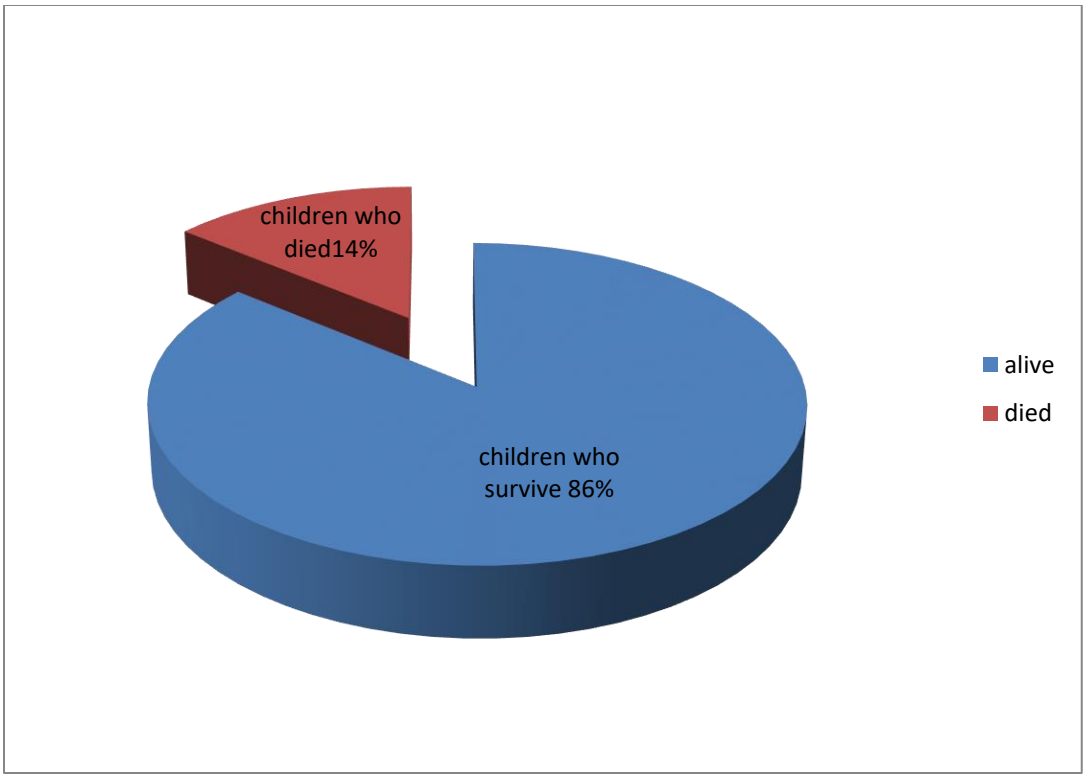
Convulsions of all the complications was the most 69% common while shock was the least common by 27% the others were Hyperparasiteamia 67%, coma 30%, Haemoglobinuria 47%, Jaundice 47%, hypoglycaemia 59%, Severe anaemia 53%, and Respiratory distress 39%. This values are over lapping this is because some children had more than one complication and so there was duplication of the percentages and that give the reason why this figures are more than 100% of the sample size.

Figure V: Cross tabulation between gender and preventive measures



Most male 37% respondents used preventive measures and 20% did not use any prevention as compared to the females who only 30% used preventive measure and 13% who did not use any preventive measures against malaria.

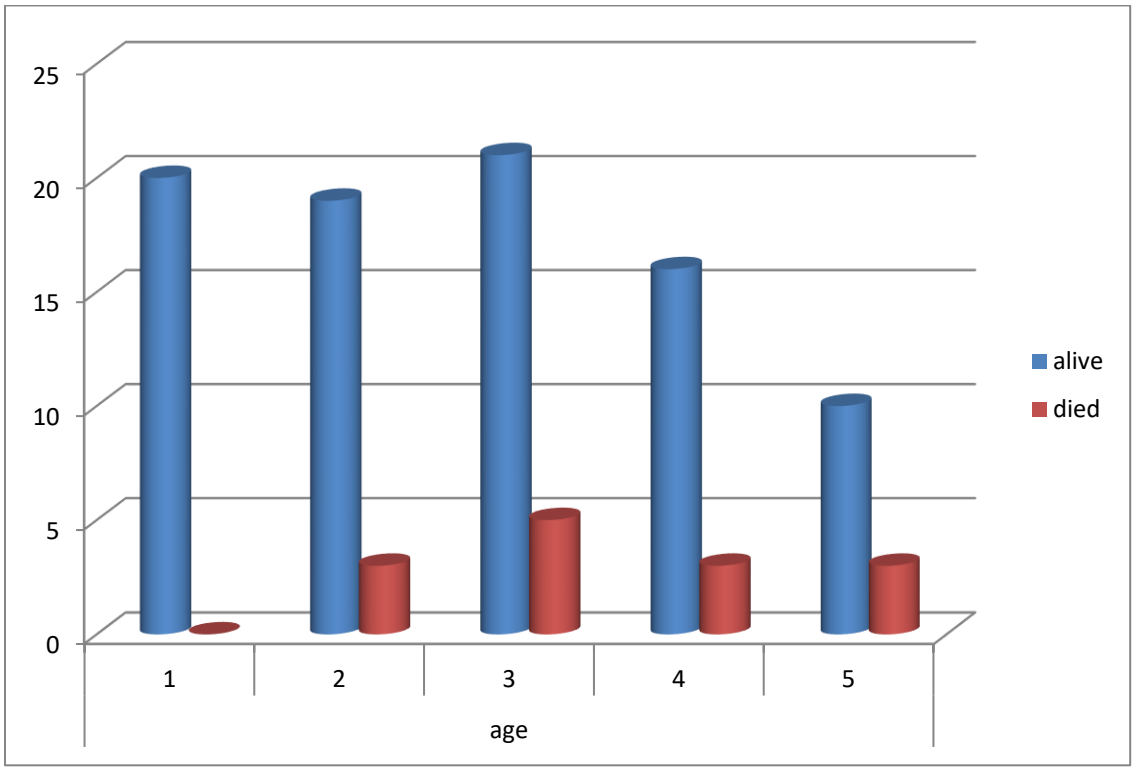
Figure VI: Distribution of immediate outcome



Immediate outcome					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	alive	172	86.0	86.0	86.0
	died	28	14.0	14.0	100.0
	Total	200	100.0	100.0	

The majority of the respondents 86% become well while 14% died of the disease and disease complications.

Figure VII: Relationship between age and immediate outcome

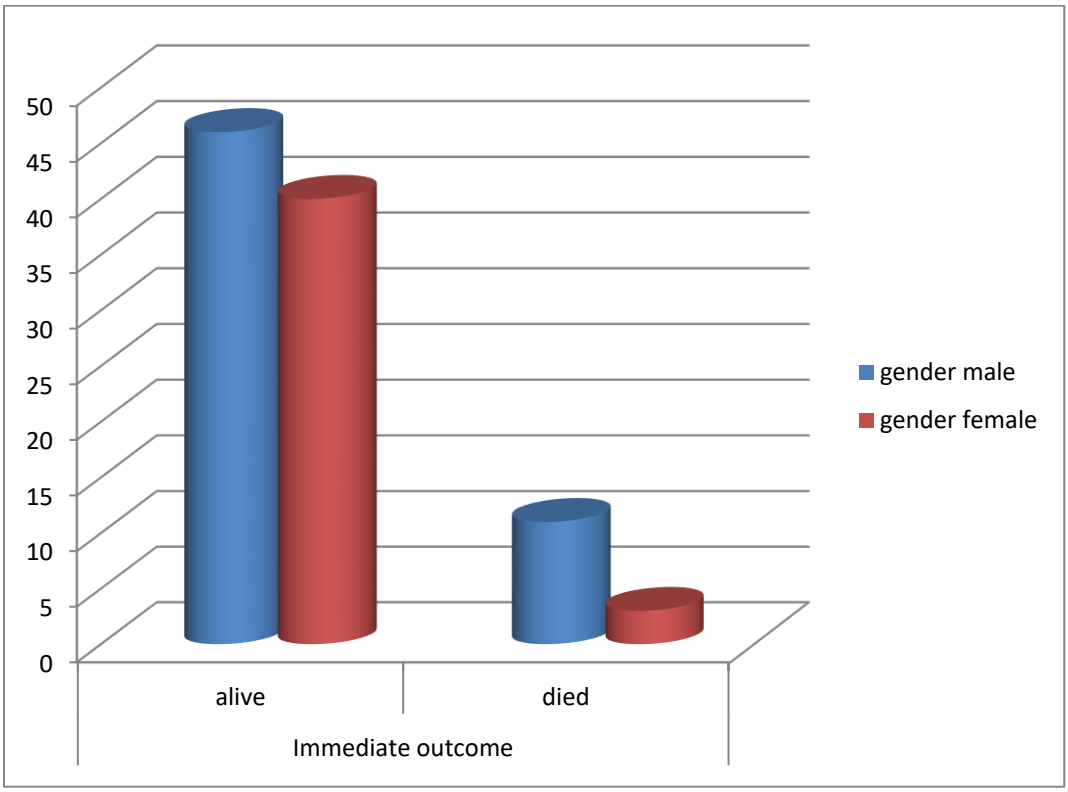


		Immediate outcome		Total
		alive	died	
Age	1	40	0	40
	2	38	6	44
	3	41	10	51
	4	32	6	38

	5	20	6	26
Total		172	28	200

Most of the respondents within the age of three years died 3% while none within the age of one year died due to malaria complications however in all age groups a larger percentage survived as seen on the table and graph above.

1.1.1 FigureVIII: Cross tabulation between gender and outcome



Most males 46% were diseased as compared to 40% females who were diseased and survived the malaria attack, 11% of the boys died and only 3% of the girls died as a result of severe malaria complication.

CHAPTER FIVE

5.0 Introduction.

In this chapter the research findings are discussed in detail and recommendations to the study as per the researcher are put forward here including the conclusions to the study.

5.2 Discussion

Soroti district has a high prevalence rate of complicated malaria at the range of 34% in children less than 5 years.

This was noted after comparing the prevalence of other endemic areas like Ethiopia which had 4.2% (Mitiku,2000) and Kisumu Kenya which was 8.6% as per 2009 (Okumu, 2009).

On the other hand there is high prevalence of malaria in general within the range of 66% at the time of data collection nearly all those files that were meeting the inclusion criteria had malaria.

Of all the cases 24% were under one year of age 18% were between one and two years, 36% of the cases were between two to three years of age, 7.5% were found between three to four years while only 14.5% were between four to five years old.

This indicates that the majority of children between 1 and 2 years got complicated malaria during the study period, this finding may agree with a report (Morat, 2000) which stated that most children under one year rarely get complicated malaria as compared to those above one year this may be attributed to breast feeding which partially boost the immunity of children under one year. (Alessandro, 1999)

From the study findings it was also discovered that most male children (57%) get complicated malaria as compared to female children this may be because male children are always more susceptible to infections than females.

This may be supported by one of the authors (Meramikwu, 2003) who quoted that males had higher risks of fever, including infections transmitted by mosquitoes. Surprisingly, most male cases 37% use preventive measures such as mosquito nets and sprays but still they succumb to the disease more than females and they have higher mortality and morbidity rates.

The likely reason to this may be because the children are not exposed to the infection or infestation therefore they do not develop proper immunity against subsequent attacks and they quickly develop severe malaria. Many literature books, journals and researchers agree that male children are more susceptible to complicated malaria although they give no clear reason as to why. The three most common complications of malaria were convulsions 69%, Hyperparasiteamia 67% and hypoglycaemia 59%.

The reason is because this is an endemic area and may also be probably because the increased number of parasites leads to hyperpyrexia which causes increased metabolic rate depleting the glucose in the body; this is compounded by lack of appetite and poor diet.

Hypoglycemia in conjunction with hyperpyrexia always cause convulsions This agrees with most researchers including research done by world health organization (WHO, 2008) which stated that Hyperparasiteamia and convulsions were the most common complications of malaria. Of the total respondents it was noted that 41% of the cases were never tested for hypoglycaemia this was due to lack of glucose strips and when available, the patients could not afford.

For those who underwent the test males had the highest frequency 18% while age wise infants had the highest frequency of 8% this could be attributed to increased requirements of glucose due to anaerobic glycolysis, increased metabolic demands of febrile illness, obligatory demand of parasites and the failure of hepatic gluconeogenesis and glycogenolysis.

The findings also concluded that the mortality rate of complicated malaria is still high. After the analysis was done 86% become well while 14% died of the disease. This finding agrees with a study done by Pan African health organization (Maurice, 2009) which stated that of 1000 cases of malaria in equatorial region 152 die, this is roughly 16% of the malaria cases. Therefore more attention is needed to reduce this high mortality rate.

The incidence of complicated malaria is more severe in males than female cases and the mortality rate is high in males than females this was concluded after the study showed that most males 11% died as compared to females 6% after an attack of complicated malaria.

This study is supported in a journal written by management science for health in Kenya (Gladys, 2006) which quoted that most male children are easily taken down by complicated malaria than female and their mortality rate is much higher when attacked.

When attacked, males succumb quickly to the disease and if early management is not done then they develop complications like convulsions, Hyperparasiteamia and hypoglycaemia.

5.3 CONCLUSION

In conclusion there is high prevalence 34% of complicated malaria as compared to other endemic regions, and males were more susceptible to complicated malaria accounting for 57% of the study sample while high frequency was also seen in cases between the age group of two to three years. Convulsions, Hyperparasiteamia and hypoglycaemia were the most common features that presented still within the age group of two to three years.

Although most respondents 41% did not test for hypoglycaemia, of the few who tested 59% of the majority were found to be hypoglycaemic.

Complicated malaria has high mortality rate with 14% deaths of the total 200 cases and most deaths were noted in males' dispute the high frequency of preventive measures used.

5.4 RECOMMENDATIONS:

According to the findings of the study, the researcher came up with the following recommendation:

1. There is need to maintain regular health education to the community on the effect of complicated malaria on children by both the government and non-governmental organizations in order to try to reduce cases of complicated malaria.
2. Local authorities should provide insecticide treated mosquito nets to all pregnant mothers and children under five to help in the control of the spread of malaria.
3. Male children are more susceptible to complicated malaria therefore they need special attention in terms of early management and control of the disease.
4. The care givers should be educated about the clinical presentations of malaria in children so that they may take their children to health centres in-case such features present. This will facilitate early management and prevention of complications.
5. Government need to employ more health workers at the same time organize seminars for health workers in order to provide more knowledge to them on how to deal with malaria in pregnancy.
6. Febrile convulsions being the most common cause of death in children should be handled with a maximum priority in bid of saving lives and ensuring healthy growth of children.
7. District local authority should recognise the efforts of Community Based Organisation operating within the district and support them both financially and with other logistic resources to back up the shortages of human resource in the district health system. There is also a need to call for integrated services to identify patients early enough and provide treatment

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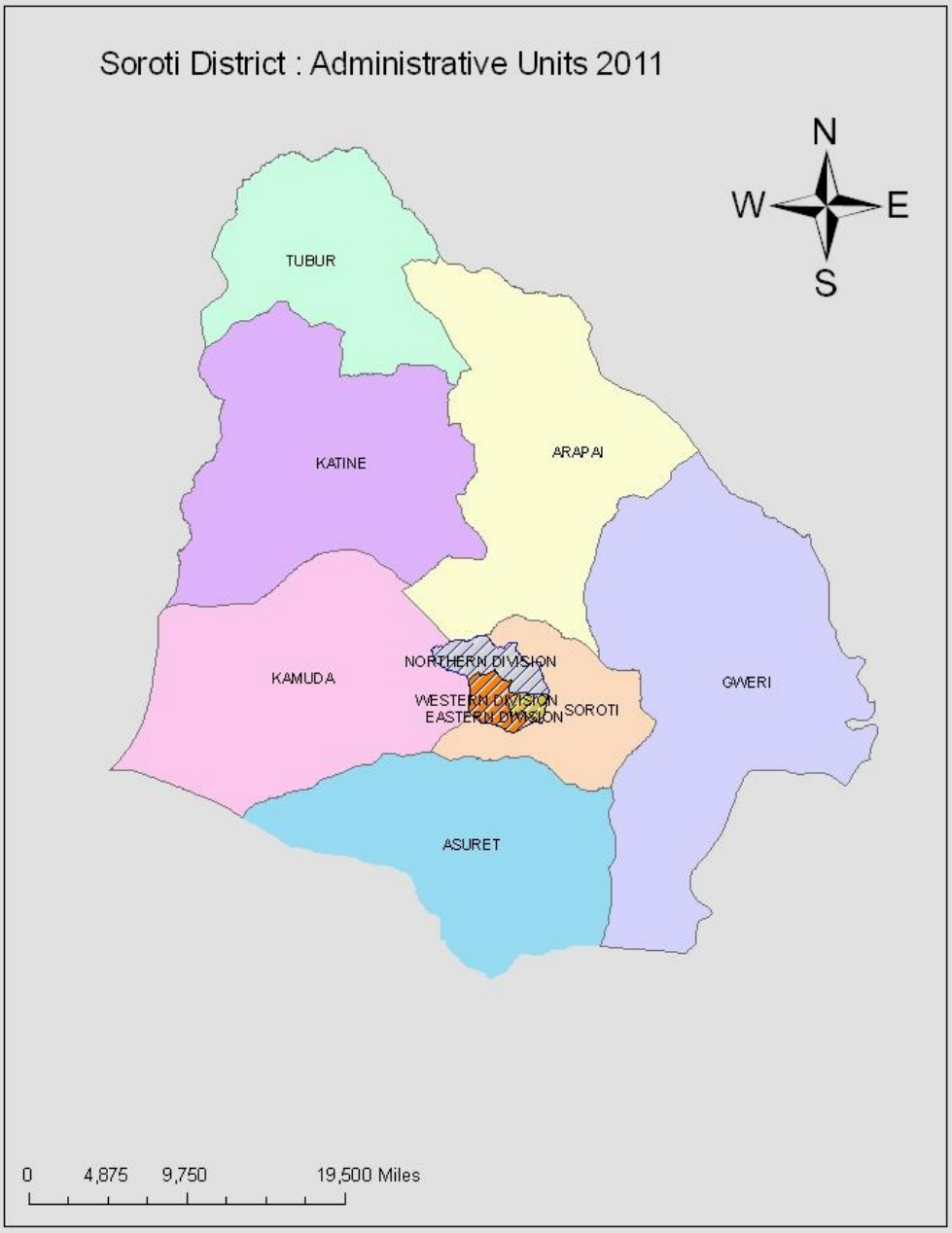
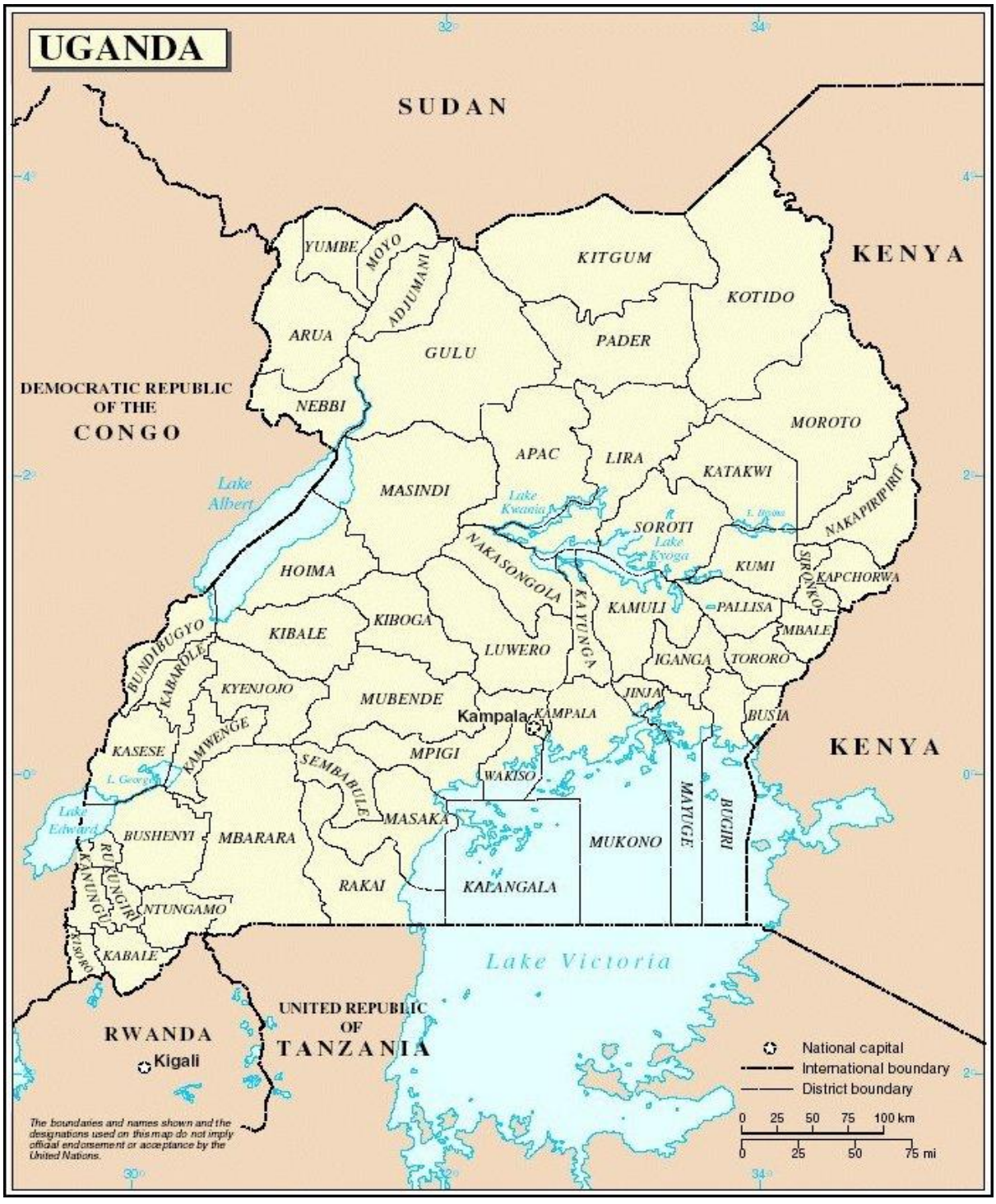
APPENDIX I


Soroti District : Administrative Units 2011
N
W
E
S
TUBUR
KATINE
ARAPAI
KAMUDA
NORTHERN DIVISION
WESTERN DIVISION
EASTERN DIVISION
SOROTI
GWERI
ASURET
0
4,875
9,750
19,500 Miles

APPENDIX II:

MAP OF UGANDA SHOWING OLD DISTRICTS IN THE COUNTRY



APPENDIX III DATA FORM

Serial no.	001		002		003		004		005		006		007		008		009		010	
Age groups																				
½ - 1 years																				
2 -3 years																				
3 –4 years																				
4 -5 years																				
Sex																				
Parents Occupation																				
Weight																				
Laboratory Diagnosis																				
Clinical diagnosis																				
Complications	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Coma																				
Hyperparasiteamia 3+ or 4+																				
Multiple generalized convulsions																				
Respiratory distress(difficulty in breathing, cough, breathlessness)																				
Severe anemia (Hb <5g/dl or Hct < 15%),																				
Shock																				
Abnormal bleeding																				
Jaundice(yellowing of eyes or skin)																				

Haemoglobinuria(tea coloured urine)																			

APPENDIX IV