PREVALENCE OF MALARIA AND ASSOCIATED FACTORS AMONG CHILDREN BELOW 10YEARS ATTENDING PAEDIATRIC CLINIC AT KIUTH

BY

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DECLARATION AND APPROVAL

I BUSINGYE FAITH, declare that this report has not been submitted to any institution for any academic award

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This research report write up has been prepared under supervision and approval of my supervisor

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LIST OF ABBREVIATION

ITN	Insecticide Treated Net
MOH	Ministry Of Health
UNICEF	United Nations International Children's E mergence Fund
WHO	World Health Organization
KIUTH	Kampala International University Teaching Hospital
UMoH	Uganda Minisrty of Health
RDT's	Rapid Diagnostic Test
SAHS	School of Allied Health Sciences
BS	Blood smear

ABSTRACT

Introduction: Malaria is considered one of the global health problems causing close to a million deaths each year. Ninety percent of these deaths occur in Sub-Saharan Africa and 70% of the deaths are of children under 10 years of age. Malaria is the leading cause of outpatient, inpatient and admissions of children less than ten years of age at health facilities in Uganda. Uganda's high rates of malaria disproportionately affect young children below 10 years and pregnant women in rural areas who experience extreme poverty, limited access to healthcare services, and lack of education.

Objective of the study: To determine the prevalence of malaria and associated factors among children below 10years attending paediatric clinic at KIUTH.

Methods: Descriptive Cross-sectional study design was used. Data was collected using questionnaire and Malaria prevalence was captured used microscopy (Blood smear)

Results In this study population, 65% of patients tested with blood smear turned positive while the minority 35% turned negative, females 55% were more affected than males 45%. The majority of the patients presented with more than one clinical signs and symptom, though the biggest number of children had fever and hyperpyrexia 90%, 88% had no appetite and the smallest population had cerebral malaria 3%.

Conclusion: Malaria is high as 65% and most affected children range between 12-60months, 55% were much affected as compared to males 45%. Over 89% of children presented with hyper pyrexia

Recommendation: There is need to scale up sensitization of communities on malaria at all levels in Bushenyi District. Also there is need to screen all children for malaria on monthly basis for prevention purposes.

CHAPTER ONE

INTRODUCTION

1.0 Background of the study

Malaria is considered one of the global health problems causing close to a million deaths each year. Ninety percent of these deaths occur in Sub-Saharan Africa and 70% of the deaths are of children under 10 years of age (WHO 2012). Malaria is the most important parasitic disease of man. Approximately 5% of the words population is infected. Malaria remains one of the major threats to public health and economic development in Africa. It is estimated that three million death results from malaria throughout the world, with Africa having more than 90% of this burden (Breman, et al 2004). Malaria is the leading cause of outpatient, inpatient and admissions of children less than ten years of age at health facilities in Uganda (UMoH, 2012). The high burden of malaria in Uganda this is due to the fact that, every year 14-18 million new malaria cases are reported although studies have been conducted elsewhere, no such study has been done at KIUTH.

Malaria is the most important parasitic disease of man. Approximately 5% of the words population is infected. Malaria remains one of the major threats to public health and economic development in Africa. It is estimated that three million death results from malaria throughout the world, with Africa having more than 90% of this burden (Breman, et al 2004). .

Malaria is the leading cause of morbidity in Uganda with 95% of the population at risk and it it kills between 70,000 and 100,000 children every year (MOH, 2015).

Children under the age of ten years are among the most vulnerable to malaria infection as they have not yet developed any immunity to the disease. In order to apply successful intervention to eradicate malaria, there is continuous need to understand the epidemiology and risk factors associated with the disease .There have been few studies done In Uganda at a time (Pullan R, et al., 2010; Clark T, 2008). Most recent studies on malaria in Uganda are hospital based, investigating clinical malaria among young children and pregnant women (Kiggundu et al.,

2013; Idro R et al., 2006). The malaria indicator survey in 2009 was the first nationally representative survey of malaria conducted in Uganda, and the ministry of health plans to carry out this survey every couple of years (MOH, 2009).

1.1 Problem Statement

Malaria is one of leading causes of morbidity among children under ten years in Uganda and is responsible for up to 40% of all paediatric outpatient visits, 25% of all paediatric hospital admissions, and 14% of all child hospital deaths (Lynch KI, Beach R, 2015).

Currently, 95% of the children are at risk, and malaria kills between 70,000 and 100,000 children every year. Uganda's high rates of malaria disproportionately affect young children below 10 years and pregnant women in rural areas who experience extreme poverty, limited access to healthcare services, and lack of education. Malaria has negative health and economic effects, and restricts the productivity of our population. Increased Insecticide Treated Bed Net (ITN) coverage and education, improved access to and delivery of treatment and emergency control of malaria are essential to control malaria in Uganda (Fawole, O.I. & Onadeko M.O. (2012).

1.2 Justification of the study

Despite of the availability of the malaria control measures and intervention, the morbidity and mortality in under-tens is still unacceptably high (MoH, 2006). This study was designed to investigate malaria prevalence and associated factors. The collected data will provide the understanding on the factors that influence the high prevalence of malaria parasite among the under ten year‘s children at KIUTH in Bushenyi District. The information that was collected will be an essential component in the effectiveness of Malaria control and elimination interventions that are currently being scaled up hence it will be used to realign the effectiveness of Malaria control measures so as to effectively reduce malaria burden and achieve elimination in children under ten years.

1.3 Study objectives

1.3.1 General objective

To determine the prevalence of malaria and associated factors among children below 10years attending pediatric clinic at KIUTH

1.3.2 Specific objectives

1. To determine the prevalence of malaria among children below 10 years attending KIUTH Ishaka Bushenyi.
2. To determine the associated factors of malaria among children attending KIUTH.
3. To access signs and symptoms of malaria in children under ten years.

1.4 Research questions

1. What is the prevalence of malaria among the under-ten years at KIUTH?
2. What are the associated factors of malaria among children attending KIUTH?
3. What are the signs and symptoms of malaria in children under ten years?

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Malaria is considered one of the global health problems causing close to a million deaths each year. Ninety percent of these deaths occur in Sub-Saharan Africa and 70% of the deaths are of children under 10 years of age (WHO 2012). Malaria is the most important parasitic disease of man. Approximately 5% of the words population is infected. Malaria remains one of the major threats to public health and economic development in Africa. It is estimated that three million death results from malaria throughout the world, with Africa having more than 90% of this burden (Breman, et al 2004). Malaria is the cause of outpatient, inpatient and admissions of children less than ten years of age at health facilities in Uganda (UMoH, 2012). The high burden of malaria in Uganda this is due to the fact that, every year 14-18 million new malaria cases are reported.

Malaria is the leading cause of morbidity and mortality in Uganda with the world's highest malaria incidence, with a rate of 478 cases per 1000 population per year (Miriam Nanyunja et al 2014). Uganda has the third largest malaria child burden in Africa and the sixth largest in the world. Currently, 95% of children at a highly endemic risk, and the remaining 5% of the country is prone to malaria epidemics (Barofsky, J, and Chase 2013).

Malaria is responsible for up to 40% of all outpatient visits, 25% of all hospital admissions, and 14% of all Child deaths due to malaria are between 70,000 and 100,000 every year, a death toll that far exceeds that of HIV/AIDS (Lock, B.and Well, S. 2011). Additionally, malaria affects maternal morbidity and mortality and is attributed as a direct or indirect cause of 65% of maternal mortality and 60% of spontaneous abortion. Additionally, 15% of life years lost to premature death are due to malaria and families spend 25% of their income on this disease (Lynch KI, 2015).

2.2 Prevalence of Malaria under 10 years.

Malaria is the major cause of morbidity and mortality in Uganda especially in children below 10 years with a high (23 per cent) frequency. The major causes of mortality in this age group is

coupled with a number of malaria related complications in the tropics where conditions favour rapid mosquito multiplication. Many of the children who die from malaria also have malarial anaemia (Kilian AHD 2009).

Children under the age of ten living in rural areas are disproportionately affected by malaria (Cheesbrough M, 2014). Rural inhabitants contribute to 87% of the burden of disease, and nearly half of all inpatient deaths among children under-ten years of age are attributed to malaria. Children have a greater risk of developing severe disease due to a malaria infection than are adults living in the same area. The increased risk of malaria morbidity in children under ten years is due to malaria-related anemia. Children living in rural areas have a higher rate of incidence of malaria but receive less treatment than those living in urban areas (Coluzzi, M. (2011).

Malaria is a major public health problem and cause of suffering and premature death in tropical and subtropical countries (Cheesbrough, 2014). Malaria is, a major cause of illness and death in children. It is estimated that more than one million children living in Africa die yearly from direct and indirect effects of malaria infection (Fawole & Onadeko, 2012). This preventable disease has reached epidemic proportions in many regions of the world and continues to spread unchecked (WHO, 2012).

African children under ten years are most at risk of malaria. Fatally afflicted children often die less than 72 hours after developing symptoms. In those children who survive, malaria drains vital nutrients from them impairing their physical and intellectual development (WHO, 2012). Malaria infections represent substantial social costs due to school absenteeism and reduced economic productivity. Malaria costs Africa up to US $12billion annually. A poor family living in malaria affected area may spend up to 25% or more of its annual income on prevention and treatment of malaria (WHO, 2010).

The Plasmodium species responsible for malaria infections in Uganda are Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale. Over 80% of malaria infections are caused by P. falciparum while up to 15% are caused by P malariae and less than 5% are caused by P ovale infections. Mixed infections with P. falciparum are common (Uganda Ministry of Health 2012). Coluzzi, M. in 2011 in a study conducted in three hospitals and a Nursery School in Busia on prevalence of Plasmodium infections in children under ten years,

discovered that out of 400 children, 233(58%) were positive and only Plasmodium falciparum were found. Among the positive cases 85.5% were observed in age group 5 - 10 while 33% was in 0-4 years indicating that the prevalence of Plasmodium infections among under 10 children is significantly affected by age.

Sex in their findings did not affect prevalence rate. There is evidence that Anopheles mosquitoes are likewise becoming better adapted to the breeding site in Kampala slums (Gilles H.M. (2013). Transmission of malaria is intense and stable in Uganda because the intensity of attack remains constant throughout the year or from year to year. The degree of endemicity of malaria measured is based on the spleen rate in children aged 2-9 years as published by W.H.O. (2011) in their order of severity. Hypoendemic malaria occurs when spleen rate in children is less than 10%. Mesoendemic malaria occurs when spleen rate in children is 11-50%. Hyperendemic malaria occurs when spleen rate is 75% in children and > 25% in adults. Holoendemicmalaria (Mbanugo J.I. and Ejim D.O 2010).

2.2 Factors associated with malaria under ten.

Numerous studies have been conducted globally that describe socioeconomic, socio-demographic, and environmental risk factors associated with malaria and malaria-related knowledge, perceptions, and prevention practices (Mabaso et al 2007) Seasonality, irrigation, farming, poverty, education, house construction, distance to water bodies, and the location of residences have all been linked to malaria transmission; proximity to health clinics, perception of risk, assets, and education have been shown to be important determinants of ITN use and personal protection practices against malaria. Net use and personal protection have also been linked to simple avoidance of mosquitoes, irrespective of knowledge of malaria risk (Agyepong & Manderson, 2009).

2.2.1 Human related factors

There is a large amount of data on malaria related morbidity and mortality in children under 10 years (Menard et al, 2010) suggested that, the risk of infection and its severity is lower in the first few months of life. Reasons for this are complex but probably include transmission of protective antibodies across the placenta, the presence of red cells containing Hbf – which are relatively resistant to malaria infection, breast feeding, lack of exposure and the protective effect of

maternal antibody is likely to be less when effective malaria control is achieved and the overall level of malaria infection declines (Hviid, & Staalsoe T.2004).

In lower transmission settings clinical malaria is spread more widely across the age groups. In such settings, occupational issues may become more important than age; this is especially true where mosquitoes which transmit malaria bite outdoors away from dwellings. Forest workers in south-east Asia are one example of this phenomenon (Erhart et al, 2004). In these settings young adults, especially males, may be more at risk than children; because they are the group at most risk from being bitten by forest dwelling vectors (Dysoley et al 2008).

2.2.2 Gender

Evidence of biological differences between boys and girls in acquiring malaria is very limited; however the evidence of sex differences is accumulating. The literature on gender differences in malaria relates mainly adults like women during pregnancy, occupational risks (e.g.: forest workers) and care-seeking behaviors. (Desai et al 2007) Reported gender differences with regard to increased risk of infection and impact of malaria on individuals largely focus on girls and women; however, there is some evidence that suggests that in some countries boys have increased exposure because they spend more time sitting outside in the evenings during peak mosquito biting times (Vlassoff & Bonilla 2004) and that some male-dominated types of work lead to increased exposure. For example, agricultural work extending to the evenings or sleeping away from settlements may raise risk, or boys spending long time in tropical grazing areas where they can get more exposed to mosquito bites than girls especially in forests, which makes boys generally more vulnerable than girls (Incardona et al 2007).

2.2.3 Knowledge on malaria

A number of studies have investigated differences in knowledge and reported health seeking behavior between men and women. Most found either no difference or those women had more limited decision-making and financial power to act? This was associated with failures and delays in seeking treatment, with differential understanding of malaria between men and women, and differential health-seeking behaviour. Women delayed seeking care until men were available, while men were less willing to spend on child health (Al-Taiar et al 2009).

.These differences are critical when considering the main child-caring role of women and children‘s increased vulnerability to malaria. Some other studies that were done by (Magesa et al., 2005) reported that knowledge of the problem; affordability and accessibility are among major obstacles for the ITN ownership and use. Net ownership has also been related to the educational levels of household members. This is a complicated relationship since educational attainment can have the impact on an individual‘s ability to understand and access information regarding malaria prevention methods. In Malawi it was found that net ownership was less common in households where the head/caretaker had not completed primary school and in homes where the house had mud walls or a grass roof (Holtz et al., 2002). This is being supported by (Nuwaha, 2001) with an evidence that educational attainment is associated with malaria-specific knowledge and uptake of preventive measures.

2.2.4 Health education

Communication is one of the key components in malaria control and prevention. Serious obstacles in most disease control strategies include lack of effective health information, education, and communication programs. Community and health providers need to understand the problem in all its relevant aspects, as well as be aware of the options available for improvement (Mboera et al, 2007).This means it is important for health providers and communities to appreciate the epidemiologic and technical dimensions of the malaria problem as well as the factors that affect whether particular control options will be feasible, technically possible, socially acceptable, environmentally friendly, and politically advantageous. For individuals and households, effective health communication can help raise awareness of health risks and solutions to provide the motivation and skill needed to reduce these risks, help them find support from other people in similar situations, and affect.

2.2.5 Socio-economic factors

Socioeconomic conditions of the community have direct bearing on the problem of malaria. Ignorance and impoverished conditions of people contribute in creating source and spread of malaria and hinder disease control strategy. This was also evidenced by (Filmer 2002) that high costs of malaria treatment may lead to delays in treatment seeking behavior, whereby he found

that the poorest groups in a society did not seek care as much as the non-poor, and did so at lower level public facilities.

Economic inequities in areas such as the control of household resources also affect access to ITNs. In one study in Benin, many women explained that since they were financially dependent on their husbands, they were unable to purchase an ITN for themselves and their children unless their husbands prioritized the use of bednets (Krause G, *et al* 2000)). The study also revealed that when women did earn an income and had control over this income, they were much more likely than men to purchase an ITN for their household (Krause G, *et al* 2000).

According to (Makundi et al, 2007) it was reported that the burden of malaria is greatest among poor people, imposing significant direct and indirect costs on individuals and households and pushing households into in a vicious circle of disease and poverty. Furthermore vulnerable households with little coping and adaptive capacities are particularly affected by malaria. Households can be forced to sell their food crops in order to cover the cost of treatment (Wandiga et al, 2006). Depleting household resources and leading to increased food shortages, debts, and poverty for the poorest households. The costs of malaria are highly regressive, with the poorer households spending a significantly higher proportion of their income on the treatment of malaria than their least poor counterparts.

A study found that while the cost of malaria care was just 1 per cent of the income of the rich, it was 34 percent of the income of poor households (Akazili, 2002). This is being supported by studies that were done on the use of ITNs where by It was only recently appreciated that a net treated with insecticide offers much greater protection against malaria. Unfortunately, the commercial price of nets and insecticide is beyond the poorest income groups of the population (World Health Organization, 2003).

Occupational and cultural differences related to undertaking activities likely to lead to malaria transmission; and when malaria is acquired, access to health services is more mixed and varies considerable across different cultural settings.

2.2.6 ITNs availability and efficacy

The use of ITNs has increased markedly over the past few years. Statistics indicate that the proportion of households with at least one untreated net has increased from 14% in 2001 to 58% in 2005. ITNs coverage is estimated to have reached 63% of households with atleast one ITN and 25%b and 26% of children under 5and pregnant women respectively sleeping under an ITN (Day N , 2008). According to the (MoH 2006); report Insecticide-treated mosquito nets (ITNs) used for protection against mosquito bites have proven to be a practical, highly effective, and cost-effective intervention against malaria. This was also supported by (Roll Back Malaria, 2005) which reported that ITNs reduces human contact with infected mosquitoes and have been shown to be an effective malaria prevention measure. In addition to the direct benefit to the individual, ITNs use offers a protective benefit for the entire community (Teklehaimonot et al., 2007).

Studies examining ITN‘s efficacy suggest a significant reduction in malaria episodes. If used universally, ITNs could prevent approximately 7% of the global under-ten mortality (Jones et al, 2003). The UNICEF corroborates that under-ten mortality rates could be reduced by about 25-30% if all young children in malaria endemic areas were protected by treated bed nets at night. This was also evidenced by (Lengeler‘s, 2004) review which demonstrates the efficacy of ITNs in both stable and unstable transmission areas where by it was documented the wide spread use of ITNs resulted in an overall reduction in mortality of 19 percent, protected against anemia, and had a substantial impact on mild disease episodes. Another One large-scale rural study Tanzania found that ITNs and untreated nets reduced mortality of children one month to four years, with protective efficacies of 27 and 19 percent, respectively **(**Armstrong and Schellenberg, 2002).

Hill et al wrote in 2006 that despite of all these efforts and its efficacy, only 3% of African children sleep under these treated nets while only about 20% sleep under any other kind of nets. This however may account for the high rate of mortality amongst children due to malaria and its related problems. Despite the evidence that the use of ITNs decreases malaria-related morbidity and mortality, the use of ITNs in sub-Saharan Africa remains relatively low (Lafferty K, 2009).

ITN ownership and use

A number of authors have described the relevance of social, cultural and economic research for understanding the views of the population on the transmission, diagnosis, treatment and prevention of malaria and the issue examined in several studies are the differences in people's socio-economic status in relation to net use (Day N 2008). Clearly, net ownership is a necessary prerequisite for net use. However, whether or not a net owner will use a net every night, some nights, or not at all depends on complex multi-level interactions between individual characteristics, household characteristics, social and cultural factors, community-level factors, aspects of the physical environment and characteristics of the net itself.

In addition, several studies reveal that even when access to ITNs is expanded, many households do not use them. This was reported in western Kenya that even when nets were given away for free, approximately 30% of them were unused likewise, in southern Tanzania, a year after free net distribution, nets were found stored in their bags and had not been utilized by a number of households (Alaii et al, 2003).

It has been also stated by (Minakawa et al, 2008) that Although ITNs are the most cost effective interventions against malaria, some unforeseen consequences of distribution of nets have been reported. Nets have been used for drying fish and for fishing among residents of fishing villages along Lake Victoria. The main reasons were that the bed nets were cheap or free and that fish dried faster on the mosquito nets. This was also supported by a study that was done in Kenya of which showed that villagers were using their nets for fishing rather than malaria prevention (Minakawa N et al 2008).

2.2.7 Physical environment/housing condition

Physical environment determines appropriate ITN use, this was according to (Toe et al, 2009) who found out in their study that the perception that a limited space in the house cannot contain the nets, the obvious problem of having a bulky product suspended in the middle of a room, having to perform some routine functions of hanging and removing nets every morning and evening because some people sleep in kitchens, halls and living area. Besides people cannot be

allocated sleep space together just because some vulnerable children must sleep under bed nets. This becomes a hindrance to appropriate ITN use.

Furthermore major urban centers, experiencing rapid and unplanned population growth due to intense migratory movements, face serious problems with sanitation, overcrowding, poor housing, pollution, lack of food, and inadequate water. This combination of conditions is conducive to transmission of vector-borne diseases (malaria, dengue, filariasis) and tuberculosis. Poorly maintained water supply, sanitation, and drainage systems contribute to the transmission of malaria by providing potential breeding areas for mosquitoes. The relative impact of this depends on the local mosquito vectors, but some impact is found in almost all countries. Even in Africa, where important vectors are broadly less selective with regard to breeding sites; this can play a role in both urban and rural settings (Well, S. 2011).

Restoring, cleaning and maintaining the drainage network and introducing an effective system for solid waste management (to stop solid waste collecting in draining channels) may be important for vector control (Amoatey PK *et al* 2008) Pools of stagnant water can be eliminated by repairs or improvements to the water supply system; soak pits can be built to remove water accumulating around stand pipes; and cisterns (water tanks) can be covered with mosquito nets or lids.

2.2.8 Environmental factors/climate

Climate and environmental conditions greatly affect the transmission and incidence of malaria, by influencing primarily the abundance and survival of vectors and parasites, and also exposure of humans and other hosts (Lafferty, 2009). The most important environmental factors for malaria transmission have to do with conditions for *Anopheles* mosquito breeding and survival – water in which they can breed, and minimum temperatures and humidity to allow them to survive long enough for the vector stage of the parasite‘s life cycle to be completed – usually about ten days

These factors are influenced by climate, as well as by topography and soil conditions, drainage, vegetation cover, land use and water – all of which vary greatly depending on local conditions. As such, changes in climate and land use such as water management, agriculture, urbanization,

and deforestation can lead to significant increases or decreases in malaria transmission, depending on local contexts (Reiter P.2001).

Some agricultural practices facilitate the spread of vector-borne diseases. Also, the presence of cattle in marshy areas results in the creation of hoof prints that potentially offer ideal conditions for mosquito breeding.

Within man- made malaria, excluding the migration of non-immunes to endemic areas, the most important impacts on transmission are probably brought about by water resource development and land use change. Human modification to the environment also can create larval development sites and malaria (Denise et al, 2003).

2.3 General Signs and Symptoms of Malaria

The clinical features of malaria are notoriously nonspecific, especially in children. Frequently, disease presents as a flulike illness with fever, chills, rigors, headache, and myalgias (Shepard DS *et al*., 2011).

Vague prodromal symptoms may occur before the development of acute paroxysms of high fever and chills. In primary episodes, classically described periodic fever patterns typically are not observed unless the illness is left untreated for many days (Ettling M*et al*., 2010). Gastrointestinal and respiratory symptoms also are common developments, especially with falciparum malaria in children. A study in Nigeria found that vomiting and abdominal pain is the most common gastrointestinal complaints in children, followed by decreased appetite and diarrhea. Because these symptoms also are characteristic of an acute gastroenteritis, they may mistakenly be identified as such, particularly in non-malaria endemic areas with returning travelers (SvensonJE *et al*., 2015).

Physical examination commonly reveals fever, tachycardia, and tachypnea. Hepatosplenomegally is a very common finding in chronically or recurrently infected children residing in highly endemic areas and commonly is detected in children migrating as immigrants and refugees from these areas (Ettling M*et al*., 2010). Jaundice, pallor, and altered mental status also may be noted and are associated more commonly with P. Falciparum infection. Typical laboratory findings include anemia, leukopenia, thrombocytopenia, and an elevated bilirubin.

Hypoglycemia also is seen frequently with falciparum malaria in children and can be the cause of severe morbidity or mortality. Hyponatremia, elevated liver enzymes, and prolonged prothrombin times also are observed frequently (Carter R and Mendis KN, 2012).

Infections with P.vivax and P. ovale can be debilitating but typically are not fatal. Fevers can be very high and incapacitating, but parasitemia levels generally are limited to less than 2 percent, as these parasites prefer young red blood cells (reticulocytes). Tender splenomegaly and anemia are common findings in patients with chronic or recurrent disease caused by P. vivax. Relapses frequently occur months to years after the initial infection unless appropriate treatment to eradicate the hepatic phase of the parasite is administered (Packard RM, 2009).

Interestingly, certain serotypes of P. vivax appear to have variable responses to treatment of the intrahepatic hypnozoite stage with primaquine, and rates of cure with treatment have been reported to range from as low as 30 percent to in excess of 80 percent.

Infection caused by P. malariae usually is mild, and the parasite generally is considered a commensal organism. However, chronic infections are typical, with disease recrudescences occasionally occurring as many as 30 to 50 years after initial infection. Chronic infection with P.Malariae also has been associated with nephrotic syndrome, which classically does not improve with malaria chemotherapy Specific Issues With Falciparum Malaria (Svenson JE *et al*., 2015).

Through this mechanism, vital organs such as the brain and kidneys may suffer impaired oxygen and nutrient exchange, which may manifest clinically with such symptoms as impaired consciousness, respiratory distress, and renal dysfunction. In addition to ischemic end-organ sequelae, infection with P. falciparum also leads to release of inflammatory mediators, such as cytokines and tumor necrosis factor, which are largely responsible for the pathophysiology of the disease. For example, abnormal macrophage activation and cytokines may be associated with heightened severity of disease and mortality (KainKC*et al*., 2008).

The clinical epidemiology of malaria is fascinating and unique. Clinical patterns of malaria vary depending on the intensity of malarial transmission. In some endemic areas termed holo- or hyperendemic areas, people may receive as many as three infective bites during a 24-hour period, and malaria is present constantly throughout the year.

In these areas, children between 1 and 3 years of age receive the brunt of clinical disease and generally manifest infection with severe anemia. As transmission becomes less intense or more unstable (seasonal), the spectrum of disease expands and begins to include cerebral malaria, which predominates in older children and extends into adults. An interesting note is that even in areas of intense transmission, infants rarely manifest clinically relevant disease, possibly because of retained maternal antibodies and the inhospitable environment that fetal hemoglobin confers against the parasite (Najera JA, 2011).

The clinical scenarios of severe malaria with P. Falciparum in children include coma, respiratory distress, marked anemia, and acidosis. The presence of impaired consciousness and respiratory distress have been shown to be associated with a high risk of death.

Frequently, laboratory evaluation in severe malaria also reveals hypoglycemia, which is postulated to be secondary to increased metabolic rate and direct inhibition of gluconeogenesis by the parasite It may be exacerbated further by the hyperinsulinemic effect of the antimalarial chemotherapeutic agents quinidine or quinine.

Cerebral malaria is a common complication of infection with P. falciparumin children. It is characterized by altered consciousness in a patient with falciparum parasitemia in which no other cause can be elucidated. Neurologic manifestations range from a mildly depressed sensorium to a deep Pediatric malaria in the developing world coma. Opisthotonic posturing and focal motor deficits also may be apparent. Mortality rates with cerebral malaria are estimated to range from 7 to 50 percent and are highly dependent on resources, appropriateness of treatment, and ability to give supportive care. Studies have demonstrated that prolonged coma, convulsions, hypoglycemia, and acidosis are predictors of death (Asenso-Okyere, 2016).

Studies also have attempted to deduce predictors of neurologic sequelae related to cerebral malaria. The depth and duration of coma and multiple convulsions were found to be the only three independent risk factors in one large prospective study in The Gambia, West Africa. The most common neurologic abnormalities identified in the study were ataxia and paresis, which had resolved in the majority of patients (Ettling M *et al*., 2010).

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study was carried out in Kampala International University- Teaching Hospital which is situated in Bushenyi District in the Western region of Uganda. The hospital has a bed capacity of 500 beds. It has outpatient, accidents and emergencies, in patient, theatre, special clinics, psychiatry and intensive care departments but the data was collected on peaditric clinic in out-patient department and laboratory records to determine those with positive tests for malaria.

3.2 Study design

Both descriptive and analytical Cross-sectional study design was used. The former was used to study prevalence while the later was used to study associated factors.

3.2 Sample size determination

Sample size was calculated basing on the prevalence of malaria among the under-ten in a study conducted by Kilian AHD in 2009 about malaria morbidity and motility in Uganda. The prevalence considered is 23%.

The sample size is calculated from the following formula

$$\mathbf{N = z^2 p\,(1\text{-}p)\,/d^2}$$

Where: N- Total number of subjects required in the sample

Z= a standardized normal deviate value that correspond to a level of statistical significance equal to 1.96

P= estimate of prevalence of malaria in children under 10 is 23% ((Kilian AHD, 2009.)

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

$N = 1.96^2 \text{ X } 0.23 \text{ X } (1\text{-}0.23)/0.05$

N= 272;

3.3 Study Population

The study population was obtained according to selection criteria i.e. inclusion and exclusion criteria. A population of 100 respondents will be used

3.4.1 Inclusion criteria

All Children below ten years who present with signs of malaria to the peadiatric outpatient department of KIUTH between the months of March and April 2017; these children had lived in Bushenyi for the last 6 months.

Informed consent was used to participate in the study.

3.4.2 Exclusion criteria

Those patients found not to be in the right state of mind such as the critically ill or those with mental disorders were not enrolled into the study

3.5 Sampling method

Consecutive enrollment of participants was used.

A simple random sampling design was employed as the sampling method to avoid bias in the study. Two lots of folded papers containing a yes and a no was made, and randomly distributed to the attendants or mothers who will have brought, those who would pick a yes were asked to be enrolled in the study thereby asking consent from them. The exercise was repeated up to when a desired population will be reached

3.6 Data analysis

Data was collected from the hospital laboratory record book to determine the proportion of children who had positive slides for *Plasmodium sp*. A structural questionnaire was used to collect data about the socio demographic characteristics of the study participants.

Prevalence and complications of malaria was assessed using proportions and associated factors assessed by using Odds ratios through logistic regression. STATA version 12 (Stata-Texas) was for all analyses.

3.7 Quality control.

The questionnaire was benchmarked with the variables from other similar studies. Also RDTs and Blood slide were examined by experienced laboratory technician.

3.8 Ethical considerations

Permission to conduct research was sought and granted by SAHS administrator and the KIUTH. A written consent to participate was sought from each respondent before the questionnaire was administered.

3.9 Limitations

Some patients not willing to participate in the study were minimized by thoroughly explaining the purpose of the study and assured of confidentiality for all the information, views and comments that would be obtained from them and this could take more time.

CHAPTER FOUR:

RESULTS

4.1 Socio-demographic characteristics of study participants of children attending pediatric clinic at KIUTH

In this study population, females were the majority comprising 55% and the majority of the participants had not gone to school 39%.

Most of the parents were peasants as much as 37% and the majority of the children were aged between 12 – 60 months.

About 54% of the participants were married and 40% were Catholics, a very small fraction, 5% were of Bishaka religion as shown in the table 1 below.

Table 1: Socio-demographic characteristics of study participants of children attending pediatric clinic at KIUTH.

Variable	Frequency	Percentage
Sex		
Male	45	45
Female	55	55
Education level		
None	39	39
Primary	30	30
Secondary	25	25
Tertiary	06	06
Occupation		
Student	5	5
Business	20	20
Housewife	26	26
Peasant	37	37
Civil servant	12	12
Age in months		
0-2	15	15
3-11	20	20

12-60	44	44
61-120	21	21
Marital status		
Single	28	28
Married	54	54
Widow	18	18
Religion		
Catholics	40	40
Protestant	35	35
Moslem	15	15
Pentecostal	7	7
Bishaka	3	3

Table 2: showing result of a blood smear.

Investigation(blood smear)	**No.**	**Percentage**
Positive	65	65
Negative	35	35

65% of patients tested with blood smear turned positive while the minority 35% turned negative.

4.2. Associated factors of malaria among children attending paediatric clinic at KIUTH

Table 3: Causes of malaria among children attending paediatric clinic at KIUTH.

This study revealed that mosquitoes were the major cause of malaria in under tens comprising of 85% and most homes were constructed proximal to farming areas 80%.

Most windows had no screens 85% and majority of the respondents used nets mostly in rainy season 67% and to small population 13% used nets in dry season as shown in the table below.

Factor	**Frequency**	**Percentage**
Mosquito	85	85
Unboiled water	5	5
Witch craft	7	7
Don’t know	3	3
Housing Environment		
Proximal to pounds	15	15

Clean environment	5	5
Proximal to farming	80	80
Structure of rooms		
There is bottoms for hanging nets	35	35
There is no bottoms for hanging nets	21	21
The is no space for hanging nets	44	44
Methods used for prevention		
Use of ITN	60	60
Environmental cleanliness	1	1
Destroying bleeding sites	2	2
Use of antimalarials	20	20
Use of traditional remedies	12	12
Use of insect sprays	4	4
Use of repellents	1	1
Source of treatment		
Hospital	68	68
Traditional herbalists	22	22
Self medication	13	13
Others(prayers)	7	7
Windows screen		
Present	20	20
Absent	80	80
Season		
Rainy	67	67
Dry	13	13
Both rainy & dry	20	20
No of nets		
One	56	56
Two	20	20
Three and above	10	10
None	14	14
Current situation of nets		
Good	57	57
Torn	43	43
Treated		
Yes	31	31

No	30	30
Don't know	39	39
Frequency of use		
Always	70	70
Not always	30	30
Source of nets		
From government	65	65
Donation	15	15
Purchase	20	20
Reasons for not using mosquito nets		
Housing structure affect net use	19	19
Absence of nets	7	7
Nets don't prevent malaria	22	22
Afraid of its toxicity	29	29
Weather	2	2
Discomfort	21	21

4.3 Signs and Symptoms of malaria among children attending Pediatric clinic at KIUTH

Table 4: Signs and Symptoms of malaria among children attending Pediatric clinic at KIUTH

In this study, majority of the patients presented with more than one clinical signs and symptom, though the biggest number of children had fever and hyperpyrexia 90%, 88% had no appetite and the smallest population had cerebral malaria 3% as shown in the table below.

Signs and symptoms	Frequency	Percentage
Fever	90	90
Chills and rigors	60	60
Loss of appetite	88	88
Abdominal	65	65
Diarrhoea	71	71
Vomiting	68	68
Joint pain	59	59
Headache	41	41

Heptosplenomegaly	33	33
Conjunctiva and palmar pallor	55	55
Hypoglycaemia	10	10
Cerebral malaria	3	3
Jaundice	22	22
Convulsions	20	20
Respiratory distress	05	05
Anemia	60	60
Dehydration	10	10
Coma	2	2

CHAPTER FIVE:

DISCUSSION

5.0 INTRODUCTION

In this chapter findings of the prevalence of malaria, the possible factors associated, the signs and symptoms of malaria in children under ten years at KIU-TH are discussed.

5.1 THE PREVALENCE OF MALARIA AMONG THE UNDER-TEN YEARS AT KIUTH

In this study population, 65% of patients tested with blood smear turned positive while the minority 35% turned negative which is in line with the surveys conducted by Miriam Nanyunja et al 2014 that concluded that Malaria is the leading cause of morbidity and mortality in Uganda with the world's highest malaria incidence, with a rate of 478 cases per 1000 population per year

The findings also showed that the condition was more prevalent among the children of respondents with low level of education where 39% never went to school and peasants as much as 37%, as shown in table 1 This was also evidenced by Filmer 2002) that high costs of malaria treatment may lead to delays in treatment seeking behavior, whereby he found that the poorest groups in a society did not seek care as much as the non-poor, and did so at lower level public facilities.

The results of the study showed that majority of children 44% attending pediatric clinic were between 12-60 months, 21% were between 61-120 months, this is because most of them are nolonger breast feeding, and therefore lack exposure and the protective effect of maternal antibody and most of them donot sleep under ITN which is in line with Makemba who reported that it was mainly the adult men who used the nets, followed by women and children under two who sleep with their mothers, while elder children were frequently the last to gain access.

More so, the study revealed that females 55% were more affected than males 45% and this an alteration from a reported gender differences with regard to increased risk of infection and impact of malaria on individuals largely focus on girls and women; however, in line with some

evidence that suggested that in some countries boys have increased exposure because they spend more time sitting outside in the evenings during peak mosquito biting times

5.2 THE POSSIBLE FACTORS ASSOCIATED WITH MALARIA AMONG UNDER TEN YEAR

Numerous studies have been conducted globally that describe socioeconomic, socio-demographic, and environmental risk factors associated with malaria and malaria-related knowledge, perceptions, and prevention practices. (Mabaso et al 2007) similarly in this study population, females were the majority comprising 55% and the majority of the participants had not gone to school 39%, most of the parents were peasants as much as 37% and the majority of the children were aged between 12 – 60 months, about 54% of the participants were married and 40% were Catholics, a very small fraction, 5% were of Bishaka religion as shown in the table 1 above.

On the understanding of the illness, Malaria is the most important parasitic disease of man and approximately 5% of the world's population is infected. Malaria remains one of the major threats to public health and economic development in Africa. It is estimated that three million death results from malaria throughout the world, with Africa having more than 90% of this burden (Breman, et al 2004) and this has corrupted the thinking of many Ugandans to an extent that 85% of the respondents in the study thought of mosquitoes to be the possible cause of their children's' condition and yet 65% of the children had malaria.

The results of the study showed that 60% of respondents reported to be using ITNS. 68% received treatment from the hospital, 80% of the patients have their housing environment proximal to farming activities, 80% of the respondents never had screened windows 44% of the patients claimed that their rooms were too small**.** Therefore seasonality, irrigation, farming, poverty, education, house construction, distance to water bodies, and the location of residences have all been linked to malaria transmission; proximity to health clinics, perception of risk, assets, and education have been shown to be important determinants of ITN use and personal protection practices against malaria. Net use and personal protection have also been linked to simple avoidance of mosquitoes, irrespective of knowledge of malaria risk (Agyepong & Manderson, 2009).

5.3 THE SIGNS AND SYMPTOMS OF MALARIA IN CHILDREN UNDER TEN YEARS

In this study, majority of the patients presented with more than one clinical signs and symptom, though the biggest number of children had fever 90%, 88% had no appetite and the smallest population had cerebral malaria 3% as shown in the table 3. This means that the clinical features of malaria are notoriously nonspecific, especially in children. Frequently, disease presents as a flulike illness with fever, chills, rigors, headache, and myalgias (Shepard DS *et al*., 2011).

5.4 STRENGTH AND WEAKNESS.

Some respondents were not willing to participate in the study as they never wanted to open to the researcher some of their private issues. The researcher explained to them that confidentiality would be kept as their names were not needed.

The research itself was quit expensive since it need a lot of money for stationary and other expenses like secretarial work and transport. The research mobilized funds from well-wishers and friends to support budget.

It was challenging to balance academic work with carrying out all necessary steps to do the research. The research employed research assistants who were willing to volunteer in data collection.

The data was examined by health professional experts in the laboratory.

5.5 CONCLUSIONS

The research was to determine the prevalence of malaria and associated factors among children below 10years attending paediatric clinic at KIUTH Bushenyi District, Western Uganda, being guided by the research questions was able to unveil that the prevalence of Malaria is high as 65% of patients tested with blood smear turned positive. The findings also showed that the condition was more prevalent among the children of respondents with low level of education where 39% never went to school and peasants as much as 37%. Malaria was more common amongst children in the age bracket of 12-60 months that is up to 44% and females 55% were much affected as compared to Males 45%.

The study further showed that the associated factors with malaria were average use of mosquito nets, rainy season, absent window screens, proximal housing to farming areas, educational level of parents, low socioeconomic status.

5.6 RECOMMENDATIONS

The study revealed a high prevalence of malaria in Children below 10years. Therefore I recommend that the staffs in KIU-TH should be very vigilant and continue with health education on malaria. In addition to this, the health promotion department in Bushenyi district needs to scale up health education and sensitization about malaria at all levels given its burden in the district.

More so; Bushenyi District education committee needs to strengthen efforts to have all children go to school so to improve the knowledge gaps and also embark on adult literacy programs in order to reduce on the gap created by low educational level. The district leadership needs promote Poverty alleviation strategies at all levels so as enhance the socioeconomic status of the community.

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APPENDICES

APPENDIX 1: ASSENT FORM

KAMPALA INTERNATIONAL UNIVERSITY

WESTERN CAMPUS

ASSENT TO PARTICIPATE IN a study "PREVALENCE OF MALARIA AND ASSOCIATED FACTORS AMONG CHILDREN BELOW TEN YEARS ATTENDING PAEDIATRIC CLINIC AT KIU-TH ISHAKA, BUSHENYI DISTRICT

For children below 10 years old

What is this study about?

Busingye Faith from KIU-TH Department of Allied Health Sciences, is doing a research study. The study will determine the prevalence of malaria and associated factors among children below ten years attending pediatrics clinic at KIU-TH Ishaka, Bushenyi district

How many people will take part in this study?

About 100 children from different (0 to 10 years old), attending pediatric clinic at KIU-TH, will be in this study.

What will happen if you decide you might want to be in this research study?

First, your parent, guardian will be asked if they give their permission for you to be in this study. They will also be asked if they agree to participate themselves, by doing some things like answering questions about you. If your parents don't agree, you cannot be in the study.

If your parents do agree, and you agree too, here's what will happen next:

Before you begin the study:

1. The study researcher will ask your parents some questions about you.

2. The study researcher will ask you questions about your possible factors associated with malaria and signs and symptoms of malaria

3. That is all

When the study ends:

The study lasts for only 1 month but you will be interviewed once.

Will any parts of this study hurt or have other risks?

No

Will you get better if you are in this study?

We don't know if this study will make you feel better. You may get a little better by being in this study, or you may stay the same, or you may get worse.

What if you have questions?

You can ask KIU-TH research division coordinator, Atuheire Collins (+256 781 509 203)

What are your choices?

If your parents agree, you can be in this study if you want to. But you don't have to be in it if you don't want to. Nobody will get mad at you if you don't want to do th

If you don't want to be in this study, just say so, and don't sign this form.

If you want to be in this study, please sign your name below.

If you sign here, it means you agree to participate in this study.

The research coordinator will give you a copy of this form to keep.

_____ _____ _____

Child's Signature Date Age

_____

Child's Name (*print*)

_____ _____

Signature of Person (parent/guardian) Conducting Assent Discussion Date

_____

Name of Person Conducting Assent Discussion (*print*)

APPENDIX 2: CONSENT FORM

Invitation to Participate in Research Project

I am Busingye Faith from KIU-WC I am undertaking an academic Research entitled, "prevalence of malaria and associated factors among children below ten years attending pediatrics clinic at KIU-TH Ishaka, Bushenyi district" **Participation** is voluntary.

Purposes, Procedures, and Duration of the Study

The purpose of the study is academic, to earn a university Diploma in Clinical medicine and community health. The findings from this study will, in addition, provide information regarding preventive measures for malaria among children below ten years. So the information you provide will be very important.

The procedure of data collection will be, non-invasive, by use of questionnaire. The time spent for this research (data collection) will be one month.

Possible Benefits and Risks of Participation

The information you do provide will not help you directly but will assist the people that are single parents; and these are your relatives, brothers and sisters.

You're Options Regarding Participation and Continuation

Members who are below 10 years will participate in this study and there is no crime if you decline to participate. In case you change your mind about participation in the study, there will be no penalty.

Confidentiality and Disclosure of Responses

Data will be captured using codes instead of names and will be kept under safe inaccessible to everyone apart from the researcher.

Agreement to Participate (or Not)

Having read this consent form, and after asking any questions that I have about the procedures, benefits, and/or risks of this study, I hereby agree to participate in this study of

"prevalence of malaria and associated factors among children below ten years attending pediatrics clinic at KIU-TH Ishaka, Bushenyi district" I also understand that I may withdraw from participation at any time without penalty. My signature also indicates that I have received a copy of this form.

_____ _____ _____

Signature Date Print name here

Having read this consent form, and after asking any questions that I have about the procedures, benefits, and/or risks of this study, I have decided to decline to participate at this time. However, if I later decide to participate, I understand that I may contact "KIU Research Coordinator" to see if this study or a related study is in progress. My signature also indicates that I have received a copy of this form.

`_____ _____ _____

Signature Date Print name here

APPENDIX 3: QUESTIONNAIRE

TOPIC:

Am here to ask you a few questions relating to prevalence of malaria and associated factors among children below ten years attending pediatric clinic at KIU-TH Ishaka Bushenyi District. The information collected in this questionnaire will be preserved with strict privacy.

A.SOCIO-DEMOGRAPHIC CHARACTER/DATA

Gender

Male ☐

Female ☐

Age…….

Education level of parents/guardians:

Primary level ☐

Secondary level ☐

Post-secondary level ☐

Never went to school ☐

Others (specify).....

Occupation of parents/guardian

Student ☐

Businesswoman ☐

House wife ☐

Peasant ☐

Civil servant ☐

Others (specify).....

Marital status of parents

Single ☐

Married ☐

Widow ☐

Tribe of parents

Munyankole ☐

Mukigai ☐

Mutooro ☐

Mukonjo ☐

Others……..

Religion of parents

Catholic ☐

Protestant ☐

Muslim ☐

Pentecostal ☐

Others…….

B. SIGNS AND SYMPTOMS

Fever ☐

Chills and rigors ☐

Vomiting ☐

Loss of appetite ☐

Joint pain ☐

Convulsions ☐

Headache ☐

Abdominal pain/discomfort ☐

Hepatosplenomegall ☐

Conjuctival and palmar pallor ☐

Diarrhoea ☐

C. INVESTIGATIONS (to be filled in comparison with laboratory results).

Blood smear for Malaria Parasites

Positive ☐

Negative ☐

RDT

Negative ☐

Positive ☐

D. FACTORS ASSOCIATED WITH MALARIA

<u>Knowledge on malaria</u>

Do you know what your child is suffering from?

Malaria ☐

Typhoid ☐

Pneumonia ☐

Brucellosis ☐

Do You know what transmits malaria?

YES

NO

Within the past six month did your child had episodes of fever?

Yes [ ]

No [ ]

]

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

What are the methods of controlling malaria do you use?

a) Use ITN

b) Environmental cleanliness

c) Destroying the breeding sites

d) Use of Antimalarials/ALU

e) Use traditional remedies

g) Use insecticide sprays

h) Using repellents

i) Other_____

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

a) Hospital

b) Traditional herbalist

c) Self medication

d) Others(specify)

How many ITNs do you have in the household?

One [ ]

Two[ ]

Three and above [ ]

None [ ]

The current situation of the available ITN:

In good order[ ]

Torn [ ]

Is your ITN treated with insecticide?

Yes [ ]

No [ ]

Don‘t know [ ]

Are they currently being used?

Currently used [ ]

Not used [ ]

Did you use it last night?

YES [ ]

NO [ ]

Frequency of mosquito net use;

Always [ ]

Not always [ ]

How did you get them?

Free from the government source,[ ]

Others/specify [

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)_____

Housing environment

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

b) Clean environment

c) Farming activities,

Are the windows screened with the mosquito wire gauze?

Yes [ ]

No

What is the structure of the room?

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

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

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

In which season of the year does the family use the ITNs?

a) Rain

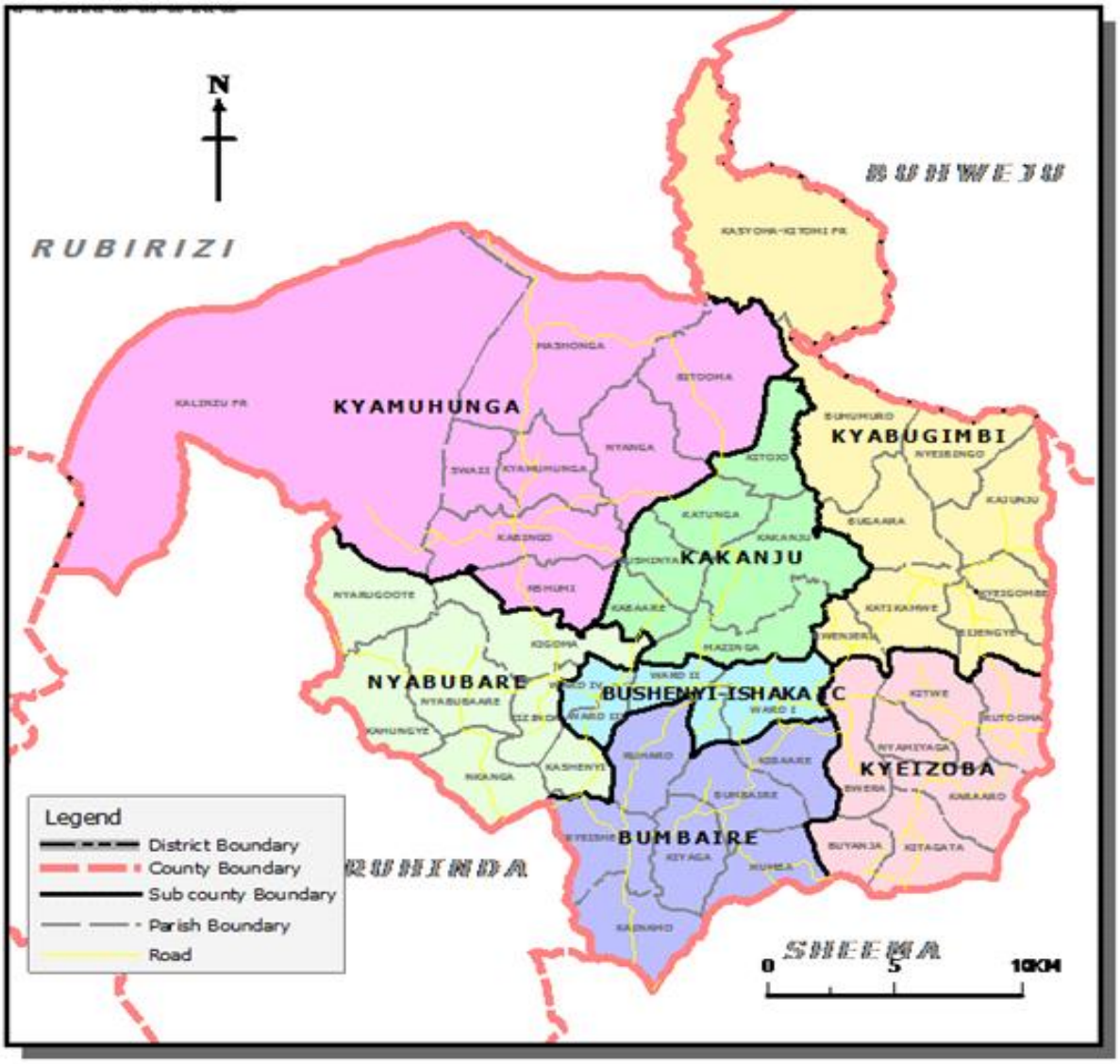
b) Dry

c) Throughout

d) D

Thank you for your time

APPENDIX 4: MAP OF BUSHENYI DISTRICT



APPENDIX 5: MAP OF UGANDA