EXPOSURE FACTORS ASSOCIATED WITH VISCERAL LEISHMANIASIS (KALA-AZAR) IN LOIMA SUB-COUNTY OF TURKANA COUNTY, KENYA

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Exposure Factors Associated with Visceral Leishmaniasis (Kala-Azar) in Loima Sub-County of Turkana County, Kenya

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DECLARATION

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

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DEDICATION

This thesis is dedicated to my wife Philomena, children Abraham, Dorcas, Gideon, my late mother Regina, my siblings and other family members for their immense support and encouragement during my entire study period.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AMREF	Africa Medical Research Institute
BMA	Bone Marrow Aspirate
CBS	Central Bureau of Statistics
DALYS	Disability Adjusted Life Years.
DAT	Direct Agglutination Test
DNDI	Drugs for Neglected Diseases Initiative
ELISA	Enzyme Linked Immuno-Sorbent Assay
FGD	Focus group discussion
GIS	Computerized Geographic Information System.
HELB	Higher Education and Loans Board
HIV	Human Immune Deficiency Virus
IEBC	Independent Electoral and Boundaries Commission
ITROMID	Institute of Tropical Medicine and Infectious Diseases.
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KA	Kala-azar
KABP	Knowledge, Attitude, Behavior and perception
KEMRI	Kenya Medical Research Institute

KII	Key informant Interview
LST	Leishmanin Skin Test.
MOH	Ministry of Health
MSF	Medicins Sans Frontiers
NCPD	National Council for population and Development
PCR	Polymerase Chain Reaction.
PKDL	Post Kala-azar Dermal Leishmaniasis
SERU	Scientific Ethical and Review Unit
SPSS	Statistical Package for Social Sciences
UNAIDS	United Nations Programme on HIV/AIDS
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Attitude: Behavior changes or lifestyles of the community towards the causes, transmission, prevention and control of kala-azar disease and other related illness.

Exposure: Is any characteristic that potentially affects the health outcome including environmental factors, life style practices, and genetic factors belonging to a particular socio-demographic group

Kala-azar: Is a vector borne disease transmitted by sand flies and is characteristic darkening of skin

Knowledge: These were acquired skills and level of understanding of new ways of controlling and preventing of spread of kala-azar from contact and widespread within a home or in the society as a whole.

Neglected tropical diseases (NTDs): Kind of diseases commonly found in tropical regions that remain less important priority for interventions**.**

Practices: In the study it was referred to common customs, behavior, habits and traditions of the communities that contributed towards spread/control of kala-azar.

Prevalence rate: Number of persons sick in a stated population at a given time.

ABSTRACT

Visceral Leishmaniasis (Kala-azar) is a life-threatening vector borne disease caused by the obligate intra-macrophage protozoan parasites known as *Leishmania* donovani and *L. infantum* in the Old World and *L. chagasi* in the New World. It is classified as a neglected disease yet it is a public health problem, causing an estimated 500,000 new cases each year and affecting the poorest of the poor in the predisposed areas. In Kenya, kala-azar is common in arid and semi-arid regions of North Eastern and Rift valley, especially the Loima Sub-county of Turkana County, West Pokot, Machakos, Mandera, Garissa, Wajir counties, Marigat and Baringo East areas. The study was conducted between October, 2015 and June, 2016. The objective of the study was to determine the exposure factors associated with kala-azar and cross-sectional design was used to determine prevalence, the socio-demographic characteristics, socio-economic and cultural factors of the respondents, health seeking behaviour, local people's knowledge, perception and behavior towards the existence of kala-azar in the purposively selected Loima sub-county. Simple random and stratified sampling technique were used to identify study subjects and a sample size of 341 respondents who were household heads or adult members were randomly sampled in the selected locations, sub-locations, villages and households of the two divisions of Loima and Turkwell for collection of quantitative data using structured questionnaires. Four (4) focus group discussions of ten (10) members each among both male and female respondents and twenty four (24) key informant interviews participants, among the knowledgeable and influential people of the community were conducted to gather qualitative data. The data collected were processed and analyzed using Statistical package for Social Science (SPSS version 21.0), with demographic data summarized and presented using tables and graphs, chi-square test used to detect the association between variables while logistic regression through bivariate and multi-variate analysis were used to test for the strength of association between the dependent and independent variables. The qualitative data was analysed using thematic content analysis. The prevalence of kala-azar as self-reported from the households was 49.3%.The key exposure factors to the disease in the community include: Age (AOR=3.2; 95% CI=(1.2 – 8.6), p=0.001), gender (AOR=4.2; 95% CI=(1.3-10.2), p=<0.001), educational level (AOR=2.6; 95% CI=(1.0 – 6.0), p=0.012), housing (AOR=3.1; 95% CI=(1.1-7.6), p=0.002) and resting or sitting near termite-mounds (AOR=3.1; 95% CI= (1.1- 7.0), p=<0.001) that had significant association with suffering from kala-azar. Also, presence of large amount of termite mounds all over the area 53.7% (n=170), low ownership and usage of bed-nets (38%), inaccessibility to health services, varying health-seeking behavior and lack of proper knowledge on transmission of disease; as well as human activities such as deforestation and hunting (52% (n=32) and dancing at night (Edong'a – 64.8% (n=167), when the sand flies are active. Qualitative results showed that a majority of the respondents had a varying level of misconception about the disease. The study concludes that kala-azar is endemic in the area and though the community is aware of its existence, the residents have different beliefs about the transmission. The study recommends the need for health policy makers and other stakeholders to have a multifaceted approach with enhanced general health education and awareness on the transmission cycle of kala-azar. Community social development and involvement in the prevention of the disease should be emphasized as well as structural development plans that include

sand fly management strategies and control methods that would ensure the removal of breeding and resting sites of the vectors within human habitation. In addition, individual behavioural change, protective measures and improvement of housing conditions to be encouraged.

CHAPTER ONE

INTRODUCTION

1.1 Background

Visceral leishmaniasis (VL), commonly known as kala-azar, is a systemic disease caused by parasitic protozoan species of genus *Leishmania*. It is a chronic disease characterized by irregular bouts of fever, hepato splenomegaly, lymphadenopathy, pancytopenia, weight loss, anaemia and is fatal if left untreated in over 95% of cases and can lead to death (Chappuis *et al.*, 2007; Khalil *et al.*, 2016). The aetiological agents belong to the *Leishmania donovani* complex, *L.d donovani*, *L.d infantum* and *L.d arachibaldi* in the old world and *L.d Chagasi* in the new world. The old and the new world species are transmitted by species of the genus phlebotomus (sand flies). Humans, wild animals and domestic dogs are known to act as reservoir hosts, the parasite enters macrophages, where it multiplies and establishes the infection (WHO, 2010; Gradoni, 2015; WHO, 2016).

Visceral Leishmaniasis is a life threatening neglected tropical infectious disease which mainly affects the poorest of the poor. It has been among the most important health problems since early 1900s, in the world and sub-Saharan Africa (SSA) especially Kenya and Sudan where major upsurges in the number of cases were and still are noted in the endemic areas (Alvar *et al.*, 2012). Since 1993, the regions that are kala-azar endemic have expanded significantly, accompanied by a sharp increase in the number of recorded cases of the disease (Alvar *et al.*, 2012; Gradoni, 2015). Though a forgotten tropical parasitic disease, it occurs in four continents and is considered to be endemic in 88 countries, 72 of which are developing countries (WHO, 2016).

According to doctors without borders, kala-azar is the second largest parasitic killer disease after malaria; second in mortality and fourth in morbidity among tropical infections (MSF, 2013). The World Health Organisation classifies it as among the 17 neglected diseases that mainly affect populations living in poverty with little or no purchasing power (WHO, 2016). There is an estimated 700,000 to 1 million new

cases of kala-azar that occur world-wide each year and 20,000 to 30,000 deaths occur annually (WHO, 2016; WHO, 2017).

In 2015, more than 90% of new cases reported to WHO occurred in 7 countries of Brazil, Ethiopia, India, Kenya, Somali, Southern Sudan and Sudan (WHO, 2016); it is almost always fatal with a mortality rate of almost 100%, if the exposure factors are not identified and if left untreated. The actual death toll of the disease may be higher than this estimate, considering the existence of its unidentified foci (Adhikari *et al*., 2010; Dawit *et al*., 2013; WHO, 2014). There are estimates suggesting an overall prevalence of 12 million people infected with kala-azar in an at- risk population of 350 million, suggesting more than 2 million new infections each year with the figures including only cases with the overt disease. In terms of Disability-Adjusted Life Year (DALYS), the disease is responsible for a loss of 34 DALYS (Dawit *et al.*, 2013; WHO, 2014; Griekspoor *et al*., 2015).

Globally, kala-azar is endemic in Bangladesh, Brazil, Indian continent, Nepal and Sudan (Alvar *et al.*, 2012). It has re-emerged from near eradication, largely due to extensive population movements following civil unrest, in areas like Sudan and to human encroachment on the sand flies natural environment through agricultural and development projects. The disease had been declared an occupational disease affecting men because of its association with the building roads and railways, oil and gold extraction, deforestation, farming, hunting and military service (Boeart *et al*., 2009; Elnaiem *et al*., 2011; WHO, 2016).

In Africa, East Africa is the second largest kala-azar focus in the world and the disease is prevalent in Sudan, Somalia, Niger, Uganda, Ethiopia and Kenya (Ngure *et al.*, 2009; Alvar *et al.*, 2012; Wasunna *et al*., 2016). The disease has focal distribution in two distinct ecologic settings:1) the semi-arid regions in the North where *Phlebotomies oriental's* breeds in cracks in black cotton clay soil and 2) the savannah and forest areas in the South where the vectors *P.martini* and *P.celiae* are found in association with macro termites in mounds (WHO, 2014;WHO, 2016). In 2001, the disease killed 51,000 people including 40,000 in South Asia and 8,000 in SSA, with majority of the cases occurring at the ages of 5-29. Males are more

affected than the females in Sub-Saharan Africa where the ratio is more than 3:1 (Argaw *et al*., 2013; WHO, 2014).

In Kenya, the disease has been reported in Kerio Valley, Kitui, North Baringo and East Pokot Sub-Counties of Baringo County, Machakos, Wajir and Mandera Counties, West Pokot and Turkana Counties, where the prevalence is high especially in Loima Sub-county (Marlet *et al.,* 2009; Gebre *et al., 2010;* Alvar *et al.,* 2012). In Pokot and Turkana areas, kala-azar has existed for at least 40 years. The World Health Organisation (WHO, 2010) report on the epidemiology of kala-azar, mentioned a survey done in 1959 where a high prevalence of the disease was confirmed in the areas. Two annual reports of Amudat Hospital, Uganda (1983, 1985) that borders West Pokot and Turkana, mentioned kala-azar as frequently being predisposed to the people in Kenya and Uganda. Loima, one of the six sub-counties of Turkana County, has a high kala-azar prevalence of about 38% against a population of 50,000 people and 6,000 households (WHO, 2010; Wasunna *et al*., 2016).

Visceral leishmaniasis is often found in areas that are remote, with absent or undeveloped health facilities, where tools for screening and identification of patients are inadequate and above all with no or few trained manpower. Due to lack of updated information, even the most critical cases remain untreated or unreported and can represent a reservoir of infection (mainly in areas where transmission is from man to man like the study area), for family members and neighbours (Alvar *et al*., 2012).

The exposure factors to the disease include environmental conditions, human behaviour and human activities like deforestation, socio-economic status, socio-cultural factors, immunogenic profile and genetic factors to human populations like in the study area (Votypka *et al.*, 2012; Reveiz *et al.*, 2013).

The environmental factors like living in houses with cracked mud, or thatched plastered house walls, damp earthen floors, sleeping on the floor or outside, and vegetation near the house can facilitate sand fly survival and enhance vector abundance via providing diurnal resting places, breeding sites and humidity

(Reithinger *et al.,* 2010; Coura *et al.,* 2013). Sand flies can hide in cracks and fissures in the un-plastered house walls, ceiling or floor (Coura *et al.,* 2013). Additionally, living close to a previous case of leishmaniasis strongly increase infection risk (Reithinger *et al.,* 2010). Lack of insecticide spraying in the houses is associated with increased risk (Coura *et al*., 2013). Sleeping outside especially during summer months without bed-nets can place people at risk of sand fly exposure, thus the use of bed-nets impregnated with insecticide is often very important for people in protecting against kala-azar transmission (Votypka *et al.*, 2012). Migration from rural to urban areas due to low quality of life and social facilities or socio-economic conditions and improper climate or even migrations into villages can increase cases of kala-azar (Reithinger *et al.,* 2010; Ghatee *et al.,* 2013). Factors such as low education level, lack of land and socio-economic concerns all reflect the increased risk related to poverty. Poverty in many ways increases the risk of kala-azar, in that it can increase sand fly access into poorly built houses and human exposure to infected flies (Ghatee *et al.,* 2013). Also poor housing and sanitary conditions such as lack of waste management and open sewerage can increase breeding of sand flies and their access to people (Dawiti *et al.*, 2013).

1.2 Statement of the problem

In Kenya, it is estimated that about 4,000 people are annually infected with kala-azar and hospital records indicate that the prevalence is higher among males than females and the disease affects all ages. It is most prevalent among the five to nine and 10 to 14 years age groups (WHO, 2016). This poses a major public health problem, mostly in arid and semi- arid areas like Loima Sub-county of Turkana County, where many people are at risk and is endemic with a high prevalence of about 38% against a population of 50,000 people in 6,000 households (WHO, 2010; Wasunna *et al*., 2016). This trend could cause a health crisis as the disease is becoming lethal. The case fatality rate associated with it range from 0-50% of treated cases to 85-99% of untreated cases (WHO, 2014; WHO, 2017). The disease is a silent killer, invariably killing almost all untreated patients (Hotez, 2008; MSF, 2011; Dawit *et al.,* 2013), hence efforts need to be taken to avert the situation.

The treatment of the endemic has a cost implication to the community like the Turkana and the families of the affected. Having a higher prevalence among the minor community, has been a problem for the communities trying to find care and prevention of the same due to lower standards of living and life style that includes opting for alternative treatment patterns. This has to attract the attention of the public health practitioners in order to help save the community from this deadly disease (Musa *et al.*, 2016).

1.3 Justification of the study.

Data on socio-economic, socio-cultural, health seeking behaviour, knowledge, attitude and perception on kala-azar are comparatively scarcely studied in rural areas like Loima Sub-County. In this area, there were no or limited studies conducted to assess the rate of disease and its status and the exposure factors associated to kala-azar including assessing knowledge, attitude and practices by the community that could be a risk to the disease. This severely hampers efforts to prevent and control the disease in the region, Counties and sub-counties. To fill this knowledge gap, was the reason the household based study was carried out to identify individual and household level exposure factors in an endemic focus of Loima sub-county of Turkana County, Kenya. If these factors are known, it would give advice that encourages community participation and cooperation that is essential in the implementation and use of program activities together with the government especially the Ministry of Health and other stakeholders for the success on further improvement of the probable intervention strategies for the prevention, control and management of this neglected tropical and yet deadly disease. The interventional measures can be done through adequate diagnosis, treatment and follow-up of patients. This is so as to reduce the morbidity and mortality attributable to the disease; and hence design an appropriate control strategy.

1.4 Research questions

The research questions were:

1) What is the prevalence of kala-azar in Loima Sub-county of Turkana County, Kenya?
2) What socio demographic, socio-economic and socio-cultural factors predispose the community to kala-azar in Loima Sub-County of Turkana County Kenya?
3) What is the community's knowledge, perception, attitude and practices about the disease with regard to its causes in Loima Sub-County of Turkana County, Kenya?
4) What is the health seeking behavior of Loima people of Turkana County, Kenya in relation to kala-azar disease?
5) What intervention measures are employed in the area in order to aid in the control, prevention and treatment of kala-azar in Loima Sub-County of Turkana County, Kenya?

1.5 Study objectives.

The objectives of the study were:

1.5.1 General objective

To determine the exposure factors associated with kala-azar and contributing to its transmission in Loima Sub-county of Turkana County, Kenya.

1.5.2 Specific objectives

1) To determine the prevalence of kala-azar in Loima Sub-County of Turkana County, through household interviews.
2) To determine the socio demographic, socio-economic and socio-cultural factors that predispose the community to kala-azar in Loima sub-county of Turkana County, Kenya.

3) To determine the community's knowledge, perception, attitude and practices about the disease with regard to its causes in Loima Sub-county of Turkana County, Kenya.
4) To determine the community's health seeking behavior in relation to kala-azar disease in Loima Sub-county of Turkana County, Kenya.
5) To identify the interventional measures that are employed in the area in order to aid in the control, prevention and treatment of kala-azar in Loima Sub-county of Turkana County, Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of kala-azar

The Leishmaniases are vector borne diseases caused by obligate intra-macrophage protozoan parasites of the genus *Leishmania* and are endemic in large areas of the tropics, subtropics and the Mediterranean basin. Poor and neglected populations in East Africa and the Indian subcontinent are particularly affected by visceral leishmaniasis (kala-azar). The disease is characterized by both diversity and complexity in that it is caused by more than 20 leishmanial species pathogenic to humans and is transmitted to humans by bites of more than 30 different species of female phlebotomine sand flies. The disease is focal in distribution (MSF, 2011; Wertheim *et al*., 2012; WHO, 2014).

The epidemiology of Visceral leishmaniasis in a given area is directly dependent on the behaviour of the human and /or animal population in relation to the cycle of transmission. There are variety of factors that influence the transmission of the disease for instance proximity of residence to sand fly breeding and resting sites, type of housing, occupation, extent of exposure to sand fly bites, natural resistance, genetic or acquired, virulence of the parasite species, zoonotic or anthroponotic reservoirs, the vectorial capacity which is the number of density, seasonality, longevity and flight range of sand fly populations (Den *et al.*, 2011; Alvar *et al*., 2012) or the infective bites delivered per human per annum (Singh *et al., 2010;* Den *et al.,* 2011).

Leishmaniasis consists of the four main clinical syndromes: cutaneous Leishmaniasis; muco-cutaneous (also known as espundia); Visceral Leishmaniasis (VL) which is known as kala-azar; and post kala-azar dermal Leishmaniasis (PKDL). Each of these produce a variety of clinical diseases depending on the virulence or tropism of the parasite and differential host immune responses. In cutaneous leishmaniasis, the patient generally presents with one or several ulcer(s) or nodules in the skin (Rashid *et al.,* 2013). In muco-cutaneous leishmaniasis, patients suffer from

progressively destructive ulcerations of the mucosa extending from the nose and mouth to the pharynx and larynx. These lesions are not self-healing and are usually seen months or years after a first episode of cutaneous leishmaniasis when the macrophages of the naso-oropharyngeal mucosa became colonized.

Visceral leishmaniasis (kala-azar) that is the subject of this thesis is the most lethal, severe form and systemic disease that is both acute and chronic, characterized by irregular bouts of fever, substantial weight loss, skin darkening, swelling of the spleen and liver as well as anemia and is fatal if left untreated and has a mortality and case fatality rate of almost 100%. It is caused by the *Leishmania donovani* complex – *L. donovani* sense- stricto in East Africa and the Indian subcontinent, and *Leishmania infantum* in Europe, North Africa and Latin America and (Lukes *et al*., 2007; Wertheim *et al*., 2012; Dawit *et al*., 2013) L. Chagasi that occurs in South and Central Africa. There are two types of visceral leishmaniasis, which differ in their transmission characteristics: Zoonotic, transmitted from animals to vector to human and anthroponotic visceral leishmaniasis transmitted from humans to vector to human and that its transmission affects people's behavior as well as sand fly and reservoir activity. In the former type, humans are occasional hosts and animals, mainly dogs are reservoir of the parasite (Nylen, 2007; Alvar *et al*., 2008; Dawit *et al*., 2013). Zoonotic Visceral leishmaniasis is found in areas of *L. infantum* transmission whereas anthroponotic type is found in areas of *L. donovani* transmission like the study area with the vector being *Phlebotomus martini (*Alvar *et al.*, 2012*;* Wasunna *et al.*, 2016*).*

Post-Kala-azar dermal Leishmaniasis (PKDL) is characterized by a macular, maculo-papular or nodular rash and is a complication of Visceral leishmaniasis. It was frequently observed after treatment in Sudan and more rarely in other East African Countries and in the Indian subcontinents (Singh *et al*., 2011). It can also occur in immunosuppressed individuals in *L. infantum* endemic areas. The interval between treated visceral leishmaniasis (VL) and PKDL is zero to six (0-6) months in Sudan and Kenya and six (6) months to three (3) years in India (Adams *et al*., 2013).

The impact of leishmaniasis in humans is enormous and it has continued to have increased incidence in many countries of the world. Africa, especially sub-Saharan Africa, is due to several reasons, including influx of non-immune population into natural foci of transmission, changes in ecology of vectors and reservoir hosts; reduction in the use of residual insecticides for the control of malaria and improvements in diagnosis and reporting of cases (Neumine 2007; MSF, 2010, WHO, 2011).

2.1.1 Worldwide distribution

Leishmaniasis is found in 88 countries Worldwide in the continents of Asia, Europe, North America, South America and Africa with a total of 350 million people being at risk. Kala-azar occurs in 72 of those countries. There are an estimated 500,000 new cases of kala-azar and more than 50,000 deaths from the disease each year, a death toll that is surpassed among the parasitic diseases only by malaria (Magill *et al.*, 2012). Both figures are approximations as kala-azar is frequently not recognized or not reported adequately (Collins *et al.*, 2006; WHO, 2016). The majority (>90%) of cases occur in just six countries of Bangladesh, India, Nepal, Ethiopia, Brazil and Sudan that is bordering Kenya. Migration, lack of control measures and HIV-kala-azar co-infection are the main factors driving its increased incidence (Burki, 2009; Mondal *et al.*, 2013; Diro *et al.*, 2014; WHO, 2016).

Kala-azar affects poor communities, generally in rural areas. The disease is mostly endemic in countries that are among the least developed in the world such as Nepal or in the poorest regions of so called middle income countries such as Kenya and Bihar State in India. Patients and families affected by kala-azar in such countries become poorer because of the high indirect costs (for example, the costs of kala-azar diagnosis and treatment) and indirect costs (for example loss of household income) of the disease. India, Nepal and Bangladesh harbor an estimated 67% of the global kala-azar disease burden (Rijal *et al;* 2006; Garg *et al.*, 2008; WHO 2014; MSF, 2013; Naznin *et al*., 2015).

The poorest segments of rural populations in Southern Asia, Eastern Africa and Brazil are also mostly affected in that access to appropriate diagnosis and treatment

is difficult. There is scanty investment in the development of new drugs for the disease. The most effective treatments are often unavailable and unaffordable for the patients in endemic or predisposed areas. Malnutrition is a predisposing factor for progression from leishmanial infection to disease and delays in diagnosis and treatment hence increases the risk of severe morbidity and mortality (Alvar *et al*., 2012; WHO, 2014). The distribution of the disease is shown in (Table 2.1).

Table 2.1: spectrum of leishmaniasis, aetiological agents and worldwide distribution

Type of leishmaniasis	**Causative agent**	**Worldwide distribution**
Visceral	*L. donovani*	China, India Iran Sudan, Kenya
	L. infantum Chagasi	Ethiopia, Mediterranean basin, Brazil, Colombia, Venezuela
Cutaneous	*L. tropica*	Mediterranean basin, Afghanistan, Kenya
	L. major	Middle East, Kenya, Senegal
	L. aethiopica	Ethiopia, Kenya
	L. Mexicana	South America
Muco-cutaneous	*L.braziliensis complex*	South America

Source: (WHO, 2015).

2.1.2 Geographical distribution in Africa

The first kala-azar case in Sudan was reported in 1938, and since then, the disease has become wide spread and is endemic in South and Eastern parts of the White Nile and Upper Nile states. Other areas affected include the provinces of Kasala, Joglei and Kapoeta in the South, El Fasher and El Nahud in the West and also North of Khartoum (WHO, 2010).

In Ethiopia, the first case of Kala-azar was documented in 1942 in the Southern Parts of the country. Since then the disease has spread to become endemic in the Segen,

Woito and Galana river valleys. In Somalia sporadic cases of kala-azar first appeared in 1934, mainly in the Middle Shabelle and Lower Juba areas. A recent retrospective study has shown that kala-azar is endemic in these areas. Children below the age of 15 years were at the highest risk and males were three times more susceptible than females (Kalacore, 2017). The distribution of the disease is shown in (table 2.1).

2.1.3 Distribution of kala-azar in Kenya

Leishmaniasis has been known to be endemic in parts of Kenya from as early as the 20th Century (MSF, 2011; Alvar *et al*., 2012; MSF 2013). An outbreak of kala-azar in the King's Africa Rifles troops encamped north of Lake Turkana in southwest of Ethiopia was reported in the 1940s (Dawit *et al.*, 2013; WHO, 2014). Since then Turkana, Baringo, Kitui Machakos, Meru, West Pokot and Elgeyo Marakwet Counties have been considered to be endemic for kala-azar (WHO, 2010; MSF, 2013). The distribution of the disease is shown in (figure 2.2).

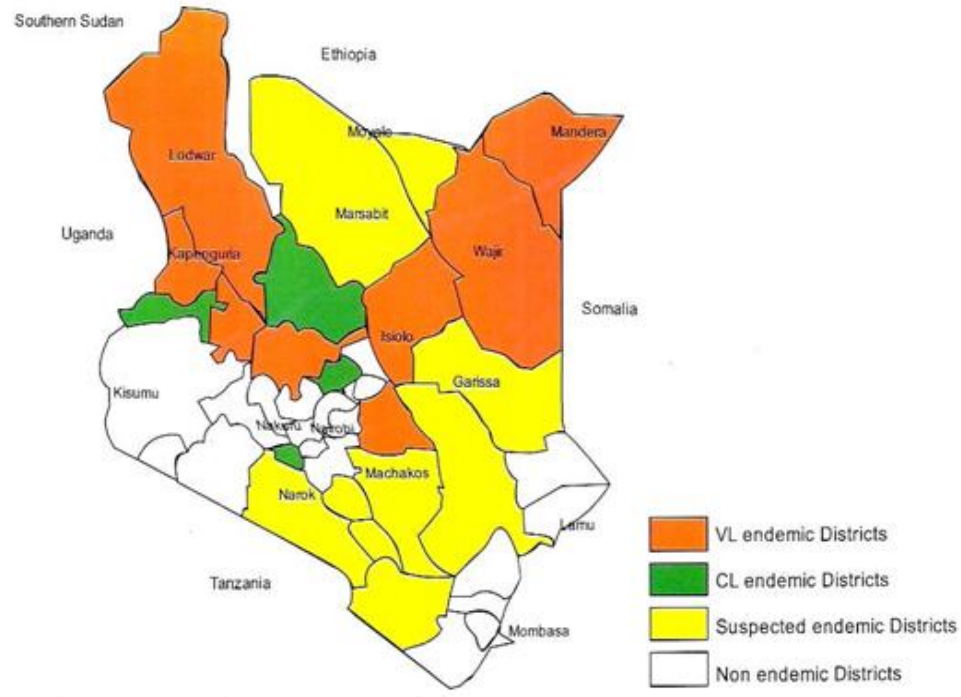

Figure 2.1: Map showing Leishmaniasis Endemic Counties in Kenya.

Source: National Multi-Year Strategic Plan for control of NTDs 2015).

2.2 Reservoir and vectors of kala-azar

2.2.1 Reservoirs of kala-azar

In the anthroponotic transmission cycle like in the study area, humans are the sole reservoir or source of infection for the vector while in the zoonotic transmission cycle, animals are the main reservoir hosts: dogs for kala-azar and several species of mammals such as rodents, jackals, and foxes for other forms of leishmaniasis (Croft and Coombs, 2006; Ready, 2013; Wasunna *et al*., 2016). Species of the sand flies belong to the genera *Lutzomyia* in Latin America and *Phlebotomus* in Kenya and the rest of the world. Humans are considered to be the source of infection of *L. donovani* in the epidemic areas of North and East India and possibly Sudan and East Africa. Similarly, *L. tropica* is thought to be dependent on humans for its survival at least in the long-established endemic foci. In these areas, no known animal reservoir has been incriminated (Macedo *et al*., 2014; Gradoni, 2015).

2.2.2 Vectors of kala-azar

Sand fly is the vector for leishmaniasis and the disease is caused by 20 species of *Leishmania* and transmitted 30 species of sand fly (Jeronimo *et al*., 2011; Belo *et al*., 2013). The insects' are two to three (2-3) mm long and are found throughout the tropical and temperate parts of the world. The sand fly require an organic matter, heat and humidity for development and are commonly found in house-hold rubbish, bark of old trees, burrows of old trees and cracks in house walls. It readily bites humans at night, especially during twilight, while the host is resting (Claborn, 2010).

Investigations of vectors of leishmaniasis in Kenya started only in the early 1950s when the kala-azar assumed importance as a result of major disease epidemic outbreak. The causative agent of kala-azar cases in Iraq, India, China, Sudan and Kenya is *Leishmania donovani.*

In Kenya, apart from *Phlebotomus martini* commonly being the vector for kala-azar *P.orientails* has also been reported and occurs in the Kajiado County (Burki, 2009; Walton, 2011;WHO, 2015). The aetiological agent for cutaneous leishmaniasis

which include *L. major* has been reported in Baringo; *L. tropica* in Laikipia, Nakuru and Nyandarua districts while *L. aethiopica* has been reported in the Mt. Elgon area. *P. duboscqi, P.guggisbergi* are the vectors of *L. major* and *L. tropica* respectively, while *P. pedifer, P. longipes* and *P. elgonensis* are the vectors *L. aethiopica* (Magill *et al.,* 2012; WHO, 2015; CDC, 2015). The sand fly species present in Kenya, rests and breeds in termite hill, animal burrows, trees holes and house walls. It feeds mainly on goats, rabbits and humans, and to a lesser extent on dogs, cattle and other hosts (Magill *et al.*, 2012; MSF, 2013).

The vector of kala-azar in Turkana and the neighbouring West Pokot is the sand fly *P. martini.* The female alone requires a blood meal for maturation of the eggs and there are then laid in organic natural detritus. Specific temperature and humidity is required for the development of the immature stage and studies have shown that termite mounds and animal burrows may be locations where juvenile stages develop and where the adults breed and rest during the day (MSF, 2013; WHO, 2014).

2.3 Factors predisposing or affecting the transmission of kala-azar.

Leishmaniasis transmission is increasing in several areas, at a rate of more than 50% in 1998 up to date, reflecting the environmental and behavioral changes that increase exposure to sand flies (Dawit *et al.,* 2013; Gradoni 2015). The factors contributing to the prevalence or influencing transmission of kala-azar include:

2.3.1 Migration

Rural-urban migration seems to have contributed to urbanizing kala-azar in Brazil, whereas in East Africa, the disease is more closely associated with migrating seasonal workers and refugees (Dawit *et al.,* 2013; Gradoni, 2015). Trans-border migrations between Bangladesh, India and Nepal are also a risk factor to the disease settlements in high-risk endemic areas such as those established by people migrating from high plateaus to tropical plains in some Andean countries increase their exposure to vectors (Dawit *et al.,* 2013; Mansueto *et al*., 2014).

In America, there is evidence that kala-azar like the Chagas disease transmission rates are strongly linked to types of housing, mobility patterns and the process of animal domestication. Domiciliary transmission of the Chagas disease has decreased due to the elimination of the main vector manifestation from the interior of the infected homes and such transmission has been affected by residual spraying in about 25% of the area under risk. Favourable conditions for the increased number of anthroponotic leishmaniasis can be found in overcrowded cities due to massive rural-to-urban migration e.g in Kabul or Aleppo (Alvar *et al*., 2012; Murray, 2012).

A broad description of the epidemiological dynamics of the infection in Kabul showed that it had retained the characteristics of a newly arrived epidemic over a period of almost 20 years. The age distribution of infection did not change and an increase in the number of cases was observed despite insecticide application in houses and intensive detection and treatment of cases. It is suggested that the epidemic of anthroponotic leishmaniasis in Kabul persisted because of rapid turnover of people in the city (Alvar *et al*., 2012; WHO, 2016).

2.3.2 Environmental Modification

Environmental modifications such as construction of dams can change the temperature and humidity of the soil and vegetation, which may result in changes in the composition and density of sand fly species as well as changes in populations of rodent species (WHO, 2010; McCall *et al*., 2013). The formation of new settlement with non-immune populations, facilitate the outbreak of leishmaniasis. For example, the outbreak of zoonotic leishmaniasis in the central and southern of Tunisia parts in 1982-83 occurred following the construction of the Sidi saad Dam (Lerutte *et al*., 2016; WHO, 2016). The increase in the incidence of leishmaniasis among non-immune settlers was observed in water irrigation schemes in the Libyan Arab, Jamahiriya, Saudi Arabia, the Syrian Arab Republi and other countries (McCall *et al*., 2013; WHO, 2016).

An outbreak of zoonotic cutaneous leishmaniasis as a result of man-made changes to the environment has been observed since 1994 in the Kasha region, north of Lafahan in the Islamic Republic of Iran. An incidence of 8-15% was reported among local

inhabitants. Available data indicate that the epidemic started after an increase in the number of *Rhombomys Opimus*-a rodent reservoir of economic cutaneous leishmaniasis in the area as a result of planting trees in the region to prevent soil erosion. Since sand fly vectors are present in the area, the active transmission of the leishmaniasis in humans has become common (Dawit *et al.,* 2013; WHO, 2016).

Outbreaks of leishmaniasis are often associated with the movement of people into foci of infection. For example, during the war between the Islamic Republic of Iraq, numerous leishmaniasis cases were observed among soldiers stationed in active foci of infection. The outbreak of the disease provoked the Iranians to start mass leishmanization of military personnel as a prophylactic operation. The displaced population of the Southern region of Sudan experienced a severe outbreak of kala-azar in Pakistan; an outbreak of the disease among soldiers was recorded after military exercises in some endemic foci of Islachistan. A rise in the incidence was recorded among personnel of the United Nations, peace-keeping forces in East Sinai (Gradoni, 2015; Kalaco, 2017).

The increased incidence of zoonotic leishmaniasis in Morocco was related to the movement of the rodent reservoir host, *Meriones shaloi grandis*; close to human settlements. This host appeared to adopt to *synenthropic behavior* by modification of its nutritional requirements. It adopted *coprophagus* and *detrivorous living* in *peridomestic areas* near garbage tips. This is another example of how man-made environmental modifications can affect transmission intensity and subsequently the prevalence and incidence of leishmaniasis (Alvar *et al*., 2012; WHO, 2014; Gradoni, 2015). A few outbreaks have originated from the introduction of the parasite into areas of potential transmission and it applies to the outbreak of kala-azar in Western Upper Nile State in Sudan where it was unknown until 1984. Because the disease was introduced by the troops from an endemic area on the Sudan-Ethiopian border, to a non-immune population and because of the breakdown of health services and famine that result from the war in Southern states, a severe epidemic area hit the Western Upper Nile State, claiming thousands of lives (WHO, 2010; McCall *et al*., 2013).

The role of the climate in the emergence and re-emergence of the infectious disease and particularly vector borne disease is well recognized (Yared *et al;* 2014; WHO, 2015). Some outbreaks of kala-azar in the endemic countries have been linked to climatic changes. For example, it is believed that heavy rains in Sudan in 1985 and 1986 created ideal breeding conditions for the sand fly and resulted in an outbreak of the disease in Khartoum with more than 10,000 cases. Furthermore, there was a massive migration of population from endemic Nile region north of Khartoum in 1984-85 following the drought in the West during June (Neumine, 2007; WHO, 2012; Yared *et al.,* 2014).

2.3.3 Inaccessibility to health care services

Visceral leishmaniasis (Kala-azar) occurs in immunologically naïve populations without any access to treatment. A follow up study after an outbreak of the disease in South Sudan, document kala-azar impact in a community with a fair access to primary health care (WHO, 2015; Hailu *et al.*, 2016). Kala-azar is becoming an emergency health problem in Eritrea, Ethiopia, Sudan and even Kenya where it is endemic for years. The high mortality rate in its outbreaks is mainly due to the absence of diagnostic facilities and the non-availability of the first line drugs at the local level. In the absence of treatment, the mortality rate is close to 100% from the disease in these areas, where no treatment exists.

A shortage of specific drugs for the treatment of leishmaniasis can potentially contribute to the intensity of transmission in the foci in the anthroponotic forms of the disease and subsequently to an increase in the morbidity and even mortality among populations at risk of infection like in the study area. Generally all humans serve as a reservoir host during endemics of anthroponotic forms of infection and if untreated, the severity of the disease will increase and prove fatal in the case of kala-azar outbreak (WHO, 2010; Dawit *et al*., 2013; Zijlistra *et al*., 2014). The lack of diagnostic facilities and drugs for treatment has been among the possible contributing factors to the subsequent economic embargo since 1991.

A fourfold to six fold rise in the number of cases have since observed due to other factor like population movement and the destruction of health and vector control

facilities during the war in Iraq and the Islamic Republic of Iran (WHO, 2010; McCal *et al*., 2013). From 2000 through 2006, a total of 3645 patients suspected of kala-azar were screened in Amudat Health centre in Uganda. A Total of 2088 patients confirmed with the disease were treated. Most of the patients (80%) were under 15 years of age 75% were male and 70% were from Kenya (MSF, 2010; WHO, 2014).

In Kenya, most of those affected with kala-azar are livestock herders like in loima and coffee plantation workers. The risk of infection with the disease under the age of seven years appears to be independent of sex, but males seem to report higher rates than women as they get older (Dawit *et al.,* 2013; WHO 2014).

Ratios of up to five times more in men than in women seems to be evident from hospital morbidity figures (Alvar *et al*., 2012), and which may also be a reflection of the higher likelihood of reporting and treatment for males. Community surveys however reveal much higher rates among women than is evident from hospital records, indicating that kala-azar and post-kala-azar dermal lesions remain under-reported by the community, due to the prevailing social-cultural and economic circumstances that hinder women's presentation in hospital (Zijlstra, 2014). The extent to which the differences between men and women occur, are due to exposure or that under-reporting is unclear, though there is some indication that part of the difference may be attributable to limited access to services, hormonal influences, response to treatment and differences in immune response (Magill *et al.,* 2012; Dawit *et al.,* 2013; WHO, 2014).

2.3.4 Knowledge, Attitude, Perception and Behavior (KAPB)

In most countries, kala-azar affects the poorest among the poor. The very poor have little knowledge about the disease and hence they are unlikely to seek early treatment and most of those who start treatment cannot afford to complete it. The occurrence of the diseases drags them further into the down-load spirit of poverty from which they are unable to recover (WHO, 2010; McCall *et al*., 2013; WHO, 2016).

In a study in Pacific Ocean on knowledge, attitude and practice by gender on kala-azar, 94% of the population believed that the disease appears as a skin disease; more men affected and more women did not know the mode of its transmission and 35% of the respondents connected the disease to the bite of an insect but did not know what the aetiologic agent was; and thought that the bite was infected by a worm that lives in the mountains. Great variety of treatment used to cure the disease was also based on plants, chemical substances, burning the lesion and to a lesser degree drugs. About 45% did not know how to prevent the disease. This in essence calls for an extensive study on knowledge and practices in the community that can help in identification and quantification of the local factors contributing to the disease, so as to institute preventive and control measures (MSF, 2013; Khanum *et al.,* 2015). The biting time of the sand flies lies between 6.30p.m and 7.00p.m at dusk. At this time people sit outside their homesteads at night. Children play on termite hills during the day and possibly early morning, between 6.00 a.m to 10.00 a.m that is the biting period of the sand flies at dawn (WHO, 2016; MSF; 2013).

A study carried out in Kitui revealed a significant correlation between kala-azar incidence and the presence of termite hills within 100 yards from homesteads. Of those with kala-azar, 30 had a termite hill present while 116 did not. Latter studies by Southgate found that 70% of homesteads close to termite hills were infected compared to only 20% of those without (WHO, 2010;WHO 2015). A pilot entomologic study conducted in 2004 in Uganda demonstrated that termite mounds are important for vector breeding and resting sites and that sitting on termite mounds increases the risk of infection (MSF, 2011).

2.3.5 Constraints in the provision of control measures for kala-azar

The re-emergence of leishmaniasis in most foci may be the result of interruption of previously applied methods of control, e.g Insecticide spraying or early diagnosis and treatment of positive cases. It is reported that reduction in the of use insecticides for malaria control contribute to the increase in the population of *synenthropic* sand flies and results in the outbreak of the disease in some endemic foci of kala-azar (WHO, 2010; Dawit *et al.,* 2013).

The success of the control measures depends on a basic understanding of the epidemiology of different forms of leishmaniasis and the cultural/social customs of the population. For example, indoor insecticide spraying will not be effective in areas with exophagic vector species nor will treatment of burrows of *Psammonys obesus* with grain treated with zinc phosphate. If the vector is exophagic and people in the foci prefer to sleep outside without mosquito nets during the transmission season, then the use of insecticide-impregnated materials will not affect the transmission (WHO, 2016; Hailu *et al.*, 2016).

The control of vectors through residual insecticide, house-spraying plays a significant role in the reduction of transmission, particularly in foci of anthroponotic form of leishmaniasis. However, the high cost of modern insecticide and increasing concern about their impact on the environment have resulted in a significant reduction in their use by national programmes (WHO, 2010; Hailu *et al.*, 2016).

Humans may be protected from kala-azar when in close proximity to livestock (because of the diversion of sand flies to alternating hosts) or when lighting fire indoors. Smoke act as a repellant to most biting flies (Hailu *et al.*, 2016). Ownership of insecticide-treated bed nets, which could protect persons from sand fly bites and reduce kala-azar transmission is low in many communities including the study area and although most of the local population have heard of kala-azar, few are aware of how it is transmitted (Enaeim, 2011; MOH, 2010; WHO, 2014).

2.3.6 Kala-azar surveillance systems

Diagnosis of leishmaniasis is based on clinical, serological and parasitological identifications. However, difficulties in clinical and parasitological diagnosis of kala-azar still exist. The signs and symptoms of the disease in areas with multiple morbidity may not be sufficient or specific to differentiate it from other tropical or parasitic diseases (McCall *et al.*, 2013).

Kala-azar in mid-1988 was, by mistake, recognized as an outbreak of typhoid fever (WHO, 2010; McCall *et al.*, 2013). Comprehensive information about the distribution of different forms of leishmaniasis in many countries is incomplete and

needs further studies. An average annual number of registered leishmaniasis cases are of cutaneous forms. However, during an epidemic as it happened in Sudan, the number of kala-azar cases considerably increased (WHO, 2010; Dawit *et al.,* 2013; WHO, 2014).

2.3.7 Visceral leishmaniasis and co-Infections

Kala-azar can be an opportunistic infection majorly in people with HIV/AIDS, Tuberculosis (TB), malaria and these are expanding. There is an increasing overlapping geographical distribution of the two pathogens of kala-azar and HIV/AIDS as reported in 34 countries especially in Asia, East Africa, South America and South Europe, the number of cases with co-infection is expected to rise. Kala-azar stimulates replication of the HIV (Davidson 1997; Desjeux, 2003; WHO, 2016); where more than 90% of the co-infected patients have less than 200 CD4 cells/cubic mm (Diro *et al.,* 2014). Kala-azar/HIV co-infection is emerging as an extremely serious new disease and is increasingly frequent (Diro *et al.,* 2014; WHO, 2016).

2.3.8 Health seeking Behaviour towards kala-azar

Patients or individuals in many endemic areas with diseases have been reported to choose alternative healthcare providers such as traditional healers, village homeopaths or untrained allopathic doctors above formally trained practitioners or government health facilities for some kind of illness (Dawit *et al.,* 2013; Diro *et al.,* 2014). Many of the locals do not make use of health facilities and only get to the hospital when the disease has advanced. In many communities, since fever is one of the common symptoms, the locals tend to first rely on traditional healing methods before deciding to go to hospital (Dawit *et al.,* 2013).

Kala-azar is an important cause of death in developing countries as a result preference of alternative treatment interventions (Alvar *et al.,* 2012). A common feature of the neglected tropical diseases (NTDs) like kala-azar is the inextricable link with poverty and often clustering in the same geographical areas, primarily in low-income countries, where the poor and disadvantaged are most at risk of infection

with one or more NTDs due to poor living and working conditions, inadequate sanitation or lack of access to safe drinking water and health care.

Kala-azar is also an important determinant of poverty through their effect on child development, the reduced productivity of infected individuals and the costs related to accessing treatment services. The stigma caused by visceral leishmaniasis is such that it has a direct effect on household wealth through catastrophic health expenditures on treatment and sales of livestock or assets to pay for the costs of care (Adhikary *et al.,* 2009).

2.4 Prevention and control measures of kala-azar

A combination of approaches are used to control the disease.These include: early recognition and treatment of cases, control of vectors and reservoir hosts. Also, health education of the population in the endemic foci which is the most important element of the control strategy as well as passive active case detection followed by treatment and case reporting use of insecticide (Jeronimo *et al., 2011;* Dawit *et al.,* 2013).

2.4.1 Reservoir Control

Dogs are the main reservoir of *L. Infantum* in zoonotic kala-azar. Despite evidence from experimental studies showing a decreased incidence of kala-azar in both dogs and children following serological screening of dogs and killing of sero-positive animals (Dawit *et al.*,2013), the efficiency and acceptability of this control strategy is increasingly being debated (Alvar *et al.,* 2012; Dawit *et al.,* 2013). Treating infected dogs is not an effective control strategy as relapses are frequent and dogs can regain infectivity weeks after treatment, despite being clinically cured (Alvar *et al*.,2012; Gradoni, 2015). Vaccination of dogs would nevertheless be the best strategy if an efficacious vaccine can be developed (Bhattarya, 2007; Dawit *et al.,* 2013).

2.4.2 Vector Control

Sand flies are susceptible to the same insecticides as anopheles mosquitoes, the malaria vector. Residual insecticide spraying of houses and animal shelters using the large scale antimalarial insecticide (dichloro-diphyl)-trichloroethane (DDT) is shown to be efficacious in some countries like India (Mondal *et al*., 2009; Enaeim, 2011; Alvar *et al.,* 2012) where the vector *Phlebotomus argentipes* is restricted to areas in and out around the home. With the use of the insecticides, kala-azar completely disappeared from the India Sub-continents. Unfortunately, the disease quickly re-emerged when these spraying campaigns were discontinued just as in Kenya due to resistance and ineffectivity intneir actions (Singh *et al.,* 2011; Alvar *et al.,* 2012).

2.4.3 Insecticide – Impregnated materials

The use of the insecticide treated bed nets (ITNs) can concomitantly prevent kala-azar and other vector-bone diseases such as malaria and Japanese encephalitis. There is limited evidence that bed nets provide protection against kala-azar.

Case control studies conducted in Bangladesh and Nepal showed that sleeping under a non-impregnated bed net during the warm months was a protective factor against kala-azar (odd ratio = 0.20, P=0.001; odds ratio =0.69, P=0.01, respectively (Ritmeijer, 2007;WHO 2014; Kalacole, 2017). Despite low usage, the mass distribution of ITNs in Sudan was accompanied by a 27% reduction in the incidence of kala-azar in an observational study (Ritmeijer, 2007; Meheus *et al*., 2013; WHO, 2014).

2.4.4 Early diagnosis and treatment

Early diagnosis and treatment are essential for both individual patients and for the community because early case finding and treatment is an important component of kala-azar control. Adult patients in Sudan with severe anaemia, malnutrition and long duration of illness had shown to be at an increased risk of death (Mueller *et al*., 2012; Dawit *et al*., 2013). Untreated kala-azar patients act as a reservoir for parasites and

therefore contribute to disease transmission in anthroponotic kala-azar areas (WHO, 2016).

2.5 Kala-azar treatment strategies

Treatment of kala-azar relies on specific anti-leishmanial drugs and the aggressive management of any concomitant bacterial or parasitic infections, anaemia hypovolemia (decreased blood volume) and malnutrition. The pentavalent antimonials (sodium stibogluconate and meglumine antimoniate) have been the first line treatment for kala-azar in many areas for more than 70 years, given as a 30 days course of 20 mg antimony per kg body weight given by injection intramuscularly (Burki, 2009; Den *et al*., 2011; Dawit *et al*., 2013). Cheaper generic forms of drugs are available that have been shown to be equivalent to the branded products (Burki, 2009; Dawit *et al*., 2013; Atia *et al.*, 2015; WHO 2017). The second line drugs are amphotericin B and AmBisome (amphotericin B in liposome). AMBisome is a safer and more effective lipid formulation of Amphotericin B. Pentavalent antimonials is the most commonly used drug in Africa, and the only one used in Kenya and in Turkana as well as the Loima Sub-County, yet the drug is also very expensive such that many locals cannot afford its treatment. Miltefosine, which was initially developed as anti-cancer drug, is the first effective oral drug for kala-azar (Dawit *et al*., 2013; Bhattacharya, 2014).

2.6 Vaccines development

The simple nature of the parasite lifestyle and the fact that healing and recovery prevents individuals from re-infection indicate that it should be possible to get a vaccine against kala-azar. The extensive knowledge that has been gathered from animal models has shown that protection against live challenge could be achieved using parasite specific proteins- DNA (Kedzierski and Handman, 2006) or genetically attenuated parasites (Blackwell *et al.*, 2009, WHO, 2010; Picado *et al.*, 2014; Medley *et al*., 2015). Advances in the understanding of Leishmania major genuine sequence (Salih *et al*., 2014; WHO, 2016) take this a step further.

Interests in developing immunochemotherapeutic vaccines which combine a vaccine with drug treatment and which have the potential to become a practical and affordable treatment for PKDL and other persistent forms of leishmaniasis, is gaining momentum. Encouraging results have been obtained using alum-precipitate autoclaved *L. major* plus Bacillus Callemette Guerine (BCG) together with pentavalent antimonials to treat persistent PKDL in Sudan (Kedzierski *et al.,* 2006; Musa *et al.,*2016; WHO, 2016).

2.7 Risk factors for kala-azar due to Cultural, Social beliefs and practices

Many communities like America, Nepal, Bangladesh, Sudan and Kenya, especially the areas of Kitui, Machakos, North Eastern, East Baringo, West Pokot and Turkana, have multifactorial explanation of ill health due to kala-azar (Boelart, 2012). They belief variables such as social class, economic position, religion, gender, life events can be correlated with misfortune that is believed to result from supernatural forces like sorcery, witchcraft, breaking of taboos, curses and spirit disturbances.

Sudden changes of weather form wet to dry, exposure to dry air during hot seasons are also believed to cause the disease (Burki, 2009; Meheus *et al*., 2013; Medley *et al*., 2015; WHO, 2016). Arrangement of living space and type of house, social isolation of certain sub-groups such as within a rigid caste system, population movements such nomadic life style are also believed to cause the disease (WHO, 2016).

Leishmaniasis, especially the visceral form, tends to affect the poorest people and marginalized societies (Burki, 2009; WHO, 2016) particularly those people that are close to water resources, live in humid houses, and are in vicinity of accumulated rubbish, sewerage and farms of livestock.

Individuals in under-developed houses for example mud or thatched rooms with cracked walls and low socio-economic status have been found at risk for leishmaniasis (Ryan *et al*., 2006; Medley *et al*., 2015). The recent risk factors contribute to the growth and multiplication of sand fly. Other studies have shown that the risk of leishmaniasis has been associated with mud house, cattle density,

presence of rodent, dog, other leishmaniasis cases and poor socio-economic status (WHO, 2015;WHO, 2016) which may have difficulties in accessing treatment. However, infected individuals may play an important role in sustaining transmission in these areas and result in endemicity of leishmaniasis in poor communities. The role of domestic animals mainly cattle in proximity of the houses has been emphasized as a risk factor for leishmaniasis.

The risk of disease in those individuals which are living in close contact to the asymptomatically infected individuals and leishmaniasis cases in the neighboring houses is significantly high. A worse socio-economic status is associated with an increased risk of sero-conversion. It has also been confirmed that sero-conversion and leishmaniasis are strongly associated. In addition, a strong association between the occurrence of a new leishmaniasis case and the presence of asymptomatically infected persons in the surrounding houses has been indicated.

Many studies have shown the use of bed-nets to be protective against Leishmania ainfection (Meheus *et al*., 2013). Some sleeping habits such as using bed-net, sleeping under a cover and spaying inside have been found to be protective (Meheus *et al*., 2013). However, sero-conversion has significantly been found that it associated with household spraying. Finally, investigation of the risk factors for this disease is complex because of the leishmaniasis with unstable transmission and because of the high number of latent infections and infected animals for which validated markers is not present.

2.8 Traditional treatment pattern and Prevention measures

Many communities devise strategies to cope with the disease that include blood-letting to reduce headaches and fever, whereas others rub oil and herbal paste to the site with fever, sitting by the fire place, use of bitter herbs, visiting of witchdoctors and traditional healers. It is estimated that between 50-80% of the people in many communities predisposed to kala-azar, first visit drug outlets and other unprofessional practitioners before going to the hospital (Den *et al.,* 2011; Alvar *et al*., 2012; Meheus *et al*., 2013; Medley *et al*., 2015).

There are people who first try to self-medicate, adopting a ‘’symptomatic’’ approach with distinct healing methods for each affliction. For instance, they cut or burn skin against the abdominal swelling and others drink herbal concoctions from various roots for yellow skin (Medley *et al*., 2015).

The association with’’ bad blood’’ can lead to the practice of blood -letting, ‘’ where there is letting of the black blood run’’ after which the wound is tied up with the acacia tree barks. If these attempts are unsuccessful, then people resort to the formal health system that might be village health centre or clinic, nearest rural hospital or pharmacy, depending on circumstances and the available money (Alvar *et al*., 2012; Meheus *et al*., 2013).

2.9 Conceptual Framework

The figure 2.2 shows the framework for socio-economic, socio-cultural, household/environmental and behavioural variables and being at risk to kala-azar in the Loima Sub-County of Turkana County, Kenya. The approach distinguishes between distal and proximate factors in that the distal factors rarely have a direct effect on the disease outcomes but operate through a number of inter-related proximate determinants which in turn affects directly risk of disease. For instance, socio-economic status may not affect directly the risk or exposure to kala-azar but can affect indirectly through the likelihood of sleeping outdoors or ownership of bed-net, both of which influence in turn risk of exposure to biting by sand flies. There is also influence of independent variables that included age, gender, socio-economic and socio-cultural factors, health seeking behaviour, accessibility or distance and time to reach to health facility, as well as availability and cost of care, attitudes, perception and practices toward kala-azar illness as it related to dependent variable which was prevalence of the disease.

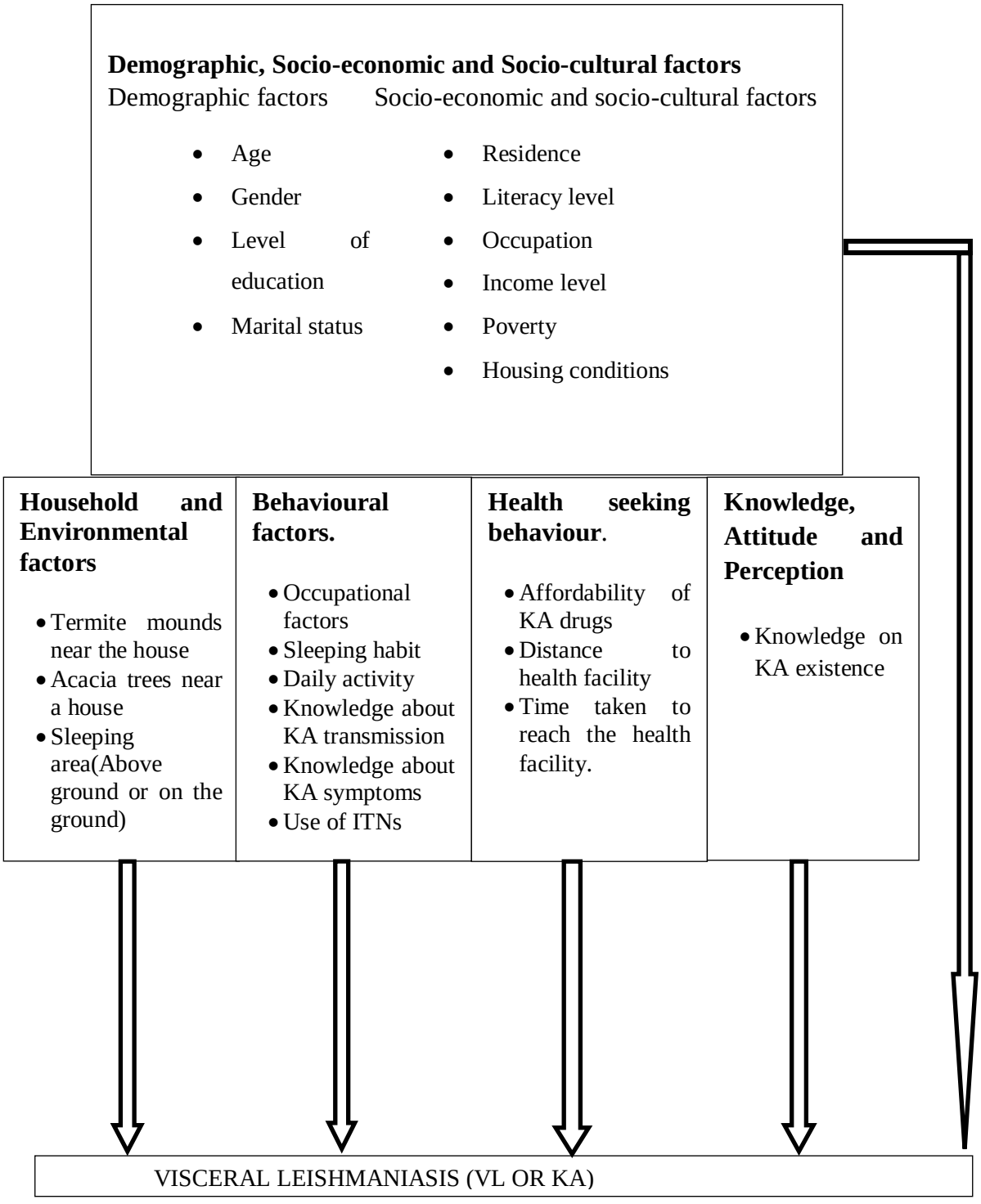

Figure 2.2: Conceptual framework showing association between exposure factors, demographic characteristics, Health seeking behaviour, knowledge, attitudes, practices and kala-azar.

The independent variable on the knowledge of the kala-azar underscored the significance of knowledge on the cause, transmission, prevention and treatment of the disease in relation to risk or endemicity of the disease in the community. The independent variable on the practices focused on the importance of observation of basic hygiene practices, preventive measures on sand fly bites such as ownership and usage of insecticide- treated bed-nets and disposal of refuse in relation to risk of kala-azar. The other predictor was the attitude towards the disease. It focused on the attitudes and values of the community on the disease and its effects especially how healthcare services might influence their subsequent perception of need and use of the services. The predictor looked into the morale of the community towards managing the disease and preventing it in the first place and how resources provide community members with the means to make use of the services.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

The study area was Loima Sub-county, Turkana County, Kenya, which is kala-azar endemic and is suspected to have about 38% of the people that are at risk of kala-azar (MSF, 2011; WHO, 2014). Loima Sub-County has two divisions of Loima and Turkwel (Figure 3.1 and Figure 3.2), 12 locations and 18 sub-locations (Figure 3.1), with an estimated human population of 50,000 people in 6,000 households with males being 52% and females 48% with a population density of 6.9 people per km^2 (CBS, 2009; CBS, 2016). The study was conducted in the two divisions of Loima and Turkwel, the locations of Namoruputh, Lokiriama, Lorugum and Nadapal and the sub-locations of Lochor Edome, Lochor Ekuyen, Urum, Lokiriama, Kalemunyang, Lobei, Nadapal and Tiya (Figure 3.1). Loima Sub-county is located in the Western part of Turkana County and is sharing boarders with West Pokot County to the South and Uganda to the West. Turkana County occupies the Northwestern part of Kenya sharing international borders with Ethiopia to the North, Sudan to the Northwest and Uganda to the West.

Loima Sub-county covers an area of approximately 4,250km^2 comprising two geographically distinct regions, Lorengikippi region (2,050km^2) and Loima hills plateau (2,200km^2). Land reforms in the Sub-county includes mountains, hills, uplands, foot slopes, dissected erosional plains, sedimentary plains and riverine (flood) plains). The area is characterized by dry savannah, acacia thorn trees with the presence of ant and termite mounds and the vegetation comprises of evergreen woodlands, deciduous bush land, deciduous bush annual 34 grasslands, and wooded grassland and it is within 10km of permanent water.

Loima Sub- County is an arid and semi-arid land with warm and hot climates, unreliable rainfall where it receives annual rainfall between 200 mm and 400 mm in the lowlands and highlands respectively and, with temperatures ranging between 24-38°C. The people in the area live in compounds (manyattas). The homesteads are

surrounded by a thick fence of acacia branches that contain several family households that keep domestic animals that are usually kept in corrals near family houses. The main economic activities include livestock farming and trade and tourism for majority of the inhabitants. Natural resources are gemstone and saltlicks, oil and gold that is dormant. Agricultural products are sorghum and maize. Despite all these, about 95% of the populations live below the poverty line, with 89.4 % being the age dependence ratio such that eight to nine individuals or families are dependant on the only one that is working (KDHS, 2014; CBS, 2016).

The health in the sub- County is such that there are 17 health facilities with only one, the Pentecostal Assemblies of God (PAG) Namoruputh faith based hospital being equipped to offer laboratory diagnostic services for kala-azar testing. The infant and under five mortality rates are 60/1000 and 12/1000 respectively (MOH, 2013). The commonly reported diseases include malaria, malnutrition, pneumonia or respiratory infections, diarrhea and neglected diseases like kala-azar. The doctor to patient ratio is 1:52,434 (MOH, 2013).

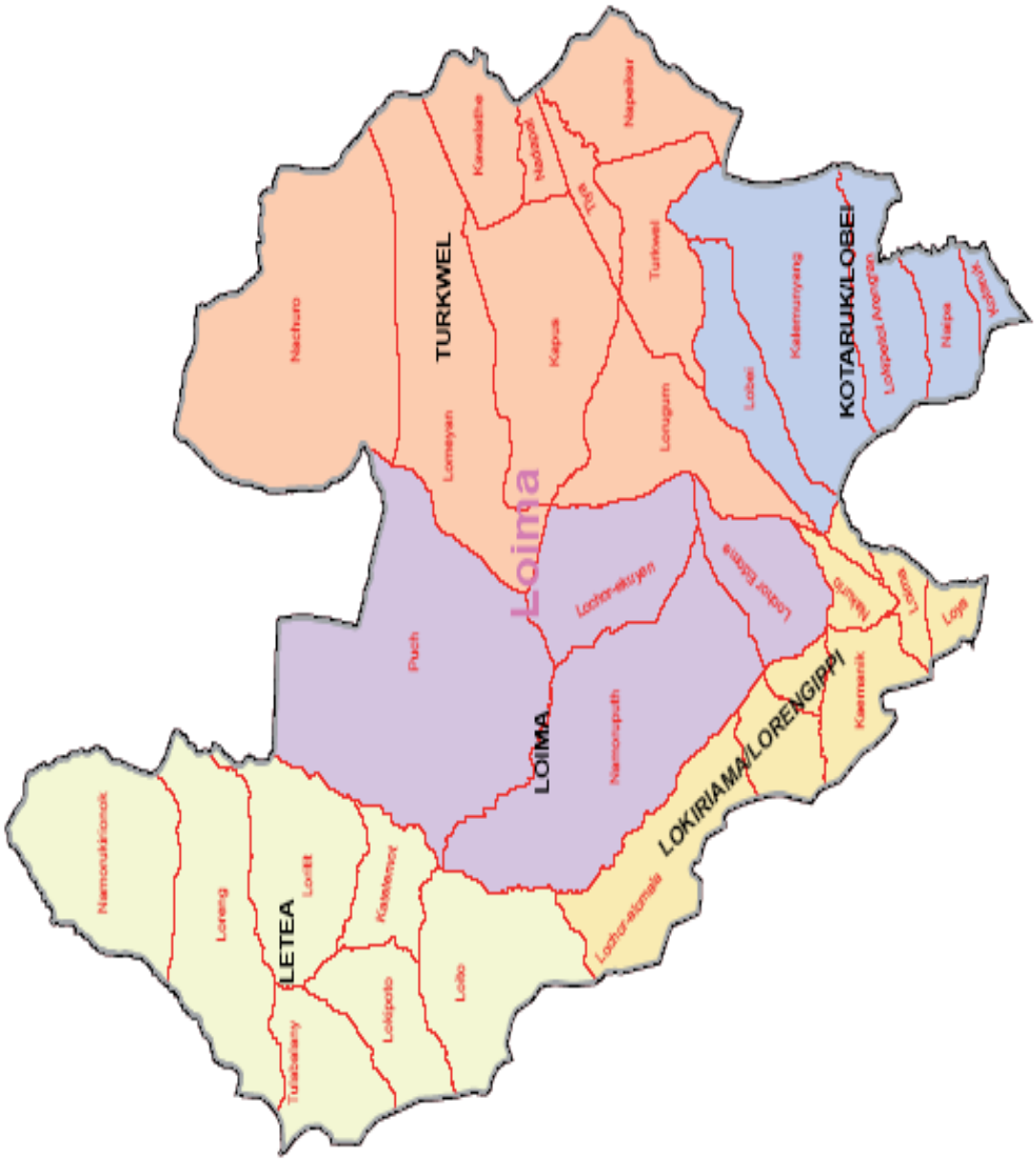

Figure 3.1: Map of Loima sub-county showing the study area locations, sub-locations and villages

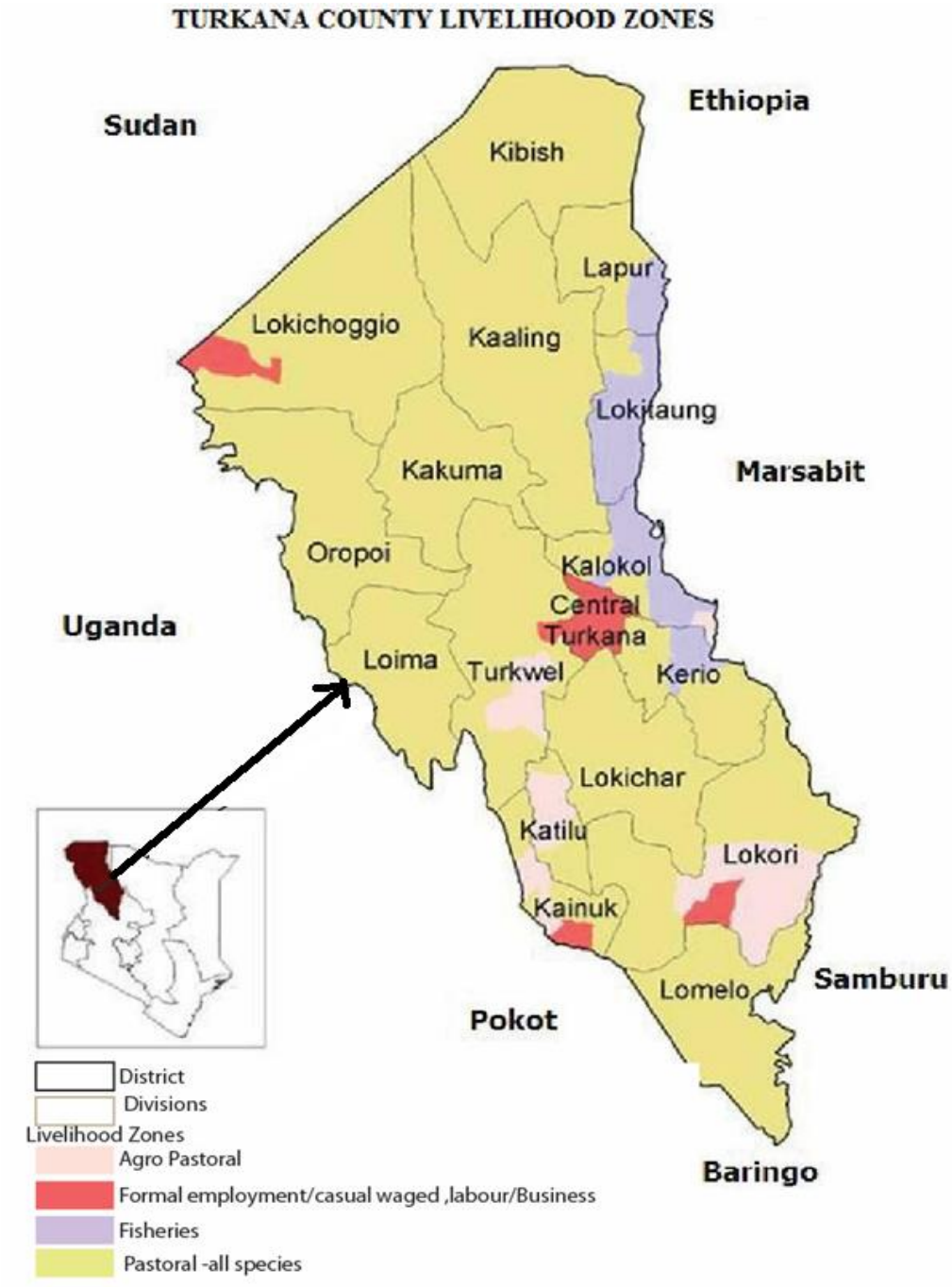

Figure 3.2: Map of Kenya showing the Turkana County, livelihood zones and the study area.

3.2 Research Design

Cross-sectional design that entailed adoption of both quantitative and qualitative data collection methods (Wisdom & Creswell, 2013; Guertterman *et al.*, 2015) , was used to determine the social demographic characteristics, socio-economic and socio-cultural factors, kala-azar prevalence, health seeking behavior, local people's attitude, perception, knowledge and behavior towards existence of kala-azar in the area, as the selected variables to be measured, among other factors (Taylor, 2010; Poth *et al*., 2015). The design was important for there can be an integration of both quantitative and qualitative data at certain stage of the research process within a single study for the purpose of gaining a better understanding of the research problem and that the data of both complement each other and allow for a more robust analysis, taking advantage of the strength of each. Both quantitative and qualitative data were obtained from the households based on these selected variables; and that the design provided a quick assessment of the strength relationship between a factor (independent variable) and the health outcome (dependent variable).

3.3 Variables

3.3.1 Independent Variables-

Selected variables were age, sex, marital status, family size, income and education, health seeking behavior local people's attitude, perception, knowledge and behavior.

3.3.2 Dependent Variables

Prevalence of kala-azar.

The association between the independent and dependent variables were measured using the Chi-square test and the logistic regression analysis was done to measure the strength of the association.

3.4 Target Population

The target population was classified as the locals or the households' respondents living in Loima Sub-County of Turkana County, predisposed or not predisposed to the disease. The sample size was calculated using the formula Bartlett *et al* ;(2002) and Lwanga and Lemeshow (1991) with the consideration of Finite Population Correction factor.

3.4.1 Study population

The study population was the households' heads respondents living in Loima Sub-County, that were at risk of kala-azar and drawn from the two divisions of Loima Sub-County, Loima and Turkwel divisions, the locations of Namoruputh, Lokiriama, Lorugum and Nadapal and the sub-locations of Lochor Edome, Lochor Ekuyen, Urum, Lokiriama, Nadapal and Tiya.

3.4.2.1 Inclusion Criteria.

The inclusion criteria were:

1) All households' heads or adult member living in Loima Sub-County of Turkana County for more than 6 months and being or not being predisposed to the disease.
2) Giving of consent of participation after the objective of the study had been explained carefully, clarifying that participation is voluntary.

3.4.2.2 Exclusion Criteria.

The exclusion criteria were:

1) Being very sick or very old household head that cannot participate in the study.
2) Not being cooperative/hostile due to one's character or being intoxicated

3.5 Sample size determination

The minimum sample size for this study was established from formula described in by Barlett *et al;* 2002 and Lwanga and Lemeshow (1991). The sample size was obtained using the following formula.

$n= Z^2p(1-p)/e^2$ for the target population above 10,000

where,

Z is the value for corresponding confidence level (1.96 for 95% confidence level; e is the margin error (0.05) and p is the estimated value for the proportion of a sample that is exposed to kala-azar (taken as (0.38) being the suspected proportion of people at risk in Loima Sub-county). Inserting this in the formula.

$$n= \frac{(1.96)^2 \times 0.38 \times 0.62}{(0.05)^2}$$

$= 362$

The formula above assumed random sampling and since the number of households in the Sub-county were less than 10,000 (Only 6,000), Finite Population Correction (FPC) was used to calculate a corrected sample size in order to obtain a more precise estimate of the population. The new sample size (n') that accounts for FPC is:

C=ni/(1+ni/N)), where **N** is the total households of the sub-county (6,000), **ni** is the sample size based on the calculations above(362) and **C** is the corrected sample size.

Corrected sample size(**C) = 362/(1+362/6000)),**

362/(1+0.0603333)

=341 Respondents interviewed.

The corrected minimum sample became 341 households.

For the 4 locations selected, the household number was selected using the probability proportion (ci = Ni*n/N), where ci is the total number of study subjects needed in each location, n is the total number of subjects obtained (362) and N is the total number of households in the Sub-county (6,000), hence from Lorugum location (Kalemunyang and Lobei sub-locations) 117HH, from Namoruputh location (Lochor Edome and Lochor Ekuyen sub-locations) 50HH, from Nadapal location (Nadapal and Tiya Sub-locations) 66HH and from Lokiriama location 108HH (Urum and Loiriama sub-locations) were included in the study (Appendix X).

3.6 Sampling Procedures

3.6.1 Purposive Sampling

The County was purposively selected because it contained the population of interest. The sub-county was also purposively selected because according to Mecins Sans Frontiers (MSF) survey of 2004, the area is more endemic of kala-azar in comparison with other sub-counties, meaning that more people in the Sub-County are predisposed to the disease (MSF, 2013).

3.6.2 Simple random and stratified sampling

Simple random and stratified sampling was used in this study (Mugenda & Mugenda, 1999) and to obtain population representation, both the two divisions (Turkwel and Loima) in the study area, which is Loima sub-County, were purposely selected. Simple random sampling was used to randomly select households, the two (2) locations and four (4) sub-locations in each division, in order to have a 30% or more representative sample hence four (4) locations and six (8) sub-locations were selected, from the twelve (12) locations and eighteen (18) sub-locations in Loima sub-county. For Turkwel division, the locations of Nadapal and Lorugum and the sub-locations of Tiya, Nadapal, Kalemunyang and Lobei were randomly selected. For Loima division, two locations of Namoruputh (Sub-locations of Lochor Edome and Lochor Ekuyen) and Lokiriama (Sub-locations of Urum and Lokiriama) were selected. All the 12 locations and the 18 sub-locations were listed on a piece of paper

and the locations and sub-locations were simple randomly selected by ballot method (Appendix XI).

Stratification of villages was done, hence a strata was the villages. Five (5) villages from each location and the consecutive households (Appendix 10) were sampled in order to obtain the required sample size. The standard formula as used by Bartlett *et al.(*2002); Lwanga and Lemeshow (1991), arrived at 341 respondents who were household heads interviewed in the strata selected randomly and sampled proportionately (Appendix XI), and was determined using probability sampling (Taylor, 2010) and the study area strata.

The population in the strata or villages varied and to maintain an equal representation, a proportion commensurate to the number of household in the strata was calculated (Table 3.2) and even according to Taylor, (2010). The consecutive sampling of the households was obtained or made available by the assistance of the community health workers, village elders and area local chiefs in charge of the locations; where the total number for sample number allocation was obtained (Appendix X) and the simple random sampling (Hickey, 1986) was used in enrolling an household for an interview. The target population was stratified into units of households and only one member of the household head was interviewed.

The sampling was completed in such a way that in each of the randomly selected village and household, the enumerator went to the Centre of the village and spinned a bottle to determine the direction that the investigation was to begin from. At the village, households were sampled consecutively until the desired sample size was reached. Household heads of each randomly selected household who lived for at least six months in the location were included in the study and when the selected household was random, the households before or after the indicated one was sampled for replacement. The proportion of respondents in the village was dependent on the population and the number of households in the village. The desired sample size was distributed proportionately to the villages as per table appendix X. Two (2) Sub-locations in each of the four (4) locations sampled were chosen randomly and the

numbers of households sampled from each of these sub-locations calculated (Appendix XI).

3.6.3 Selection of Focus group discussions (FGDs) and Key Informant Interviews (KIIs)

A total of 24 KII (Appendix VIII) and 40 FGD (Appendix IX) participants were selected purposively since they were likely to possess the required information. Focus Group Discussion was used in assessing knowledge, attitudes, health seeking behaviour and perception on disease existence in the area and was focused on selected heads of households in the selected locations and sub-locations and down to villages. The Key informant interviews participants gave an in-depth knowledge about the disease and also confirmed and clarified any pending or new issues described in the questionaires and FGDs. The key informants' interview was distributed as per appendix 8

The FGD was used to obtain insight information on the existing difficulties/gaps and also their probable measures that could be used in developing new kala-azar control interventions (Appendix IX).

3.7 Data collection

3.7.1 Data collection instruments.

The structured questionaires, focus group discussions and key informat interview guides were the data collection instruments employed in this study. Data collection from the households was done from the homes following prior appointments. The interviews were conducted in the local language Turkana, English and Kiswahili (Appendix II).

3.7.2 Training of research assistants

Research assistants (4), were trained on the use of interview schedules, making respondents understand questions, objectives and the significance of the study as well as explaining to them that participation is voluntary (Appendix I). They also helped in the translation of the local Turkana language for those who may not have understood Kiswahili/English, filling answers in the interview schedules and also assisted in locating the randomly selected respondents, (Appendix II).

3.7.3 Pretesting of the study tools

A pilot study was done in the Turkana Central Sub-County divisions,' locations and sub-locations that were not part of the study but had similar characteristics with the study area, in order to ascertain the validity and suitability of the data collection instruments. The data collection tools were pilot tested among 30 respondents selected at random. The pilot study took 4 days after which data was analysed and adjustments made on the instruments for reliability purposes before the main study.

3.7.4 Household data collection (Questionnaire administration)

The household heads or adult members were sampled in the selected divisions, locations or villages/households in order to obtain the necessary information that were filled in the structured questionnaires (Appendix II) which were the main quantitative data collection tool in this study and they were used for collecting data from the randomly selected household heads or adult members. The purpose of the study was clearly explained to the respondents while requesting them to sign informed consent forms (Appendix I) as a sign of willingness. The questionnaires were constructed to accommodate each objective and hypothesis of the study.

3.7.5 Focus group discussions (FGDs)

This tool was used to collect qualitative data and the selected household heads-both male and female were involved in the focus group discussions. There were four (4) focus group discussions with 10 members each from the selected locations, sub-locations and households that involved both males and females with equal

representation. These persons were invited to participate in a FGD on a fixed time and date at a convenient location to them and the discussions were conducted on around table arrangement after consent to participate in the study was sought. The purpose of the study was clearly explained to them while requesting to sign informed consent forms (Appendix I) as a sign of willingness.

Each focus group discussion was led by a moderator who was an expert in qualitative studies in the preferred language of the group, notes were taken by the research assistants and a standard FGD interview guide (Appendix III) with a list of questions was used for all focus groups, with appropriate modification for different age groups. The FGD was used to obtain insight information on whether kala-azar is a common and a serious problem in the community, community's socio-cultural beliefs, health seeking behaviour, treatment patterns, knowledge, attitude and practices associated with the disease and the existing/ gaps and also the probable measures that could be used in developing new kala-azar control interventions. Each FGD lasted for about 45 minutes.

3.7.6 Key informant Interviews (KII's)

A total of 24 KII participants who were the selected health facilities workers and other opinion leaders such as the doctors, nurses, clinical officers, medical laboratory technologists, public health officers, chiefs, head teachers and village elders were involved. The purpose of the study was clearly explained to these participants while requesting them to sign informed consent forms (Appendix I) as a sign of willingness.

These participants were selected due to their position of leadership in the community whether formal or informal. They first gave their own independent views on the subject matter and due to their ability and willingness, were able to confirm and clarify any pending or new issues described in the questionnaires and FGDs. Health workers were identified because they are the ones who are directly involved in the diagnosis, management, prevention and control of kala-azar and other opinion leaders can give their honest views. After identification, they were intermittently interviewed at a place and time most convenient and confidential for the participants

including their offices so that they reflect on the findings and give in-depth knowledge about the disease in the community. The key informants were observant, articulate and available for multiple interviews of varying duration. A KII guide (Appendix IV) was used in the discussions and it captured issues which needed more clarity from questionnaires and focus group discussions and the note taking and moderation were done by the trained field researchers and the principal investigator.

3.8 Data Management

3.8.1 Quantitative data management

Data from the questionnaires were coded and entered into a spreadsheet and the database; was double entered in MS- *Acces*s and cleaned in *Epinfo*. Data cleaning and validation was done so as to achieve a clean data set that was then exported into a Statistical Package format (IBM SPSS Statistics for Windows, version 21.0) for analysis. There were back up files stored in flash discs and CD Roms and all data were stored in a restricted access room at the research station and the hard copies of questionnaires were kept under lock and key for confidentiality.

Univariate categorical variables especially socio-demographic characteristics, were analysed in frequencies, pie charts and bar graphs, which were used to describe, organize and summarize the data; with figures and tables being used in data presentation. Chi-square or Fisher's exact test was used to test for associations and comparison of proportions where applicable.

In bivariate analysis, Pearson's Chi-Square test was used to test the strenghth of association between the categorical variables. Odds Ratio (OR) and 95% Confidence Interval (CI) were used to estimate the strenghth of association between independent variable (kala-azar exposure factors) and the dependent variable (kala-azar presence or prevalence), where a probability value of $p<0.005$ at 95% confidence interval, were considered significant (Taylor, 2010).

In multivariate analysis, a manual backward elimination approach was utilized so as to reach the most parsimonious model, where all independent variables identified to significantly associate with self- reported kala-azar prevalence at Bivariate analysis, were considered at Multi-variate analysis.This was performed using binary logistic regression with the use of Software statistical Package for Social Sciences (SPSS) version 21.0), where the backward conditional method was specified in order to identify and control confounders and effect modifiers (Taylor, 2010). Adjusted Odds Ratios (AOR) together with their respective 95% confidence intervals were used to estimate the strength of association between the retained independent predictors and kala-azar prevalence.

3.8.2 Qualitative data mangement

Qualitative data collected was conceptualized, coded, categorized and summarized based on the themes and according to each objective of the study. The FGDs were also tape recorded and the audio taped discussions were transcribed in readiness for analysis. Qualitative data was analysed thematically using the stages of the Framework method (Gale *et al*., 2013), where interviews were transcribed verbatim and the data then explored to identify important and relevant themes around issues relating socio-economic and socio-cultural factors associated with kala-azar presence or exposure, community's health seeking behaviour, knowledge, attitude and perception about the disease as well as prevention and control measures of the disease. Schematic analysis was done and that common themes were extracted, emerging categories were merged and analysed; where necessary verbatim quotes were used to amplify the voices of the informants (Green and Thorogood, 2010). To enhance credibility, a social scientist was identified who coded the transcript independently and this was compared with the already done coding and no major coding differences were found and hence major themes were agreed upon.

3.9 Logistical and Ethical Considerations.

Ethical clearance for the study was obtained from Scientific and Ethical Review Unit (SERU) in KEMRI (Appendix V). Approvals were obtained from Jomo Kenyatta University, Ministry of Health and Ministry of Education. Further permission was sought from the Provincial Administration Turkana County and Loima sub-county, household heads and the community leaders. The purpose of the study was clearly explained to the participants in both quantitative and qualitative participation, while requesting them to sign informed consent forms (Appendix I) as a sign of willingness. Participation was fully voluntary and confidentiality was observed at all times.

CHAPTER FOUR

RESULTS

4.1 Introduction

The results presented in this chapter are findings of the study conducted. The participants were 341 respondents who were household heads/adult members, 40 (fourty) household heads (males and females) and twenty four (24) community/opinion leaders and health workers who were participants for focus group discussions and key informat interviews respectively.

4.2 Prevalence of kala-azar obtained from households data

4.2.1 Prevalence of kala-azar in the household in Loima sub-county of Turkana county, Kenya, 2016.

Almost a half 49.3% (n=168) of the respondents interviewed or a member of the household, had suffered from kala-azar in their life time. Therefore, the prevalence of kala-azar from self-reporting was 49.3% (table 4.1).

Table 4.1: Prevalence of kala-azar in the household in Loima sub-county of Turkana County, Kenya, 2016.

If respondent/household member ever suffered from kala-azar	N	%
1) Yes	168	49.3
2) No	173	50.7
Total	**341**	**100**

4.3 Demographic characteristics of the respondents

4.3.1 Socio demographic characteristics and socio-economic factors of the study subjects

The results of the study have shown that majority of the respondents 170 (49.9%), interviewed were in the age category 18-35 and only 3 (0.9%) were in the age category of above 70 years (Table 4.3). Of those interviewed, 181 (53.1%) were females while 160 (46.9%) were males.

A high number of 294 (86.2%) of the respondents were married while 47 (13.8%) were single, widowed or divorced; with majority of them 160 (46.9%) having children between 1-5, while another considerable number 68 (20%) had a more number of children of between 11-15. With regard to religion, 299 (87.7%) were christians while traditionalists and Muslims constituted 35 (10.3%) and 7(2.0%) respectively (Table 4.3). A majority, 193 (56.7%) of the respondents had no formal education and 33(9.6%) had college/university education. With respect to occupation, 181(53.1%) were livestock keepers (herdsmen) while 85 (24.9%) were either administrators, teachers, health workers or house-wife. A large number, 172 (50.5%) of the respondents were unemployed while 169 (49.5%) were employed with either self or formal employment. Majority of the respondents, 179 (52.5%) had livestock keeping as their source of income while 162 (47.5%) had their income source being business, farming or formal employment, with many of them 206 (61.0%) living in rural areas with 127 (37.2%) living in pre-urban area of Loima-County (Table 4.3).

Table 4.2: Socio demographic characteristics and socio-economic factors of the study participants (N=341), in Loima sub-county of Turkana County, Kenya, 2016.

		Socio-demographic characteristic
Age Range	**N**	**%**
18-35	170	49.9
36-49	129	37.8
50-70	39	11.4
Above 70	3	0.9
Total	**341**	**100**
Gender of subjects	**N**	**%**
Male	160	46.9
Female	181	53.1
Total	**341**	**100**
Social demographic characteristics cont'		
Educational level of subjects	**N**	**%**
No Education	193	56.7
Primary	70	20.5
Secondary	45	13.2
College/University	33	9.6
Total	**341**	**100**
Marital status	**N**	**%**
Married	294	86.2
Single	35	10.3
Widowed	10	2.9
Separated	2	0.6
Total	**341**	**100**
Number of children	**N**	**%**
1-5	160	46.9
6-10	113	33.1
11-15	68	20.0
Total	**341**	**100**
Religious status of subjects	**N**	**%**
Protestants	93	27.3
Catholic	206	60.4
Traditionalist	35	10.3
Muslim	7	2.0
Total	**341**	**100**
Subjects source income	**N**	**%**
Farming	35	10.3
Livestock keeping	156	45.7
Formal employment	66	19.3
Business	43	12.6
Multiple answer-Business, farming or formal employment	27	8
Others for example selling of local brew	14	4.1
Total	**341**	**100**
Socio demographic characteristics and socio-economic factors of the study participants Cont'		
Employment	**N**	**%**
Employed	169	49.5
Unemployed	172	50.5
Total	**341**	**100**
Residence of subjects	**N**	**%**
Pre-urban	133	39.0
Rural	208	61.0
Total	**341**	**100**
Occupation of subjects	**N**	**%**
Business	41	12.0
Peasant farmers	34	10.0
Livestock keeping (herdsmen)	181	53.1
Administrator	25	7.3
Health worker	10	2.9
Teacher	35	10.3
Other e.g. House wife	15	4.4
Total	**341**	**100**

4.3.1.2 Prevalence of kala-azar in relation to socio-demographic factors

In considering prevalence of kala-azar disease obtained through household data, the disease was more prevalent among the age groups of 18-35 years, 52.9% (n=90) and more prevalent among the males, 59.4% (n=95). The disease was also more prevalent in those with no education, 57.5% (n=111) as well as with majority 61.1% (n=22) of those who were traditionalists. It was also noted that the disease was more prevalent in 54.3% (n=19) as compared to 48% (n=141) of the married (Table 4.4). It was prevalent more in many of the respondents 54.8% (n=114) that reside in the rural as compared to 40.6% (n=54) of those that reside in the peri-urban area (Table 4. 4).

Table 4.3: Prevalence of kala-azar in relation to socio-demographic factors in Loima sub-county of Turkana county, Kenya, 2016.

Social Demographic Factors		If ever suffered from kala-azar	
		Yes = 168	No= 173
	Overall n (%)	n(%)	n(%)
Age			
18-35	170(49.9)	90(52.9)	80(47.1)
36-49	129(37.8)	56(43.4)	73(56.6)
50-70	39(11.4)	20(51.3)	19(48.7)
Above 70 years	3(0.9)	1(33.3)	2(66.7)
Gender			
Male	160(46.9)	95(59.4)	65(40.6)
Female	181(53.1)	73(40.3)	108(59.7)
Marital Status			
Married	294(86.2)	141(48.0)	153(52.0)
Unmarried	35(10.3)	19(54.3)	16(45.7)
Widowed	10(2.9)	4(40.0)	6(60.0)
Divorced	2(0.6)	0(0.0)	2(100.0)
Educational level			
No education	193(56.6)	111(57.5)	82(42.5)
Primary	70(20.5)	32(45.7)	38(54.3)
Secondary	45(13.2)	18(17.7)	27(82.3)
College/University	33(9.7)	7(21.2)	26(78.8)
Religion			
Roman Catholic	205(60.1)	100(48.8)	105(52.2)
Protestant	93(27.3)	43(46.2)	50(53.8)
Traditionalist	36(10.6)	22(61.1)	14(38.9)
Muslim	7(2.0)	3(42.9)	4(57.1)
Residence			
Peri-Urban	133(39.0)	54(40.6)	79(59.4)
Rural	208(61.0)	114(54.8)	94(45.2)

4.3.1.3 Association of socio-demographic factors and kala-azar exposure in the community

Bivariate analysis

Table 4.4 shows the strength of association between the socio demographic characteristics of the respondents and having suffered from kala-azar, from five variables; age, gender, educational level, marital status, religion and residence. Three out of the selected socio-demographic factors were statistically significantly associated with suffering from kala-azar. The results showed that of the ages between 18-35 years who were majority, 52.9% (n=58) were more likely to have suffered from kala-azar as compared to 43.4% (n=56) of those with the ages of 36-49 years, 51.3% (n=20) of the 50-70 years or even those beyond 70 years. There was a statistical association between suffering from kala-zar and the age brackets of 18-35 and 36-49 (OR=3.9; 95%CI= (1.6-9.3), P=0.002). Males were 4.9 times more likely to suffer from kala-azar compared to females where 59.4% (n=95) of males were more at risk than 40.3% (n=73) of females (OR=4.9; 95%CI=(1.9-12.2), P=0.001. The results also indicated that the level of education was a significant predictor in being at risk or suffering from kala-azar; of the respondents with no education and who were majority, 56.6% (n=111) were more likely to suffer from kala-azar compared to those with tertiary education. Moreover, 45.7% (n=38) of those with primary education, were also 3.4 times more likely to suffer from kala-azar compared to those with tertiary education). There was statistical significance in those with no education and primary education (OR=3.1;95%CI=(1.1-8.5),p=0.025), secondary education (OR=3.1; 95%CI=(1.1-8.5),p=0.039 and association with kala-azar. There was no statistical significance in the association between the marital status, religion and residence and suffering from kala-azar (p>0.005), (Table 4.4).

Table 4.4: Socio-demographic factors associated with kala-azar in Loima sub-county of Turkana County, Kenya, 2016 (N=341).

Bivariate analysis

Social Demographic Factors	Overall n (%)	If ever suffered from kala-azar Yes=168 n(%)	No =173 n(%)	Odds Ratio (95% CI)	P values
Age					
18-35	170 (49.9)	90 (52.9)	80 (47.1)	Ref	
36-49	129 (37.8)	56 (43.4)	73 (56.6)	3.9 (1.6-9.3)	0.002
50-70	39 (11.4)	20 (51.3)	19 (48.7)	2.8 (0.21-7.1)	0.433
Above 70 years	3 (0.9)	1 (33.3)	2 (66.7)	2.6 (0.20-35.4)	0.462
Gender					
Male	160 (46.9)	95 (59.4)	65 (40.6)	4.9 (1.9-12.2)	0.001
Female	181 (53.1)	73 (40.3)	108 (59.7)	Ref	
Marital Status					
Married	294(86.2)	141(48.0)	153 (52.0)	Ref	
Unmarried	35(10.3)	19(54.3)	16 (45.7)	0.68 (0.17-2.73)	0.558
Widowed	10(2.9)	4(40.0)	6 (60.0)	0.63 (0.31-3.12)	0.574
Divorced	2(0.6)	0(0.0)	2(100.0)	NA	0.999
Educational level					
No education	193(56.6)	111(57.5)	82(42.5)	Ref	
Primary	70(20.5)	32(45.7)	38(54.3)	3.4(1.1-8.5)	0.025
Secondary	45(13.2)	18(17.7)	27(82.3)	3.1(1.1-9.5)	0.039
College/University	33 (9.7)	7(21.2)	26(78.8)	0.8(0.2-2.9)	0.757
Religion					
Roman Catholic	205(60.1)	100(48.8)	105(52.2)	2.6(0.25-26.7)	0.427
Protestant	93(25.2)	43(46.2)	50(53.8)	3.0(0.7-1.9)	0.365
Traditionalist	36(10.6)	22(61.1)	14(38.9)	2.7(0.33-40.6)	0.268
Muslim	7(2.1)	3(42.9)	4(57.1)	2.8(0.15-54.1)	0.495
Residence					
Peri-Urban	33 (39.0)	54 (40.6)	79(59.4)	2.2(0.46-10.3)	0.326
Rural	208 (61.0)	114 (54.8)	94(45.2)	Ref	

95%CI=Confidence Interval.P=Level of significance, OR=Odds Ratio P<0.05-The relationship is significant.Ref=Reference.NA=Not analysed

In multivariable analysis, binary logistic regression was performed by adjusting all factors significantly at P<0.05 associated with kala-azar at Bivariate analyses. All the three significant factors were retained in the reduced model as the significant predictors using the backward conditional method as presented in table 4.6. The results showed, that those of the ages between 18-35 years, were more likely to have suffered from kala-azar as compared to those with ages of 36-49 years, 50-70 years or even those beyond 70 years. There was a statistical association between suffering from kala-zar and the age brackets of 18-35 and 36-49 (AOR=3.2; 95%CI= (1.2-8.6), P=0.001). Males were 4.2 times more likely to suffer from kala-azar compared to females (AOR=4.2; 95%CI=(1.3-10.2), P=<0.001. The results also indicated that the level of education was a significant predictor in suffering from kala-azar; the respondents with no education who were majority, were more likely to suffer from kala-azar compared to those with tertiary education. Moreover, those with primary education, were also 2.6 times more likely to suffer from kala-azar compared to those with tertiary education (AOR=2.1; 95%CI=(1.0-6.0),p=0.012). There was a statistical association between those with no education and primary education (AOR=2.6; 95%CI=(1.0-6.0),p=0.012),secondary education (AOR=2.1; 95%CI=(1.0-8.3),p=0.024 and association with kala-azar.

Table 4.5: Multivariate regression of socio-demographic factors associated with self-reported kala-azar in Loima sub-county of Turkana County, Kenya, 2016 (N=341).

Social Demographic Factors	95% CI Adjusted Odds Ratio(AOR)			
	AOR	Lower	Upper	P.value
Age				
18-35	Ref			
36-49	3.2	1.2	8.6	0.001
50-70	2.8	0.11	6.4	0.213
Above 70 years	2.6	0.10	28.5	0.322
Gender				
Male	4.2	1.3	10.2	<0.001
Female	Ref			
Educational level				
No education	Ref			
Primary	2.6	1.0	6.0	0.012
Secondary	2.1	0.1	8.3	0.024
College/University	0.4	0.1	2.6	0.617

95%CI=Confidence Interval.P=Level of significance, AOR=Adjusted Odds Ratio P<0.05-The relationship is significant.Ref=Reference

4.3.2.2 Socio-economic characteristics of the respondents

4.3.2.2.1 Participants' monthly level of income

Almost half of the respondents - 164 (48.1%) earned between Kshs. 2,000- Kshs. 5,000 monthly, while only 6 (1.8%) had an income of >Kshs 15,000 monthly (Figure 4.1).

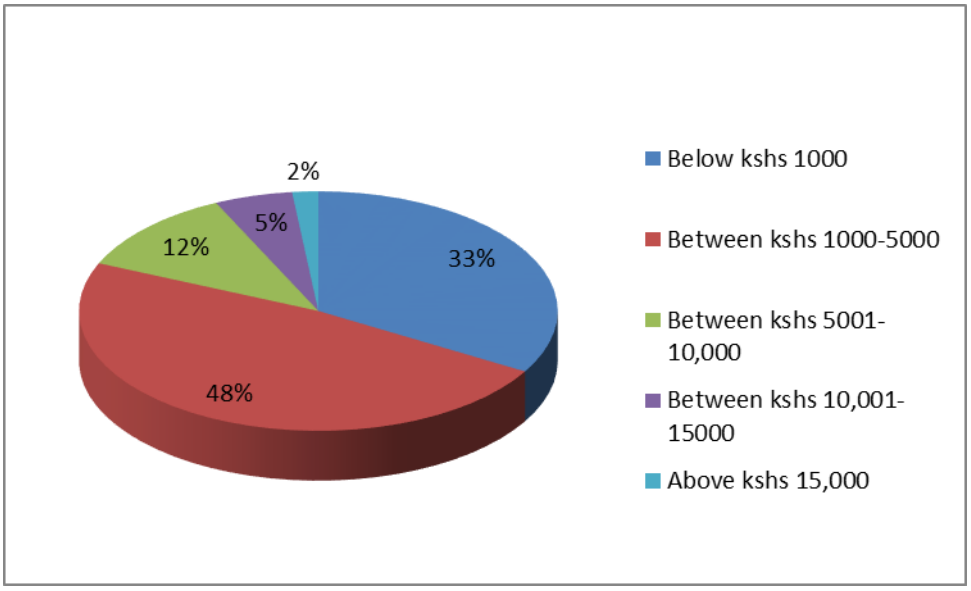

Figure 4.1: Participants level of income in relation to exposure or kala-azar risk(N=341)

4.3.2.2.2 Housing of participants

A high number of 186 (54.6%) of the respondents lived in grass thatched houses, 115 (33.7%) in semi-permanent houses while only 40 (11.7%) lived in permanent houses (Figure 4.2)

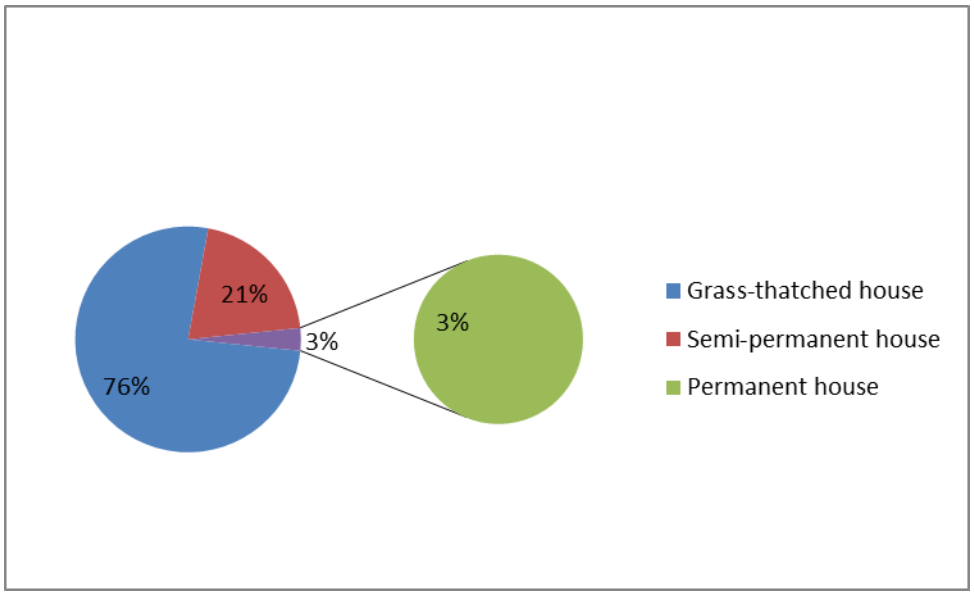

Figure 4.2: Housing of subjects in Loima Sub-county of Turkana County, Kenya , 2016 (N=341).

4.3.2.2.3 House wall

A small proportion 40(11.7%) of the respondents had their house wall being permanent while majority 186 (54.6%) had theirs being by mud (Figure 4.3).

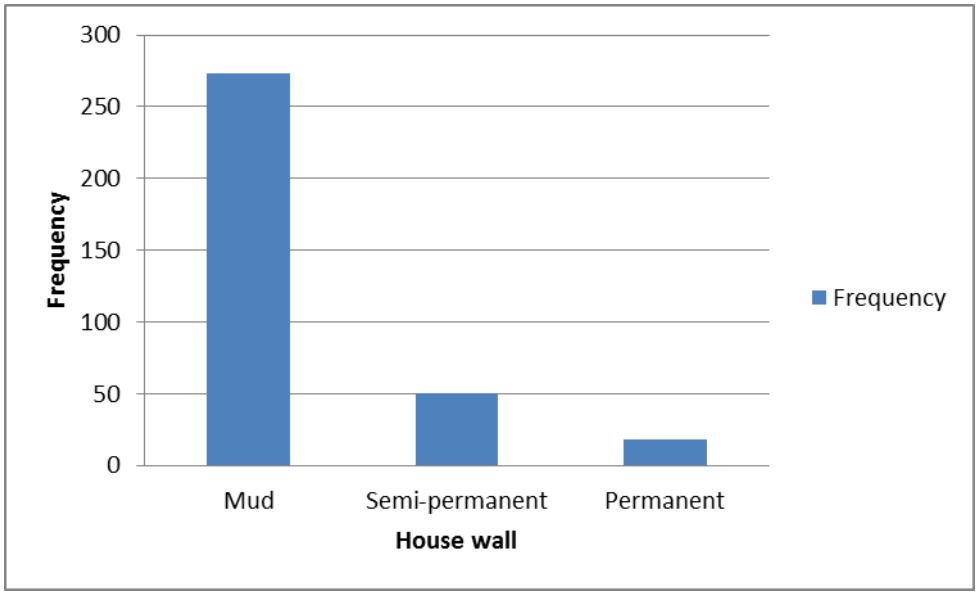

Figure 4.3: Respondents house wall (N=341)

4.3.2.2.4 Kala-azar predisposing factors

Majority of the respondents 326 (97.6%) mentioned correctly that the predisposed groups are mostly affected because of their daily activities or occupation, their contact with sand flies and due to lack of knowledge about the disease (Table 4.7). Only 8 (2.4%) mentioned association with dogs which according to even focus group discussions and healthy workers do not play a role in transmission of kala-azar in the area. There was a statistical association between the mentioned reasons and exposure to kala-azar(x^2=9.546,df=3,p=0.002), (Table 4.6).

Table 4.6: Reasons why the predisposed groups are mostly affected by kala-azar (N=341)

Reason for being mostly affected	N	%	x^2	Df	p-value
1.Daily activities or occupation	93	27.2	9.546	3	0.002
2.Sand flies contact	220	64.5			
3. Lack of knowledge about the disease	20	5.9			
4. Dogs association	8	2.4			
Total	341	100.0			

4.3.2.2.5 Summary of socio-economic characteristics of the respondents

Majority of the respondent 186 (54.6%) had their house roofing being grass-thatched, while only 41 of the respondents (12.0%) had clay as their roof. A high proportion 62% (n=211) of the respondents did not have cracks in the walls of their house while 130 (38%) of them had cracks in their houses' walls and this was confirmed even through observations. With regards to the house floor, majority- 156 (45.7%) had it with mud and only 8.8% had it with tiles. More than a half of the respondents 59% (201) had a termite mound near the house while 41% (140) did not have. A high proportion of the respondents 63% (n=215) had acacia tree near the house while only 37% (n=126) did not have acacia tree near the house. With regard to economic activity, 284 (83.3%) of the respondents mentioned livestock keeping as their major economic activity in the area, while 12 (3.5%) said they do business like burning charcoal (Table 4.8).There was a statistical significance between house roofing type

(x^2=7.057,df=2,p=0.003), having cracks in the walls of the house (x^2=6.456, df=1,p=0.001),having a termite hill near a house (x^2=10.321,df=1,p=0.021), acacia tree near a house(x^2=7.65,df=1,p=0.0001), and the association with kala-azar, (Table 4.7).

Table 4.7: Participants socio- economic characteristics and the association with kala-azar

Variable	N	%	x^2	Df	p-value
Monthly income				4	
Below kshs 1,000	114	33.4	10.231	4	0.002
Between ksh 1,000-5,000	164	48.1			
Between ksh 5,001-10,000	38	11.2			
Between ksh 10,001-15,000	18	5.3			
Above ksh 15,000	7	2			
Housing type					
Grass thatched house	186	54.6	6.623	2	0.001
Semi permanent	115	33.7			
Permanent	40	11.7			
House Roofing type					
Grass-thatched	186	54.6	7.057	2	0.003
Iron sheets	114	33.4			
Clay	41	12.0			
Cracks in the walls of the house					
Yes	130	38	6.456	1	0.001
No	211	62			
House floor					
Mud	156	45.7	5.53	df=3	P=0.136
Wooden	85	25.0			
Cement	70	20.5			
Tiles	30	8.8			
Termite hill near a house			x^2	df	p-value
1. Yes	201	59	10.321	1	0.0021
2.No	140	41			
Acacia tree near a house	N	%	x^2	df	p-value
1. Yes	215	63	7.65	1	0.001
2.No	126	37			
Source of water			x^2	df	p-value
1. Borehole	92	27.0	3.716	3	0.294
2. Tap	128	37.5			
3. River water	127	37.2			
4. Other	3	0.9			
Economic activity			x^2	Df	p-value
Peasant farming/agriculture	20	5.9	8.423	3	0.032
livestock	284	83.3			
Multiple answers	12	3.5			
other like burning charcoal	25	7.3			

4.3.2.2.6 Association of kala-azar and socio-economic factors

Bivariate analysis

Results in table 4.8 shows the strength of association between suffering from kala-azar and eight socio-economic factors. Employment, economic activities, house wall and house floor were not statistically associated with kala-azar. The results revealed that 60.2% (n=84) of those who engaged in livestock keeping and business, were more likely to be exposed or suffer from kala-azar than those who practiced other forms of occupation (OR=0.24;95%CI=(0.08,0.75),P=0.002). The results further revealed that 27.1% (n=15) of the respondents who had formal employment were 0.19(95%CI=(0.05,0.63),P=0.207) less likely to suffer from kala-azar compared to 39.5% (n=17) who were business men (OR=0.37;95%CI=(0.15,0.92),P=0.036); 42.9% (n=15) who were farming (OR=0.11;95%CI=(0.02,0.59),P=0.070) ;60.9% (n=109) of livestock keepers and 57.1% (n=8) of those who had other sources of income (OR=0.63;95%CI=(0.29,0.86),P=0.033). The results further revealed that housing had an impact on being at risk of the disease. Respondents -15.8% (n=6) who had permanent houses, were 0.57(95%CI=(0.32,0.99),P=0.049 times less likely to suffer from kala-azar as compared to 33.3% (n=38) of those who had semi-permanent (OR=3.4;95%CI=(1.2,8.7),P=0.032) and 51.0%(n=95) of those with grass thatched houses. Furthermore, 25.0% (n=15) whose level of income was between Kshs. 10,001-Kshs.15,000 were 0.7(95%CI=(0.43,1.13),P=0.148 times less likely to suffer from kala-azar compared to 47.6% (n=30) of those with income between Kshs 5001-Kshs 10,000 (OR=0.5;95%CI=(0.34,0.65),P=0.008); 52% (n=39) of those whose income was between Kshs 2000-Kshs 5000 (OR=0.12; 95%CI=(0.03,0.55), p=0.004) and 58.1% (n=54) of those with income of less than Kshs. 1,000,(Table 4.8).

Table 4.8: Association of kala-azar and socio-economic factors by bivariate analysis in Loima sub-county of Turkana County, Kenya, 2016.

Socio-economic factors	Community suffered from kala-azar						
	Overall	Yes=168	No=173		Odds Ratio		
Variable	n(%)	n (%)	n(%)		(95%CI)		
Employment				OR	Lower	Upper	P values
Employed	169 (49.5)	70 (41.4)	99(58.6)	0.41	0.16	1.03	0.157
Unemployed	172 (61.8)	98 (57.0)	74(43.0)	Ref			
Occupation							
Farmer	34 (10.0)	15 (44.1)	19(55.9)	0.21	0.08	0.75	0.018
Livestock keeper	181 (53.1)	109 (60.2)	72(39.8)	Ref			
Teacher	35 (10.3)	9 (25.7)	26(74.3)	0.18	0.06	0.59	0.105
Health worker	10 (2.9)	2 (20.0)	8(80.0)	0.15	0.01	1.64	0.121
Administrator	25 (7.3)	7 (28.0)	18(72.0)	0.08	0.01	0.71	0.024
Businessman	41 (12.0)	17 (41.5)	24(58.5)	0.24	0.08	0.75	0.002
Other e.g. House wife	15 (4.4)	9 (60.0)	6(40.0)	0.39	0.18	0.85	0.013
Source of income							
Farming	35 (8.8)	15 (42.9)	20(57.1)	0.11	0.02	0.59	0.070
Livestock keeping	179 (52.5)	109 (60.9)	70(39.1)	Ref			
Formal Employment	70 (20.5)	19 (27.1)	51(72.9)	0.19	0.05	0.63	0.207
Business	43 (12.6)	17 (39.5)	24(64.3)	0.37	0.15	0.92	0.036
Other e.g. selling of local brew	14 (4.1)	8 (57.1)	6(42.9)	0.63	0.29	0.86	0.033
Economic activities							
Farming/agriculture	38 (11.1)	15 (39.5)	23(60.5)	1.8	0.42	3.08	0.092
Livestock keeping	203 (59.5)	110 (54.2)	93(45.8)	Ref			
Farming& livestock keeping	75 (22.)	30 (40.0)	45(60.0)	1.2	0.34	4.2	0.073
Other e.g. burning charcoal	25 (7.3)	13 (52.0)	12(48.0)	0.8	0.4	0.9	0.054
Housing							
Grass-thatched	186 (54.6)	95 (51.0)	91(49.0)	Ref			
Modern iron sheets/semi-permanent	115 (33.7)	38 (33.3)	77(66.7)	3.4	1.2	8.7	0.003
Stone-built /permanent	40 (11.7)	6 (15.8)	34(84.2)	0.57	0.32	0.99	0.049
House wall							
Mud	186 (54.6)	102 (54.8)	84(45.2)	1.21	0.65	4.5	0.048
Semi-permanent	115 (33.7)	56 (48.7)	59(51.3)	Ref			
Permanent	40 (11.7)	10 (25.0)	30(75.0)	1.06	0.41	2.77	0.543
House Floor							
Mud	156 (45.7)	90 (57.7)	76(42.3)	Ref			
Wooden	85 (25.0)	51 (60.0)	34(40.0)	2.9	0.75	11.59	0.124
Cement	70 (20.5)	20(28.6)	50(71.4)	0.6	0.29	1.35	0.233
Tiles	30 (8.8)	7 (23.3)	23(76.7)	1.1	0.6	2.3	0.213
Association of kala-azar and socio-economic factors by bivariate analysis Cont'							
Level of income(Monthly)							
<Kshs 1,000	93 (23.5)	54 (58.1)	39(41.9)	Ref			
Between Kshs.2,000-Kshs5000	75 (22.0)	39 (52.0)	36(48.0)	0.12	0.03	0.55	0.004
Between Kshs.5,001-Kshs. 10,000	63 (18.5)	30 (47.6)	33(53.4)	0.5	0.34	0.65	0.008
Between Kshs.10,001-Kshs. 15,000	60 (17.6)	25 (41.7)	35(57.3)	0.70	0.43	1.13	0.148
>Kshs.15,000	50 (14.6)	20 (40.0)	30(60.0)	1.19	0.57	2.49	0.640

95%CI=Confidence Interval.P=Level of significance, OR= Odds Ratio P<0.05-The relationship is significant.Ref=Reference

In multivariable analysis, binary logistic regression was performed by adjusting all factors significantly at P<0.05 associated with kala-azar at Bivariate analyses. Three significant factors were retained in the reduced model as the significant predictors using the backward conditional method as presented in table 4.10. The results revealed that respondents who engaged in business, were 0.24 (95%CI=(0.08,0.75),P=0.001) times more likely to suffer from kala-azar than those who practiced other forms of occupation. The results further revealed that respondents who had grass thatched and semi- permanent houses, were 3.1 (95%CI=(1.1,7.6), P=0.002) times more likely to suffer from kala-azar as compared to those who had permanent houses (AOR=0.42; 95%CI=(0.22, 0.86), p=0.037). Furthermore, those whose level of income was between Kshs. 10,001-Kshs.15,000 were 0.5 (95%CI=(0.32,1.11), P=0.108 times less likely to suffer from kala-azar compared to those with income between Kshs 5001-Kshs 10,000 (AOR=0.4;95%CI=(0.31,0.62),P=0.006); those whose income was less than Kshs. 1,000 and those with income between Kshs 2000-Kshs 5000 (AOR=0.12; 95%CI=(0.03,0.55), p=0.001), (Table 4.9).

Table 4.9: Association of kala-azar and socio-economic factorsby multivariate analysis in Loima sub-county of Turkana County, Kenya, 2016.

Socio-economic factors	Community suffered from kala-azar			
	Adjusted Odds Ratio (AOR)			
Variable		(95%CI)		P values
Occupation	AOR	Lower	Upper	P values
Farmer	0.11	0.04	0.65	0.013
Livestock keeper			Ref	
Teacher	0.18	0.06	0.59	0.103
Health worker	0.15	0.01	1.64	0.101
Administrator	0.08	0.01	0.71	0.020
Businessman	0.24	0.08	0.75	0.001
Other e.g. House wife	0.39	0.18	0.85	0.011
Housing				
Grass-thatched			Ref	
Modern iron sheets/semi-permanent	3.1	1.1	7.6	0.002
Stone-built /permanent	0.42	0.22	0.86	0.037
Level of income(Monthly)				
<Kshs 1,000			Ref	
Between Kshs.2,000-Kshs5000	0.12	0.03	0.55	0.001
Between Kshs.5,001-Kshs. 10,000	0.4	0,31	0.62	0.006
Between Kshs.10,001-Kshs. 15,000	0.5	0.32	1.11	0.108
>Kshs.15,000	1.19	0.57	2.49	0.440

95%CI=Confidence Interval.P=Level of significance, AOR=Adjusted Odds Ratio P<0.05-The relationship is significant.Ref=Reference

4.3.3 Socio-cultural factors

4.3.3.1 Sleeping time

A large number of respondents 150 (44.0%) slept between 9.30 p.m-10.30 p.m., while 41 (12.0%) said sleep at a time beyond 11.30 p.m. (Figure 4.4).

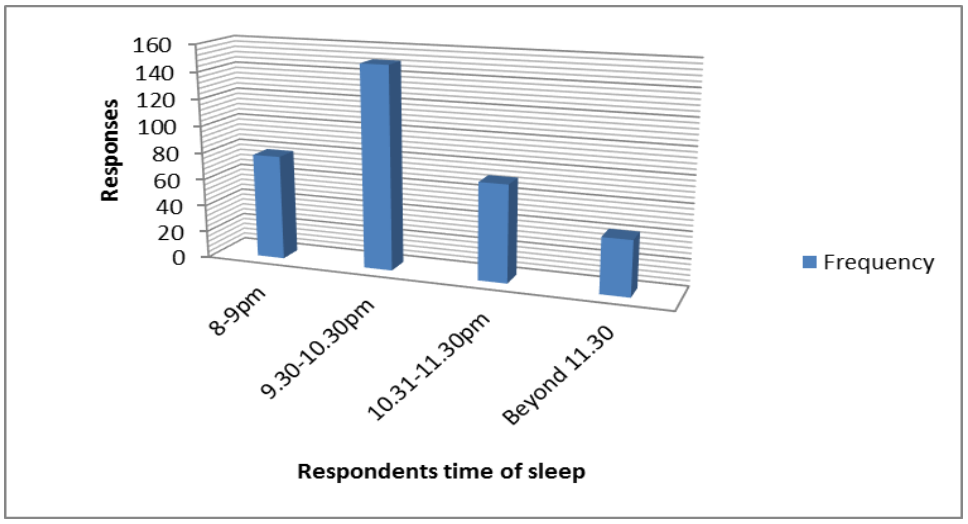

Figure 4.4: Distribution of sleeping time of respondents by exposure (N=341)

4.3.3.2 Respondents sleeping habit

The respondents sleeping habit is shown in table 4.11 that only 15% (n=51) do sleep indoors all of the year, while half 50% (n=171) of the respondents do sleep outside all of the year (Table 4.10).There was a statistical association between the respondents sleeping habit and exposure to kala-azar (x^2=4.654, df=2,p=0.004).

Table 4.10: Respondents sleeping habit in Loima sub-county of Turkana County, Kenya, 2016 (N=341).

Respondents sleeping habit	N	%	x^2	Df	p-value
1. Sleeping indoors all of the year	51	15	4.654	2	0.004
2. Sleeping outside during some months	119	35			
3. Sleeping outside all of the year	171	50			
Total	341	100			

4.3.3.3 The respondent by gender that has a habit of sleeping outside their houses at night.

A large proportion 203 (70.0%) of the males respondents that are mostly herders and also sleep or rest near termite mounds, mostly have a habit of sleeping outside their houses at night hence are at higher risk of being exposed to sand fly bites. Another proportion 87(30%) of the respondents indicated that females also have a habit of sleeping outside their houses at night, (Table 4.11). Based on the analysis, both males and females are at risk of contracting the disease due to exposure to the bites of the kala-azar vector. There was a statistical association between sleeping outside and exposure to kala-azar azar (x^2=4.306, df=1,p=0.026), (Table 4.11).

Table 4.11: Sleeping outside the houses at night by gender (n=290)

	Sleeping outside				
	n	**%**	x^2	**df**	**p-value**
Gender					
1. Males	203	70	4.306	2	0.026
2. Females	87	30			
Total	290	100.0			

4.3.3.4 Number of livestock owned by the participants

Half of the respondents 170 (50%) had less than 10 livestock, with a smaller proportion 41(12%) having livestock of between101-500. The majority of the livestock included goats, sheep, some cows, camels, poultry and donkeys to aid in transportation (Table 4.12).

Table 4.12: Respondents' number of livestock (N=341)

Respondents number of livestock	N	%	x^2	Df	p-value
1-10	102	30	3.353	4	0.501
11-50	72	21			
51-100	58	17			
101-500	41	12			
None	68	20			

There was no association between the number of livestock and kala-azar according to the results (x^2=3.353, df=4,p=0.501), (Table 4.12).

4.3.3.5 Sleeping near animals or not

Less than half of the respondents that had livestock 115(42.2) mentioned that they sleep near livestock while 158(57.8%) said they do not (Table 4.13).

Table 4.13: Respondent Sleeping near livestock or not

Respondents if sleeping near livestock kept	**n**	**%**	**x^2**	**df**	**p-value**
1. Yes	115	42.2%	2.762	1	0.001
2. No	158	57.8%			
Total	273	100.0%			

There was a statistical association between sleeping near livestock and kala-azar (x^2=2.762, df=1, p=0.001), (Table 4.14).

4.3.3.6 Distance from ones house to livestock shed

Majority of the respondents that had livestock 272(90.9) mentioned that the distance from their houses to the livestock shed is between1-50 metres while a small proportion stated between 51-500 metres. The distances were confirmed by the researcher through observations and estimations. There was no statistical association between distance form ones' cattle shed and exposure to kala-azar(x^2=14.621, df=2, p=1.00), (Table 4.14).

Table 4.14: Distance from one's homestead/house to animal shed (N=273)

Distance from cattle shed(in metres)	n	%	x^2	df	p-value
1-50 metres	78	28.6	14.621	9	1.00
51-100	64	23.4			
101-150	46	16.8			
151-200	30	11.0			
201-250	14	5.1			
251-300	12	4.5			
301-350	10	3.7.			
351-400	8	2.9			
401-450	6	2.2			
Distance from one's homestead/house to animal shed Cont'					
451-500	5	1.8			
Total	273	100			

4.3.3.7 Behavior or practice predisposing the community to the disease

A high proportion of 273 (80.2%) of the respondents agreed that they practice resting, playing or sitting near the termite mounds, 41 (12%) said that they practice resting or sleeping close to goatherds, while 27(7.8%) said they practiced both (Figure 4.7). There was a statistical association between the practiced behaviour especially resting, or playing close to termite mounds and being exposed to the disease(x^2=11.421,df=2,p=0.001), (Figure 4.5).

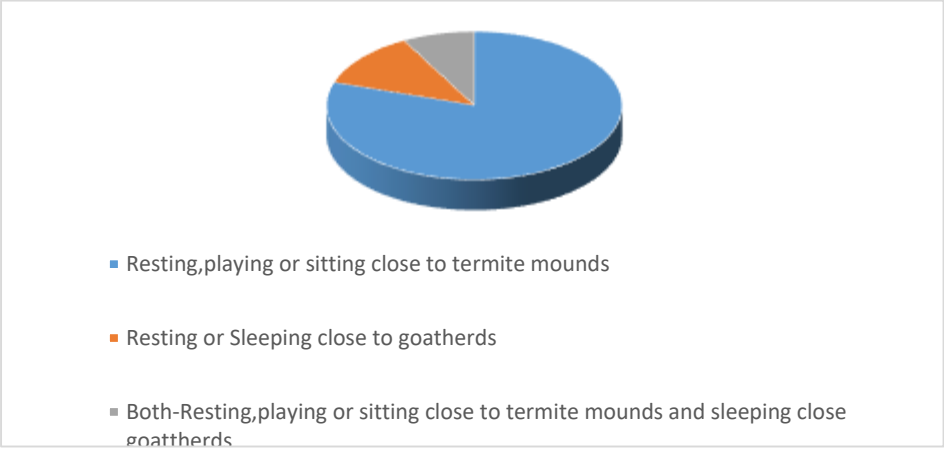

Figure 4.5: Behavior or practice predisposing the community to the disease (N=341)

4.3.3.8 Human activities practiced by the respondents in relation to kala-azar exposure

The activities practiced by the respondents included livestock keeping by 181 (53.1%), deforestation by 84 (24.6%) and hunting by 34 (10.0%). Also 26 (7.6%) practiced peasant farming, 10 (2.9%) practiced gold extraction while 6 (1.8%) mentioned to practice all the above activities (Figure 4.6).

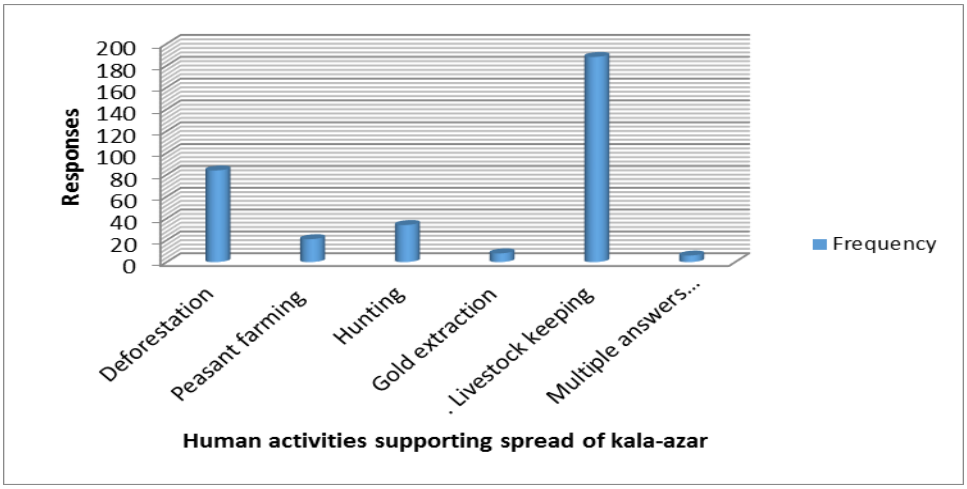

Figure 4.6: Human activities encouraging kala-azar to be common in the area

As to perception on whether these activities encourage spread of kala-azar, 58 % (105) of those who practiced livestock keeping and 43% (36) of those that practiced deforestation, 54% (18) of those that practiced hunting perceived and mentioned that these activities could be exposing them to kala-azar. Majority 70% (n=6) of those that practiced peasant farming, 61% of those that practiced gold extraction while 75% (n=5) of those that practiced multiple activities said they do not perceive these activities to predispose to kala-azar disease. There was a statistical association between perception on the practice of human activities of hunting (x^2=12.512, df=1,p=0.003), deforestation (x^2=8.28, df=1,p=0.003), livestock keeping (x^2=10.333, df=1,p=0.002) and exposure to kala-azar, (Table 4.15).

Table 4.15: Perception on human activities that encourage kala-azar to be common in the area (N=341)

Human activities	**Perception to be risk to KA**	**N**	**%**	**x^2**	**df**	**p-value**
Deforestation (N=84)	Yes	36	42.9	8.828	1	0.003
	No	48	57.1			
	Total	84				
Agriculture/peasant farming(N=26)	Yes	8	30.8	10.211	1	0.642
	No	18	69.2			
Total		26				
Livestock keeping (N=181)	Yes	47	26	10.333	1	0.002
	No	134	74			
Total		181	100			
Hunting (N=34)	Yes	18	52.9	12.512	1	0.003
	No	16	47.1			
Total		34	100			
Gold extraction (N=10)	Yes	4	40	11.458	1	0.431
	No	6	60			
Total		10				
Multiple answer (N=6)	Yes	1	16.7	7.712	1	0.427
	No	5	83.3			
	Total	6	100			

4.3.3.9 Cultural Practices or Festivals among residents of Loima sub-county of Turkan County, Kenya, 2016.

Majority 202 (72.8%), of the respondents agreed that they practice cultural festivities, particularly of dancing at night (*Edong'a*); and perceive that these could predispose them to kala-azar, while 25 (7.2%) mentioned practicing polygamy. A high proportion 239 (70%) of the respondents that were involved in these activities were at risk of suffering from kala-azar as compared to 102 (30%) who were not. There was an association between the cultural practice of dancing at night (*Edong'a*) and suffering from kala-azar (x^2 =63.236, df=5,p=0.002).

4.3.3.10 Domestic Dogs presence

Dogs were stated to have no role to play in the transmission of kala-azar in the area by majority of the respondents and supported by existing data, key informants and focus group discussions. A high proportion 226 (66.2%) of the respondents mentioned that they do not know that dogs are associated with kala-azar, 101 (29.7%) mentioned correctly that dogs may not be the reservoir hosts of the disease in the area while 14 (4.1%) mentioned dogs are wild and not close to the people in the area. There was no statistical association between dogs presence and exposure to kala-azar (x^2 =5.312, df=2,p=0.128).

4.3.3.11 Treatment and association with kala-azar among members of the community

With regard to treatment, 134 (39.3%) of the respondents that had himself/herself or a member of family having suffered from kala-azar mentioned that they use traditional herbs, 115 (33.7%) resort to hospital while 44 (12.9%) apply cow-dung. Another 33 (9.7%) drew blood from the affected area after making an incision while 15(4.4%) had multiple answers (Table 4.17). There was statistical association between the treatment given and exposure to kala-azar (x^2 =9.159, df=4,p=0.003), (Table 4.16).

Table 4.16: Treatment to kala-azar patient among members of the community (N=341)

Treatment	N	%	x^2	df	p-value
1. Smear of cow dung to the affected area	44	12.9%	9.159	4	0.003
2. No treatment, but taken to the hospitals	115	33.7%			
3. Use of traditional herbs around or given by traditional healers	134	39.3%			
4. Making of an incision to the affected area (spleen) or stomach and drawing blood out	33	9.7%			
5.Multiple answer(Both use of traditional herbs and making of an incision to the affected a rea)	15	4.4%			
Total	341	100			

4.3.3.11.1 Practices on the traditional treatment of kala-azar

The results showed that preference for alternative treatment influences the health seeking behavior in the community and thus more exposure to the disease. This is because out of the five practices, the only correct or good practice is taking the sick to hospital 115 (33.7%) for medical intervention other than the other 186 (63.3%) that are incorrect practices (Table 4.17).

Table 4.17: Practices on the traditional treatment of kala-azar

Practice	n	%
1. No traditional treatment, but taken to the hospitals	115	33.7
2.Incorrect traditional treatment practices	226	66.3
3. Total	341	100

4.3.3.12 Socio-cultural factors associated with self-reported kala-azar in Loima sub-county of Turkana County, Kenya, 2016.

Bivariate analysis

Table 4.18 shows the association between having suffered from kala-azar and socio-cultural factors. The results revealed that members of the community (majorly males-55.7% (n=113), who have a habit of sleeping outside their houses at night were 2.6 times more likely to suffer from kala-azar as compared to those who do not sleep outside (OR=2.6; 95%CI=(1.0-6.8), p=0.003). The respondents or the community members that carry out the human activities of livestock keeping 48.9%(n=92) and hunting 55.8%(n=22), were 2.0 (95%CI= (0.3-13.7), p=0.013) times more likely to suffer from kala-azar as compared to practicing deforestation 51% (n=43), (OR=0.7; 95%CI= (0.2-0.68), p=0.004), peasant farming 44% (n=9),(OR=0.4; 95%CI= (0.08-2.4), p=0.346), military service 40%(n=2) (OR=0.4; 95%CI= (0.2-10.5), p=0.614), or gold extraction 33.3%(n=1), (OR=1.3; 95%CI= (0.1-2.4), p=0.870),

The results revealed that the practice of cultural activities of dancing at night (*Edong'a*) 57.8% (n=144) could be more an exposure to kala-azar than drinking of animal blood during dry season 31.3% (n=15), (OR=0.06; 95%CI=(0.04-0.97), p=0.047), polygamy 25% (n=14),(OR=0.3; 95%CI=(0.03-2.4), p=0.245 and early marriages, 9.1%(n=2) (OR=0.3; 95%CI=(0.06-1,78), p=0.196 which had no statistical significance in the association with kala-azar (p>0.005), (Table 4.18).

The results showed that the respondents or community's members daily activities or occupation 45.2% (n=42), OR=3.3; 95%CI= (1.3-7.1), p=0.003), their often contact with sand flies 52.3% (n=115), lack of knowledge about the disease 51.9%(n=8), makes them 3.2 (95%CI= (1.1-7.0), p=0.004) times more at risk of suffering from the disease as compared to their association with dogs 25% (n=2) OR=0.3; 95%CI= (0.02-2.2), p=0.321). There was a statistical association between contact with sand flies, daily activities or occupation (OR=3.3; 95%CI= (1.1-7.1), p=0.003), lack of knowledge about kala-azar disease (OR=3.2; 95%CI= (1.1-7.0), p=0.004 and being exposed to kala-azar.

The respondents time of sleep beyond 11.30 pm 60% (n=25), 9.30-11.30pm. 51% (n=40) exposed them to the disease as compared to sleeping between 9.30pm-1030pm 48.3% (n=35) and time between 8pm-9pm 45.3% (n=68). There was a statistical association between the time of sleep beyond 11.30pm (OR=3.0; 95%CI= (1.3-7.3), p=0.003) and being exposed to kala-azar. The sand flies (kala-azar vector) are active during all these times, hence the people are at risk daily, thus the need to always use insecticide treated bed nets and other preventive measures.

The behavior or practice of resting, playing or sitting close to termite mounds oftenly (50.6% (n=138), exposed the respondents more to kala-azar as compared to having multiple practices OR=0.7;95%CI=(0.5-2.9), p=0.423). There was a significant statistical association between these behaviors or practice of resting, playing or sitting near termite mounds oftenly, resting or sleeping close to the goatherds 41.5% (n=17) and exposure to kala-azar OR=3.3; 95%CI=(1.2-7.2), p=0.001). The results also revealed that the respondents' or community members practice of making of incision to the affected area (spleen) or stomach and drawing out blood as a form of treatment 44.4% (n=15) OR=3.2; 95%CI=(1.4-72.2), p=0.002), use of traditional herbs around or given by traditional healers 63.1%(n=85) and smear of cow-dung to the affected area 60% (n=26), (OR=3.4; 95%CI=(1.2-77), p=0.002, exposes more to the disease as compared to going straight to the hospital when sick of kala-azar without first going through the traditional healers 34% (n=39), OR=1.2; 95%CI(0.1-2.5), p=0.056). There was a statistical association between the practice of making of incision to the affected area (spleen) or stomach and drawing out blood as a form of treatment, use of traditional; smear of cow-dung to the affected area and exposure to kala-azar, (Table 4.18) .

Table 4.18: Socio-cultural factors associated with self-reported kala-azar among residents of Loima sub-county, Turkana County, Kenya, 2016. Bivariate analysis

Social-cultural factors	Community suffering from kala-azar				
		Yes=168	No=173	Odds Ratio	
	Overall n (%)	n (%)	n (%)	(95%CI)	P Values
Human Activities encouraging disease spread			**OR Lower Upper P values**		
Deforestation	84 (24.6)	43(51.0)	41 (49.0)	0.7 0.2 0.68	0.004
Agricultural/Peasant farming	21 (6.2)	8(38.1)	13 (60.9)	0.4 0.08 2.4	0.346
Hunting	40 (11.7)	22 (55.8)	18 (44.2)	2.0 0.03 1.4	0.013
Military service	5 (1.5)	2 (40.0)	3 (60.0)	0.4 0.2 10.5	0.614
Livestock keeping	188 (55.1)	92 (48.9)	96 (51.1)	Ref	
Gold extraction	3 (0.9)	1 (33.3)	2 (66.7)	1.3 0.1 2.14	0.870
Reasons for the community being exposed					
Daily activities or occupation	93 (27.2)	42(45.2)	51 (54.8)	3.3 1.3 7.1	**0.003**
Sand flies contact	220 (64.5)	115(52.3)	105 (47.7)	Ref	
Lack of knowledge about the disease	20 (5.9)	9(45.0)	11 (55.0)	3.2 1.1 7.0	**0.004**
Dogs association	8 (2.3)	2(25.0)	6 (75.0)	0.3 0.02 2.2	0.321
Socio-cultural factors associated with self-reported kala-azar- Bivariate analysis Cont'					
Cultural activities					
Polygamy	19 (5.6)	5(25.0)	14 (75.0)	0.3 0.03 2.4	0.245
Dancing at night **(Edong'a)**	249 (77.6)	144 (57.8)	105 (42.2)	Ref	
Early marriages	17 (5.0)	2 (9.1)	15 (90.9)	0.3 0.06 1.78	0.196
Drinking animal blood	47 (12.2)	15 (31.3)	32 (68.7)	0.6 0.04 0.97	***0.047**
Multiple answer	9 (2.6)	2 (20.5)	7 (79.5)	0.5 0.09 3.9	0.478
Respondents time of sleep					
Between 8p.m-9p.m	150 (44.0)	68 (45.3)	82(54.7)	Ref	
9.30-10.30pm	72 (21.1)	35 (48.3)	37(51.7)	0.6 0.1 2.8	0.453
9.31pm-11.30pm	78 (22.9)	40 (51.0)	38(49.0)	0.6 0.7 2.4	0.154)
Beyond 11.30pm	41 (12.0)	25 (60.0)	16(40.0)	3.0 1.3 7.3	0.003
Sleeping habit					
Sleeping indoors all of the year	51 (15)	15 (29.4)	36 (70.6)	0.4 0.1 2.1	0.125
Sleeping outside during some months	119 (35)	57 (47.9)	62 (52.1)	2.6 1.0 6.8	0.003
Sleeping outside all of the year	171 (50)	96 (56.1)	75 (43.9)	Ref	
Sleeping outside by gender (n=290)		**Yes=143**	**No=147**		
Males	203 (70.0)	113 (55.7)	90 (44.3)	Ref	
Females	87 (30.0)	30 (34.5)	57 (65.5)	0.6 0.7 2.3	0.004
Practice or behaviour predisposing to the disease					
Resting, playing or sitting near termite mounds oftenly	273(80.2)	138 (50.6)	135(49.4)	Ref	
Resting or sleeping close to goatherds	41 (12.0)	17 (41.5)	24(58.5)	3.3 1.2 7.2	**0.001**
Multiple answer(Both)	27 (7.8)	13 (48.1)	14(51.9)	0.7 0.5 2.9	0.423
Treatment given to somebody when sick of kala-azar n=341		**Yes=168**	**No=173**		
Smear of cow-dung to the affected area	44 (12.9)	26 (60.0)	18 (40.0)	3.4 1.5 77.0	**0.002**
No other treatment but taken to Hospital	115(33.7)	39 (34.0)	76 (66.0)	1.2 0.1 2.5	0.056
Making of incision to the affected area (spleen) or stomach and drawing out blood	33 (9.7)	15 (44.4)	18 (55.6)	3.2 0.14 72.2	**0.004**
Use of traditional herbs around or given by Traditional healers	134 (39.3)	85 (63.1)	49 (36.9)	Ref	
Multiple answer	15 (4.4)	5 (31.0)	10(69.0)	2.7 0.28 29.5	0.224

95%CI=Confidence Interval.P=Level of significance, OR=Odds Ratio P<0.05-The relationship is significant.Ref=Reference

In multivariate analysis, binary logistic regression was performed by adjusting all factors significantly at P<0.05 associated with kala-azar at Bivariate analyses. Six significant factors were retained in the reduced model as the significant predictors using the backward conditional method as presented in table 4.19**.** The results revealed that members of the community (majorly males), who have a habit of sleeping outside their houses at night were 2.2 times more likely to suffer from kala-azar as compared to those who do not sleep outside (AOR=2.2; 95%CI=(1.0-6.3), p=0.002). The respondents or the community members that carry out the human activities of livestock keeping and hunting, were 2.0 (95%CI= (0.2-2.8), p=0.001) more likely to suffer from kala-azar as compared to practicing deforestation (AOR=0.6; 95%CI= (0.1-0.68), p=0.003), peasant farming (AOR=0.4; 95%CI= (0.06-2.3), p=0.242), military service (AOR=0.4; 95%CI= (0.1-9.3), p=0.522), or gold extraction (AOR=1.1; 95%CI= (0.1-2.14), p=0.600),

The results revealed that the practice of cultural activities of dancing at night (*Edong'a*) could be more an exposure to kala-azar than drinking of animal blood during dry season (AOR=0.06; 95%CI=(0.04-0.82), p=0.034), polygamy (AOR=0.3; 95%CI=(0.01-2.1), p=0.133 and early marriages (AOR=0.2; 95%CI=(0.04-1,54), p=0.184) which had no statistical significance in the association with kala-azar (p>0.005), (Table 4.19).

The results showed that the respondents or community's members daily activities or occupation (AOR=3.1; 95%CI= (1.1-6.0), p=0.002), their often contact with sand flies and lack of knowledge about the disease (AOR=3.0; 95%CI= (1.1-6.4), p=0.003 exposes them more to the disease as compared to their association with dogs (AOR=0.3; 95%CI= (0.01-2.0), p=0.215). There was a statistical association between contact with sand flies, daily activities or occupation (AOR=3.1; 95%CI= (1.1-6.0), p=0.002), lack of knowledge about kala-azar disease (AOR=3.0; 95%CI= (1.1-6.4), p=0.003 and exposure to kala-azar.

The behavior or practice of resting, playing or sitting close to termite mounds oftenly exposed the respondents more to kala-azar as compared to having multiple practices (AOR=0.6;95%CI=(0.4-2.6), p=0.312). There was a significant statistical association

between these behaviors or practice of resting, playing or sitting near termite mounds oftenly, resting or sleeping close to the goatherds and exposure to kala-azar (AOR=3.1; 95%CI=(1.1-7.0), p=<0.001), (Table 4.19).

Table 4.19: Socio-cultural factors associated with self-reported kala-azar among residents of Loima sub-county, Turkana County, Kenya, 2016. Multivariate analysis

Social-cultural factors	**Community suffering from kala-azar**			
	Adjusted Odds Ratio (95%CI)			
Human Activities encouraging disease spread	AOR	Lower	Upper	P values
Deforestation	0.6	0.1	0.68	0.003
Agricultural/Peasant farming	0.4	0.06	2.3	0.242
Hunting	2.0	0.02	2.8	0.001
Military service	0.4	0.1	9.3	0.522
Livestock keeping	Ref		Ref	
Gold extraction	1.1	0.1	2.14	0.600
Reasons for the community being exposed				
Daily activities or occupation	3.1	1.1	6.0	0.002
Sand flies contact	Ref		Ref	
Lack of knowledge about the disease	3.0	1.1	6.4	0.003
Dogs association	0.3	0.01	2.0	0.215
Socio-cultural factors associated with self-reported kala-azar-Multivariate analysis Cont'				
Cultural activities				
Polygamy	0.3	0.01	2.1	0.133
Dancing at night (Edong'a)			Ref	
Early marriages	0.2	0.04	1.54	0.184
Drinking animal blood	0.6	0.04	0.82	*0.034
Multiple answer	0.5	0.5	3.4	0.365
Sleeping habit				
Sleeping indoors all of the year	0.3	0.1	1.8	0.116
Sleeping outside during some months	2.2	1.0	6.3	0.002
Sleeping outside all of the year	Ref		Ref	
Sleeping outside by gender (n=290)				
Males	Ref		Ref	
Females	0.6	0.7	2.1	0.003
Practice or behaviour predisposing to the disease				
Resting, playing or sitting near termite mounds oftenly	Ref		Ref	
Resting or sleeping close to goatherds	3.1	1.1	7.0	<0.001
Multiple answer(Both)	0.6	0.4	2.6	0.312

95%CI=Confidence Interval.P=Level of significance, AOR=Adjusted Odds Ratio P<0.05-The relationship is significant.Ref=Reference

4.4 Knowledge, attitude, perception and practices of the study participants

4.4.1 Knowledge on kala-azar presence in the area

A larger proportion of the respondents; 317(93.0%), said they have heard about kala-azar while 24(7.0%) said they have not heard of it. Majority of the respondents; 244 (77%), that had heard about kala-azar said it is common in the area with 238 (75), giving their attitude on its seriousness, that it's a health problem in the community, while 10% said that they do not even know whether it's a health problem in the area, indicating the number of people in the community that do not know what kala-azar is (Table 4.20). Whereas the people responded differently, the medical records indicated that the disease is among the top ten priority diseases prevalent in the area and 2nd parasitic disease after malaria. Majority of the respondents 254 (80.1%) also indicated that there is no stigma and discrimination on peoples' suffering from kala-azar, while only 42 (13.2%) said they are discriminated and 21(6.7%) mentioned that they do not know whether they are stigmatized or discriminated (Table 4.20).

Table 4.20: Knowlegde on existence of disease in the area

Variable	N	%	x^2	df	p-value
Heard about kala-azar (n=341)					
Yes	317	93.0	6.535	1	0.038
No	24	7.0			
Kala-azar is a serious problem (n=317)					
Yes	238	75.0	10.271	2	0.001
No	47	15.0			
Don't know	32	10.0			
Kala-azar if it is a common		77.0			
disease in the area	244	23.0			
Yes	73				
No			3.641	1	0.016
Stigma & discrimination on kala-azar patients (n=317)	42	13.2			
Yes					
			9.010	2	0.637
No	254	80.1			
Don't know	21	6.7			

There was a statistical association between kala-azar and knowledge of respondents on its presence in the area (x^2 =6.535; df=1; p=0.038), its seriousness in the area (x^2 =10.271; df=1; p=0.001) and being common in the area (x^2 =3.641; df=1; p=0.016). There was no statistical association between kala-azar and knowledge of respondents on stigma and discrimination of the disease patients (x^2 =9.010; df=2; p=0.637), Table 4.21).

4.4.2 Knowlegde origin of kala-azar

On where kala-azar came from, 95 (30%) were knowledgeable and mentioned correctly that it came from insects that are sand flies and found inside anti-hills, others mentioned other origins like 55 (17%) of the respondents mentioned that it came from livestock and 41 (13%) said drinking dirty water infected by malaria. Moreover, 35 (11%) of them said that it came from both drinking fresh milk and

eating unwell prepared meat, 23 7%) said it is an inherited disease, 38 (12%) mentioned that they do not know where it came from while 30 (10%) had multiple answers, (Table 4.21).

Table 4.21: Knowledge on kala-azar origin (N=317)

Knowledge on where kala-azar came from	N	%
1.Livestock keeping	55	17%
2.Drinking dirty water infected by malaria	41	13%
3.From insect found inside ant hills	95	30%
4.Eating unwell prepared meat	19	6%
5.Drinking fresh milk	16	5%
6.Inherited disease	23	7%
7.Multiple answers (Inherited disease and from dirty water infected by malaria)	30	10%
8.I do not know	38	12%
Total	317	100%

4.4.2.1 Level of knowledge on kala-azar origin

Majority of the respondents 65(38.9%) who were knowledgeable on kala-azar origin were males and 30(20.0%) were females. The proportion of the males who were not knowledgeable was 102 (61.1%) while that of females was 120 (80%), (Table 4.22).

Table 4.22: Level of knowledge on kala-azar origin

S/No	Gender	Level of knowledge	n	%
1	Males	Knowledgeable	65	38.9
		Not knowleadgeable	102	61.1
		Total	167	100
2	Females	Knowledgeable	30	20
		Not Knowledgeable	120	80
		Total	150	100
		Grand total	317	100

4.4.3 Ranking of kala-azar

The results from the respondents and supported by medical records and key informant interviews, showed that among the prevalent diseases in the area, kala-azar is the 2nd parasitic disease 56 (17.6%) after malaria 126 (39.6%) and the most neglected tropical disease in the area (Figure 4.7).

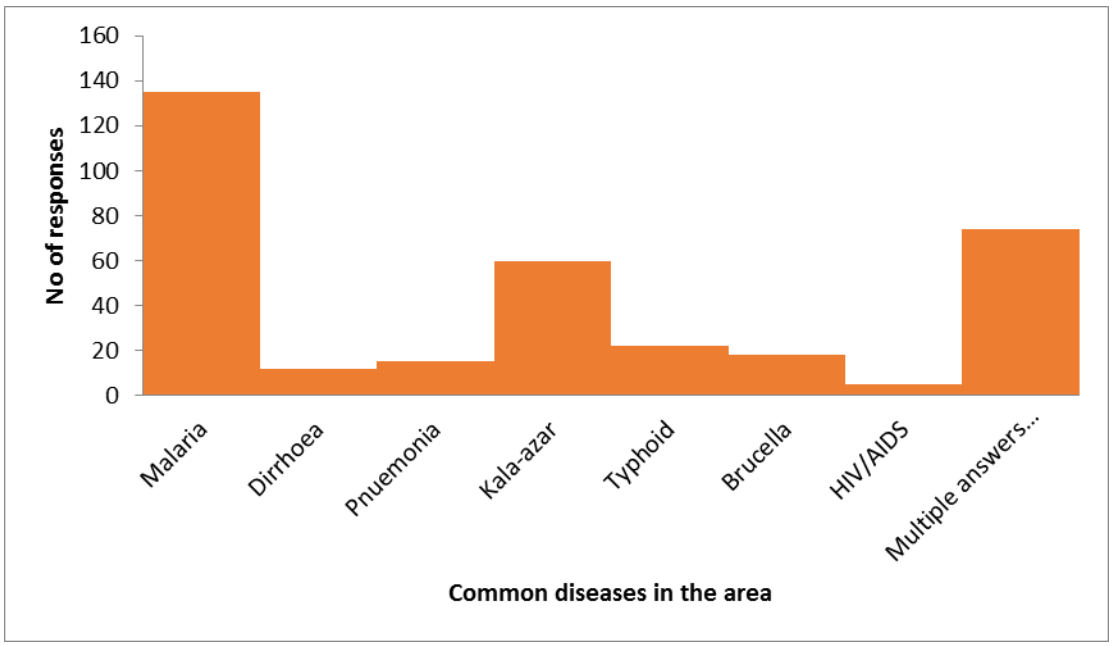

Figure 4.7: Common diseases in the area

4.4.4 Factors encouraging spread of kala-azar disease.

A considereable proportion of respondents 190 (59.9%) correctly mentioned that presence of ant hills in large numbers encourages the disease to spread. Other factors also mentioned by the respondents that encourage spread include livestock or cattle keeping by 55 (17.4%), lack of medical facilities or medical intervention by 48 (15.1%), and drought 12 (3.8%). Three (1.0%) mentioned people's association with dogs not to encourage the spread, while 9 (2.8%) said that they do not know what encourages the disease to spread, (Table 4.23).

Table 4.23: Factors associated with disease spread (N=317)

Factors associated with disease spread	n	%
1.Drought	12	3.8
2. Presence of anti-hills	190	59.9
3. Cattle keeping	55	17.4
4. Lack of medical facilities or medical interventional	48	15.1
5. Peoples' association with dogs	3	1.0
6. I don't know	9	2.8
Total	317	100.0

4.4.4.1 Knowledge on factors encouraging kala-azar spread

More than a half of the respondents 104 (61.9%) that were knowledgeable and mentioned correctly the presence of ant-hills as a factor encouraging kala-azar spread were males and 86 (57.7%) were females, (Table 4.24). A higher proportion 63 (42.3%) of females were not knowledgeable while 64 (38.1%) of males were not knowledgeable.

Table 4.24: Knowledge on factors encouraging kala-azar spread

Gender	Level of knowledge	N	%
Males	Knowledgeable	104	61.9
	Not knowleadgeable	64	38.1
	Total	168	100
Females	Knowledgeable	86	57.7
	Not Knowledgeable	63	42.3
	Total	149	100
	Grand total	317	100

4.4.5 Disease or co-infections supporting the spread of kala-azar

Majority of the respondents 279 (88%) agreed that HIV/AIDS and its opportunistic infection like Tuberculosis (TB) do support the spread of kala-azar. Another small number 22 (7%) mentioned malaria only to be encouraging the spread of the disease while 16 (5%) said all the mentioned diseases encourage the spread of the dreadful

disease (Figure 4.8).The true situation is that kala-azar is a co-infection for HIV/AIDs together with the other common diseases like malaria, TB in the area. The secondary data from Namoruputh health centre, the only one undertaking diagnostic services with confirmatory test for kala-azar indicate that HIV/AIDs, TB, malaria and typhoid are the co-infections of the disease in the area. The results are supported by key informant interviews, focus group discussions and medical records that indicate kala-azar is now becoming an AIDS defining disease.

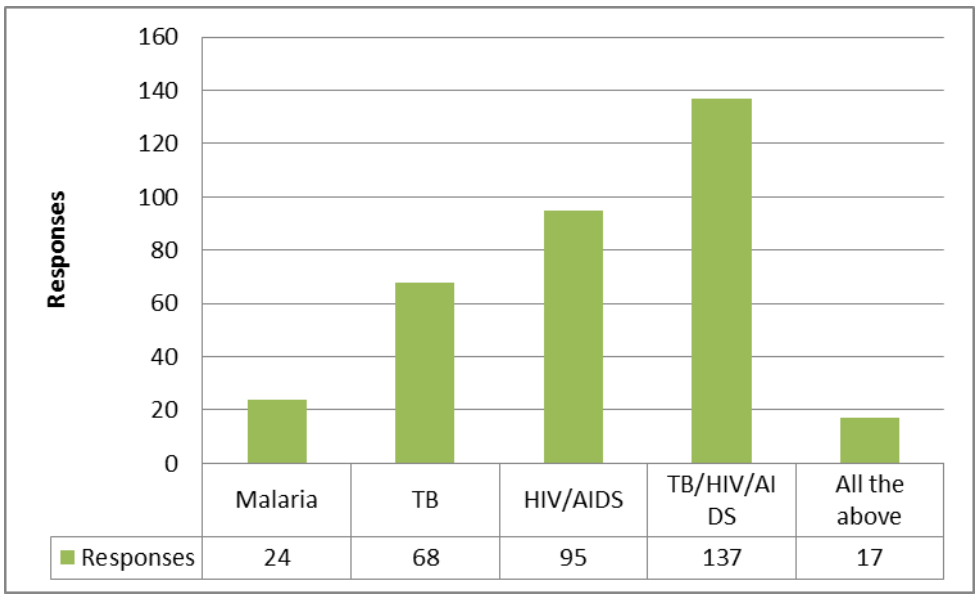

Figure 4.8: Disease or co-infections supporting the spread of kala-azar

4.4.6 Knowledge on spread/transmission of kala-azar

Majority of the respondents that had declared existence of kala-azar in the area-212 (67.0%) were knowledgeable and correctly associated sand fly bites with the transmission of kala-azar according to even medical records and key informants. However, 97 (30.5%) thought that it is transmitted by drinking unboiled milk, mosquito bites, termites and bedbug bites, rain, dog bites, ghosts and 2.5% (n=8) said they did not know the transmission mode (Figure 4.9). There was a statistical association between knowledge on the transmission of kala-azar and exposure to it (x^2 =111.2264; df=7; p=0.001).

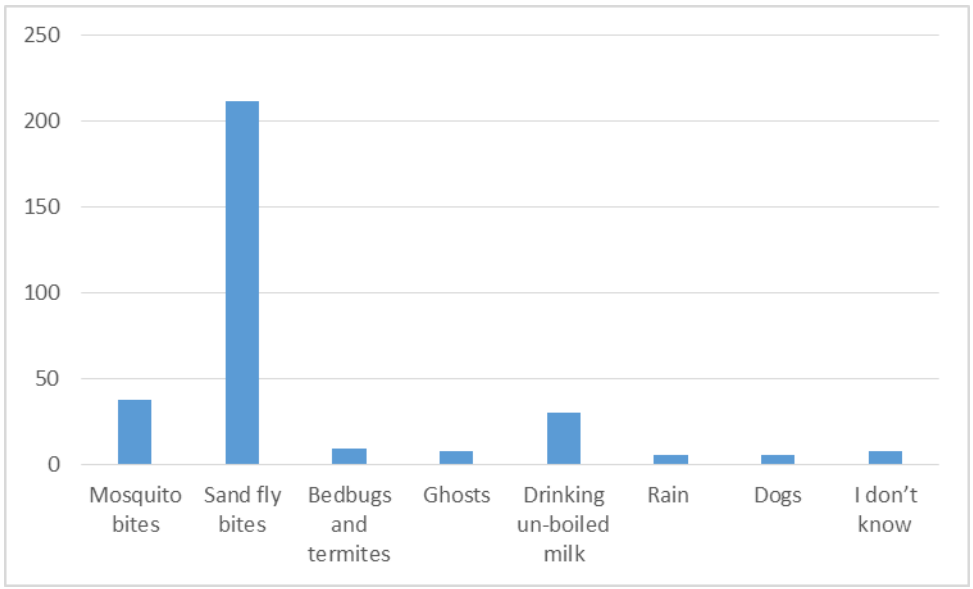

Figure 4.9: knowledge on spread/transmission of kala-azar (N=317)

4.4.6.1 Level of knowledge on transmission of kala-azar

Majority of the respondents 112 (67.5%) who were knowledgeable on transmission of kala-azar were females and 100 (56.2%) were males. The proportion of the males who were not knowledgeable was 51 (33.8%) while that of females was 54 (32.5%), (Table 4.25).

Table 4.25: Level of knowledge on transmission of kala-azar

Gender	Level of knowledge	n	%
Males	Knowledgeable	100	66.2
	Not knowleadgeable	51	33.8
	Total	151	100
Females	Knowledgeable	112	67.5
	Not Knowledgeable	54	32.5
	Total	166	100
	Grand total	317	100

4.4.7 Sand fly habitat

A larger proportion 193 (91%) of the respondents that associated sand fly bites with kala-azar transmission mentioned correctly that the sand flies live commonly in termite mounds or ant-hills, tree holes or rocks, garbage collection or animal burrows, house walls as their preferred habitats, or even the livestock shed. Those who were not knowledgeable mentioned stagnant water 13 (6.3%) and six (2.7%) said they do not know what the habitat is, (Figure 4.10). There was a significant association between the knowledge on kala-azar habitat and exposure to it (x^2 =14.172; df=6; p=0.003).

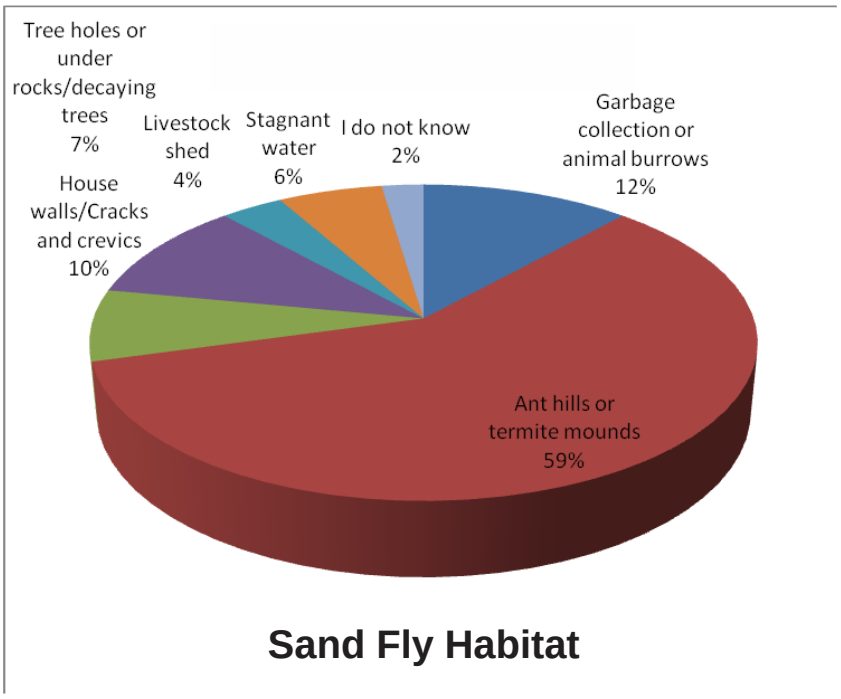

Figure 4.10: knowledge on sand fly habitat

4.4.7.1 Level of knowledge on kala-azar vector (Sand fly) habitat

As in table 4.27, majority of the respondents 105 (92.9%) who were knowledgeable on kala-azar vector habitat were females and 88 (88.9%) were males. The proportion

of the males who were not knowledgeable was 11 (11.1%) while that of females was 8 (7.1%), (Table 4.26).

Table 4.26: Level of knowledge on kala-azar vector (Sand fly) habitat

Gender	Level of knowledge	n	%
Males	Knowledgeable	88	88.9
	Not knowleadgeable	11	11.1
	Total	99	100
Females	Knowledgeable	105	92.9
	Not Knowledgeable	8	7.1
	Total	113	100
	Grand total	212	100

4.4.8 Seasons when the sand fly is common in the area.

On seasons when the sand fly is common in the area, 64 (30.0%) mentioned correctly that the sand fly is active year around with increased activity during the rainy season. Other respondents, 47 (22.4%), 40 (18.9%), 24 (11.3%) and 25 (11.7%) thought that the sand flies were only active during both the very hot and dry season, or during the dry season only, at the beginning of the rainy season and during the cold and rainy seasons respectively. Another remarkable proportion of the respondents 12 (5.7%) mentioned that they do not know the season(s) the sand fly is active in the area (Table 4.27). There was a significant association between knowledge on the seasons when the disease vector (sand fly) is active in the area and exposure to the disease (x^2 =8.153; df=4; p=0.004), (Table 4.27).

Table 4.27: Seasons when the sand fly (Kala-azar vector) is common in the area (N=212)

When the sand fly is active	n	%	x^2	df	p-value
1.During the very hot and dry season	47	22.4	8.153	4	0.004
2.During dry season	40	18.9			
3.At the beginning of the rainy season	25	11.7			
4.During the cold and the rainy season	24	11.3			
5.Active year round with increased activity during the rainy season	64	30.0			
6. I don't know	12	5.7			
Totals	212	100			

4.4.8.1 Level of knowledge on seasons the kala-azar vector is common in the area

As in table 4.29, majority of the respondents 45 (40.9%) who were knowledgeable on seasons kala-azar vector is common in the area were males and 19 (18.6%) were females. The proportion of the males who were not knowledgeable was 65 (59.1%) while that of females was 83 (81.4%), (Table 4.28).

Table 4.28: Level of knowledge on seasons the kala-azar vector is common in the area

Gender	Level of knowledge	n	%
Males	Knowledgeable	45	40.9
	Not knowleadgeable	65	59.1
	Total	110	100
Females	Knowledgeable	19	18.6
	Not Knowledgeable	83	81.4
	Total	102	100
	Grand total	212	100

4.4.9 Times the sand flies bite most.

A small proportion 16 (7.6%) mentioned correctly that the sand flies bite at all times, while 62 (29.3%) mentioned the afternoon, 57 (26.7%) said in the morning, 40 (19.1%) while 37 (17.3%) mentioned that they bite most in the evening. There was a significant association between knowledge on the times the sand fly bite most and exposure to the disease (x^2 =10.445; df=4; p=0.003), (Table 4.29).

Table 4.29: Times when sand fly bite most (N=212)

Times when sand fly bite most	n	%	x^2	df	p-value
Morning	57	26.7	10.445	4	0.003
Afternoon	62	29.3			
Evening	37	17.3			
Night	40	19.1			
All times	16	7.6			
Total	212	100.0			

4.4.9.1 Level of knowledge on times when the sand fly bite most

As in table 4.33, the respondents 10 (8.8%) who were knowledgeable on times the sand fly bite most were females and 6 (6.1%) were males. The proportion of the males who were not knowledgeable was 92 (93.9%) while that of females was 104 (91.2%), (Table 4.30).

Table 4.30: Level of knowledge on times when the sand fly bite most

Gender	Level of knowledge	n	%
Males	Knowledgeable	6	6.1
	Not knowleadgeable	92	93.9
	Total	98	100
Females	Knowledgeable	10	8.8
	Not Knowledgeable	104	91.2
	Total	114	100
	Grand total	212	100

4.4.10 Source of Information about kala-azar

With regard to source of information about kala-azar transmission, or control, a half 159 (50%) of the respondents that had of kal-azar said they got information from another person who suffers or is suspected to have kala-azar, about 120 (38%) mentioned getting information from health centers or community health workers, while 38 (12%) said they got from either public barazas, church leaders, friends, neighbors, internet, media or all the above (Figure 4.11).

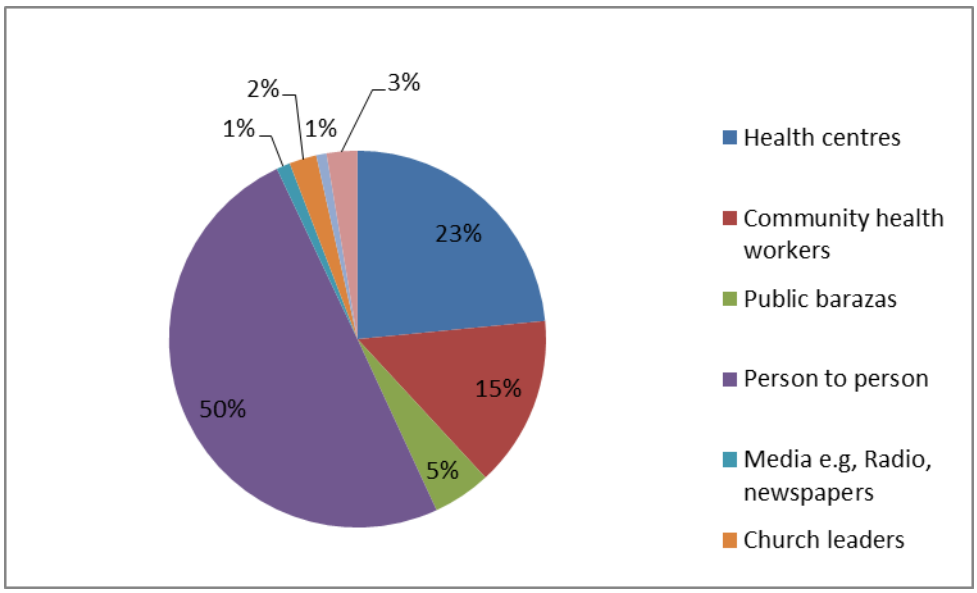

Figure 4.11: Source of Information about kala-azar (N=317)

4.4.11 Knowledge on the common signs of kala-azar

Majority of the respondents 266 (83.8%) had correct knowledge on the key signs of Kala-azar, that is, the enlargement of the spleen, change of complexion, Fever and weakness (Table 4.34). About 51 (16.2%) were not able to mention these signs. There was statistical significance between the distribution of the proportions and knowledge on the chief kala-azar signs (x^2 =15.491; df=8; p=0.003), (Table 4.31)

Table 4.31: Knowledge on the chief signs of kala-azar (N=317)

Signs and symptoms of kala-azar	N	%	x^2	df	p-value
1.Fever	10	3.0	15.491	8	0.003
2.Abdominal swelling	38	12.0			
3.Loss of appetite	143	45.0			
4.Headache	33	10.5			
5.General body Weakness	14	4.5			
6.Change in body complexion	6	2.0			
7.Loss of sight	16	5.2			
8.I do not know	35	11.0			
9.Multiple answer-Fever, headache and general body weakness)	22	6.8			
Total	317	100			

4.4.11.1 Level of knowledge on chief signs of kala-azar

Many of the respondents 140 (81.8%) who were knowledgeable on chief signs of kala-azar were males and 126 (86.3%) were females. The proportion of the males who were not knowledgeable was 31 (18.2%) while that of females was 20 (13.7%), (Table 4.32).

Table 4.32: Level of knowledge on chief signs of kala-azar

Gender	**Level of knowledge**	**n**	**%**
Males	Knowledgeable	140	81.8
	Not knowleadgeable	31	18.2
	Total	171	100
Females	Knowledgeable	126	86.3
	Not Knowledgeable	20	13.7
	Total	146	100
	Grand total	317	100

4.4.12 Knowledge on time it takes for the disease to be treated

On time it takes for the disease to be treated, only 159 (50.2%) of the respondents knew the correct duration, that is one month while 49.8% mentioned other times. Table 4.33 gives more details.

Table 4.33: Knowledge on time it takes for the disease to be treated (N=317)

Treatment duration	N	%
1.1-2 weeks	42	13.2
2.1 month or shorter (2 weeks)	159	50.1
3. 3-6 months	84	26.4
4. I do not know	32	10.3
Total	317	100.0

4.4.12.1 Level of knowledge on treatment duration of kala-azar

Many of the respondents 99 (56.2%) who were knowledgeable on treatment duration of kala-azar were males and 60 (42.6%) were females. The proportion of the males who were not knowledgeable was 77 (43.8%) while that of females was 81 (57.4%), (Table 4.34).

Table 4.34: level of knowledge on treatment duration of kala-azar

Gender	Level of knowledge	N	%
Males	Knowledgeable	99	56.2
	Not knowleadgeable	77	43.8
	Total	176	100
Females	Knowledgeable	60	42.6
	Not Knowledgeable	81	57.4
	Total	141	100
	Grand total	317	100

4.4.13 Factors encouraging the disease to be common in the area.

A high proportion 183 (53.7%) of the respondents mentioned correctly that the disease is common in the area due to the presence of large number of termite mounds that promote breeding of sand flies and other environmental factors. Just 62 (18.2%) associated this to shortage and cost of drugs, while 71 (20.8%) mentioned lack of health facilities for diagnostics services (Table 4.35). Only 23 (6.7%) of the respondents said they do not know what reasons contribute to its prevalence.

Table 4.35: Factors encouraging the disease to be common in the area (N=317)

Factors encouraging the disease to be common	n	%
1.No drugs to treat and it is expensive to treat	58	18.2
2.No health facility for diagnostic services	66	20.8
3.I do not know	21	6.7
4.Presence of large number of termite mounds all over the area that promote the breeding of sand flies and other environmental factors	170	53.7
5. Others	2	0.6
Total	317	100

4.4.13.1 Level of knowledge on endemicity of kala-azar in the area

Majority of the respondents 111 (65.8%) who were knowledgeable on what makes kala-azar to be common in the area were males and 59 (47.2%) were females. The proportion of the males who were not knowledgeable was 81 (42.2%) while that of females was 66 (52.8%), (Table 4.36).

Table 4.36: Level of knowledge on endemicity of kala-azar in the area

Gender	Level of knowledge	N	%
Males	Knowledgeable	111	57.8
	Not knowleadgeable	81	42.2
	Total	192	100
Females	Knowledgeable	59	47.2
	Not Knowledgeable	66	52.8
	Total	125	100
	Grand total	317	100

4.4.14 Attitude on Malnutrition predisposition to kala-azar

Many of the respondents 239 (70%) stated that malnutrition does not predispose the people to the disease. Another 68 (20%) said they do not know if malnutrition predisposes while 34 (10%) mentioned that the people get predisposed by malnutrition to kala-azar, (Table 4.37). The true position is that malnutrition exposes one to kala-azar. The results are supported by the medical records, key informant interviews and the focus group discussion, that malnutrition has not been ruled out to be a risk factor in the area.

Table 4.37: Malnutrition if it predisposes one to kala-azar (N=317)

Malnutrition if it predisposes one to kala-azar	N	%
1.Yes	32	10
2.No	222	70
3.I don't know	63	20
Total	317	100

4.4.15 Association between kala-azar and Knowledge, Attitude, Perception and practices of the community in Loima sub-county of Turkana County, Kenya.

Bivariate analysis

The results in the Table 4.38 shows the analysis on the association between the community's knowledge, attitude and perception and suffering from kala-azar. From the results, those who were knowledgeable on the existence of kala-azar and perceived that it is a serious problem in the community, 48.3% (n=153) were 0.6 (95%CI=(1.3-2.2, p= 0.0163) times less likely to suffer from kala-azar as compared to 62% (n=15) who had no knowledge. Also, 56.9% (n=29) of the respondents who were not knowledgeable on the chief signs of the disease, were 3.2 (95%CI=1.2-7.2, p= 0.012) times more likely to suffer from kala-azar as compared to 22.9% (n=61) of those that were knowledgeable.

The results indicated that those who had no knowledge (65.5% n=69) on the transmission of the disease, were 3.6 times more likely to suffer from it as compared to (41.0% n=87) who knew the transmission vector as the sand fly bites. There was a significant association between the disease and knowledge of the respondents on its transmission (OR=3.6; 95%CI= (1.1-11.7), p=0.002); hence the variation in knowledge of the disease transmission dynamics is a risk or an exposure factor. The results also showed that respondents who lacked knowledge on the treatment duration for kala-azar (61.0%) n=96), were 2.6 times more likely to suffer from it as compared to 44.0% (n=70) who had knowledge and knew the treatment duration that it is one (1) month, (OR=2.6; 95%CI= (1.0-6.8), p=0.015). Also, of those who were knowledgeable (53.6% n=170) and knew, perceived and had an attitude that what it makes the disease to be common in the area is mostly due to the presence of large termite mounds all over the area that promote breeding of sand flies, (32.9% (n=56) were less likely to suffer from kala-azar as compared to (68% (n=100) of those who had no knowledge. There was a statistical association between the presence of large termite mounds all over the area that promote breeding of sand flies and being predisposed to the disease (OR=3.0; 95%CI= (1.1-12.3.), p=0.013), (Table 4.38).

Table 4.38: Knowledge, attitude, perception and practices of the community towards kala-azar in Loima sub-county of Turkana County, Kenya, 2016.

Knowledgeable or not knowledgeable on Kala-azar	Community suffering from kala-azar				
		Yes	No	Odds Ratio	
	Overall n (%)	N (%)=168	N (%)=173	(95%CI) OR Lower Upper	P value
Existence of Kala-azar					
Yes	317 (93.0)	153 (48.3)	164 (51.7)	Ref	
No	24(7)	15 (62.0)	9 (30.0)	0.6(1.3-2.2)	0.0163
Kala-azar origin (n=317)		**Yes(n=156**	**No=161**		
Correct response-From insects(sand flies)	95(30.0)	31(32.3)	64(67.7)	2.2(1.0-3.6	0.136
Incorrect responses Symptoms/signs	222(70.0)	125(55.9)	97(44.1)	Ref	
Correct responses	266(83.9)	61(22.9)	205(77.1)	Ref	
Incorrect responses Transmission	51(16.1)	29(56.9)	22(43.8)	3.2(1.2-7.2)	0.012
Correct response-Sand fly bites	212(67.0)	87(41.0)	167(59.0)	Ref	
Don't' know/Incorrect responses Duration for Kala-azar treatment	105(33.0)	69(65.5)	36(34.5)	3.6(1.1-11.7)	0.024
Correct response-1 month or 2 weeks	159(50.2)	70 (44.0)	89 (56.0)	Ref	
Don't know/Incorrect response Encouragement of the disease to be common in the area	158(49.8)	96 (61.0)	62 (52.8)	2.6(1.0-6.8)	0.015
Correct response-Presence of large termite mounds all over the area that promote breeding of the sand flies	170(53.6)	56(32.9)	114(67.1)	Ref	
Don't know/incorrect response	147 (46.4)	100(68.0)	47(32.0)	3.0(1.1-12.3)	0.013
Season when the sand fly (kala-azar vector) is active in the area (N=212)		**Yes=105**	**No=107**		
Correct response-Active year round with increased activity during the rainy season	64 (30.0)	24 (38.0)	40 (62.0)	2.6(1.1-10.3)	0.012
Don't know/incorrect responses	148 (70.0)	81 (55.0)	67 (45.0)	Ref	
Times when the sand fly bites most (N=212)		**Yes=105**	**No=107**		
Correct responses-All times	16(7.6)	4(25.0)	12(75.0)	1.6(1.1-5.3)	0.025
Incorrect responses Sand fly habitat	196(92.4)	101(51.6)	95(48.4)	Ref	
Correct response-Anti hills or termite mounds, tree holes, cracks/crevices/house walls	193(91.2)	42(21.7)	151(78.3)	Ref	
Incorrect response-Don't know/Stagnant water	19(8.8)	12(63.2)	7(36.8)	2.3(1.1-5.9)	0.014

95%CI=Confidence Interval.P=Level of significance, OR= Odds Ratio P<0.05-The relationship is significant.Ref=Reference

The results also indicated that 55% (n=81) of those with no knowledge on which season the sand fly that is kala-azar vector is active in the area, were 2.6 (95%CI=1.1-10.3, p=0.012) times more likely to suffer from the disease as compared to (38% (n=24), of those who mentioned correctly that the sand fly is active the year round with increased activity during the rainy season. The respondents (25.0% (n=4) that stated correctly that the sand fly bites at all times were less likely to suffer form kala-azar as compared to (51.6% (n=101) of those who were not knowledgeable. There was a statistical association between kala-azar and knowledge of respondents on the disease biting times (OR=1.6; 95%CI=(1.1-5.3), p=0.025).Those respondents who got information about kala-azar from the health centers or health workers (20.8%n=21), public barazas (31.0% n=7), or the church leaders (30% (n=11) were less likely to suffer from the disease as compared to those who got information from a person who had suffered or heard of kala-azar(49.2% n=79). There was no association between kala-azar and the source of information (OR=0.4; 95%CI= (1.2-2.1), p=0.041). Also, the results indicated that those who had no knowledge about the habitat of sand fly, (63.2% n=12) were 2.3 (95%CI= 1.1-5.9), p=0.014) times more likely to suffer from kala-azar as compared to (21.7%=42), of those who had knowledge and correctly said that the habitat is mostly ant hills or termite mounds, (Table 4.38).

In multivariate analysis, binary logistic regression was performed by adjusting all factors significantly at P<0.05 associated with kala-azar at Bivariate analyses. Five significant factors were retained in the reduced model as the significant predictors using the backward conditional method as presented in table 4.39. The results indicated that those who had no knowledge on the transmission of the disease, were 3.2 times more likely to suffer from it as compared to those who knew the transmission vector as the sand fly bites. There was a significant association between the disease and knowledge of the respondents on its transmission (AOR=3.2; 95%CI= (1.1-9.2), p=0.001). Also, of those who were knowledgeable and knew, perceived and had an attitude that what it makes the disease to be common in the area, that it is mostly due to the presence of large termite mounds all over the area

that promote breeding of sand flies, were less likely to suffer from kala-azar as compared to those who had no knowledge. There was a statistical association between the presence of large termite mounds all over the area that promote breeding of sand flies and being predisposed to the disease (AOR=2.6; 95%CI= (1.0-11.1.), p=0.003), (Table 4.39).

The results also indicated that those with no knowledge on which season the sand fly that is kala-azar vector is active in the area, were 2.4 (95%CI=1.0-9.0, p=0.002) times more likely to suffer from the disease as compared to those who mentioned correctly that the sand fly is active the year round with increased activity during the rainy season. The respondents that stated correctly that the sand fly bites at all times were less likely to suffer form kala-azar as compared to those who were not knowledgeable. There was a statistical association between kala-azar and knowledge of respondents on the disease biting times (OR=1.3; 95%CI=(1.0-5.1), p=0.005). Also, the results indicated that those who had no knowledge about the habitat of sand fly, were 2.2 (95%CI= 1.0-5.4), p=0.004) times more likely to suffer from kala-azar as compared to those who had knowledge and correctly said that the habitat is mostly ant hills or termite mounds,(Table 4.39).

Table 4.39: Knowledge, attitude, perception and practices of the community towards kala-azar in Loima Sub-county of Turkana County, Kenya, 2016.- Multivariate analysis

Knowledgeable or not knowledgeable on Kala-azar	Community suffering from kala-azar			
	Adjusted Odds Ratio	(95%CI)		P value
Transmission	AOR	Lower	Upper	P value
Correct response-Sand fly bites	Ref			
Don't' know/Incorrect responses	3.2	1.1	9.2	0.001
Encouragement of the disease to be common in the area				
Correct response-Presence of large termite mounds all over the area that promote breeding of the sand flies	Ref		Ref	
Don't know/incorrect response	2.6	1.0	1.0-11.1)	0.003
Season when the sand fly (Kala-azar vector) is active in the area				
Correct response-Active year round with increased activity during the rainy season	2.4	1.0	9.0	0.002
Don't know/incorrect responses	Ref		Ref	
Times when the sand fly bites most				
Correct responses-All times	1.3	1.0	5.1	0.005
Incorrect responses	Ref		Ref	
Sand fly habitat				
Correct response-Anti hills or termite mounds, tree holes, cracks/crevices/house walls	Ref		Ref	
Incorrect response-Don't know/Stagnant water	2.2	1.0	5.4	0.004

95%CI=Confidence Interval.P=Level of significance, AOR=Adjusted Odds Ratio P<0.05-The relationship is significant.Ref=Reference

4.5 Health seeking Behavior of the community in Loima sub-county of Turkana County, Kenya.

4.5.1 Health seeking Behavior Behavior among kala-azar patients in Loima sub-county of Turkana County, Kenya.

The search of treatment by respondents when having an episode of kala-azar on those who had heard or suffered of it, was such that less than a half of the respondents 111 (35%) mentioned that they went to the hospital, another 127 (40.0%), visited traditional healers first then to the hospital, 48 (15%) used the traditional herbs around and 19 (6%) bought drugs from the nearby shop or chemist (Table 4.40). Variation in the search for medical intervention according to the medical records, key informants and focus group discussion in itself is a risk or an exposure factor.

There was statistical association between the search for treatment by use of traditional herbs or drugs from the chemist and suffering from kala-azar ($x^2 = 9.158$, df=4,p=0.003). The highest proportion 126 (37.0%) of the respondents said that they take a longer time like more than one hour by foot to reach the nearest health facility, with 20(5.9%) taking 11-19 minutes. There was an association between length of time to the health facility and exposure to kala-azar ($x^2 = 10.809$, df=5,p=0.002).

Majority of the respondents 169 (69.6%) said that they cover a longer distance to reach the nearest health facility like 102 (29.9%) said they cover 2-5km, 9(20.2%) covered 5-8km, 48 (14%) covered 9-10km and even others 44 (12.9%) travel over 10km to the nearest health facility. Only 78 (23.0%) walk or travel less than 2km to the nearest health facility. Moreover, a larger proportion of the respondents 263 (76.9%) mentioned that they take their children to school while 78 (23.1%) said that they do not take them to school. On whether the respondent that had heard or ever had a member of family with kala-azar, takes children and other people to hospital when sick of kala-azar and other diseases, majority 226 (71.3%) said they do so while 91 (28.7%) said they do not (Table 4.40).

Table 4.40: Health seeking Behavior of the study population in Loima Sub-county in relation to self-reported kala-azar

Place of seeking treatment(n=317)	n	%	x^2	df	p-value
Go to hospital	111	35.0	9.158	4	0.003
Go to see traditional healers first then to the hospital	127	40.0			
Use traditional herbs around	48	15.0			
Buy drugs from the nearby shop or chemist	19	6.0			
Multiple answer	12	4.0			
Length of time respondents walk to health facility(n=341)					
5-10 min	27	7.9	10.809	5	0.002
11-19min	20	5.9			
20-40min	38	11.1			
41-59min	96	28.1			
1-2Hrs	126	37.0			
3-24hrs or days	34	10.0			
Distance to the nearest health facility(n=341)					
Less than 2km	78	23.0	8.771	4	0.002
2-5km	102	29.9			
5-8km	69	20.2			
9-10	48	14.0			
Over 10km	44	12.9			
Children go to school(n=341)					
Yes	263	76.9	6.985	1	0.130
No	78	23.1			
Taking children and other people to hospital when sick(n=317)					
Yes	226	71.3	12.157	1	0.004
No	91	28.7			

4.5.1.1 Level of knowledge on where treatment is sought when sick of kala-azar

Majority of the respondents 64 (42.4%) that were knowledgeable on where treatment is sought were females and 47 (28.3%) were males .More than a half 107 (72.7%) of those who were not knowledgeable were males and 75 (57.6%) were females (Table 4.41).

Table 4.41: Level of knowledge on where treatment is sought when sick of kala-azar (N=317)

Gender	Level of knowledge	n	%
Males	Knowledgeable	47	28.3
	Not knowleadgeable	119	72.7
	Total	166	100
Females	Knowledgeable	64	42.4
	Not Knowledgeable	87	57.6
	Total	151	100
	Grand total	317	100

There was a significant association between where treatment is sought and exposure to kala-azar (x^2 =9.159, df=4,p=0.003), (Table 4.41)

4.5.1.2 Reasons for not taking children and other people to the hospital

Of the respondents that said they do not take their children when sick of kala-azar and other diseases to the hospital, 68 (75%) said it is because the hospital is far and it takes more than 2 hours to reach there, 15.0% said it is because there is no money and 10.0% said they take them to traditional healers (Figure 4.12).There was a statistical association between not taking the sick of kala-azar to the hospital and being exposed to kala-azar (x^2 = 12.057, df=2,p=0.003).

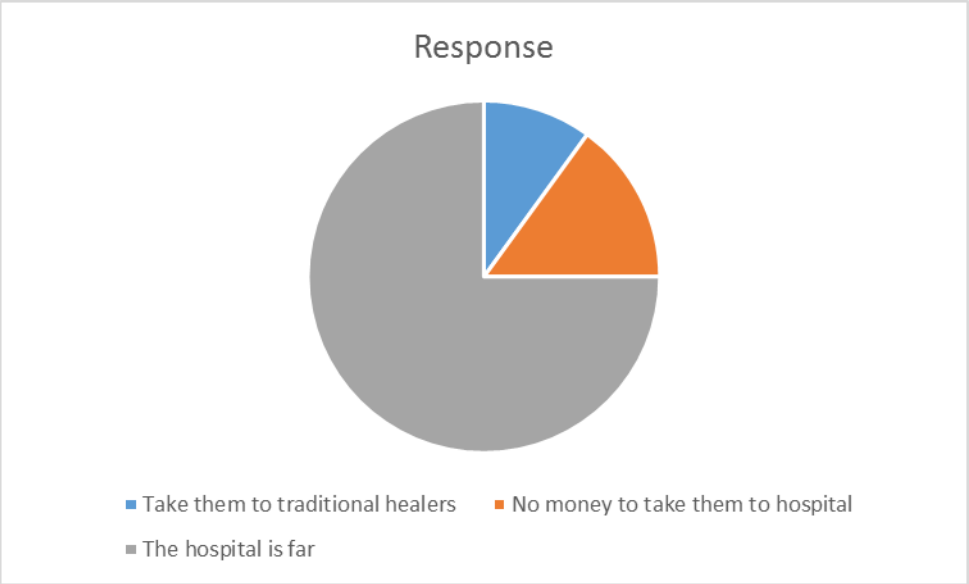

Figure 4.12: Reasons for not taking children and other people to the hospital

4.5.2 Affordability of drugs for treatment of kala-azar in Loima sub-county

Slightly over a half 94 (56%) of the respondents that had ever suffered from kala-azar said kala-azar drugs are not affordable by majority of the locals while 74 (44.0%) said they are affordable (Figure 4.13). According to the local health workers, the drugs are available majorly at the Lodwar Referral Hospital that is many kilometers away at a cost of more than 300 US dollars when the people can only afford 500 shillings per treatment thus the reason for preference of traditional healers.

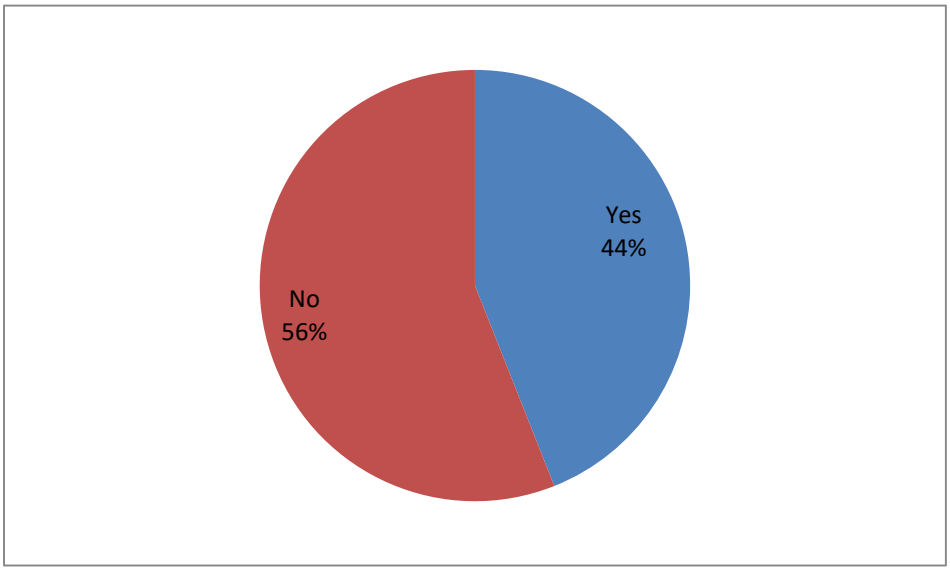

Figure 4.13: Affordability of drugs for treatment of kala-azar (N=168)

4.5.3 Association of kala-azar and health seeking behavior of the community in Loima sub-county of Turkana County, Kenya, 2016.

Bivariate analysis

The Table 4.42 shows the association of kala-azar and the community's health seeking behaviour. The results revealed that 62.5% (n=79) of those who sought treatment from traditional healers or bought drugs from the nearby shop or chemist 48% (n=9) were 2.6(95%CI=(1.08,6.26),P=0.033) times more likely to suffer from kala-azar compared to 34.7% (n=38) of those who went to the hospital. The results further revealed that 56.8% (n=25) of the respondents whose distance to the nearest health facility was 5-8km were 3.54 (95%CI=(1.31,9.59), P=0.013) times more likely to suffer from kala-azar compared to 52.8% (n=38) OR=1.15;95CI=(0.6,1.98) of those who covered 2-5km, 40.7% (n=70) who covered less than 2km or took less than an hour to reach the nearest health facility. Moreover, 51.1% (n=12) of the respondents who took 3-24 hours or days to reach the hospital were 3.4 (95%CI= (1.6, 9.8), P=0.017) times more likely to suffer from kala-azar as compared to 47.6% (n= 60), who took 5-10 minutes. There was a statistical association between kala-

azar and distance coverage to the health facility (Table 4.42). Furthermore, the respondents 56.4% (n=51) who did not take their children and other people to the hospital when sick of kala-azar, were 2.6 (95%CI=(1.1,7.4), p=0.001) times more likely to suffer from kala-azar compared to 45.8% (n=104) of those who took their children and other people to the hospital when sick of kala-azar. Respondents who did not take their children and other people to the hospital due to the unavailability of drugs in the hospital, 44.0% (n=4) were 13 (95%CI=(3.10,54.54), P<0.001) times more likely to suffer from kala-azar compared to the respondents who revealed that the hospital is far 53% (n=18) as one of the reasons for not taking their children and other people to the hospital.

Table 4.42: Association of kala-azar and health seeking behavior of community in Loima sub-county of Turkana County, Kenya, 2016. Bivariate analysis

Health seeking behavior	Community suffered from kala-azar				
		Yes=156	No= 161	Odds Ratio(OR)	
	Overall n(%)	n(%)	n(%)	(95%CI)	P values
Where treatment is sought(N=317)					
				OR(Lower-upper)	
Go to hospital	111(35.0)	38(34.7)	73(65.3)	1.1(0.4-1.3)	0.213
Traditional Healers	127(40.0)	79(62.5)	48(37.5)	Ref	
Traditional herbs around	48(15.0)	25(52.0)	23(48.0)	1.6(0.8-2.5)	0.042
Buys drugs from the nearby shop or chemist	19(6.0)	9(48.0)	10(52.0)	2.6(1.08-6.26)	0.033
Multiple answer	12(4.0)	4(32.0)	8(68.0)	0.6(0.3-2.2)	0.206
Distance to nearest facility(N=341)		**Yes=168**	**No=173**		
Less than 2km	172(50.4)	70(40.7)	102(59.3)	Ref	
2-5km	72(21.2)	38(52.8)	34(47.2)	1.15(0.6-1.98)	0.619
5-8km	44(13.0)	25(56.8)	19(43.2)	3.54(1.3-9.5)	**0.013**
9-10km	21(6.0)	15(71.4)	6(28.6)	2.13(0.7-6.9)	**0.011**
Over 10km	32(9.5)	20(62.5)	12(37.5)	1.62(0.8-3.5)	**0.015**
Time taken to reach the hospital(N=341)					
5-10minutes	126 (37.0)	60 (47.6)	66 (52.4)	Ref	
11-19minutes	91 (26.6)	42 (46.2)	49 (54.8)	0.6(0.4-1.7)	0.513
20-40minutes	43 (12.6)	23 (53.5)	20 (46.5)	1.2(0.5-3.2)	0.519
41-59minutes	33 (9.6)	17 (51.5)	16 (48.5)	0.6(0.5-2.1)	0.442
1-2hours	27 (7.9)	14 (51.9)	13 (48.1)	2.4(1.4-9.3)	**0.047**
3-24 hours or days	21 (6.3)	12 (57.1)	9 (42.9)	3.4(1.6-9.8)	**0.017**
If respondents children go to school(N=341)					
Yes	263(76.9)	121 (46.0)	142 (54.0)	Ref	
No	78(23.1)	47 (60.0)	31 (40.0)	0.7(0.4-2.1)	0.285
If respondents take children and other people to hospital when sick of kala-azar (N=317)		**Yes=156**	**No=161**		
Yes	226(71.3)	104(45.8)	122(54.2)	Ref	
No	91(28.7)	51(56.4)	40(43.6)	2.6(1.1-7.4)	**0.001**
Reasons for not taking children and other people to the hospital(N=91)		**Yes=45**	**No=46**		
Hospital is far	34(37.0)	18(53.0)	16(47.0)	Ref	
No money to take them to hospital	19(21.0)	9(46.0)	10(54.0)	0.4(0.2-1.6)	0.043
Take them to traditional healers.	24(26.0)	14(57.0)	10(43.0)	3.1(1.1-10.40)	**0.003**
Association of kala-azar and health seeking behavior of community-Bivariate analysi Cont'					
No drugs in the hospital	10(11.0)	4(44.0)	6(56.0)	13(3.1-54.5)	**<0.001**
Multiple answer	4(5.0)	1(25.0)	3(75.0)	1.3(0.3-5.3)	0.713

95%CI=Confidence Interval.P=Level of significance, OR= Odds Ratio P<0.05-The relationship is significant.Ref=Reference

In multivariate analysis, binary logistic regression was performed by adjusting all factors significantly at P<0.05 associated with kala-azar at Bivariate analyses. Five significant factors were retained in the reduced model as the significant predictors using the backward conditional method as presented in table 4.43. The results revealed that those who sought treatment from the hospital, were 0.4 (95%CI=(0.2,1.8), P=0.102) times less likely to suffer from kala-azar than those who went to traditional healers, took traditional herbs around (AOR=1.4;95CI=(0.6,2.3), p=0.002), bought drugs from a chemist (AOR=2.2;95CI=(1.0,6.0), p=0.003), or even had multiple sources of treatment (AOR=0.6;95CI=(0.4,2.1), p=0.200). The results further revealed that the respondents whose distance to the nearest health facility was 5-8km were 3.1(95%CI=(1.1,9.0),P=0.003) times more likely to suffer from kala-azar compared to those who covered less than 2 km. Those who covered 2-5km were 1.1 (95CI=(0.4,1.98), P=0.506) times more likely to suffer from kala-azar than those who covered less than 2km. Also, those who covered 9-10km were 2.1 (95CI=(0.6,6.2), P=0.001) times more likely to suffer from the disease than those who covered less than 2km.Those respondents who covered over 10km were 1.4 (95CI=(0.6,3.3) P=0.004), times more likely to suffer from kala-azar than those who covered less than 2km or took less than an hour to reach the nearest health facility. Moreover, the respondents who took 3-24hours or days to reach the hospital were 3.2(95%CI= (1.4, 9.5), P=0.003) times more likely to suffer from kala-azar as compared to those who took 5-10 minutes. There was a statistical association between kala-azar and distance coverage and time to the health facility (Table 4.43); and the results indicated the need to have a health facility 5km within reach with another facility; even according to the World Health Organization (WHO) recommendation.

Furthermore, the respondents 56.4% (n=50) who did not take their children and other people to the hospital when sick of kala-azar, were 2.6 (95%CI=(1.0,7.1), p=<0.001) times more likely to suffer from kala-azar compared to those who took their children and other people to the hospital when sick of kala-azar. Respondents who did not take their children and other people to the hospital due to the unavailability of drugs

in the hospital, were 6.1 (95%CI=(3.1,36.4),P<0.001) times more likely to suffer from kala-azar compared to the respondents who revealed that the hospital is far as one of the reasons for not taking their children and other people to the hospital.

Table 4.43: Association of kala-azar and health seeking behavior of community in Loima sub-county of Turkana Cpounty, Kenya, 2016. Multivariate

Health seeking behavior	Community suffered from kala-azar (95%CI) Odds Ratio			
	AOR	Lower	Upper	P values
Where treatment is sought				
Go to hospital	0.4	0.2	1.8	0.102
Traditional Healers	Ref			
Traditional herbs around	1.4	0.6	2.3	0.002
Buys drugs from the nearby shop or chemist	2.2	1.0	6.0	0.003
Multiple answer	0.6	0.4	2.1	0.200
Distance to nearest facility(N=341)				
Less than 2km	Ref			
2-5km	1.1	0.4	1.98	0.506
5-8km	3.1	1.1	9.0	0.003
9-10km	2.1	0.6	6.2	0.001
Over 10km	1.4	0.6	3.3	0.004
Time taken to reach the hospital(N=341)				
5-10minutes	Ref			
11-19minutes	0.6	0.4	1.6	0.401
20-40minutes	1.1	0.4	3.0	0.426
Association of kala-azar and health seeking behavior of community-Multivariate analysis Cont'				
41-59minutes	0.6	0.4	2.1	0.231
1-2hours	2.2	1.2	9.1	0.004
3-24 hours or days	3.2	1.4	9.5	0.003
If respondents take children and other people to hospital when sick of kala-azar				
Yes	Ref			
No	2.6	1.0	7.1	<0.001
Reasons for not taking children and other people to the hospital				
Hospital is far	Ref			
No money to take them to hospital	0.4	0.2	1.5	0.003
Take them to traditional healers.	3.0	1.0	9.1	0.002
No drugs in the hospital	6.1	3.1	36.4	<0.001

Multiple answer	1.1	0.3	5.1	0.501

95%CI=Confidence Interval.P=Level of significance, AOR=Adjusted Odds Ratio P<0.05-The relationship is significant.Ref=Reference

4.6 Knowledge on control of kala-azar in Loima Sub-county of Turkana County, Kenya

4.6.1 Control of kala-azar by the community.

4.6.1.1 Kala-azar if it can be controlled and treated

A huge proportion 218 (68.8%) of the respondents responded correctly that kala-azar can be controlled and treated. Only 70 (22.1%) did not perceive that it can be controlled, with even another 29 (9.1%) declaring that they do not know if it can be controlled. For those who said that kala-azar can be controlled, more than a half 120 (55.0%) further said this could be through medical intervention. Another significant number 98 (45.0%) suggested the use of traditional herbs or both traditional and conventional medicine (Table 4.44). There was a significant difference in the propotions of those who agreed that kal-azar can be controlled and those who did not agree(x^2 = 3.407, df=2,p=0.003), and how the disease can be controlled (x^2 = 9.160, df=2,p=0.027), (Table 4.44).

Table 4.44: Kala-azar can if it can be treated/controlled

Control/Treatment of kala-azar(n=317)	**N**	**%**	**x^2**	**df**	**p-value**
1.Yes	218	68.8	3.407	2	0.003
2.No	70	22.1			
3.Do not know	29	9.1			
Total	317	100			
How kala-azar is controlled/treated(n=218)			x^2	df	p-value
1.Medical intervention	120	55	9.160	2	0.027
2.Use of traditional herbs	43	20.			
3.Use of both traditional herbs and conventional medicine	55	25			
Total	218	100			

4.6.2 Practice on protection against sand fly bite.

About 85 (40%) of the respondents said correctly that they practice the use of ITNs, 40 (19.0%) burning of fire at night near the house as a protection from sand fly bites. Another 30 (14.0%) said by wearing protective clothing, 21 (10.0%) by screening the house while 36 (17%) said any of the above ways can be used (Figure 4.14).

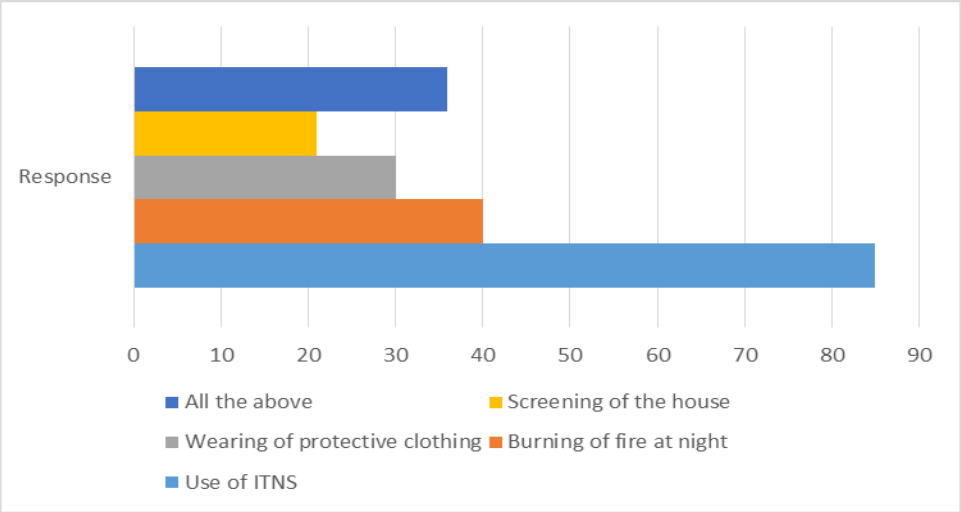

Figure 4.14: Protection against sand fly bite (N=212)

All the above practices are correct ones in the protection against sand fly bite. There was a significant difference in the proportions about the protection measures against sand fly bite (x^2 =18.625, df=4, p=0.004)

4.6.3 Ownership and use of bed-nets by the respondents in Loima sub-county of Turkana County, Kenya.

4.6.3.1 Bed-nets one has in the household.

Less than half 133 (39.0%) of the respondents indicated that they do not have bed-nets, while 208 (61.0%) had a varying number of bed-nets with majority 163 (47.8%) owning one (1), two (2), three (3) or four (4) bed-nets. A significant proportion 79 (38.0%) of the respondents reported that they do use the nets they own at night while 129 (62.0%) said that they do not use despite ownership. On how often the respondents that have nets use them, a higher proportion of 59 (74.5%) said that

they used them majorly during the times of greatest mosquito nuisance and only 15 (11.0%) mentioned correctly that they always use, with 13 (9.0%) mentioned use during the rainy season (Table 4.45).

Respondents that do not use bed-nets despite ownership gave reasons for not sleeping under them such as that the bed nets increases warmth 35 (27.4%), are expensive, have few and yet family size is large by 33 (25.7%), that use of bed nets cannot prevent bites from sand flies by 32 (24.8%) while 29 (22.1%) gave all multiple answers. More than half 53.1% (n=42) of the participants that use bed-nets responded that their use can be an effective kala-azar control measure, 21.5% (n=17) of them said their use cannot be an effective measure while 25.4% (n=20) said they do not know whether their use can be an effective kala-azar measure (Table 4.47). There was a significant difference in the distribution of the proportions on ownership of bed-nets for kala-azar control (x^2 =12.352, df=6 p=0.003), use (x^2 =12.434, df=1 p=0.003), how often they are used (x^2 =10.465, df=2 p=0.036), why not use despite ownership (x^2 =9.371, df=3 p=0.004) and if bednets use is an effective kala-azar control measure (x^2 =11.334, df=2 p=0.002), (Table 4.45).

Table 4.45: Ownership and usage of bed-nets

Ownership of bed-nets	**N**	**%**	**x^2**	**df**	**p-value**
None	133	39.0	12.352	6	0.003
1	50	14.5			
2	44	13.0			
3	39	11.3			
4	31	9.0			
5	18	5.4			
6	16	4.8			
7	10	3.0			
Total	341	100.0			
Usage of bed-nets(n=208)	N	%	x^2	df	p-value
1.Yes	79	38	12.434	1	0.003
2.No	129	62			
Total	208	100			
How often the bed-nets are used(n=79)	N	%	x^2	df	p-value
1.Always	11	13.7	10.465	2	0.036
2.During the rainy season	9	11.8			
3.During the times of greatest mosquito nuisance	59	74.5			
Total	79	100			
Why not use bed-nets despite ownership(n=129)	N	%	x^2	df	p-value
1. Their use cannot prevent sand fly bite	32	24.8	9.731	3	0.004
2.Are expensive, have few and yet family size is large	33	25.7			
3. They increase warmth	35	27.4			
4.Multiple answers	29	22.1			
Total	129	100			
Usage of bed-nets if an effective kala-azar control measure(N=108)	N	%	x^2	df	p-value
1) Yes	42	53.1	11.334	2	0.002
2) No	17	21.5			
3) Don't know	20	25.4			
Total	79	100			

4.6.4 Community involvement in the prevention/control of kala-azar

The results indicated that less than a half 152 (48%) of the respondents that had heard of kala-azar said that they are involved as members of the community in the prevention of kala-azar, 111 (35%) mentioned that the community does not get involved while 54 (17%) mentioned that they do not know if it gets involved (Table

4.48).There was no significant difference in the distribution of the proportions about the community involvement in the prevention/ control of kala-azar (x^2 =5.731, df=2; p=0.123), (Table 4.46).

Table 4.46: Community involvement in the prevention/control of kala-azar

Community involvement in the control of Kala-azar	n	%	x^2	df	p-value
1.Yes	152	48.0	5.731	2	0.122
2.No	111	35.0			
3.I don't know	54	17.0			
Total	317	100.0			

4.6.5. Destruction of termite mounds if it can be an effective kala-azar control measure.

A significant proportion 138 (65%) of the respondents that had associated sand fly bites with the transmission of kala-azar correctly agreed with this statement with the explanation that this can reduce ant hills that are majorly the sand fly habitat hence affect the transmission cycle, while 74 (35%) did not agree with the statement. Those who did not agree argued that the termite mounds harbor termites that comprise a local delicacy 44 (60.0%), that termite mounds are not the only resting or breeding sites for the sand flies 11 (15.4%) and 18 (24.6%) argued that environmental manipulation is just not sustainable. There was no significant differernce in the distribution of the proportions about the destruction of termite mounds and their effectiveness as a kala-azar control measure(x^2 =6.388, df=4; p=0.148).

4.7 Focus Group Discussions and key informant Interviews Results

This section focused on interviewing the selected households' heads and women for focus group discussions (Appendix 9) and community leaders, community health workers and opinion leaders for key informant interviews (Appendix VIII).

4.7.1 Focus Group Discussions

4.7.1.1 Theme 1:Kala-azar presence or existence in the area

In the focus group discussions, majority of the participants-both male and female, described''kala-azar *is a terrible disease of the poor among the poorest and has existed in the area for long''*.

The participants from the discussions showed that kala-azar is a well- known illness and familiar to many, yet with varying level of misconceptions. Almost all participants knew someone who had suffered from the disease known by the local name as *etid* meaning ''the disease affecting the spleen''. They were able to correctly identify the sand fly as the transmitting agent and its association with acacia trees, cracks of the soil and mud huts and animal dirt. However, almost a quarter of the participants did not know the cause of kala-azar especially during the focus group discussions and attributed it to mosquitoes, ghosts, contaminated water, unhygienic houses, hunger and staying outside the village on farmland; they believed that the disease could be passed from person –to- person in the same house, drinking water or sharing food with patients, sleeping in the same bed, clothes and sweat of the patients were also evoked by some as ways to get infected. Half (50%) of the participants said everyone, rich and poor alike, can get kala-azar. However, they acknowledged vulnerability of some groups like children, teenagers or the young in general were thought to be more at risk as they practice hunting, play or dance (*edong'a)* at night in the open space, play outside close to the trees, termite mounds where the sand fly lives and have ''weaker blood''. Family members and poor families with food insecurities were also perceived to be at a higher risk to be exposed or get kala-azar.One female FGD participant explained:

''Yes, hunger causes it, the sand fly brings it. The person who does not eat enough definitely he will be sick and the illness will increase. When the fly finds that your blood is weak, it strikes you' '.The discussants during the interviews made more contributions such as:"The disease is common here and for a very long time even before I was born; needs to be removed because many families which are affected

are poor and suffering more" Lamented a 38 year old female participant during the focus group discussions, indicating endemicity and the burden of the disease and the way it affects more those with low socio-economic status in the area.

"*We need God to help us and that our young men who are mostly affected should change the behavior and practice of resting and sleeping near and under the shade of termite mounds when herding, because I hear that is the home of the insects or parasites that causes this bad disease that makes somebody's stomach to swell and even one can be said to have little blood", r*esponded a 46 year old male pastor who was also a focus group discussion participant, calling for God's intervention and alluding to exposure factors to the disease being due to human's own behavior.

From the FGD, one of the male household head said *''kala-azar prevalence is majorly contributed to by presence of large termite mounds harbouring sand flies, the kala-azar vector''.* One of the participant advocating health education that *"most of the community members did not understand about kala-azar and nobody had come to tell them what causes it and how it is moved from one person to another*. Another household head said that "*we kept and lived with animals hence this might make sand flies to be commonly present in our community households"* (Figure 4.15*)*. Some of the FGD participants (Figure 4.16) appreciated the efforts of county government of building health facilities, but they raised concerns that they had not been taught about kala-azar control and prevention. They emphasized that there was a greater need for educating the community on what causes and how to reduce risks associated with kala-azar disease.

Figure 4.15: Acacia trees and termite mounds found in large number in the study area; they are the sand fly habitant, the insect that transmits kala-azar disease in the area

Figure 4.16: participants during a focus group discussion in the study area

4.7.1.2 Theme 2: **Health seeking behaviour for kala-azar**

Participants in the focus group discussions emphasized preference for alternative treatment methods as mostly being practiced in the community this way: ‘’*Before the health facilities came into existence, the people in the community treated kala-azar using local herbs, cutting the swollen parts and use of hot livestock dung to burn the affected area’’,* as stated by 48 year male participant in the focus group discussion, showing support of traditional medicine in the management of kala-azar. Another emphasized that: *‘’There is still use of herbs or visiting traditional healers not only for treating this disease that makes one stomach to swell but also others like malaria or typhoid. The affected part is cut or removed and burnt. Powder is put in that area in order to relieve the pain’’,* (36 years female participant) indicating there is the practice of body tattoing and preference to alternative treatment methods by the community members.

An elderly woman who participated in the FGD said **“***the people do walk far long distance seeking essential health care services and the nearest health facility is even more than 5 km away. This has created difficulties for locals in seeking prompt kala-azar treatment thus resulting to first visit to alternative treatment patterns***”.** This she said in support of alternative treatment pattern due to inaccessibility of health care services as a result of long distance coverage. The households heads further explained: ‘*’The health workers and* **“***village madaktari”did not reach us in the villages to provide teaching or explain* to *us on the important ways of preventing and quality access to kala-azar treatment but we only went to health facilities when we were sick and at the health facilities no time were we explained thoroughly the problems causing the disease*”.

The majority of the female participants supported and all agreed that *“Negative perceptions and lack of vital information among the community influenced negative practices and increased acceptance of traditional herbal medicine and that constant engagement of the community in the whole process could be of great achievement in the prevention of this dreadful disease***”.**

Most of the participants for the FGD agreed that the majority of the community members did not go to health facility immediately when they became infected with kala-azar". During the group discussion, majority of the community participants raised concerns that "*most of our local community lacked adequate information about kala-azar and always seeks first traditional medicine since it was most available*".

4.7.1.3 Theme 3: Knowledge, attitude and perception (KAP) and cultural beliefs on the disease

''To deal with kala-azar episode is costly'' This is a statement made by both the KII and FGDs groups, that although kala-azar drugs cost is subsidized, there are other many expenses for the kala-azar patients and their families, which they have to pay out of pocket. They include hospital entry ticket, bed, syringes, different laboratory investigations, medicines for other non-kala-azar conditions and meals for care takers when one goes for medication. Participants described their coping mechanisms such as borrowing money, selling cattle or asking for help. The financial losses are felt both in the short- and long-term, the main reason for not taking the sick to hospital.

The FGD participants lamented: '*'the government is not working for us and they are far away from us, we are not aware of kala-azar and this has not changed our community cultural and beliefs and has increased negative health seeking behavior"*. The four FGD groups expressed concerns that the majority of the community "*still continued to seek traditional cultural practices because they associated kala-azar to witchcraft and other human influences".*

Women indicated that *"most men, as heads of households, have sustained negative cultural and behavioral practices towards disposing of human wastes and through reluctance to make informed decisions on health and hygiene which includes building household toilets for their families'.*

The four FGD groups drew a concluded remark that *"the majority of the community still have poor attitudes towards seeking and relying on modern medicine but rather opted for traditional medicine before they went to the health facilities. However,*

worse, they preferred seeking modern medicine when their conditions were turning extremely bad". Further discussion on the issue of hygiene and construction of toilets was done, since this was seen as a great challenge to the community, one of the village head strongly suggested *''unless community are forced to do so and moving from house to house should be initiated in order to remove negative practices and perceptions against constructing and use of toilets''.*

It was found out from the discussion that there were strong attitudes and beliefs among the community that cannot easily be wished away, which it may take sometime to change gradually. The household heads unanimously expressed their views that the best way to reduce and eliminate these common kala-azar condition was *"continuously doing health education and raising community awareness on the importance of controlling this kala-azar by engaging them directly through frequent public barazas, local opinion leadership and administration in the community meeting water points where they fetched water for their animals and domestic uses".*

The participants from the four FGD groups believed that ''*the best approach to helping the infected was to conduct regular mobile health care outreaches to most prevalent areas and encourage the sick to attend outreach clinics so as to receive drugs and treatment. Also, encourage them to identify and refer those who are sick at home for medical checkups".* A common claim emerged from the participants that they have not seen health workers coming to educate vulnerable communities on preventive measures against kala-azar.

4.7.1.4 Theme 4: Practices or behaviour encouraging exposure

This practice was confirmed during focus group discussions that ;"*Most of the people here who are herders use the termite mounds or anti hills as shelter due to persistent drought and dry trees"* as mentioned by a 35 year male participant during the focus group discussions, showing the closeness of people to the anti-hills (Figure 4.14). "*We even sleep under the anti-hills in shifts as the others look after the animals and watch out for cattle rustlers especially from 11 am-3pm when the sun is too hot"* Responded a 22 year old male herder, emphasizing the importance of termite mound to them.

'*We say it is malaria first and then it changes into kala-azar. Sometimes they say it is typhoid. Malaria becomes typhoid and typhoid becomes kala-azar'',* exclaimed a male FGD participant.*''Kala-azar is a dishonest disease. If there is any other disease in your body, then it will not appear in the test, until you get rid of all other diseases you have''*added a female FGD participant pointing to a kala-azar patient (Figure 4.18) and indicating the perception of kala-azar co-infections.

Gender inequalities further exacerbates kala-azar impact on the family in that kala-azar is broadly perceived as a dangerous disease that needs to be taken seriously. The notion of danger was mentioned by the female participants that it is linked to its severity and belief that it ultimately kills.

''Kala-azar is the most dangerous disease since it is difficult to be cured. While other infections can be cured in the nearest hospital, kala-azar can result into one being referred. It is so expensive and can cost 300 or more US dollars. We think it is the most dangerous disease as it causes death'', exclaimed a male focus group discussion participant indicating the severity of the kala-azar disease.

When a family is suspected to have kala-azar and while both parents are responsible in making a decision, the female is in a disadvantaged situation. The women are expected to handle the multiple tasks like child care, household chores or agricultural work. Permission from the husband or the male family member is culturally sought and this is strongly linked to the financial solvency as the man's prerogative. Despite this, respondents still said that the women could be in a position to raise money from sale of charcoal, crops from peasant farming or reaching to the collective community resources.

Majority of the female participants spoke of the impact of kala-azar on the family, the emotional toll of dealing with emotions related to the disease and unexpected death and further impoverishment to the family even if the patient is not the main breadwinner. Having to stay in the hospital disrupts their life as the work in the field has to be abandoned or delegated to others.

Figure 4.17: A herder who is a kala-azar victim found in one of the households in the study area

4.7.1.5 Theme 5: Control of kala-azar

4.7.1.5.1 Kala-azar control strategy

The strategy on control of kala-azar was emphasized by focus group discussions participants as follows:"*Kala-azar has to be controlled adequately for it has stayed in this place for long. All people need to work together and decide on what can be done to termite mounds, for they are where the disease is coming from",* Suggested a 42 year old female participant," *Ant hills are with us, people rest or sit near them, even when one is treated the disease comes back because of exposure to them and I am sure dogs do not bring it",* she added, indicating kala-azar relapse.

"Kala-azar is a common disease in this area for a long time and I think it is contributed by the presence of so many ant hills all over the area, where the insects that bite people and cause the disease live. However, I do not think people can accept that these ant hills be destroyed for they support breeding of termites which are eaten during the rainy season;" responded a 37 year old male participant, indicating the prevalence of the disease and ineffectiveness of environmental manipulation if employed.

The FGD groups commented that due to "*huge lacks and shortage of essential water, as a source of life, the little available water was prioritized for cooking foods and drinking only rather than use for other cleanliness".* This was because they observed that *the government and other partners are focusing much attention to men and local administrators leaving out women when it comes to making informed decision for the community*. Some household heads pointed out that seeking proper diagnosis and prompt treatment could not only be enough to prevent kala-azar but further explained that unless concerted efforts were made through continued raising community awareness on safe water, sanitation and hygiene through regular general cleanliness practices for populations at risks especially children and women it could be difficult to prevent it in the near future. They reported that the community households' heads very often migrate with their animals due to persistent droughts and lacks of water for domestic use leaving women with their children at homes alone hence making

them vulnerable of many situations including being at of kala-azar and other diseases.

4.7.1.5.2 Challenges to the preventive measures of the disease

Some of the preventive measures of the disease are perceived not to be successful and this was explained by the participants. *''We are worried about the disease treatment and control measures. We keep asking how to fight the sand fly from its habitat. From our experience to cut down acacia trees and run after the sand fly to catch it is a failure' '*exclaimed a male FGD participant. When asked about what more could be done to tackle the disease, more than three quarter of the participants suggested that more the emphasize the use of Insecticde Treated Bed-nets (ITNS) in the community, use of indoor spraying, health education on the effective control and preventive measures of kala-azar to the community. However, the government support is always seeming inadequate and more health facilities are needed for the hard to reach areas like Loima sub-county, including more diagnostic services, more health workers and better infrastructure as well as economic programmes to tackle poverty.

4.7.2 Key informant interviews

4.7.2.1 Theme 1:Kala-azar presence or existence in the area

Majority of the key informants interview respondents on kala-azar defined it as, '*'a tropical parasitic neglected disease associated with poverty' '*.About the problems causing the presence of kala-azar disease, most of the KII participants said that key issues include "*practices and cultural beliefs, poor sanitation and hygiene standards, lack of water for general cleanliness, lack of awareness and low health seeking behaviors were associated with prevalence and incidences of kala-azar disease*".

The participants from the discussions showed that kala-azar is a well- known illness and familiar to many, yet with varying level of misconceptions. Almost all participants including confirmation from health workers, knew someone who had suffered from the disease known by the local name as *etid* meaning ''the disease

affecting the spleen''. The respondents described the disease as characterized by bouts of fever, weakness, abdominal swelling, nose bleeding, and dry lips. People also linked kala-azar with low appetite, yellow skin, pale eyes, vomiting and anxiety. They were able to correctly identify the sand fly as the transmitting agent and its association with acacia trees, cracks of the soil and mud huts and animal dirt. One male KII who is a community leader indicated; ‘*’When you eat some of the food or drink meant for the sick person, you will be infected with kala-azar. When the disease infects a person in a family, it must also infect two or three other persons''*.

4.7.2.2 Theme 2: **Health seeking behaviour for kala-azar**

The journey to seek health intervention is a huge challenge and these hurdles are evoked as the most important reason to delay coming to the hospital. Treating the initial symptoms with medicines brought from market is also common. A female health worker described it thus: *''In case someone is sick, he/she comes to the hospital and if no kala-azar is found immediately, he goes away and buys the medicine from the outside. In reality, he may have kala-azar, yet he buys the medicine from outside and many patients are lost this way. A person's health worsens and they bring him here when it is too late''*.

Most of the participants of both FGD and KII agreed that the majority of the community members did not go to health facility immediately when they became infected with kala-azar, but seek first traditional medicines.

4.7.2.3 Theme 3: Knowledge, attitude and perception (KAP) and cultural beliefs on the disease

''To deal with kala-azar episode is costly'' This is a statement made by both the KII and FGDs groups, that although kala-azar drugs cost is subsidized, there are other many expenses for the kala-azar patients and their families, which they have to pay out of pocket. They include hospital entry ticket, bed, syringes, different laboratory investigations, medicines for other non-kala-azar conditions and meals for care takers when one goes for medication.

*The financial situation is so bad; you find the families which are too poor to have food for tomorrow or even the day, they have no money to see a health worker and buy medicine, so he stays with the disease. They say thank God if he/she recovers, if not then it is God's will''*explained a KII who was a community leader.

4.7.2.4 Theme 4: Practices or behaviour encouraging exposure

Health workers who were key informats explained and was confirmed from the focus group discussions that people mostly believed that kala-azar can only be found after multiple tests. They perceive that the ''easy'' type of kala-azar is the one that is detected immediately, whereas the ''difficult'' one is the one with repeated negative test results. Kala-azar is to a larger extent thought to be'' hiding'' in the body and will only show itself after evolving from malaria, inflammation, or typhoid. In the experience of many, there is need to be treated for other diseases first.'

When a family is suspected to have kala-azar and while both parents are responsible in making a decision, the female is in a disadvantaged situation. The women are expected to handle the multiple tasks in the home. Permission from the husband or the male family member is culturally sought and this is strongly linked to the financial solvency as the man's prerogative.

''To get the medication, one has to buy it when sometimes there is no money and the father is not around. A sick child may spend 10 or more days before going to the hospital because the mother tells you the father is not around and there is no money. The mother has to wait until the father comes back. Some people sell their cattle in the market to get the money, hence money is a major problem for it can block everything and that is why there can be a delay'' explained a female KII participant.

Majority of the female key informat participants spoke of the impact of kala-azar on the family, the emotional toll of dealing with emotions related to the disease and unexpected death and further impoverishment to the family even when the patient is not the main breadwinner. Stay in the hospital disrupts their life as the work back at home gets abandoned or done by others.

'The family gets troubled and despite their poverty, they do what is beyond their reach. All the family care needs to be addressed and be directed to the patient. Kala-azar is most dangerous disease here and it is still a problem hence concerted efforts need to be employed to control it'' contributed a female KII participant.

4.7.2.5 Theme 5: Control of kala-azar

The response to the availability of kala-azar control strategies, by the key informatsdescribed that "*the majority of the community always seeks alternative medicines, of traditional origin*. *The community had strong beliefs that the variety of traditional medicines cures many of diseases present including kala-azar*". Majority of the KII who were community leaders, were not aware of the government interventions for the kala-azar control citing especially lack of awareness and inadequate education of the community.

The KII participants were asked to suggest ways of improvement which aimed at reducing the prevalence and incidences of kala-azar burdens in the community. Majority of them suggested that "*there was need to initiate and organize community sensitization meetings; emphasized on sanitation and hygiene education; provide nomadic mobile medical outreaches/clinics; and provide scale up community water supply to increased households general cleanliness".*

When asked about existing challenges to kala-azar control, majority of KII respondents said "*the great challenge was about poor access to the quality health care facilities"*. People travel long distances to seek essential health care services, where the average distance travel to the nearest heath facilities were more than WHO recommended distance of 5 km. All of them agreed that "*negative attitudes, and behaviors were identified as barrier to latrine use, general cleanliness and lack of knowledge by the community which they believed as a major obstacles to prevention and treatment of kala-azar".*

4.7.2.5.2 Commonly used diagnostic tests and treatment for kala-azar

Participants who had kala-azar in the past or cared for family members with kala-azar claimed that the search for a definitive diagnosis and treatment is a major challenge. People first try to self-medicate, adopting a ‘’symptomatic’’ approach with distinct healing methods for each affliction. For example, they rub oil and herbal paste against fever, cut or burn skin against the abdominal swelling, drink herbal concoctions from various roots for yellow skin, or drink water that has been prayed for and is blessed as a more general measure. The association with’’ bad blood’’ led to the practice of blood -letting, ‘’letting the black blood run’’ after which the wound is tied up with tree barks. If these attempts are unsuccessful, then people resort to the formal health system that could be distant and that the available might be village health centres or clinics. Private clinics are rare, the nearest rural hospital or pharmacies, are expensive and hence are visited depending on circumstances and the available money.

‘’The commonly used drugs at the health facilities for treatment of kala-azar are both Pentavalent injectables-1st line treatment; Amphotericin B and AmBisome- as the 2nd line treatment . The cost of the drugs is high at over 300US Dollars per treatment. This cost is mostly out of reach of most patients, thus the reason for preference to traditional healers’’, narrated a female health care worker during the key informant interview.

‘*’The commonly used diagnostic tests in the health facilities include formol gel test (FGT), used commonly at majority of the health facilities with diagnostic services, yet is non- specific and non- sensitive. Direct agglutination tests (DAT), Opti-leish and bone marrow aspirates (BMA) are the specific tests but only used especially at Pentecostal Assemblies of God (P.A.G) health facility at Namoruputh. Polymerase chain reaction (PCR) and enzyme linked Immuno-sorbent essay (ELISA) that are more robust tests are not used due to their cost. There is shortage of diagnostic services and health personnel, since out of the seventeen (17) health facilities found in Loima Sub-County, only four (4) offer diagnostic services. There is shortage of specialized equipment and skilled personnel; leaving only one health centre that is well equipped being burdened with many patients’’ explained* the health facility in-charge at Namoruputh hospital, a faith based-Organisation. *‘The correct*

confirmatory test for kala-azar in the health facilities is Bone Marrow Aspirate(BMA) or Splenic aspirate, but is only used mostly by a few health facilities and not many other health facilities, thus the disease is still prevalent in Loima owing to few diagnostic services and shortage of personnel' 'Added another male KII health worker.

4.7.2.5.3 Challenges to the preventive measures of the disease

The health workers interviewed mentioned that a good number of the treated patients relapse even after treatment due to often exposure to the sand fly habitat or natural encroachment like resting or sitting near termite mounds hence there is need to devise effective preventive measures. ''*The patients treated at the health facilities get relapses and come back to the hospital for further treatment. This is due to their exposure or the encroachment of the kala-azar habitat''*Stated (40%) of the KII health workers interviewed. The government (both the national and the county) needs to give adequate support to hard to reach areas like the study area, with provision of more health facilities with more diagnostic services, more health workers with requisite expertise and better infrastructure as well as economic programmes to tackle poverty. This was explained by the participants:*''The government and other stakeholders need to help the communities and have a multisectoral approach to handle the disease including its transmission dynamics, treat the affected individuals and deal with things that are difficult for them to manage. The poor community members cannot get medicines and searches for the cost of treatment'* 'proposed a key informant interview participant who was a community leader.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECCOMENDATIONS

5.1 Introduction

This chapter is the presentation of discussion, conclusions and recommendations made based on the presentation, analysis and interpretation of the results of this study. The chapter has been presented according to the objectives and research questions of the study and organized in generalized themes and with incorporation of both quantative and qualitative data where consideration was put for factors that had significant chi-square and logistic regression results.

5.2 Discussions

5.2.1 Prevalence of kala-azar

The results have shown that kala-azar is endemic in the area, owing to the high prevalence of 49.3% obtained from the household data. Among the prevalent and top priority diseases in the area, kala-azar is the 2nd parasitic disease after malaria (39.6%), even according to medical records and the key informant interviews (MSF, 2013, WHO, 2014). More than half (75%) of the respondents have mentioned that kala-azar is a serious and common disease in the area. A high proportion of the respondents indicated, agreed and revealed that a family member or themselves had once suffered or had an episode of kala-azar; thus indicating endemicity and prevalence of this disease kala-azar in the area hence the need for enhanced health education and medical intervention for control strategies as supported by other studies (Siddiqui *et al., 2010;* Bantie *et al., 2013;* Belo *et al., 2013;* WHO, 2015). Kala-azar according to the medical records and key informant interview is the most neglected tropical disease in the area followed by trachoma. A similar study in India showed that 98% of the respondents were aware that kala-azar is an endemic, 2nd parasitic after malaria and the most neglected tropical disease in the area (Singh *et al., 2006*a; Mondal *et al., 2009*).

5.2.2 Social Demographic characteristics, socio-economic and socio-cultural factors

5.2.2.1 Social demographic characteristics and socio-economic factors

The results of this study have demonstrated that age has a significant association with kala-azar infection; where of the respondents of ages between 18-35 years who were the majority, 52.9%(n=90) and 43.4% (n=56) of the ages between 36-49 years, were 3.2 times more likely to suffer from kala-azar as compared to other age brackets. This is because these age groups of 18-35 years that were in the age bracket youth could be more exposed due to them being the most actively involved in the exposure practices of livestock keeping/ herding, hunting, firewood collection, deforestation, charcoal burning, dancing at night (*Edong'a*) in the open space; and sitting or resting under the large termite mounds shades that are kala-azar vector habitat (Alvar *et al.*, 2012; WHO, 2016).

In line with this finding, a study done in Trishal Upazila, Bangladesh demonstrated a significant association between VL and different age groups (Akter *et al., 2012*). A study on factors associated with Visceral leishmaniasis infection in North Gondar zone, Amhara region, North West Ethiopia by Kindie Bantie *et al.*, 2014*)* revealed the association between age and infection; such that children less than 15 years were 3.3 times more likely to be infected with VL than adults who are aged 18 years and above (AOR=3.26;95%CI=1.54,56.92). Another study done in Nepal also indicated that age is associated with increased risk of infection (Schenkel *et al., 2006*) and a study in South Sudan also indicated that the peak age group for VL infection was under the age of three years (Lagu *et al., 2011*). The possible justification for the age based predominance in the mentioned studies like also the current study, could be due to the reason that children whose age is below 15 years are less developed immune system and most of them would not have previous attack with VL which could make them partly immune after getting infected with the disease commonly observed in areas with sustained transmission of the disease (Bantie *et al., 2014*).

It has been demonstrated that males who majority were in the age category of 18-35 years, were more likely to suffer from kala-azar compared to females where 59.4%

(n=95) of the males were 4.2 times more at risk than females. This could due to their occupation or the mentioned practices that often bring them into contact with termite mounds that are kala-azar vector habitat. The observation concurs with other studies (Collins *et al.,* 2006; Boelaert, 2012; Bantie *et al., 2014;* Hailu *et al.*, 2016) which have noted that males are three times more susceptible to kala-azar than females.

An epidemiological systematic review and meta- analysis done in America to assess factors associated with Visceral Leishmaniasis (VL) also revealed that the male sex was significantly more associated with infection with Odds Ratio (ORs) of 1.30 and 2.38 (Belo *et al.,* 2013). In the same study, males were about 4.6 times more likely to be infected with kala-azar than females. The male gender predominance of the infection could also be due to the reason that males are mostly engaged in outdoor activities and stay outdoor from dawn to dusk that might increase their contact with sand fly and in most rural parts of our country like Loima, men are mostly forced to sleep outside to keep their cattle and other valuables from theft; hence the need for enhanced health education on effective protective and control measures.

Another study on distribution of kala-azar and its risk factors in Metemma, Ethiopia by Yibeltal *et al.,* 2015, revealed that males were highly affected by the disease compared to females with the rate of 97% and 3% respectively. The possible high risk to males could be due to exposure of the males to different agricultural areas outside home whereby the sand flies can easily multiply and bite these individuals especially in rural area like Loima and furthermore, due to the high trafficking of males for agricultural activities, males are more vulnerable than females (Argaw *et al.,* 2013; Picado *et al.*, 2014). Men also seem to be at higher risk of kala-azar compared with women, probably due to the role of sex hormones in modulating the response to Leishmania (Mengesha *et al.,* 2014; Picado *et al.*, 2014).

Education level, occupation, housing and the level of income also had a significant contribution to exposure since those with higher education (college/university) seem to have better occupation hence high level of income and better housing in the community. Apparently, results show majority of the community members have primary, secondary or no formal education 90.3%. It is shown that more than half of

the respondents that had no education and who were majority, 57.5% (n=111) and 45.7% (n=32) of those with primary education were 3 times more likely to suffer from kala-azar compared to those with tertiary education. It is demonstrated from the results that few of the respondents are salaried, many live in either grass thatched (54.6%) or semi-permanent (33.7%) houses and low income levels (48.1% and 33.4% earning between ksh 2000 - kshs 5000 and less than kshs 1000 a month respectively). They have a higher number of children (53.1% have between 6-15 children) and fewer numbers of cattle (51% having between 1-50 animals) despite the main economic activity in the area being livestock keeping. Majority of the respondents 59% and 63% had at least a termite hill and an acacia tree near a house respectively; with 38% having cracks in the house walls and that 51%(n=95) of those with grass thatched houses were more at risk of suffering from kala-azar as compared to 33.3%(n=38) of those with semi-permanent houses. This situation is increasing exposure to kala-azar as most people are not economically able to protect themselves from the disease that is reported to hit the poorest among the poor in the communities (Burki; 2009; Dawit *et al.*, 2013; WHO, 2014). A study on exposure factors associated kala-azar by Oryan *et al.,* 2014 agrees with the studied finding of the current study with some contrary aspects, that living in houses with cracked mud or thatched plastered house walls, dampen earthen floors, sleeping on the floor or outside and vegetation near a house can facilitate sand fly survival and enhance vector abundance through providing diurnal resting places, breeding sites and humidity (Dawit *et al.,* 2013; Ghatee *et al.,* 2013). Consistent with this finding, another study reported that low income can be associated with poor housing conditions, poor environmental hygienic conditions, poor nutritional status and increased risk of infections (WHO, 2014; Bantie *et al., 2014*). The housing condition like mud as type of floor, wall and roofing were associated with increase in kala-azar infection, according to this study. This finding is consistent with findings from other studies which indicated that housing condition is one of the most important factors for Visceral leishmaniasis (Picado *et al*., 2014).

Exposure factors for kala-azar study done in India demonstrated that thatched wall of housing condition is high risk for the disease (Singh *et al., 2010*). A similar study from India also showed that house made of mud wall was significantly more

associated with VL infection in comparison to house made of permanent materials (Kesari *et al., 2010).* The possible reason for this could be due to the fact that thatched and mud walls are most likely to be cracked like in the study area and favorable for entrance and breeding of the sand fly, the kala-azar vector. It is also reported that mud walls can retain moisture for many months after the rainy season, which further increases favorable conditions for the sand fly breeding and resting (Bantie *et al., 2014);* hence filling of cracks and crevices in walls with a mixture of lime and mud can be advocated as an ecologic approach for the control of the sand fly inside the house (Dawit *et al.,* 2013; Ghatee *et al*., 2013).

A study by Singh *et al., (2010*); reported that low socio-economic status was found to be associated with Visceral Leishmaniasis and another study done in India also showed that an improved socio-economic status was associated with reduced risk of VL infection compared to lower ones (Hasker *et al., 2012*). Similarly, a study done in Kenya and Uganda demonstrated that highest socio-economic status was protective to VL infection (Kolaczinski *et al., 2008*). A report from systematic review and meta-analysis that assessed subjects' income directly showed that an increase was associated with a decrease in the occurrence of the disease (Belo *et al., 2013*). The probable justification for this could be that low income can affect over all status of household and individuals in many aspects. Low income also contributes to malnutrition which has been identified as a risk factor in severity of the leishmaniasis (Mengesha *et al., 2014;* Herrador *et al.,* 2015*),* was very high and it was associated with intestinal parasitic infections. Therefore, screening of severely malnourished VL patients for intestinal parasitic infections during admission is recommende (Mengesha *et al., 2014;* Herrador *et al.,* 2015).

5.2.2.2 Socio-Cultural Factors

The results indicated that the sleeping time for the community at night ranges from 8pm and beyond 11.30 pm. The current study has shown that majority of the respondents 85.0% (n=290) have a habit of sleeping outside their houses and among them that sleep outside their houses at night all the year, 56.1% (n=96) are at risk of suffering from kala-azar as compared to (47.9% (n=57) of those who sleep outside

during some months. Majority 70% (n=203) of those who sleep outside are males with 55.7% (n=113) being at risk of suffering from kala-azar. This is because due to nature of the people in the study area practicing pastoralism, men are forced to sleep outside to keep their cattle and other valuables from theft.

The biting times of sand flies lie between 6.30pm-6.30am at dawn according to the study at Uganda, Sudan and Bangladesh (MSF, 2013; Alvar *et al., 2012*) and according to Gebre-Michael and Berhe (2010), both *P. martini* and *P. celiae* are reported to show peak activity between 20.00 and 22.00 hours around termite hills and in human dwelling compounds (Gebre *et al*., 2010). Clearly, most people especially are perpetually exposed and prone to frequent sand fly bites and kala-azar infections (Dawit *et al., 2013;* WHO, 2016).

Peoples' association with dogs according to the results do not predispose the community people to the disease. This was confirmed by WHO, (2010) and MSF, (2013) whose report on a study in Uganda and along the Kenyan boarder said that the type of kala-azar found in the area is anthroponotic where transmission is directly from human to human and not zoonotic (MOH 2013, WHO, 2014) that is supposed to be from animals to man ; hence dogs are not reservoir hosts of kala-azar in Loima, as even is indicated by the medical records, key informant interviews and focus group discussions (Hailu *et al.,2012;* MOH, 2013; WHO, 2014); and that there is no animal reservoir, either domestic or sylvatic that has been found in East Africa (WHO, 2015).

A study in North Gondar zone, Amharan region, North West Ethiopia on factors associated with kala-azar infection and similar study in Addis Zemen, Ethiopia had their results to the contrary. These studies showed that dog ownership was associated with Visceral leishmaniasis and that the finding of epidemiological survey and meta-analysis in the combined data also demonstrated pattern of increasing likelihood of infection for subjects with dogs in the households; with the possible justification being that dogs are reservoir hosts for canine Visceral leishmaniasis and they attract sand flies for search of blood meal (Seife *et al., 2009;* Kintie Bantie *et al., 2014*).

Majority of the respondents 57.8% (n=144) in the study that carry out the cultural festivities, particularly dancing at night (Edong'a) in the open space without any preventive measures, were at risk of suffering from kala-azar due to exposure to the biting of sand flies. This was supported by focus group discussions, key informant interviews and other studies (Dawit *et al.,* 2013; WHO, 2014).The study also showed that the human activity of livestock keeping as practiced by majority of the respondents 55% (n=188) with 48.9% (n=92) being at risk of suffering from kala-azar, is an exposure to the disease in the area with also deforestation and hunting activities that had a statistical association with kala-azar prevalence.

According to this study, majority of the respondents (80.2%) revealed that the behaviour or practice of resting, playing or sitting under the termite mounds shade oftenly especially by the males of the ages between 18-35 years, predisposes the community to the disease a great deal, as compared to multiple practices. A considerable proportion of respondents 170 (53.6%) correctly mentioned that presence of ant hills or termite mounds in large numbers, promote breeding of sand flies and other environmental factors that make the disease to spread due to the human encroachment of the vector habitat. These were confirmed through the key informats and focus group discussions.The study is consistent with other studies (Mondal *et al., 2009;* Bantie *et al., 2014*). A similar study on kala-azar exposure factors in North West Ethiopia and another study in Southern Ethiopia also indicated that presence of termite mounds (ant hills) and acacia trees near home was associated with kala-azar disease (Bantie *et al., 2014*). The probable reason could be that termite hills and acacia trees with barks as it is in the study area, are highly favorable sites for breeding and resting of sand flies (Siddiqui *et al., 2010.* Belo *et al., 2013*). A study from Southern Ethiopia also agrees with this finding that proximity of termite hills to home was associated with the disease (Ter *et al.*, 2013).

5.2.3 Knowledge, Attitude, Perception and Behavior.

The results showed that majority of the people in the community are aware and have heard of kala-azar *(*90%) with many- (93%) confirming that they know its existence in the area and that it is a menance to the community while only a small proportion

of (7%) said that they do not know about the disease in the area. This level of awareness, could be due to frequent health campaign carried out in the area (Melaku, 2011; MOH, 2013). From the results, those who were knowledgeable on the existence of kala-azar and perceived that it is a serious problem in the area were 0.6 times less likely to suffer from it as compared to those who had no knowledge. The result of the current study on the level of awareness and association, was slightly higher than that of a study conducted in Northwest Ethiopia where 87.4% had heard about kala-azar (Alemu *et al.*, 2013) and a study in West Pokot, Kenya and Uganda where 95% of participants had heard of kala-azar (MSF, 2013; Mueller *et al*., 2014.). In another study in India, Nepal and Bangladesh (Mondal *et al., 2009*), almost all (98%) of respondents reported the awareness and existence of kala-azar which is similar to this study. In a study done in Muzaffarpur (Singh *et al., 2006a).* 97.4% of the respondents were aware of the existence of the disease. This is not an unusual finding. The possible reason for better awareness about the disease existence could be that Loima is one of the Sub-counties with the consistently highest endemicity in the county and the country for more than 40 years and can be considered to be the epicenter for kala-azar (MSF, 2013, WHO, 2014).

Slightly over a half (50.1%) of the community members were knowledgeable and knew the time it takes for the disease to be treated, that is, 1 month, with majority being males at 56.2%. However, (49.1%) gave different suggestions, which could affect their health seeking behavior. For instance, that the disease would even take 3-6 months to be treated hence the ultimate result has been the preference to alternative treatment such as the use of traditional herbs. The results showed that respondents who lacked knowledge on the treatment duration for kala-azar were 2.6 times more at risk of suffering from it as compared to those who had knowledge and knew the treatment duration. The results on treatment duration knowledge were supported by focus group discussions, medical records and other studies (Rijal *et al., 2006*; Boealart, 2012; Bantie *et al., 2014;* WHO, 2015).

A sizeable number of respondents (30%), were knowledgeable with males being 40.9% and knew the times the sand fly is common in the area, that it is active all year round with increased activities during the rainy season, while majority 70% were not

knowledgeable with females at 81.4% in that they mentioned various times. This varying perception has a bearing on prevention efforts. The results indicated that 55% of those with no knowledge on when the season the sand fly that is kala-azar vector is active in the area, and that are ones practicing the cultural activities of dancing at night (Edong'a) human activities of livestock keeping and hunting were 2.6 times more likely to suffer from kala-azar as compared to (38%) of those who mentioned correctly the season the sand fly is active. The results are in consistence with other similar studies (Lukes *et al., 2007;* Siddiqui *et al., 2010;* Dawit *et al., 2013;* Hailu, *et al., 2016).*

The results revealed that generally despite majority (67%) of the respondents being knowledgeable on kala-azar transmission, still a high proportion (33%) did not have an in-depth knowledge about the spread or transmission of kala-azar including 3% who didn't' know about the mode of transmission. Those who had no knowledge (50.1%) on the transmission of the disease were 3.6 times more likely to suffer from it as compared to those who knew the transmission vector as the sand fly bites (21.1%). On the other hand, the current study has shown that the females were more knowledgeable on the disease cause and transmission than males. An explanation for this finding could be the fact that women are known to pay more attention to health issues, indicating their attentiveness within their family; in various situations with their children, partners, parents and grandparents (WHO, 2015).This care is often based on accumulated experience or learning the experience from other women in the family and so this knowledge can be put into practice to prevent the disease and guarantee the family's health; although other factors like social class and educational level can influence the health knowledge and practices (Lopez *et al.*, 2014;WHO, 2015).

Vast majority of the respondents (83.8%) were familiar or knowledgeable about kala-azar symptoms, while a significant number (16.2%) of the respondents could not recognize correctly the common symptoms of kala-azar. Majority of the community members 43.8% who were not knowledgeable on the symptoms or knew chief signs of kala-azar and the transmission dynamics were 3.2 times at risk of suffering from the disease as compared to 56.9% that were knowledgeable. In a

study by Alemu *et al.,(*2013) on knowledge, attitude and practices related to kala-azar in Northwest Ethiopia, 68% of the participants said that the causative agent of kala-azar was transmitted through sand fly bite and 14.4% of the respondents didn't' know about the mode of transmission and this result was almost consistent with the current study. On the contrary, the result is higher than that found in Sudan (Salem *et al*., 2016) where only 6% indicated that the disease is transmitted by sand fly bite. The difference could be due to source of information or educational status varying in the areas. These findings were similar to another study conducted in Muzaffaprur (Singh *et al., 2006a*) and another study results (Mondal *et al., 2009*). It is important for all the community members to know the breeding sites and disease vector habitat as a preventive measure to reduce the chance for vector-human contact. The findings were again similar with other studies (Mondal *et al., 2009;* Siddique *et al*., 2010). Overall, the above findings were consistent with earlier conducted studies on malaria, filariasis, kala-azar and dengue fever in different parts of the world (Matta *et al., 2006;* Belo *et al*., 2013; Bantie *et al., 2014*).

The difficulty some respondents had in identifying the mode of transmission due to lack of knowledge, was important because sand flies may not be perceived to be important, in transmission of kala-azar, hence they may not act appropriately to protect themselves against their bites. The knowledge on disease transmission mechanisms and progression needs to be enhanced because the above mentioned studies have suggested that if villages do not perceive mosquitoes to be responsible for disease such as malaria, they do not take sufficient measures to protect themselves against the vector, thus this could be the same perception applied to the kala-azar disease.

With regard to source of information about kala-azar transmission, or control, a half (50%) of respondents said they get information from person to person who suffers or is suspected to have kala-azar, about (38%) mentioned getting information from health centers or community health workers, while (12%) said they get from either public barazas, church leaders, friends, neighbors, internet and the media. This is consistent with other studies (Matta *et al., 2006;* Kintie Bantie *et al., 2014*). This suggests that friends, neighbors, church leaders, internet, mass media such as

television, radio, magazines and newspapers are not a very important source of information for kala-azar in Loima. One of the possible explanations for that could be the poor information, education and communication (IEC), activities for kala-azar through all sources including mass media.

Overall, these findings suggest ineffective information, education and communication efforts of the public health system and other responsible agencies. Even after such prolonged and incessant disease transmission in the area, exposure due to lack of awareness about kala-azar, indifferent attitudes and incorrect practices are indicators of little commitment of health policy planners for the disease as revealed in other studies (Siddique *et al., 2010;* Bantie *et al., 2014*). Even if health care facilities were comprehensive, acceptable and accessible which is not the case in this study area, the purpose would not be achieved if the community itself is not involved in the program.

It is vital to know the knowledge, attitude, perception and behavior of the community or extent of awareness and other exposure factors predisposing the community to the disease, then help to improve the level of awareness to satisfaction before launching any control program in order to get maximum support from the community (Belo *et al., 2012*). In this study, although the awareness on existence and mode of transmission of kala-azar is high, more emphasis should be laid on putting the knowledge into positive attitudes and practices through enhanced health education. The respondents could be at risk due to varying knowledge about symptoms or signs, mode of transmission, preventive measures of the disease and breeding site of sand flies. This emphasizes the need for rethinking remedial action. It is documented by various studies that health education could offer promise of influencing individuals to adopt preventive measures (Siddique *et al., 2010;* Bantie *et al., 2014*).

5.2.4 Health seeking behavior

The results have showed a varying health seeking behavior trend by the people in the area due to many factors including having little or no purchasing power, thus no access to conventional life-saving treatments. The results of this study have

identified poverty as a major factor in development of full-blown kala-azar. This is exemplified by the observation that access to the appropriate health facilities is a big challenge to the most majority in the community. Due to distance to the health facility and expense, there is preference for traditional modes of treatment, which are rarely effective (Dawit *et al., 2013;* MOH, 2013).

It was observed that the use of traditional herbs or visitation to the traditional healers is common in the community. The period of time taken to walk to the health facility by majority of the locals is a major setback. Slightly over half, take more than 1-2 hours. Owing to this, most of the community members (65%) prefer either obtaining local herbs or self-prescribed drugs which are non-effective from the shops or chemists to ameliorate the symptoms instead of seeking appropriate medical intervention, with only (35%) being the ones that go to the hospital on the first onset to seek medication. The variation in the search for medical intervention according to the medical records, key informants, focus group discussion and other studies is itself a risk factor (Siddiqui *et al., 2010,* Belo *et al., 2013;* Bantie *et al., 2014*). Some members also apply cow dung to the affected are or even cut incisions into the skin (MSF, 2013; WHO, 2015). A study on awareness about kala-azar disease and related preventive attitudes and practices in India showed on the contrary that government hospitals and health centers were the first choice of treatment by 73.6% of respondents if a suspected case of kala-azar occurred in the household (Siddiqui *et al.,2010*). Another longitudinal study in Northwest Ethiopia by Lopez *et al.*, (2015) on knowledge, attitude and perception related to kala-azar showed contrasting results on the kala-azar choice of treatment where public health facilities were the first choice of treatment. The condition of such studies could probably be owed to the quality and free-of-charge nature of health services provided at the kala-azar treatment centers in that area while our current study condition on the contrary as even indicated by other studies is associated with geographical accessibility, treatment costs, confidence in service providers as well as perceived staff attitude (Siddiqui *et al.,* 2010; Alemu *et al*., 2013). The current study yielded a high use (more than 60%) of traditional medicine for kala-azar treatment compared to other studies in which local healers were consulted by 20 to 50% of the population (Kolaczinski *et al*; 2008; Monda *et al*; 2009).

Slightly over a half (56%) of the respondents stated that kala-azar drugs are not affordable by majority of the locals while (44.0%) said they are affordable and this is in consistent with other studies (Rijal *et al., 2016;* Siddiqui *et al., 2010*). According to local health workers who were key imformants, the drugs are available majorly at Lodwar County and Referral Hospital that is over 60 km away at a cost of .more than 300 US dollars when the people can only afford 500 shillings per treatment thus the reason for preference to traditional healers (Singh *et al., 2006a;* WHO, 2014). A study on economic analysis of kala-azar in Sudan was almost in consistent with the current one where it estimated the total cost at US$450 for an episode and it was totally unaffordable for most (61%) subsistence farmers in that area (Meheus *et al.,* 2013).

The study showed that majority of the people about (50%) in the community walk long distances including for days as they walk to access health services. The health centers are few and apart which forces residents to walk for tens of kilometers to reach the nearest health facility. This is a journey trod on rough volcanic rocks under the scorching heat and humid temperatures. By the time they reach there, residents seeking health services are severely dehydrated, hungry and on the verge of collapse. According to the results there is need to have a health facility 5km between the locals and another facility even according to the World Health Organization (WHO) recommendation (Avar *et al*., 2012; WHO, 2016). The data was supported by key informats, focus group discussions, medical records and other studies (Siddiqui *et al*., 2010; Bantie *et al.*, 2014; WHO, 2016).

Majority of the respondents (88%) mentioned that HIV/AIDS and its opportunistic infection like TB do support the spread or existence of kala-azar. Another small number (7%) mentioned malaria only to be encouraging the spread of the disease while (5%) mentioned that multiple diseases encourage spread of this dreadful disease. The results were supported by key informant interviews, focus group discussions and medical records that indicate kala-azar is now becoming an AIDS defining disease. According to other studies, kala-azar has been claimed to be 5th opportunistic infection considered as one of AIDS defining illness (Bantie *et al, 2014;* Belo *et al.,2013* ;Ter *et al*., 2013); and a study done in Tigray, showed that

being infected with HIV was the most important predictor of death among kala-azar patients (Picado *et al*., 2013), hence exposure or risk factor data are essential to designing the appropriate public health response that includes development of effective prevention and control strategies (WHO, 2017).

Majority of the respondents (53.1%) had children between 6 and 15, thus the burden of some for educating and other upkeep including taking to hospital despite low socio-economic status. Majority (76.9%) mentioned positively that they take their children to school while (21.3%) said that they do not. The possible reason for some children not being taken to school could be lack of knowledge on the value of education which is also a risk factor for disease infection, low economic status despite free primary education and subsidized secondary education fees and the need to have children herding the animals (Jan Kolaczinski *et al.,* 2008). Furthermore, the respondents (56.4%) who did not take their children and other people to the hospital when sick of kala-azar, were 2.6 times more likely to suffer from kala-azar compared to (45.8%) of those who took their children and other people to the hospital when sick of kala-azar. The advanced reasons for not taking children and other people to hospital when sick of kala-azar and even other diseases included distance, lack of money, preference to traditional healers and shortage of drugs in the health facilities as even stated in other studies (Adhikari *et al., 2010;* Hasker *et al., 2012*). A study from Addis Zemen, Ethiopia revealed presence of association between number of family members in a household and risk of kala-azar infection (AOR=3.54,95%CI=1.9,6.6 (Seife 2009), though on the contrary the current study did not determine the number size of the entire household but only the number of children.

The results of this study, showed that half of the respondents (50%) had none or fewer of livestock of between 1-50-, with even a smaller proportion (12%) having between 101-500 livestock. The majority of the animals kept included goats, sheep, some cows, camels, poultry, and donkeys to aid in transportation. The study showed also that majority of the respondents (80.4%) had the distance from their houses to animal shed being between one and 200 metres while a small proportion (19.6%) had theirs between 201-500 metres. This is an exposure to the bites of sand fly due to

proximity to the animals. The general smaller number of livestock in the community is a depiction of low socio-economic status that hinders one economically in protection against diseases like kala-azar; because these animals can be sold and money obtained can help in one making a decision to seek for medical intervention in case of an episode (Surendra *et al, 2011).* Conventially, ownership of cattle should be a protective measure where attention of the sand flies is drawn to the kept animals from humans (Hasker *et al.*, 2012). A study on factors associated with kala-azar in Ethiopia showed that subjects who owned cattle were 2.6 times more likely of getting kala-azar infection than their counterparts (Bantie *et al., 2014*). Contrary to this study, a study conducted in Urban residents in Dharan town of east Nepal to investigate factors for kala-azar and a study from rural Bihar, India reported the negative association between cattle ownership and risk of kala-azar infection (Surendra *et al., 2011;* Epco *et al., 2012*). This could be due to the reason that cattle in India and Nepal might be kept away from human beings in a separate room unlike our case where most rural residents keep cattle and other domestic animals inside or near a house with close proximity to human beings due to fear of theft.

5.2.5 Control of kala-azar

5.2.5.1 Control of kala-azar by the Community.

During the interviews that were carried out, it became evident that in order to strengthen control measures, findings of this study support partnership and capacity building in the area; and this strategy was emphasized by focus group discussions participants who emphasized the need for concerted efforts to control kala-azar adequately since it has stayed in the place for so long. The participants explored what needs to be done with the termite mounds- the kala-azar vector (sand fly) habitat since they explained that people rest or sit near the mounds and relapse occurs even after treatment due encounter with them oftenly (Avar *et al*., 2012).

A larger proportion (68.8%) of the respondents reported correctly that kala-azar can be controlled and treated. Only (22.1%) did not believe that it can be controlled, with even another (2.9%) declaring that they do not know that it can be controlled. For those who said that kala-azar can be controlled, more than a half (55.0%) further said

this could be through medical intervention. Another significant number (45.0%) suggested the use of traditional herbs or both traditional and conventional medicine. This indicated a varied health seeking behavior which is a risk factor and that was in consistence with other studies (Siddiqui *et al., 2010;* Bantie *et al., 2014*).The results of the current study is in consistency with a study by Alemu *et al., (*2013) on knowledge, attitude and practices related to kala-azar in Northwest Ethiopia, where 81.2% of the participants said that control or preventability of the disease is possible, though the finding is slightly higher. The higher knowledge on disease control could be due to the fact that as people know the preventability or the control of malaria, that is also a vector-borne disease like kala-azar and a top priority disease in the area, they would conclude that kala-azar can also be controlled. The massive scale-up of insecticide-treated nets for malaria control also may have a collateral benefit for kala-azar control (Alemu *et al.,* 2013; WHO 2017).

The results indicated that less than a half (48%) of the respondents believe that kala-azar can be controlled or prevented through community participation or involvement, whereas (35%) mentioned that the community does not get involved; another 54 (17%) mentioned that they do not know if it gets involved. This result is similar to that from a study conducted in a highly endemic rural area of India (Siddiqui *et al., 2010).* A significant proportion (65%) of the respondents mentioned that destruction of termite mounds can be an effective kala-azar control measure, while (35%) said it cannot. Those who did not agree argued that the termite mounds harbor termites that comprise a local delicacy by (60.0%), that termite mounds are not the only resting or breeding sites for the sand flies (15.4%) and another (24.6%) argued that environmental manipulation is just not sustainable. This study results were supported by key informants, focus group discussions and other studies (Siddiqui *et al., 2010;* Bantie *et al., 2014;* WHO, 2014).

The results of this study have shown, that the ownership of bed nets- (61.0%) in the community is high, but its usage is low (38%). Many peoples' (74.5%) main reason for low usage was that, despite having a bed net, they only use them during the times of greatest mosquitoes nuisance and that lack of use of bed nets is due to large family size, cost as well as belief that bed nets increase warmth and cannot protect from

sand fly bites (Alvar *et al., 2012;* WHO, 2014). There was significant association between kala-azar, ownership and use of bed-nets. Ownership and often use of bed-nets is a recommended protective measure by world Health Organisation against sand fly bite during sleep or rest (WHO, 2016). The results of this study were in contrast with results in rural areas of Nepal; where 58% of villagers in Titaria and 36.8% in Haraincha used bed- nets (Surendra *et al*., 2011). Results in rural areas of Bihar state India (23.9%); (Adhikari *et al*., 2009; Medley *et al*., 2015) and a study in Ethiopia showed a high usage of bed-nets at 93.7%. The contrast in the results might be due to the fact that the government gives bed-nets to people for the control and prevention of malaria in some of these area oftenly as earlier alluded, or differences in time of investigation, in the socio-economic status of the people or in people's awareness. A case control study conducted in Fangak, South Sudan revealed that regular use of bed net during rainy and other seasons provides a degree of protection from kala-azar (Lagu *et al., 2011).* A finding from India and other studies also highlighted that bed net ownership and its consistent usage was protective against kala-azar, but not statistically significant at the 5% level (OR=0.62;95%CI=0.37-1.03) for bed –net ownership or OR= 0.79;95%CI=0.6-1.02 for its use)(Singh *et al., 2010;* Siddique *et al., 2010;*Bantie *et al., 2014*).

With regard to effectiveness of bed-nets as a kala-azar control measure, more than half (53.1%) of the participants that use bed-nets responded that their use can be an effective kala-azar control measure. Another 21.5% of them said their use cannot be an effective measure while 25.4% said they do not know whether their use can be an effective kala-azar measure. The results indicated that despite emphasis on the use of ITNS (40%), the respondents (60%) mentioned correctly other measures such as wearing protective clothing (14%, screening of the house (10%) and burning of fire at night near the house (19%). A combination of all these measures (17%) was said to be employed in the protection against sand fly bite even as it is supported by other studies (WHO, 2010; MOH, 2013; Bantie *et al., 2014*).

5.2.5.2 Diagnosis and treatment measures at the Health facility

Co-infections encouraging spread of kala-azar are mostly HIV/AIDS and TB according to the health professionals interviewed during this study. There are diagnostic tools and confirmatory tests for the disease but not used in all health facilities, except in few health facilities like P.A.G health center at Namoruputh even as supported by other studies(MSF, 2006; MSF, 2011; MOH, 2007). The HIV prevalence among women in Turkana County is 10.8%, which is higher than men 6.5% (KNBS, 2016). One of the major threats to control of visceral leishmaniasis (VL) is it's interaction with HIV infection. Visceral leishmaniasis has emerged as an important opportunistic infection. A concomitant HIV infection increases the risk of developing active VL between 100 and 2320 times (WHO, 2016). In Sudan, no association between the active VL disease with *L.donovani* and *Tuberculosis* has been reported. However, the progression to active VL disease might be different in *M.tuberculosis*-infected than in non-infected persons and vice versa. Prospective studies are needed to document the prognosis of TB/VL co-infection (Diro *et al., 2014*). Visceral Leishmaniasis has been claimed to be the 5th opportunistic infection considered as one of AIDS defining illness (Ter *et al., 2013*). The study done in Tigray, showed that being infected with HIV was a predictor of death among Visceral leishmaniasis patients- AOR=4.5 and that findings all over the world highlighted the importance of HIV as a risk factor for kala-azar infection (Ter *et al., 2013;* WHO 2016). The possible reason for this could be that both diseases attack the immune system of human beings and kala-azar affects the already weakened immune system on top of HIV (WHO, 2016).

Out of 17 (seventeen) health facilities found in Loima Sub County, according to abstraction of data from the health workers during key informant interviews, observations, focus group discussions and medical records, only 4 (four) offer diagnostics services. This is a low percentage of 23.5% with even shortage of specialized equipment and skilled health personnel hence resulting to inaccessibility of health services which can be a risk factor to the disease for many of the community members (Siddiqui *et al., 2010;* MSF, 2013; Bantie *et al., 2014*). The commonly used diagnostic tools in the health facilities according to the medical

records and the health workers, included formol gel test (FGT), an old method used commonly at majority of the health facilities with diagnostics services, though is also non- specific and non- sensitive. Direct agglutination tests (DAT) Opti-leish and bone marrow aspirates (BMA) are the specific tests but only used by few of the health facilities especially at Pentecostal Assemblies of God(P.A.G) health facility at Namoruputh in Loima. Polymerase chain reaction (PCR) and enzyme linked immuno-sorbent assay (ELISA) that are more robust tests are not used due to their cost. The results indicated shortage of diagnostic services with only one health centre that is well equipped being burdened with many patients just as in other areas endemic with kala-azar (Kolaczinski *et al., 2008; Belo et al., 2012;* MOH, 2014).

The correct confirmatory test for kala-azar in the health facility is BMA or Splenic aspirate, according to the health workers during key informant interviews, but is only used mostly at few health facilities and not in many other health facilities, thus the disease is still prevalent in Loima owing to few diagnostic services and shortage of qualified medical personnel, according to even the medical records, observations and focus group discussions and other studies (Siddiqui *et al.,2010;*MSF,2013;Bantie *et al., 2014*).

The commonly used drugs at the health facilities are both Pentavalent-1st line that contributes to most of the treatment, Amphotericin B and AmBisome- is the 2nd line. The cost of the drugs is high at over 300US dollars. This cost mostly out of reach of most patients, thus the reason for preference to traditional healers (MOH, 2007, MSF, 2013). Not all patients diagnosed and treated recover from the episode, for there are cases of relapse being encountered in the health facilities. The health workers stated that they emphasize the use of insecticide treated nets (ITNS) and residual spraying in the community but the government support is always inadequate, even according to other studies (Siddiqui *et al., 2010;* Bantie *et al., 2014*).

A significant proportion (80%) of the health workers respondents mentioned that majority of the patients relapse even after treatment due to frequent exposure to the sand fly habitat or natural encroachment like resting or sitting near termite mounds; where these patients that encounter relapse come back for treatment after a short-

while. These results are supported by the medical records and other studies (Kolaczinski *et al., 2008;* MSF, 2013).

5.3 Study limitations

The respondents self-reports on prevalence, their behavioural and socio- cultural practices, kala-azar co-infections, its signs and symptoms that may be overlapped by those of other diseases may lead to recall bias, under-reporting or over reporting. However, participants were encouraged of genuinenes assured of anonymity of their responses, hence they became genuine and got opened up with their answers. Also, abstraction of data was done at the health facilities especially the Namoruputh faith-based hospital that does the diagnostic services for confirmation on kala-azar endemicity, top priority diseases and co-infections managed in the area with further confirmation through key informats who were health workers. The study took place in one of the six sub-counties of Turkana County, the resultant data may not be generalized to be a representative for the county or the national data. Loima sub-county was chosen because according to MSF, (2011) and MSF, (2013) reports, the area has a higher prevalence in the entire county, hence the need to determine the risk or the exposure factors. Despite these limitations, the present study has generated valuable information to enhance kala-azar effectiveness programs in the community, county, nation and even the continent.

5.4 Conclusions.

1) Kala-azar is endemic in Loima sub-county of Turkana, Kenya, owing to the high prevalence of 49.3% obtained from the households data. Among the prevalent and top priority diseases in the area, kala-azar is the 2nd parasitic disease after malaria, hence a public health problem that needs enhanced health education and medical intervention for control strategies and Integrated Disease Surveillance and Response (IDSR). It is however apparent that kala-azar is a neglected disease in the area.

2) Socio demographic and socio-economic factors that had a significant predictor in being exposed to kala-azar in the area include; age, where of the respondents of ages between 18-35 years, were more likely to suffer from kala-azar as compared to other

age brackets, due to their occupation or daily practices. In gender, males have predominance of the infection than females, possibly due to the reason that males are mostly engaged in outdoor activities and stay outdoor from dawn to dusk that might increase their contact with sand fly. Educational level, occupation, housing and the level of income also have a significant contribution to exposure since those with higher education (college/university) have better occupation hence high level of income and better housing in the community. The socio-cultural factors associated with kala-azar included daily practices, human activities of deforestation, collection of firewood, charcoal burning, hunting and livestock keeping, practices of resting or sitting under the shade of the termite mounds oftenly as well as the cultural practices of dancing at night (*Edong'a)* in the open space, which is an exposure to the biting of sand flies. There is also a habit of sleeping outside the houses majorly by males at night the whole year without any preventive measure, thus making the people get perpetually exposed and prone to frequent sand fly bites, hence the need for more emphasis for health education and effective preventive measures.

3) Whereas most people have knowledge, attitude, perception and behaviour about kala-azar existence, it's mode of transmission including biting times and seasons; signs and symptoms, transmission vector and sand fly habitat and risks of getting infected; a significant number did not have an in-depth knowledge but associate its transmission with drinking of unboiled milk, mosquito bites, ghosts or even rain, hence there is need for enhanced health education and campaign on the understanding of transmission dynamics of kala-azar so as to reach sustainable prevention and control measures. The most important risk factor contributing to the disease occurrence in the area is the presence of termite hills (where the sand flies are found) associated with Visceral leishmaniasis transmission in Kenya, in large numbers all over the area as correctly mentioned by a considerable proportion of respondents. There is need for enhanced control measures.

4) There is a varying health seeking behavior trend by the people in the area due to many factors including preference for traditional modes of treatment, which are rarely effective, time or distance coverage to the health facilities; shortage of drugs and expenses. These many factors result into having little or no purchasing power,

since also, access to the appropriate health facilities is a big challenge to the majority in the community. There is therefore need to have adequate and equipped health facilities in the area.

5) The ownership of bed nets as a kala-azar control measure in the community is high, but its usage is low. Many peoples' main reason of low usage was that despite having a bed net, how often they use, is during the times of greatest mosquitoes nuisance and that lack of use of bed nets is due to cost as well as belief that bed nets increase warmth and cannot protect from sand fly bites. Despite emphasis on the use of insecticide treated-bed nets, other measures such as wearing protective clothing, screening of the house and burning of fire at night can be emphasized in the protection against sand fly bite.

5.5 Recommendations

Given the key findings, the following are recommendations emanating from the study;

1) Owing to the high prevalence and its being apparently a neglected disease, kala-azar is a public health problem in the area. Therefore, there is need for the policy makers, especially the Ministry of Health authorities at the National and the County Governments, to encourage an effective elimination initiative that adopts the main strategies of enhanced health education and medical intervention for control strategies and Integrated Disease Surveillance and Response (IDSR).

2) There is need for proper implementation by public health authorities and community leaders and other stakeholders, of existing health awareness programs to help people in rural areas such as Loima, other parts of the country, continent and even the globe, modify their behavioural patterns through continued and strengthened behavioural change communication and social mobilization related activities. There should also be encouragement of better housing and improved living conditions in the area in order to reduce the transmission of the disease by eliminating conditions suitable for breeding of sand flies inside the wall of cracked

houses through filling of cracks and crevices in walls with a mixture of lime and mud as an ecologic approach for the control of the sand fly inside the house.

There is need to have an emphasis for effective preventive measures in the area in order to curd the socio-cultural factors associated with kala-azar which included daily practices, human activities of deforestation, collection of firewood, charcoal burning, hunting and livestock keeping, practices of resting or sitting under the shade of the termite mounds oftenly as well as the cultural practices of dancing at night (*Edong'a)* in the open space, which was also an exposure to the biting of sand flies. There is also need to give health education so as to control the sleeping habit where members of the community (majorly males), have an habit of sleeping outside their houses at night the whole year without any preventive measure, hence making them get perpetually exposed and prone to frequent sand fly bites. The nocturnal activities or preferences of habitats by Phlebotomine sand flies (kala-azar vectors) have epidemiological significance and thus control measures have to be directed to these habitat with certain degree of accuracy; and because *P. Martini* is active during the night when people are at sleep, it is recommended that the ownership and usage of bed nets to block transmission be enhanced in the community through health education and campaigns as well as the government creating an enabling environment by fostering private sector growth in the provision of subsidized, affordable ITNS.

3) There should be health education campaigns, sensitization and empowerment of the people through community strategies be targeted to the poorer segments of society. This is to enhance knowledge, attitude, perception and behaviour about kala-azar, it's mode of transmission including biting times and seasons; signs and symptoms, transmission vector and sand fly habitat and risks of getting infected; so that they can effectively contribute to the sustainable control and prevention of the disease through enhanced usage, expansion and maintenance of impregnated bed-nets, household spraying and even environmental sanitation.

The termite hills associated with Visceral leishmaniasis transmission in Kenya that are common throughout or all over the area, need control strategies such as insecticidal applications to resting habitats such as termite mounds and insecticide barrier spraying and not termite mounds destruction as suggested by some people in the community.

4) Due to the varying health seeking behavior trend by the people in the area like preference for traditional modes of treatment, which are rarely effective, time or distance coverage to the health facilities; shortage of drugs and expense; these many factors result into having little or no purchasing power. Access to the appropriate health facilities is a big challenge to the majority in the community. There is therefore need to have adequate and equipped health facilities in the area.

5) Most kala-azar infections occur in remote areas where facilities are not well established like the study area, no proper control measures and where the infections often co-exist with malaria and other deliberating parasitic infections. There is therefore need for the government especially the Ministry Of Health both at the National and County level and other stakeholders to put more health facilities at least 5 km away in the areas as per WHO's recommendation. There is need to provide new and more effective drugs, the confirmatory test like bone marrow aspirate or splenic aspirate and other better diagnostic services.There is need for enough health and qualified medical personnel to be put in every health facility and be provided with up to date information on the geographical distribution of kala-azar in the endemic areas in order to alleviate the difficulty; so that patients are not referred to already burdened Lodwar County and Referral Hospital or even other referral hospitals in the country or the region. Control measures towards domestic and peridomestic sand fly vectors to be done as an additional benefit accruing to programs against other insect vectors using indoors spraying or insecticide treated bed nets. However, in areas where dogs are among the main reservoir hosts increased use of insecticide-treated dog collars is necessary

5.6 Suggestions for further research

The following suggestions are made for further research. There is need for;

1) A study to establish the exposure or risk factor for kala-azar in the entire Turkana County so as to inform on the incidence and prevalence of the disease in the area.
2) A study to assess the exact magnitude of the disease in the area in order to aid the Ministry of Health in the National and County Governments, other stakeholders on planning for interventional measures for the area.
3) An empherical study to establish whether the disease may also be tramsmitted by dogs, through for instance a human- dog linked household study.This is so as to get true data and not depend on the findings of a few studies conducted in the past.

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APPENDICES

Appendix I: Informed Consent Form

Identification No.	**Version Number 4.0**
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Title of the Research Study: Exposure factors associated with Visceral Leishmaniasis in Loima sub-county of Turkana County,Kenya.

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Investigators Statement

I am a PhD student at JKUAT/ITROMID. Part of my study requirement is conducting research work.Therefore, i am kindly requesting you to take part in this research study. The purpose of this form is to make sure that you have all the information about the study before you decide to join the study. Read the form very carefully, if you do not understand any part of it, i will be happy to make clarifications. You may ask questions about the risk, benefits and your rights as a volunteer or anything else about this research.

When you understand and feel satisfied with the answers to your questions, you can decide whether to join the study or not. Remember your participation is

voluntary.The information you provide would be held in strict confidence and would be used for the purpose of this study.

Purpose of the Research:

This study involves research on **Exposure Factors associa**ted **with Visceral Leishmaniasis in Loima sub-county of Turkana County, Kenya.**The aim of this study is to determine the, socio demographic,socio cultural, epidemiological and other risk factors making kala-azar to be endemic in such an area,so as to provide scientific reference for prevention and control of neglected vector borne diseases yet they are a public health problem.

Request

The investigator hereby requests your participation in this research study.

Study Procedures

The study will involve interviews for all randomly selected respondents using a structured questionnaire, focus group discussions and key informant interviews of the health workers and opinion leaders. Data will be abstracted from the medical records, provincial administration, church leaders, school heads, village elders and or other confidential sources.You will be asked questions related to demographic (age,gender,education level, socio-economic status, socio-cultural issues).You will also be asked issues related to your health seeking behaviour and knowledge, perception and attitude on cause, transmission, prevention and control of kala-azar.The study may involve some taking of video, photographs and audio recording. You would be the representative of your household.A Global Positioning System will be used to identify the location of your house for the purpose of mapping.

Risks

There are no risks whatsoever involved in the study.The quesionaire is abit long and answering of questions might take about 1 hour and so this may consume your time and bring some inconveniences. Please be patient and complete the whole

questionnaire if possible, but you may choose not to answer any questions or withdraw at any time. The researcher will provide some refreshments during the time your are filling the quesionaire.

Benefits

The interview will personally help you assess your health status and the health seeking behaviour and whether your are taking the right measure towards prevention and control of kala-azar.The information would help in understanding the possible risk or exposure factors related to kala-azar.The information would inform and help in developing interventions to improve the prevention and control of kala-azar.

The whole community as well would be informed of the results of the study as the stakeholders.

Confidentiality

The investigator guarantees that all the information given would be kept private and remains confidential. All the data collected from you will be coded in order to protect your identity.Only the research staff will have access to the information. At the end of the study, there will be no way to link your name with your data.Questionaires will be securely locked in cabinets. Any additional information about the study will be provided to you including the final results.The results of the study may be published or dessiminated without revealing your identity.

Rights

Your participation in this study is voluntary.You are free to withdraw or refuse to answer any questions at any time without consequences.

Compensations

After the completion of the study, participants would be informed of the results in general.There would be no monetary compensations.

Participant's statement

I have read the consent form.The details in this consent have been explained to me.The nature of this study has been explained that it involves interview, household investigation and that results would remain confidential property of the investigator.All questions and concerns have been answered satisfactorily and i freely choose to participate in the study.I understand that i have rights to refuse to answer any questions or withdraw from the study any moment, and this would not affect my future care or treatment in any way. I understand my rights and privay will be maintained throughout.

I have been fully informed of the study including the benefits, risks and my rights as a participant. Consequently, i hereby wish to consent to be in the study.

Name (optional)_____Signature or thumb_____Date_____

Investigator or representative

My signature certifies that i have explained the objectives and procedures for this study to the participant and that i have answered all the questions that the participant had about the study and that the participant has voluntarily agreed to take part in the research.

Name----------Signature----------Date----------

Note-If you have any questions or concerns about this research study, please contact the investigator-Joseph A Lotukoi,C/o ITROMID Director Telephone Number 067-52095,PO BOX 62000-00200 Nairobi Cell phone 0711258328,Email-jlotukoi@yahoo.com or the Secretary, KEMRI National Ethics Review Committee PO BOX 54840-00200 Nairobi, Telephone Number 020-2722541 Cell phone 0722205901 0r 0733400003.

b. For any questions pertaining to rights as a research participant, the contact person is: The Secretary, KEMRI Ethics Review Committee, P. O. Box 54840-00200, Nairobi; Telephone numbers: 020-2722541, 0722205901, 0733400003; Email address: erc@kemri.org

Appendix II: Structured questionnaire

We gathering information on Exposure factors associated with kala-azar in the area so as to assist the decision makers, state health policies and stakeholders to design ways or prevention measures on how to control the disease. You have been chosen randomly to be interviewed and I would like to ask you some questions about some of these factors, through this questionnaire. There are no risks of you being in this survey and taking part is voluntary. You don't have to answer questions you do not want and you are free to end the interview at any time.

Every information you give would be treated with a lot of confidentiality, secrecy and professionalism**.** *(Natafuta habari kuhusu magonjwa na vitu zinazochangia kukuweka hatarini kupata Kala-azar katika eneo ili kusaidia kuzia kuenea kwa ugonjwa huu.umechaguliwa kupeana habari kwa kujibu maswali kwa hiari yako.*

Kila ujumbe unayopatiana itakuwa ni ya siri na utakuwa wa kitaalamu)

Division (*Tarafa***)_____**

Location *(Eneo)* **_____**

Village name *(Kijiji)* **_____**

Household Number *(Nyumba ya ngapi)* **_____**

A. Social Demographic Characteristics *(sifa za idadi ya watu katika jamii)*

1) **Age** *(Umri)*

1. 18- 35 years/*Miaka 18-35* ( )
2. *36-49years/miaka 36-49* *( )*
3. 50-70 years/ *Miaka 50-70* ( )
4. Above 70 years *Zaidi ya 70* ( )

2) **Gender** *(Jinsia)* 1.Male/ *Mwanaume* ( ) 2. Female/ *Mwanamke* ( )

3) **Marital status/** *Ndoa*:

1. Married/ *Umeoa/ Umeolewa* ( )
2. Unmarried/ *Hujaoa/ Hujaolewa* ( )
3. Widow/ *Bwana ama Bibi alifariki* ( )
4. Separated/ *Umeachana na bibi yako ama bwana yako* ( )
5. Divorced/ *Mumeachana kwa njia ya Koti* ( )
6. Single parent/ *Wewe ndiye mzazi pekee* ( )

4) Education *(masomo):*

1. No education */ hujasoma* ( )

2. Primary level */ elimu ya msingi* ( )

3. Secondary level */shule ya upili* ( )

4. College or University level / *chuo kikuu* ( )

5. Other **/** *mengine* _____

5) Employment ***(****Kazi)***:**

1.Self-employed / *Ajira binafsi* ( ) 2.Employed / *Umeajiriwa* ( ) 3.Unemployed / *Huna kazi* ( )

1) **Occupation** *(Aina ya Kazi)***:**

1. Farmer / *Mkulima* ( )
2. Livestock keeper ( )
3. Teacher / *Mwalimu* ( )
4. Health worker / *Mfanyikazi wa kijiji wa afya* ( )
5. Administrator / *Mkuu wa Idara* ( )
6. Other (specify)/ *Mengine (Fafanua)* _____

2) **Monthly Income** *(Kiwango cha pesa unayotumia kwa mwezi)***:**

1. Below Kshs 1000/ *Chini ya shilingi 1000* ( )
2. Kshs 1000-5000/ *Shilingi elfu 1000-5000* ( )
3. Kshs 5001-10000/ *Shilingi 5001-10000* ( )
4. Kshs 10001-15000/ *Shilingi 10001-15000* ( )
5. Above Kshs 15000/ *zaidi ya shilingi 15000* ( )

3) **Sources of Income** *(Kazi inayokuletea riziki ni ipi)?* (Tick all that apply/ *chagua yote unayofanya*):

1. Farming/ *Kilimo* ( )
2. Livestock keeping ( )
3. Formal employment/ *Ajira inayolipa* ( )
4. Business/ *Biashara* ( )
5. Other/ *Mengine* (specify/ *fafanua*) _____

4) **Religion** ***(****Dini)***.**

1. Roman Catholic/ *Katoliki* ( )
2. Protestant/ *Madhehebu ya kiprotestani* ( )
3. Jehovah Witness/ *Jehova witnes* ( )
4. Traditionalist/ *Dini za kijadi* ( )
5. SDA ( )
6. Muslim ( )
7. Other/ *mengine* (Specify/ *fafanua*) ( )

B. **Social Behavior** *(Tabia za Kijamii)*

10) Where do you live (*Unaishi wapi)?*

1. Urban area/ *Jijini* ( ) 2. Peri-urban area/ *Kijiji* ( ) 3. Rural/*Mashambani* ( )

11) In which house do you live/ *Unaishi katika nyumba gani*?

1. Grass thatched house/ *Nyumba ya nyasi* ( )
2. Modern mabati house/ *Nyumba ya mabati* ( )
3. Stone built house/ *Nyumba ya mawe* ( )
4. Other/ *mengine* _____

12) What is the house's roof, walls and floor/ *Paa, ukuta na sakafu ya nyumba imetengenezwa na nini*? **(Assess)**

Roof/ *Paa*

1. Thatched/ *Paa la nyasi* ( )

2. Mabati / *mabati* ( )

3. Clay tile/ *vigae* ( )

4. Other/ *mengine* (Specify/ *fafanua*) _____

13) Wall/ *Ukuta*

1. Mud/ *udongo* ( )

2. Semi-permanent/ *ukuta isiyoyakukawia* ( )

3. Permanent/ *ukuta ya kukawia* ( )

4. Other/ *mengine* (Specify/ *fafanua*) _____

14) Floor/ *sakafu*

1. Mud/ *udongo* ( )

2. Wooden/ *sakafu ya mbao* ( )

3. Cement/ *simiti* ( )

4. Other/ *mengine* (Specify/ *fafanua*) _____

15) How many children do you have/ *uko na watoto wangapi*?

1.1-5 ( ) 2.6-10 ( ) 3.11-15 ( ) 4.other/ *wengine* ( )

16) Do your children go to school/ *Watoto wako wanaenda shule*?

1. Yes/ *Ndio* ( ) 2.No/ *La* ( ).

17) How many heads of cattle do you keep/ *unamiliki ngombe ngapi*?

1.1-10 ( ) 2.11-50 ( ) 3.100-500 ( ) 4.Above/ *juu ya* 500 ( )

18) What is the number of animals in your compound/ *unafuga wanyama wangapi kwako*?

1.Cows /*Ng'ombe*	2.Goats /*Mbuzi*	3.Sheep /*Kondoo*	4.Camels /*Ngamia*	5.Donkeys / *Punda*	6.Chicken /*Kuku*	7.Dogs /*Mbwa*

19) What is the economic activity in your area/ *Ni kazi zipi zinazopea jamii riziki katika eneo lako*?

1. Agriculture/ *kilimo* ( )
2. Livestock/ *kuweka mifugo* ( )
3. All the above/ *yote yaliyotajwa* ( )
4. Other/ *mengine* _____

20) What human activities encourage kala-azar to be common in the area/ *tabia zipi zinazochangia kusambaa kwa ugonjwa wa Kala-azar katika eneo lako*?

1. Deforestation/ *Ukataji miti ovyo ovyo* ( )
2. Farming/ *ukulima* ( )
3. Hunting/ *uwindaji* ( )
4. Gold extraction/ *kulimia dhahabu* ( )
5. Military service/ *shughuli za kijeshi* ( )

6. Livestock keeping/ *ufugaji mifugo* ( )

7. All the above/ *yote yaliyotajwa* ( )

8. Others/ *mengine* (Specify/ *fafanua*)

_____

21) What is your source of water/ *watoa wapi maji*?

1. Bore hole/ *kisima* ( )2. Tap water/ *maji ya mfereji* ( ) 3.River water/ *mtoni* ( ) 4.other/ *kwengine*? _____

C. Knowledge, Attitude, Behavior and Perception *(Maarifa, Usemi, Tabia na Maoni)*

22) Which diseases do you think are common in the area/ *Magonjwa yepi yanayotokea mara katika eneo lako?*

1. Malaria ( )

2. Diarrhea/ *Ugonjwa ya kuendesha* ( )

3. Pneumonia/ *numonia* ( )

4. TB/ *Kifua kikuu* ( )

5. Kala-azar ( )

6. Typhoid/ *Homa ya matumbo* ( )

7. Brucella/ *brusela* ( )

8. All the above/ *Yote yaliyotajwa* ( )

9. Others/ *Mengine* (Specify/ *fafanua*)

_____

23) Do you know about Kala-azar/ *Unajua ugonjwa wa Kala-azar*?

1. Yes/ *Ndio* ( ) 2. No/ *La* ( )

24) Where does kala azar come from and what is the local name/ *Ugonjwa wa Kala-azar unatokana na nini and jina la kinyumbani unaitwa je?*

_____

25) Have you ever suffered from kala azar/ *Umewahi ugua ugonjwa wa Kala-azar?*

1. Yes/ *Ndio* ( ) 2.No/ *La* ( )

26) What are the signs and symptoms of kala azar/ *Unatambua ishara na dalili za Kala-azar*? (tick all that apply/ *chagua yoyote inayofaa*)

1.Fever */Joto Mwilini*	2.Loss of appetite */Kupoteza hamu ya kula*	3.Swollen abdomen */Kuvimba kwa tumbo*	4.Pain in the abdomen */Uchungu tumboni*	5.Headache */Kuumwa na kichwa*	6.Change of complexion */Ngozi kubadilika rangi*	7.General weakness */Mwili kuisha nguvu*	8.Loss of sight */Kutoona vizuri*	9.Madness */Wazimu*

10.Others/ *Mengine* (specify/ *fafanua*)

_____

27) What kind of treatment for kala azar is best according to you/ *Kwa maoni yako, ni matibabu gani ya Kala-azar ni bora zaidi?*

1. Hospital/ *Hospitali* ( )
2. Herbal medicine/ *Miti shamba* ( )
3. Traditional healer/ *Daktari wa Kienyeji* ( )
4. Prayers/ *maombi* ( )
5. Other/ *Mengine* (specify/ *fafanua*)

_____

28) Kala azar is spread by/ *Kala-azar inaenezwa vipi?*

1. Mosquito/ umbu ( )
2. Sand fly/ sandfly ( )
3. Bed bugs/ kunguni ( )
4. Lice/ chawa ( )
5. Termites/ mchwa ( )
6. Other/ *mengine* (specify/ f*afanua*)

_____

29) Do you have termite mounds near your house/ *Je mchwa upatikana karibu nyumba yako*?

Yes/ ndio ( ) No/ La ( )

30) Where do sand flies breed/ *Sandfly wanazaana wapi*? (tick as many as may apply/ *chagua majibu mengi iwezekanavyo)*

In stagnant water */Maji Yaliyotulia*	Termite mounds */Kichuguu Cha mchwa*	Animal burrows */Mashimo*	Livestock sheds */Zizini*	Cracks & crevices */Nyufa na Mashimo*	Decaying trees */Miti yaliyooza*

Others/ *mengine* (specify/ *fafanua*)

_____

31) When do sand flies bite the most/ *Sandfly huuma nyakati gani sana?*

Morning/ a*subuhi* ( ) Afternoon/ a*lasiri* ( ) Evening/ *Jioni* ( ) Night/ *Usiku* ( )

32) Where do you get information about kala azar/ *Ulipata ujumbe kuhusu Kala-azar vipi*? (tick as many as may apply/ *chagua majibu mengi iwezekanavyo)*

1.Health centres */Kituo Cha afya*	2.Community health workers */Mfanyikazi Wa afya*	3.Public barazas */Baraza*	4.Person to person */Kutoka Mwenzi we*	5.Media e.g. radio, newspapers */Vyombo vya habari*	6.Church leaders */Viongozi Wa dini*	7.Teachers */Walimu*	8.Internet */Mtandao*

9.Others/ *Mengine* (specify/ *fafanua*)

_____

33) What is the distance from your house to the animal sheds/ *Umbali kati ya nyumba yako na zizi ni mita ngapi?* _____

34) Is there any stigma and discrimination of people suffering from kala azar/ k*una unyunyupa na ubaguzi wowote wanaougua Kala-azar hupitia?*

1. Yes/ *Ndio* ( ) 2. No/ *La* ( ) 3. I don't know/ *Sijui* ( )

35) In which of the following seasons is Kala azar most prevalent/ *Ni msimu upi ugonjwa wa Kala-azar unaenea sana?*

1. At the beginning of the rainy season/ *Mwanzo wa msimu wa mvua* ( )
2. At the peak of the rainy season/ *Kilele cha msimu wa mvua* ( )
3. At the end of the rainy season/ *Mwisho wa msimu wa mvua* ( )
4. During the dry season/ *Msimu wa kiangazi* ( )
5. I don't know/ S*ijui* ( )

36) Malnutrition predisposes one to kala azar/ *Je, utapia mlo huweka mtu hatarini kupata ugonjwa wa Kala-azar*?

1. True/ Ukweli ( ) 2. False/ Uwongo ( )

37) Who do you think is mostly affected by kala-azar/ *Je, nani ako katika hatari sana kuathiriwa na ugonjwa wa Kala-azar*?

1. Males/ *wanaume* ( ) 2. Females/ *wanawake* **( )** 3.Both/ *wote* **( )**

38) Who is more at risk of contracting Kala azar/ *Nani ako katika hatari sana kupata ugonjwa wa Kala azar*?

1.Young boys /*Watoto wa kiume*	2.Young girls /*Watoto wa kike*	3.Female youths /*Vijana wa kiume*	4.Male youths /*Vijana wa kike*	5.Adult men /*Wanaume wazima*	6.Adult female /*Wanawake wazima*

39) Do you have acacia trees near your house/ *Uko na miti karibu na nyumba yako?*

1. Yes/ Ndiyo ( )
2. No/ La ( )

40) What do you think causes the disease/ *Kwa maoni yako, ni nini chanzo cha ugonjwa wa Kala-azar*?

1. Ghosts/ jini ( )
2. Unboiled milk/ maziwa isiyochemshwa ( )
3. Sand flies/ sandfly ( )
4. Mosquitoes/ umbu ( )
5. Rain/ mvua ( )
6. Dogs/ mbwa ( )
7. All the above/ yote yaliyotajwa ( )
8. Others/ mengine (Specify/ fafanua)

_____

41) What makes the disease to be common in the area/ *Ni nini kinachosababisha ugonjwa wa Kala-azar kuenea sana katika eneo hili*?

1. Expensive to treat and lack of grugs/*Ukosefu wa madawa na ni bei ghali kutibu* ( )
2. Environmental factors/ *Mazingira* ( )
3. No health facility for diagnostic services/ *Ukosefu wa vituo vya afya* ( )
4. I do not know/ *Sijui* ( )
5. Others/ *Mengine* (Specify/ fafanua)

_____

42) Which of the following cultural practices do you do and can predispose the community to Kala-azar/ *Ni mambo yepi ya kitamaduni wewe unafanya na yanayochangia jamii kupata ugonjwa wa Kala-azar?*

1. Polygamy/ *Kuoa wanawake zaidi ya moja.* ( )
2. Overgrazing/ *Mifugo kula nyasi kuzidi kiwango* ( )
3. Early Marriages/ *Ndoa za mapema* ( )
4. All the above/ *Yote yaliyotajwa juu* ( )

43) What do you think makes the disease to spread/ *Kwa maoni yako, ni nini kinachosababisha ugonjwa huu kuenea*?

1. Drought/ *Ukame* ( )
2. Presences of anthills/ *Kuwepo kwa vilima vya chungu chungu* ( )
3. Cattle keeping/ *Ufugaji mifugo* ( )
4. Lack of health facility or medical intervention/ *Ukosefu wa vituo vya afya ama mipango ya kuboresha afya* ( )
5. People; s relationship with dogs/ *Kufuga mbwa* ( )
6. I do not know/ *Sijui* ( )
7. Other/ *Mengine* _____

44) Do you think the disease can be controlled or treated/ *Kwa maoni yako, wadhania ugonjwa wa kala-azar yaweza tibiwa*?

1. Yes/ *Ndio* ( ) 2.No/ *La* ( ) 3.I do not know/ *Sijui* ( ) 4.other/ *Mengine* _____

45) If yes, how/ *Kama umekubali hapo juu, yaweza tibiwa vipi*?

1. Through traditional healers/ *Kupitia madaktari wa kienyeji* ( )
2. Medical intervention/ *Kupitia mipango ya kuboresha afya* ( )
3. All the above/ *Yote yaliyotajwa* ( )
4. I do not know/ *Sijui* ( )
5. Others/ *Mengine* _____

46) What stakeholders or sectors are involved in the control of the disease/ *Ni washikadau wagani ama sekta zipi zinazotekeleza kazi ya kupigana na ugonjwa wa Kala-azar*?

1. The government/ *Serikali* ( )
2. NGO/ *Shirika zisizo za serikali* ( )
3. Church organization/ *Shirika za dini* ( )

4. The community/ *Jamii* ( )

5. All the above/ *Yote yaliyotajwa* ( )

47) How long has the disease been seen in the area/ *Ugonjwa wa Kala-azar imekua katika eneo hili kwa muda gani*?

1.20-50 ears ago/ *Miaka 20-50 iliyopita* ( )

2.10-15 ears' ago/ *Miaka 10-15 iliyopita* ( )

3.5-9.years ago/ *Miaka 5-9 iliyopita* ( )

4. Recently- 1-4 years ago/ *Juzii, miaka 1-4 iliyopita* ( )

5. I do not know/ *Sijui* ( )

48) Why are the predisposed groups affected/ *Mbona kikundi kilicho katika hatari zaidi ndio hukumbwa na ugonjwa huu?*

1. Their daily activities or occupation/ *Sababu ya mashughuli za kilasiku kikazi* ()

2. There encounter with sand flies/ *Kuumwa na Sandfly* ( )

3. Their relationship with dogs/ *Kuishi na mbwa* ( )

4. Other/ *Mengine*

_____

49) How long does it take to treat the kala-azar disease?/ Je utachuwa muda gani *kwa maoni yako kutibu ugonjwa huu*?

1.1-2 weeks ( ) 2.1 month or shorter ( ) 3.3-6 months- ( ) 4.I do not know/ *sijui* ( )

6. Others/ *mengine* (Specify/ *fafanua*)

_____

50) Choose one of the following statements/ *chagua moja ya sentensi zifuatazo;*

1. Kala azar is more serious than malaria/*Kala azar ni hatari zaidi ya malaria* ( )
2. Malaria is more serious than Kala azar/ *Malaria ni hatari zaidi ya kala azar* ( )
3. Malaria and Kala azar are equally serious/ *Malaria na kala azar ziko na hatari sawa* ( )

51) Kala-azar is considered an important problem/ *Kala-azar ni ugonjwa inayotiliwa maanani*;

a. Yes/ *Ndio* [ ] 2. No/ *La* [ ]

52) Does a patient suffering from Kala azar need isolation/ *Je, mgonjwa anaye ugua kala-azar anahitaji kutengwa?*

i. Yes/ *Ndio* [ ] 2. No/ *La* [ ]

53) Have you ever been trained on the identification, prevention and control of Kala azar/ *Je, umewai pewa funzo kuhusiana na kutambua, kuzia na kutibu Kala-azar?*

1. Yes/ *Ndio* [ ] 2.No/ *la* [ ]

54) If you have been trained on Kala azar, who trained you/ *Je, umepokea mafunzo,na ni nani aliyekufunza*?

1. Community health worker/ *Wafanyikazi wa afya kwa jamii* [ ]
2. Media/ *vyombo vya habari* [ ]
3. Teachers/ *walimu* [ ]
4. Doctors, nurses and other health workers/ *madaktari. wauguzi* na wafanyi kazi wegine wa afya [ ]
5. Researchers/ *wafanya uchunguzi* [ ]

6. NGOs/ *shirika zisizo za serikali* [ ]
7. Other/ *mengine* (specify/ *fafanua*)_____

55) Do you know the closest health center that specializes in the treatment of kala azar/ *Je unajua kituo cha afya kilicho nawe karibu kinachopeana huduma ya kutibu Kala-azar?*

1.Yes/ *Ndio* [ ] 2.No/ *la*[ ]

56) You can get kala-azar by/ *Utapata kala-azar kutokana na?* (tick as many as may apply/ chagua majibu yote)

1.Touching an infected person's clothes *Kuguza mavazi ya aliyeugua*	2.Sharing food */Kukula pamoja*	3.Sharing clothes */Kutumia mavazi pamoja*	4.Transfusion of blood */Upenyeshaji* *Kupewa damu*	5.Sharing of needles */Kutumia sindano pamoja*	6.A pregnant mother infecting the unborn child */Mama kuambukiza mtoto*

57) Do you believe that you are at risk of contracting the disease/ *Je, waamini ya kwamba uko katika hatari ya kupata ugonjwa wa Kala-azar*?

1. Yes/ *Ndio* ( ) 2.No/ *La* ( )

58) Are the statements below true or false/ *Sentensi zilizoandikwa hapa chini ni za ukweli ama uongo*?

Statement/ *sentensi*	True/ *ukweli*	False/ *uongo*
1.Consumption of alcohol heals kala azar/ *Kunywa pombe yasababisha Kala-azar*		
2.Kala azar is a disease that affects people with many goats and sheep/ *Kala azar inakumba san asana wafugaji mifugo*		
3.Kala azar is a disease for the poor/ *Kala azar ni ugonjwa ya maskini*		
4.Kala azar is a disease for the rich/ *Kala azar ni ugonjwa ya matajiri*		
5.Kala azar is a punishment from God/ *Kala azar ni kisasi kutoka kwa mungu*		
6.Kala azar is a disease for the illiterate/ *kala azar ni ugonjwa ya wasio jua kusoma na kuandika*		
7.Kala azar affects only certain ethnic group/ *Kala azar inakumba kabila moja moja*		
8.One can get infected with kala azar through contact with an infected person/ *Waeza pata Kala-azar kupitia kukaa na mtu aliye nayo*		

59) How long is the distance to the nearest health facility/ *Kituo cha afya cha karibu iko umbali gani kutoka unapoishi*?

1. Less than 2km/ *Chini ya kilomita 2* ( )
2. 2-5km/ *Kilomita 2-5* ( )
3. 5.5-8km/ *Kilomita 5.5-8* ( )
4. 8.5-10 km/ *Kilomita 8.5-10* ( )
5. Over 10km/ *Juu ya kilomita 10* ( )

60) How many bed nets do you have in your household/ *Uko na neti ngapi katika nyumba yako*? _____

61) Do you use the bed nets/ *Wajifunikia neti*?

1. Yes/ *Ndio* ( ) 2.No/ *La* ( )

62) How many members of your household do not use the bed nets/ *Watu wangapi katika familia yako hawajifuniki na neti*? _____

63) Do any of your household members sleep outdoors/ *Je, kuna watu katika familia yako wanao lala nje ya nyumba*?

1. Yes/ *Ndio* ( ) 2. No/ *La* ( )

64) Does any of your household members spend time outside the house in the evenings before they go to bed/ *Je, kuna mtu katika familia yako ambaye hukaa nje ya nyumba nyakati za jioni kabla ya kuenda kulala*?

1. Yes/ *Ndio* [ ] 2. No/ *La* [ ]

65) Before the health centers came up, how did people treat kala azar/ *Kabla ya kukuja kwa vituo vya afya, Kala-azar ilitibiwa aje*?

……

66) What have you done to protect yourself from kala azar/ *Umefanya nini kujikinga kutokana na kupata Kala-azar?*(tick any that apply/ *Chagua jibu yoyote inayofaa*)

1.I use bed-nets/ *Kujifunikia neti*	2.I spray my house with insecticides */Kutumia dawa za kuua wadudu*	3.I observe personal hygiene */Kuwa na usafi wa kimwili*	4.I practice proper waste disposal/ *Kutupa taka inavyofaa*	5.I have installed a window mesh */Kuweka neti kwenye dirisha*	6.I use sterilized water */Kutumia maji iliyotibiwa*	7.I apply repellants */Kutumia dawa za kufukuza wadudu*

D.Health Seeking Behavior /*Tabia za Kutafta Matibabu*

67) What do you do when you get sick of Kala-azar/ *Ni jambo gani unachofanya unapopatwa na Kala-azar*?

1. Go to hospital/ *Kuenda hospitali* ( )
2. Go to see the traditional healers/ *Kuenda kwa daktari wa kienyeji* ( )
3. Use traditional herbs around/ *Kutumia mti shamba* ( )
4. Buy drugs from the nearby shop or chemist/ *Kununua madawa* ( )
5. Other/ *Mengine* (specify/ fafanua)

_____

68) How long do you walk to the health facility/ *Watumia muda gani kufikia kituo cha afya kilicho karibu*?

1. 5-10 mins/ *Dakika 5-10* ( )
2. 20-40 mins/ *Dakika 20-40* ( )
3. 1-2 hours/ *Masaa 1-2* ( )
4. 5-10 hours/ *Masaa 5-10* ( )
5. 1-3 days/ *Siku 1-3* ( )

69) Do you take your children and other people to hospital when sick of Kala-azar and any other disease/ *Je, wewe hupeleka watoto wako na watu wengine hospitali wanapopata Kala-azar ama ugonjwa mwingine wowote*?

1. Yes/ *Ndio* ( ) 2. No/ *La* **( )**

70) Why" No"/ *Kama umejibu la hapo juu, ni kwanini*?

1. Hospital is far/ *Hospitali iko mbali* ( )
2. Take them to traditional healers/ *Kuwapeleka kwa daktari wa kienyeji* ( )
3. No money to take them to hospital/ *Kukosa pesa kuwapeleka hospitali* ( )
4. Hospital has no drugs/ *Hakuna madawa hospitali* ( )
5. Other/ *Mengine* _____

71) Is there any health facility near you/ *Je, kuna kituo cha afya karibu nawe*?

1. Yes/ *Ndio* ( ) 2. No/ *La* ( ) 3. I do not know/ *Sijui* **( )**

72) Do you think there is need of a health facility in the area/ *Kwa maoni yako, waonelea ni vizuri kuwepo na kituo cha afya katika eneo lako*?

1. Yes/ *Ndio* ( ) 2. No/ *La* ( )

73) Why do you say yes/ *Mbona Wakubali?*

1. Very important for there are a lot of illnesses affecting the people/ *Ni muhimu kwa sababu kuna magonjwa mengi yanayo athiri jamii* ( )
2. There is none existing yet/ *Hakuna mgonjwa* ( )
3. The next health facility is very far/ *Kituo cha afya kiko mbali* ( )
4. All the above/ *yote yaliyotajwa hapo juu* ( )
5. Other/ *Mengine* (Specify/ *fafanua*)

_____

74) Why do you say "No"/ *Mbona wakataa*?

1. The existing one does not serve the people as it should/ *Iliyoko aihudumi jamii ifaavyo* ( )
2. There is one nearby/ *Kuna nyingine karibu* ( )
3. I dont know the purpose of a health facility/ *Sijui kazi ya Kituo cha afya* ( )
4. There would be no health workers to serve the people/ *kukosekana kwa madaktari na wauguzi* ( )
5. All the above/ *yote yaliyotajwa juu* ( )
6. Others/ *Mengine* (Specify)

_____

E. Health facility staff Questionnaire /*Maswali kwa wafanyikazi wa Kituo cha afya*

75) Can you know that it is Kala-azar one is suffering from/ *Je,waweza kutambua mgonjwa anayeugua Kalaazar*?

1. Yes/ *Ndio* ( ) 2. No/ *La* **( )**

76) If" Yes", how/ *Kama ndio, Aje?*

1. By signs and symptoms/ *kupitia ishara na matokeo ya ugonjwa* ( )
2. Splenomegally/ *kufura kwa wengu* ( )
3. Hepatomegally/ *kufura kwa ini* ( )
4. Anaemia / *anemia* ( )
5. All the above/ *yote yaliyotajwa hapo juu* ( )
6. Others/ *mengine* (Specify/ *fafanua*) _____

77) Do you think other diseases encourage kal-azar spread/*Je unaamini kuna magonjwa mengine yanachangia ka-alazar kuenea?*

1) Yes ( ) 2) ( )

78) Which disease(s) encourage the spread of Kala-azar/ *Magonjwa yapi yanayo changia kuenea kwa Kala-azar?*

1. Malaria/ *Malaria* ( )
2. TB/ *kifua kikuu* ( )
3. HIV/AIDS/ *virusi vya ukimwi* ( )
4. All the above/ *yote yaliyotajwa juu* ( )
5. Others/ *mengine* (Specify/ *fafanua*) _____

79) What is the differential diagnosis for Kala-azar/ *Ni matokea gani ya maabara yanayotofautisha Kala-azar*?

1. Malaria/ *malaria* ( )
2. Typhoid/ *homa ya matumbo* ( )

3. TSS/ *tss* ( )
4. TB/ *kifua kikuu* ( )
5. Other/ *mengine* (Specify/ *fafanua*) _____

80) Is there any diagnostic tools used in the facility for Kala-azar/ *Kuna vifaa vinavyo tumika kudhibitisha Kala-azar katika maabara?*

1. Yes/ *Ndio* ( ) 2. No/ *La* ( )

81) What is the most commonly used diagnostic test(s) for Kala-azar/ *Ni dhibitisho gani hutumika sana katika utambuza wa Kala-azar?*

1. FGT ( ).2.DAT ( ).3.ELISA ( ).4.PCR ( ).5.BMA ( ).6.Kr 39 ( ).7.All the above ( ).8.Others _____

82) What is the confirmatory test/ *test ya kudhibitisha gani?*

1. PCR ( ).2.ELISA ( ).3.BMA ( ).4.DAT ( ).5.Kr 39 ( ).6.All the above ( ).7.Other-Specify _____

83) Is the confirmatory test used/ *Je, udhibitisho huo watumika?*

1. Yes/ *Ndio* ( ) 2. No/ *La* ( ) 3. I do not know/ *Sijui* ( )

84) If "No" why/ *Kama la.kwanini?*

1. It is expensive to get the reagents, hence only used in specialized laboratories/ *vifaa ni bei ghali sana* ( )
2. No qualified personnel to carry out the tests/ *Wafanyikazi hawana tajiriba ifaayo* ( )
3. All the above/ *yote yaliyotajwa hapo juu* ( )
4. Other/ *Mengine* (Specify/ *fafanua***)**

_____

85) What is the most commonly used drug for treatment/ *Dawa gani inayotumika sana kwa matibabu?*

1. Pentavalent-1st line ( )
2. Amphotericin B and AmBisome-2nd line ( )
3. Both/ *zote mbili* ( )
4. Others/ *mengine* (Specify/ *fafanua*)

_____

86) Do all the diagnosed patients with the disease get treatment/ *Je, wanaopatikana na ugonjwa wanapata matibabu*?

1. Yes/ *Ndio* ( ) 2. No/ *La* ( )

87) How do you prevent kala azar? *Wazuia vipi Kala-azar?* (Tick all that apply)

1.Bed nets*(Neti)*	2.Insecticides*(Dawa ya kuua wadudu)*	3.Personal hygiene *(Usafi binafsi wa mwili)*	4.Proper waste disposal*(Kutupa taka inavyofaa)*	5.Installing window mesh *(Kuweka meshi dirishani)*	6.Using sterilized water*(Kutumia maji yaliyotibiwa)*	7.Using repellants(Utumizi wa dawa za kufukuza dudu)	8.Praying against kala azar*(Maombi)*

9. Other *(Mengine)* (specify) _____

88) What other control measures are employed to contain the disease/ *Je, mikakati zipi zingine zatumika*.

1. Use of insecticide treated nets (ITNS)/ *Neti zilizotibiwa* ( )
2. Use of indoor residual spraying/ *Utumizi wa dawa ya kuua wadudu* ( )
3. All the above/ *yote yaliyotajwa hapo juu* ( )

4. Others/ *Mengine* (Specify/ *fafanua*)

_____

89) How effective are these control measures/ *Je mikakati hizi zinatimiza lengo*?

1. Very effective/ *nzuri sana* ( )
2. Effective, but not commonly emphasized and practiced by the community people/ *ni nzuri lakini haitiliwi maanane na kutumika na jamii* ( )
3. Effective, but the supply of ITNS and the use of residual spraying is insufficient / *ni nzuri, lakini neti iliyotibiwa hazitoshi na dawa ya kufukuza wadudu pia haitoshi* ( )
4. All the above/ *yote yaliyotajwa juu* ( )
5. Others (Specify)

_____

Appendix III : Focus Group Discussions(FGDs)

We gathering information on Exposure factors associated with kala-azar in the area so as to assist the decision makers, state health policies and stakeholders to design ways or prevention measures on how to control the disease. You have been chosen as an opinion leader or professional to be helpful in the focuss group discussion to give in-depth-information or opinion about some of these factors.Some photographs and videotaking as well as audio recordings may be done during the discussion.There are no risks of you being in this discussion and taking part is voluntary. You don't have to answer questions you do not want and you are free to end the discussion at any time. At the end of the study, there will be no way to link your name with your data. Every information you give would be treated with a lot of confidentiality, secrecy and professionalism**.** *(Natafuta habari kuhusu ugonjwa na vitu zinazochangia kuweka watu hatarini kupata Kala-azar katika eneo hili, ili kusaidia kuzia kuenea kwa ugonjwa huu.umechaguliwa kama kiongozi au maatalam kupeana habari zaidi unazosijuia kwa kushiriki katika mazungumzo haya na kujibu maswali kwa hiari yako.Kunawesa kuwa na kuchukuwa picha,video na kunakili mambo.Uko huru kuacha masungumzo wakati wo wote na pia hunawesa usijibu maswali usiyotaka.*

Kila ujumbe unayopatiana itakuwa ni ya siri na utakuwa wa kitaalamu).

Division (*Tarafa***)_____**

Location *(Eneo)* **_____**

Village name *(Kijiji)* **_____**

Household Number *(Nyumba ya ngapi)* **_____**

1) Is kala-azar present here and is it a serious problem in this community? *Je,kala-azar hiko hapa na ni tatizo kubwa katika hii jamii?*
2) What is the knowledge and attitude on kala-azar,where do you get information about it?Je wawazaje ama *wapata wapi ujumbe kuhusu Kala-zar?*
3) What do you think encourages kala-azar to be common in the area? *Ni mambo yapi yanayochangia kusambaa kwa Kala-azar?*
4) What are the cultural believes,perceptions and practices associated with kala-azar and its cause? *Tamaduni zipi zinazohusiana na Kala-azar?*

5) Who are the most at risk gender or age groups to this disease? *Nani wako hatarini jinsia au umri kwa huu ugonjwa*?

6) What are the people in the community doing to control or prevent Kala-azar and what do you think should be done to alleviate this menace? *Mambo yapi yanayofanywa katika jamii kuzuia Kala-azar?*

7) When and where do the people in the community seek medical attention when sick of Kala-azar? *Ni wapi na wakati upi watu katika jamii yako hutafuta usaidizi wa Kituo cha afya wanapougua Kala-azr?*

8) What do people in the community use to treat of Kala-azar? *Nini au madawa gani ndio inatumika katika matibabu ya Kala-azar?*

9) What is the burden of this disease to the community? *Ni vikwazo vipi kinaletwa na ugojwa huu katika jamii?*

Appendix IV: Key informant Interview guide

We gathering information on Exposure factors associated with Kala-azar in the area so as to assist the decision makers, state health policies and stakeholders to design ways or prevention measures on how to control the disease. You have been chosen as an opinion leader or professional to be interviewed to give in-depth-information and I would like to ask you some questions about some of these factors, through this interview.Some photographs and videotaking as well as audio recordings may be done during the interview.There are no risks of you being in this interview and taking part is voluntary. You don't have to answer questions you do not want and you are free to end the interview at any time. Every information you give would be treated with a lot of confidentiality, secrecy and professionalism**.**

Division _____

Location _____

Village name _____

1) Which diseases do you think are common in the area*?*

2) Is kala-azar a common and a threat disease here?

3) What do many people think causes/transmits kala-azar?

4) What human activities do you think encourage Kala-azar to be common in the area*i*?

5) Where do sand flies breed and when do they bite the most in this area*?*

6) Who is mostly affected by kala-azar and where do people get information about it?

7) In which seasons is kala azar most prevalent here*?*

8) What cultural practices or behaviour predispose the community to kala-azar here*?*

9) What stakeholders or sectors are involved in the control of the disease here?

10) Is there any closest health center that specializes in the treatment of kala azar or where do people seek for treatment here?/ *Je unajua kituo cha afya kilicho nawe karibu kinachopeana huduma ya kutibu Kala-azar ama watu hutafuta matibabu wapi?*

11) What is the knowledge, attitude,perception and behaviour of the people about kala-azar?

12) What is the sleeping habit of people in this area ?

Questions for only Health workers/Health facility staff

13) Which disease(s) encourage the spread of Kala-azar*?*

14) What is the differential diagnosis for Kala-azar?

15) Does the facility/facilities have laboratory diagnostic services and if yes, which diseases are tested?

---

16) Is there any diagnostic tools used in the facility for kala-azar*?*

17) What is the most commonly used diagnostic test(s) for kala-azar here*?*

18) What is the confirmatory test used here and is it used*?*

19) What is the most commonly used drug for treatment of Kala-azar here*?*

20) Are there cases of patients treated of Kala-azar coming back sick of kala-azar?

21) How often and what do you think cause relapses for the disease?

22) How is kala-azar prevented and controlled at the community and the health facility*?*

Appendix V: Proportionate allocation of estimated sample of 341 households distributed by village

Sub-Locations of Nadapal, Tiya, Kalemunyang, Lobei, Lochor edome, Lochor Ekuyen, Lokiriama and Urum				
Village	**Households(HH)**	**Population(POP)**	**Proportionate to size**	**Pro rata sample allocation**
Namoruputh location villages-Lochor Emeyan, Kalapata, Ekoropus, Kobang and Lomukuse	810	5596	(810/5576)x 341	50
Lokiriama location villages- Natelo, Tapaik, Namoru Arengan,Namoni angikala and Lokitela Kapis.	1764	13435	(1764/5576) x341	108
Nadapal location villages-Akwamekwi Ng'itorokippi,Nakwapoo, Lokipetot and Koopun	1081	6209	(1081/5576) x341	66
Lorugum location villages-Kang'alita,Lokitela Kori, Komera, Natorowoi and Nawoyaregai	1921	14630	(1921/5576) x341	117
Total	5576	39870		341

The (Appendix 6) shows the households sampled as per the division, location and sub-locations

Appendix VI: The households sampled as per the division, location and sub-locations

Division	Location	Sub-Location	Village	Population	No.of Households	No.of HHs to be Calc.	No.of HHs sampled
Loima	Loima/ Namoruputh	1.Lochor Edome	Lochor Emeyan, Kalapata	Loc 19848 Sub-loc 3354	Loc 2550 Sub loc 511	50	31
		2.Lochor Ekuyen	Lomukuse,Kobang, Ekoropus	2242	299		19
	Lokiriama	1.Urum	Natelo, Namoru Areng'an, Tapaik	Loc 13435 Sub loc5839	Loc 1400 Sub loc 1282	108	78
		2.Lokiriama	Namoru Ang'ikala, Lokitela Kapis	3615	482		30
Turkwel	1.Nadapal	1.Nadapal	Akwamekwi, Ng'itorokippi	Loc 12258 Sub loc 3286	Loc 2391 Sub loc 645	66	39
		2.Tiya	Nakwapoo,Lokipetot, Koopun	2923	436		27
	2.Lorugum	1.Kalemunyang	Lokitela Kori, Kang'alita, Nawoyaregae	Loc 26671 Sub loc 8666	Loc 4437 Sub loc 1250	117	76
		2.Lobei	Komera and Natorowoi	5129	671		41
	Total			Loc 5877 Sub loc 15306	Loc 3233 10784 Sub loc 2257	341	341
	Grand Total			Loc 5877 Sub loc 15306	Loc 12181 Sub 5576	341	341

Appendix VII: Distribution of key informants' interview (KII)

S/No	Position	Gender	Age	Division	Location	Sub-location	Village
1	Community leader	Male	45	Turkwel	Nadapal	Tiya	Nakwapoo
2	Community leader	Female	33	Turkwel	Nadapal	Tiya	Lokipetot
3	Community leader	Male	37	Turkwel	Nadapal	Tiya	Koopun
4	Community leader	Female	35	Turkwel	Nadapal	Nadapal	Akwamekwi
5	Community leader	Female	42	Turkwel	Nadapal	Nadapal	Ng'itorokippi
6	Community leader	Male	46	Turkwel	Nadapal	Nadapal	Ng'itorokippi
7	Community leader	Male	51	Turkwel	Lorugum	Kalemunyang	Lokitela kori
8	Community leader	Female	38	Turkwel	Lorugum	Kalemunyang	Kang'alita
9	Community leader	Female	42	Turkwel	Lorugum	Kalemunyang	Nawoyaregai
10	Community leader	Male	49	Turkwel	Lorugum	Lobei	Komera
11	Community leader	Male	34	Turkwel	Lorugum	Lobei	Komera
12	Community leader	Male	36	Turkwel	Lorugum	Lobei	Natorowoi
13	Health worker	Female	35	Loima	Namoruputh	Lochor Edome	Lochor Emeyan
14	Health worker	Male	38	Loima	Namoruputh	Lochor Edome	Kalapata
15	Health worker	Male	34	Loima	Namoruputh	Lochor Edome	Kalapata
16	Health worker	Male	36	Loima	Namoruputh	Lochor Ekuyen	Lomukusei
17	Health worker	Female	40	Loima	Namoruputh	Lochor Ekuyen	Kobang
18	Health worker	Female	35	Loima	Namoruputh	Lochor Ekuyen	Ekoropus
	Distribution of key informants' interview Cont'						
19	Health worker	Male	38	Loima	Lokiriama	Urum	Natelo
20	Health worker	Male	34	Loima	Lokiriama	Urum	Namoru Areng'an
21	Health worker	Female	41	Loima	Lokiriama	Urum	Tapaik
22	Health worker	Male	43	Loima	Lokiriama	Lokiriama	Namoru Ang'ikala
23	Health worker	Male	35	Loima	Lokiriama	Lokiriama	Lokitela Kapis
24	Health worker	Male	33	Loima	Lokiriama	Lokiriama	Lokitela Kapis
Total		Males	15				
		Females	9				
Grand total			24				

Appendix VIII: Distribution of Focus Group Discussions (FGDs)

No.of FGD	No.of participants	Males	Females	Division	Location	Sub-location	Village
1st	10	5	5	Turkwel	Nadapal	Nadapal and Tiya	Akwamekwi, Ng'itorokippi, Nakwapoo, Lokipetot and Koopun
2nd	10	5	5	Turkwel	Lorugum	Kalemunyang and Lobei	Kang'alita, Lokitela Kori, Komera, Natorowoi and Nawoyaregai
3rd	10	5	5	Loima	Namoruputh	Lochor Ekuyen and Lochor Edome	Lochor Emeyan, Kalapata, Ekoropus, Kobang and Lomukuse
4th	10	5	5	Loima	Lokiriama	Lokiriama and Urum	Natelo,Tapaik, Namoru Areng'an,Namoru Ang'ikala, and Lokitela Kapis
Totals	40	20	20				

Appendix IX: Scientific Ethical Review Unit (Seru) Approval Letter

KENYA MEDICAL RESEARCH INSTITUTE

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KEMRI/RES/7/3/1 **October 08, 2015**

TO: **JOSEPH A. LOTUKOI,**
PRINCIPAL INVESTIGATOR

THROUGH: **DR. CHARLES MBAKAYA,**
THE DIRECTOR, CPHR,
NAIROBI

Forwarded 14/10/2015

Dear Sir,

RE: **KEMRI/SERU/CPHR/002/3121 (*RESUBMISSION OF INITIAL SUBMISSION*): EXPOSURE FACTORS ASSOCIATED WITH VISCERAL LEISHMANIASIS (KALA-AZAR) IN LOIMA SUB COUNTY OF TURKANA COUNTY, KENYA-(*VERSION 2.0 DATED SEPTEMBER, 2015*)**

Reference is made to your undated letter. KEMRI/Scientific and Ethics Review Unit (SERU) acknowledges receipt of the revised study documents on 18th September, 2015.

This is to inform you that the Committee notes that the issues raised during the 242nd meeting of the KEMRI/Scientific and Ethics Review Unit (SERU) held on 18th August, 2015 have been adequately addressed.

Consequently, the study is granted approval for implementation effective this day, **8th October, 2015** for a period of one year. Please note that authorization to conduct this study will automatically expire on **October 7, 2016.** If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval to SERU by **August 26, 2016**.

You are required to submit any proposed changes to this study to SERU for review and the changes should not be initiated until written approval from SERU is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of SERU and you should advise SERU when the study is completed or discontinued.

You may embark on the study.

Yours faithfully,

FOR

PROF. ELIZABETH BUKUSI,
ACTING HEAD,
KEMRI/SCIENTIFIC AND ETHICS REVIEW UNIT

In Search of Better Health

Appendix X: Summary of Publication 1: Exposure factors associated with Visceral Leishmaniasis in Loima Sub-County of Turkana County, Kenya

Pathology and Laboratory Medicine

2017; 1(1): 1-12

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doi: 10.11648/j.plm.20170101.11

Exposure Factors Associated with Visceral Leishmaniasis (kala-azar) in Loima Sub-County of Turkana County, Kenya

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Abstract: Background: Visceral Leishmaniasis (Kala-azar) is a serious disease caused by species of the parasitic protists Leishmania. It can affect humans living in parts of the tropics and sub-tropics and is transmitted by Phlebotomus sandflies. It is classified as a neglected disease yet it is a public health problem, a debilitating disease causing an estimated 500,000 new cases each year, and a tenth of these patients will die in the predisposed areas. Objective: To assess the exposure factors associated with kala-azar in Loima sub-county of Turkana County, Kenya. Methods: Descriptive cross- sectional research design was employed and the study was conducted between October, 2015 and June, 2016. Cluster random sampling technique was used to identify study subjects in the purposively selected Loima Sub-county. A sample size of 341 respondents who were household heads or adult members were randomly sampled. Data collection was done using pretested structured questionaires, interviews, focus group discussions and observations; entered into Statistical Package for Social Sciences (SPSS) version 21.0 for analysis. Presentation of data was done using both quantitative and qualitative approaches.

Results: The key exposure factors to the disease in the community include: Age, gender, educational level, socio-economic status, housing, presence of large amount of termite mounds all over the area 60.1%(n=205),inaccessibility to health services, varying health-seeking behaviour and lack of proper knowledge on transmission of disease. Also, human activities such as deforestation and hunting 52%(n=32), resting or sitting near termite mounds 70%(n=191) and dancing at night (Edong'a 64.8%(n=167), when the sand flies are active. There was a significant association between age ((OR=3.9; 95%CI= (1.6-9.3), p=0.002), gender (OR=4.9; 95%CI= (1.9-

12.2), p=0.001),education level (OR=3.1; 95%CI= (1.1-8.5), p=0.0301)), housing (OR=3.4; 95%CI= (1.2-8.7), p=0.032), resting and presence of large amount of termite mounds (OR=3.3; 95%CI=

(1.2-7.2), p=0.0035) and resting or sitting near termite-mounds and exposure to kala-azar.Conclusion: The study concludes that kala-azar is prevalent in the area and though the community is aware of its existence, the residents have different beliefs about transmission. The study recommends the need for enhanced general health education and awareness on the transmission cycle of kala-azar. Community empowerment and participation should be emphasized as well as structural development plans that include sand fly management strategies and control methods that would ensure the removal of breeding and resting sites of the vectors within human habitation. In addition, integrated disease surveillance and response to be implemented to avert the disease situation.

Keywords: Visceral Leishmaniasis, Kala-Azar, Exposure, Loima, Kenya.

Appendix XI: Summary of Publication 2 Knowledge,Attitude,Perception and the Behaviour of the Community towards Visceral Leishmaniasis in Loima Sub-County of Turkana County, Kenya

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KNOWLEDGE, ATTITUDE, PERCEPTION AND THE BEHAVIOUR OF

THE COMMUNITY TOWARDS VISCERAL LEISHMANIASIS (KALAAZAR) IN LOIMA SUB-COUNTY OF TURKANA COUNTY, KENYA.

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Abstract

Background: Visceral Leishmaniasis (Kala-azar) is a serious disease caused by species of the parasitic protists *Leishmani* and transmitted by Phlebotomus sandflies . It is classified as a neglected disease yet it is a public health problem, a debilitating disease causing an estimated 500,000 new cases each year, and a tenth of these patients will die in the endemic areas.

Objective: To assess the knowledge, attitude, perception and the behaviour of the community towards kala-azar in Loima Sub-County of Turkana County, Kenya**.**

Methods: Descriptive cross- sectional research design was employed and the study was conducted between October, 2015 and June, 2016. Cluster random sampling technique was used to identify study subjects in the purposively selected Loima area. A sample size of 341 respondents who were household heads or adult members were randomly sampled. Data collection was done using pretested structured questionaires, interviews, focus group discussions and observations; entered into Statistical Package for Social Sciences (SPSS) version 21.0 for analysis and presentation done using both quantitative and qualitative approaches**.** The chi – square test with 95 CI was used to compare the association between variables. P-value of less than 0.005 was considered as a level of significance.

Results: The key factors influencing knowledge, attitude, perception and behaviour towards the disease in the community and with significant association include:Age ((OR=3.9; 95%CI= (1.1-9.3), p=0.002) ,gender(OR=4.9; 95%CI= (1.9-12.2), p=0.011), educational level (OR=3.4; 95%CI= (1.1-8.5), p=0.025, socio-economic status, housing (OR=3.4; 95%CI= (1.2-8.7), p=0.003), behaviour of resting or sitting near termite mounds 70%(n=191) (OR=3.3; 95%CI= (1.2-7.2), p=0.001)) and lack of proper knowledge on transmission of disease. Also, human practices such as deforestation and hunting 52%(n=32), and dancing at night (Edong'a - 64.8%(n=167), when the sand flies are active.

Conclusion: The study concludes that kala-azar is endemic in the area and though the community is aware of its existence, the residents have different of beliefs about the transmission. The study recommends the need for enhanced general health education and awareness on the transmission cycle of kala-azar. Community empowerment and participation should be emphasized as well as structural development plans that include sand fly management strategies and control methods that would ensure the removal of breeding and resting sites of the vectors within human habitation.

Keywords: Visceral leishmaniasis, kala-azar, KAPB, Loima, Kenya.