CLINICAL MANIFESTATIONS AND ANTHROPOMETRIC PROFILES OF VISCERAL LEISHMANIASIS IN SELECTED CENTRES IN ETHIOPIA

by

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Submitted in partial fulfilment of the requirements

for the degree of

MASTER OF PUBLIC HEALTH (MPH)

at the

UNIVERSITY OF SOUTH AFRICA.

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November 2011

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DECLARATION

I declare that **CLINICAL MANIFESTATIONS AND ANTHROPOMETRIC PROFILES OF VISCERAL LEISHMANIASIS IN SELECTED CENTRES IN ETHIOPIA** is my own work and all the sources I have used or quoted have been indicated and acknowledged with full references. This work has not been submitted before for any other degree at any other institute.

28 February 2012

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SIGNATURE **DATE**

(Abate Mulugeta Beshah)

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ABSTRACT

Visceral leishmaniasis is a severe systemic illness and early case management is important for the avoidance complications and control of the disease. Improving health workers' knowledge on leishmaniasis is essential in improving the control programme. A quantitative, retrospective study of patient records and descriptive, explorative study of health care professionals' knowledge on leishmaniasis were conducted. Data was collected from patient records (n=299) using a structured audit tool and from health care professionals (n=55) by means of a structured questionnaire.

The study findings highlight that the commonest clinical manifestations of visceral leishmaniasis are fever and splenomegaly. Severe malnutrition and HIV co-infection contribute to mortality. The findings indicate the need for training to improve health care professionals' awareness of visceral leishmaniasis. Leishmaniasis disease surveillance and support by the regional and district heath offices should be improved.

KEY WORDS

Visceral leishmaniasis; clinical manifestations; nutritional status; anthropometry; VL clinics.

ACKNOWLEDGEMENTS

Praise and thanks to Almighty God for without whose blessing, providence and guidance this study would not have been possible.

There is a saying that no feast comes to the table on its own legs. This is also true of any dissertation therefore I wish to express my gratitude to the following, who made this "feast" possible:

- Prof Susan Hattingh, my supervisor, for her dedication, support, encouragement and guidance
- The University of South Africa, for permission to conduct the study
- The Tigray and Amhara Regional Health Bureaus, for providing support for the study
- The Kafta Humera Hospital and Addis Zemen Health Centre Leishmaniasis Treatment Clinics, for their collaboration
- Mr Endale, Dr Ayalneh and the data collectors, for their dedicated assistance
- Mèdecins Sans Frontières, for establishing and running the two VL clinics during the study period
- My wife, Martha and my daughter, Ruth, for their love, encouragement and patience
- The respondents, for their time and valuable information
- Mrs Rina Coetzer, for her patient and professional formatting and finalisation of the manuscript
- Mrs Iauma Cooper, for critically and professionally editing the manuscript

Dedication

This dissertation is dedicated to the victims of the 2005 VL outbreak in Libo Kemkem and Fogera Districts, who provided enlightenment for the national leishmaniasis control programme.

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List of abbreviations

The following abbreviations are used in this study:

ART	Antiretroviral therapy
BMI	Body Mass Index
CL	Cutaneous Leishmaniasis
MoH	Ministry of Health
HAPCO	HIV/AIDS Prevention and Control Office
HIV	Human Immuno Deficiency Virus
KA	Kala-Azar
MCL	Muco-cutaneous Leishmaniasis
mm	millimetre
μm	micrometre
MSF	Mèdecins Sans Frontières
NGO	Non-governmental Organizations
PKDL	Post Kala-azar Dermal Leishmaniasis
VL	Visceral Leishmaniasis
WHO	World Health Organization
Wt/Ht	Weight for Height

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CHAPTER 1

Orientation to the study

1.1 INTRODUCTION

Leishmaniases is a group of diseases caused by the leishmania parasite. It is still one of the most neglected diseases mainly affecting the poorest and impoverished group of the populations in Africa, Asia, South America and, to some extent, Europe (Negera, Gadisa, Yamuah, Engers, Hussein, Kuru, Hailu, Gedamu & Aseffa 2008:3; World Health Organization [WHO] 2010a:1).

Visceral leishmaniasis (VL) is a chronic, systematic disease characterized by fever, (hepato) splenomegaly, lymphadenopathy, pancytopenia, weight loss and generalized body weakness, and if left untreated, may lead to death. Visceral leishmaniasis, also called *kala-azar,* is usually caused by *Leishmania donovani* or *Leishmania infantum*, where the protozoan parasite is transmitted by the bite of phlebotomine sand flies. *L. donovani* is the causative agent in eastern Africa and the Indian subcontinent and *L. infantum* in the Mediterranean and Middle East regions (WHO 2010b:13; Wilson, Jeronimo & Pearson 2005:147, 148). Although there are different leishmania parasites that cause VL, the different species of the parasite have virulence variation seen in different endemic regions probably due to the parasite, the vector and the host factors (Murray, Berman, Davies & Saravia 2005:1563).

In general, the clinical manifestation and response to treatment in leishmaniasis results from a complex interaction between the species of the leishmania parasite, the host response and the treatment given where effective treatment remains the most important challenge (Alvar, Bashaye, Argaw, Cruz, Aparicio, Kassa, Orfanos, Parreno, Babaniyi, Gudeta, Canavate & Bern 2007:282; Zanger, Kötter, Raible, Gelanew, Schönian & Kremsner 2010:692). Depending on the severity and duration of illness, VL patients may present with mild to moderate levels of malnutrition and approximately 30% of all VL patients are severely malnourished (Ministry of Health [MoH] 2006:15). Untreated VL

is invariably fatal as the duration of illness, malnutrition, human immunodeficiency virus (HIV) co-infection and the presence of other co-morbidities affect the case fatality rate (Collin, Davidson, Ritmeijer, Keus, Melaku, Sammy & Davies 2004:618).

1.2 BACKGROUND TO THE PROBLEM

Visceral leishmaniasis (VL) is distributed throughout the lowlands of Ethiopia with varying degrees of endemicity and new foci recently reported (MoH 2006:2). It is one of the several diseases causing febrile hepatosplenomegaly. Patients present usually with prolonged fever, body weakness, weight loss, pallor and hepatosplenomegaly (MoH 2006:4).

The prevalence of leishmaniasis in areas such as Ethiopia is steadily rising because of the limited access to treatment and the increased rate of HIV-VL co-infection from 19% in 1998-1999 to 34% in 2006-2007 (WHO 2010:105). Understanding the most common clinical presentation of patients with VL is useful for early case detection and management. However, the clinical presentations for VL are shared with other tropical diseases, such as malaria, typhoid fever, tuberculosis and brucellosis. According to health facilities in Ethiopia, approximately 30%-50% of patients with the case definition have VL disease, which shows confirmation needs to be made before starting treatment (MoH 2006:4).

1.2.1 What is known about VL

Ethiopia is one of the VL endemic countries in East Africa with most of the endemic localities found in the remote and arid but fertile parts of the country. Various species of the leishmania parasites can cause the disease and L. donovani is the isolated parasite causing VL in Ethiopia (Collin et al 2004:618). Three species of sand flies are found to be the most common vectors transmitting the disease in Ethiopia, namely *Phlebothomus orientalis, Phlebothomus martini* and *Phlebothomus celiae* (Dereure, El-safi, Bucheton, Boni, Kheir, Davoust, Pratlong, Feugier, Lambert, Dessein & Deder 2003:1107; MoH 2006:3).

The favourable breeding sites for sand flies are acacia and balanite forests in north and north western Ethiopia where *P.orientalis* are dominant. In the southern part of the

country, there is a different ecological setting, where termite mounds are the breeding places with *P.martini* and *P.celiae* (MoH 2006:3). However, activities are underway in the country to obtain more detailed information on the parasite and the characteristics of the different vectors for leishmaniasis. The occurrences of sporadic VL cases in the western part of Ethiopia are often attributed to the immigration of VL patients from Sudan (Desjeux 2004:308).

The epidemiology of leishmaniasis is usually dependent on factors such as the species of the leishmania parasite, the ecology of transmission, the exposure status of the population to the leishmania parasite, and the behaviour of the human population (WHO 2010:36). Hence, depending on the exposure status in areas with substantial level of transmission, large numbers of the adult population will have acquired immunity. From an epidemiological point of view, leishmaniasis transmission can be divided into two categories depending on the life cycle of the parasite. The first category is anthroponotic leishmaniasis, where infected humans are the reservoirs on whom the sand fly feeds and that will eventually infect another susceptible human. The second category is zoonotic leishmaniasis, where the reservoir is a non-human mammal for example a dog (Alvar, Yactao & Bern 2006:554).

Transmission of VL in Ethiopia is believed to be anthroponotic because zoonotic transmission has not yet been identified (MoH 2006:3). The same is true in southern Sudan because no animal species has been definitely identified as a reservoir (Collin et al 2004:612). However, the host-parasite relationship has been identified in humans and dogs in Eastern Sudan (Dereure, El-Safi, Bucheton, Boni, Kheir, Davoust, Pratlong, Feugier, Lambert, Dessein & Deder 2003:1103-1108).

The lowlands of Kafta-Humera and Metema in north-western Ethiopia and the Konso district and Segen Valley in southern Ethiopia are established foci for VL, with the disease spreading. It is one of the emerging infectious diseases which are rapidly increasing in incidence over an expanded geographical range. It affects populations or communities where the disease did not previously occur (Marlet, Sang, Ritmeijer, Muga, Onsongo & Davidson 2003:515; MoH 2006:2; WHO 2007:10).

Clinical manifestations differ depending on the species of the leishmania parasite, the host immune status of the host, and presence of other co-morbidities. After an

incubation period of between two and six months, the manifestations occur gradually. The clinical features seen most are enlargement of the spleen, recurring and irregular fever, as well as anaemia and weakness that are common in all endemic areas. However, some manifestations like lymph node enlargement are less frequent outside Sudan and India. Wasting is a common clinical presentation for VL as 30% of patients present with malnutrition in Ethiopia (Burki 2009:371; MoH 2006:15). Wasting is also a common presentation for VL in Sudan, Brazil and India (WHO 1996:7). Fever, weight loss and splenomegaly are the most common VL features in Ethiopia. In Axum, Northern Ethiopia, Haile and Anderson (2006:390) found that 28% of patients presenting with weight loss and splenomegaly were co-infected with HIV.

VL may be endemic, sporadic or epidemic (WHO 2010:5). In areas where the disease is endemic, it tends to be more of a chronic nature. In these situations, children are mainly affected by L. donovani or L. Infantum. VL occurs mainly in India and East Africa, affecting mostly children and young adults. Sporadic disease outbreaks of leishmaniasis often occur in non-indigenous people of any age who enter VL endemic areas. These patients mainly present with an acute onset of symptoms and signs (WHO 2010:7). Epidemic VL affects all susceptible age groups with no acquired immunity and leads to a higher rate of mortality.

L infantum is the aetiological agent of VL in endemic countries from North America and South America, including Brazil, Peru and Argentina (WHO 2010:9,103). In these areas most cases of VL occur in children under ten years old and in children post-*kala azar* dermal leishmaniasis is extremely rare.

A variety of hematologic manifestations are also seen in VL, such as haemolysis. There can also be bone marrow infiltration by the leishmania-infected macrophages, haemorrhage, and sequestration of the spleen (Chappuis, Sundar, Hailu, Ghalib, Rijal, Peeling, Alvara & Boelaert 2007:874). Clinical advanced stages of disease, intercurrent infections, which include chest infections, and dysentery may occur and are common causes of mortality (WHO 2010:13).

For the control of VL in anthroponotic transmission, the focus should be on early diagnosis, treatment and reducing or avoiding sand fly-human contact. Drug resistance

is a serious and important concern. This is different in the zoonoses category, where drug-resistant parasites are diluted by the reservoir host (Alvar et al 2007:277).

In a study in Sudan, risk factors for death in VL patients revealed extremes of age, namely from younger than two years to older than 45 years, malnutrition, anaemia, bleeding, diarrhoea and vomiting (Collin et al 2004:618). Moreover, VL relapse cases and HIV/VL co-infected individuals have a poor treatment outcome (Collin et al 2004:616,618; Lyons, Veeken & Long 2003:735,736; WHO 2007:27).

In Ethiopia, patients with the clinical case definition for VL are finally diagnosed using a serologic test (Rapid diagnostic test [RDT] or Direct agglutination test [DAT]) or conducting a parasitological test from tissue sample (MoH 2006:4, 5).

The first-line treatment for VL in Ethiopia is Sodium Stibogluconate (SSG) with a dose of 20mg/kg for 30 days. SSG though, is a drug well known to have serious toxic effects such as cardiotoxicity and pancreatitis (MoH 2006:7, 8). Because of the high direct and indirect cost of VL treatment, the treatment service is available in only very few selected non-governmental organization (NGO)-supported treatment centres in the country.

The second-line treatment for VL in Ethiopia is Amphotericin B and the indications are toxicity, relapse and treatment failure and the liposomal form of Amphotericin is the safest and most effective anti-leishmanial drug (MoH 2006:8,11)

1.2.2 What is not known about VL

Due to the sub-species variation in the parasite, host immune responses and the choice of antileishmania drugs, there are some differences in clinical manifestations and treatment responses of VL patients in different geographic localities (Alvar et al 2007:280). Identifying and describing the most common clinical manifestations for VL in Ethiopia is an issue to address in relation to the clinical case definition. It is also important to determine the nutritional status of VL patients depending on the anthropometric measures (Body mass index [BMI] - weight-for-height).

1.2.3 Diagnosis and prevention of VL

The transmission of leishmaniasis is complex and involves the human host, the parasite, the sand fly vector and, in some situations, animal reservoirs thus making the control complex (WHO 2010:49). Early case detection and treatment is the most important strategy for the control of VL, especially in areas where transmission is anthroponotic. Improved knowledge on leishmaniasis, availability of diagnostic and drug supplies, implementation of vector control strategies, and existence of functional surveillance systems would contribute to the control programme. Moreover, for this, the availability of health care workers trained in leishmaniasis is very important to improve access to the leishmaniasis services. The training will help the health workers to identify cases as early as possible before the disease becomes advanced and complicated.

1.3 RESEARCH PROBLEM

According to the Ministry of Health (MoH) of Ethiopia (2006:i), the burden of VL in Ethiopia is between 4 500 and 5 000 annually. It is reported from more than 40 different localities or administrative areas, affecting five of the nine administrative regions with different degrees of endemicity.

VL often exists in areas that are either remote or inaccessible and where health facilities are barely available or, if available, are inadequate. Those most likely to be infected are people who are poor, living in villages far from roads and health facilities. VL leads to death before medical advice is sought (Alvar et al 2007:275; Hailu, Musa, Royce & Wasunna 2005:590).

Despite the high incidence of the disease and availability of diagnostic and treatment services for VL, local people know little about it and usually seek medical advice only after traditional medications (Alvar et al 2007:278). Leishmaniasis service decentralisation and targeted health education should therefore be equally important measures for the control of the disease.

Furthermore, there are regional variations in how VL patients present. This variation includes the population and age group affected, mode of transmission, clinical

manifestations as well as treatment approaches and responses (Murray, Berman, Davies & Saravia 2005:1561).

The researcher is a health care professional and noticed that the local community where the disease occurs do not seek medical help timeously. For example, during the 2005 outbreak in the centre of Amhara state of Ethiopia, it was found that the mean duration of illness for VL patients was about six months before seeking medical attention (Alvar et al 2007:278). Early during that outbreak, a substantial proportion of patients died at home before the recognition of the epidemic due to low awareness both by health care practitioners and the local population (Alvar et al 2007:231; Herrero, Orfanso, Argaw, Mulugeta, Aparicio, Parreno, Bernal, Rubens, Pedraza, Lima, Flevaud, Palma, Bashaye, Alvar & Bern 2009:373).

Later outbreak investigation of VL was carried out (Alvar 2007:278; Bashaye 2009:37). The signs and symptoms of VL, alone or in combination, are not specific enough to differentiate the condition from chronic malaria, schistosomiasis and other systemic infections (WHO 2010:49). However, VL should be suspected in a patient with fever and splenomegaly who lives in or returned from an endemic area. The problem is therefore that it is not clear what the most common clinical manifestations and nutritional status are of patients in Ethiopia suffering from VL, which hampers the timeous diagnosis and treatment of the disease. It is therefore important that health care professionals recognise the early signs and symptoms of the disease and be updated to recognise these signs.

1.4 PURPOSE OF THE STUDY

The overall purpose of the study was to investigate the clinical manifestations and nutritional status of VL patients in Ethiopia. This knowledge would assist the researcher to propose measures to promote early and improved case management, including proper nutritional management of VL patients.

1.4.1 Research questions

To achieve the purpose, the researcher wished to answer the following questions:

- What are the most common clinical manifestations that patients who suffer from VL present with in selected clinics in Ethiopia?
- What is the nutritional status of VL patients in the selected clinics, using the anthropometric variables?
- Are health care professionals equipped to recognise early signs and symptoms of VL? What measures can be applied to promote early case management of VL patients presenting in Ethiopia?

1.4.2 Research objectives

The objectives of the study were to:

- Investigate the clinical manifestations of VL in selected treatment centres in Ethiopia.
- Describe the nutritional status using anthropometric variables of VL patients admitted to selected VL clinics in Ethiopia.
- Explore whether health care professionals are sufficiently equipped to recognise the early signs and symptoms of VL.
- Explore measures that would promote early case management of VL patients.

1.5 SIGNIFICANCE OF THE STUDY

Significance refers to the relevance of research conducted on some aspects of a profession, its contribution to improving the knowledge base of a profession and its contribution to evidence-based practice (Burns & Grove 2005:3; Polit & Beck 2006:70).

Understanding the most common clinical manifestations of VL in the identified clinics treating patients suffering from leishmaniasis would provide guidelines on the improvement of case management. An additional outcome could be to promote early

screening of cases and in doing so, improve early case identification and management. The proper use of diagnostic tests could be promoted with improved clinical case screening. Through prompt and early management of VL cases, the treatment outcome of VL patients in Ethiopia may be improved.

The nutritional status of an individual is assessed using four standard methods, namely dietary survey; clinical examination for signs and symptoms; biochemical tests from liver, blood and urine, and anthropometric measurements. In dietary survey, a systematic study is made of the individual's dietary intake, through dietary history, food diary, food frequency or weighted intake. Assessing nutritional status is done through clinical examination for signs and symptoms. This method, though simple to do, is not specific. Biochemical tests from liver, blood and urine may also be used. Finally, anthropometric measurements (weight for height, mid upper arm circumference, body mass index) may be used for assessment of nutritional status is. Because of resource constraints and the retrospective nature of the study, the researcher used the anthropometric measurement method to assess the nutritional status of VL patients (*Gale Nutrition Encyclopaedia*, 2004; Kaur, 2009). The description of anthropometric profiles for VL patients will help to understand the nutritional status of these patients. Improving the nutritional support of VL patients appropriately could also add to improved treatment outcomes. It was envisaged that the findings of the study would also help to optimise the national leishmaniasis control programme.

Programme planners, the academic community, policy makers, service providers, health care professionals and most of all patients suffering from leishmaniasis should benefit from this study as prevention and early detection would contribute to lowered morbidity and mortality due to this debilitating, preventable and curable disease.

1.6 RESEARCH SETTING

The study was conducted in two selected clinics in the northern part of Ethiopia. The two clinics are situated in the Libo Kemkem district of Amhara and the Kafta Humera district of Tigray administrative regions of Ethiopia.

1.6.1 Ethiopia

Ethiopia is located in the horn of Africa and is the tenth largest country on the African continent, covering 1.1 million square kilometres. Ethiopia is bordered on the north and northeast by Eritrea, on the east by Djibouti and Somalia, on the south by Kenya and on the west and south- west by Sudan (see Figure 1.1 and 1.2). Ethiopia has a rich diversity of peoples and cultures, and its own unique alphabet. It embraces a complex variety of nations and nationalists, with its peoples speaking altogether over 80 different languages.

Figure 1.1 shows a map of Africa and the location of Ethiopia in the eastern part of the continent as well as the countries bordering Ethiopia.

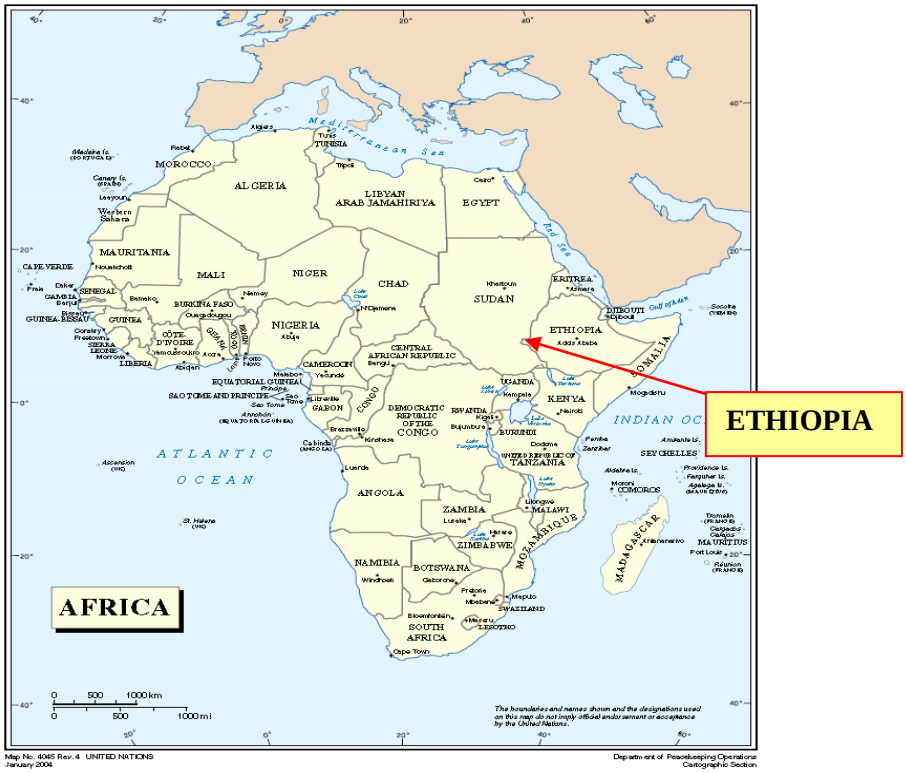


Figure 1.1 Map of Africa showing the location of Ethiopia

Source: Ethiopis College (2000)

The country has nine regional states and two city administration councils where these are further divided into 817 districts (Ministry of Health [MoH] 2010:3). It has geographical and topographic diversity with high peaks of 4 550 metres above sea level to low depression of 110 metres below sea level (MoH 2010:2).There are three

principal climatic groups in Ethiopia, i.e. tropical rain, dry and warm temperate climates (Central Statistical Agency [CSA] 2006:2). Projections from the 2007 population and housing census estimated a total population in 2010 of 79.8 million with the population pyramid of wide base (MoH 2010:2).

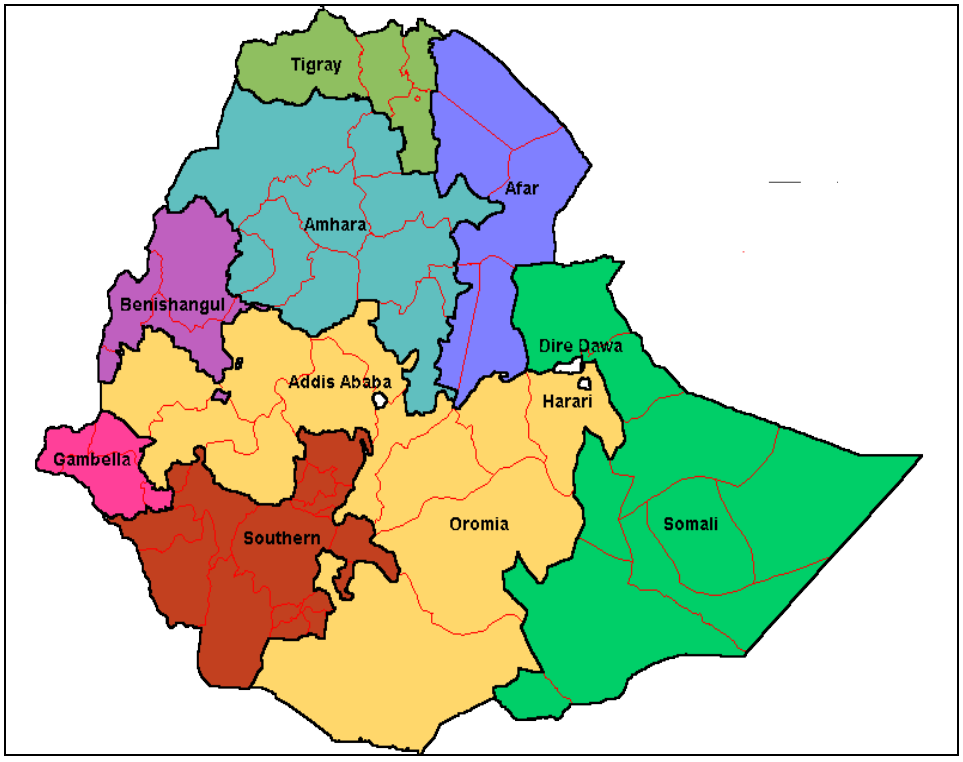


Figure 1.2 Map of Ethiopia with administrative regions

Source: Ethiopis College (2002)

According to the CSA (2006:2), Ethiopia's economy is mainly dependent on agriculture, 80% of the population is agrarian and agriculture accounts for 54% of the gross domestic product (GDP).

1.6.2 Health status

The health status in Ethiopia is poor and the population of Ethiopia faces high morbidity and mortality rates. Life expectancy is 54 years (53.4 years for males and 55.6 years for females) and the infant mortality rate is 77 per 1000 (MoH 2010:4). The main health problems are communicable diseases and nutritional disorders with 90% of infant/child

deaths due to pneumonia, diarrhoea, malaria, neonatal problems, malnutrition and HIV/AIDS, or combinations of these conditions (MoH 2010:4).

The health system has a three-tier health care delivery system where level one is a Primary Health Care Unit (PHCU) which serves 60,000 to 100,000 people; level two is a General Hospital serving 1 to 1.5 million people, and level three is a Specialised Hospital serving 3.5 to 5 million people (MoH 2010:5).

1.6.3 Libo Kemkem and Kafta Humera districts

Libo Kemkem (also called Libo) district is a district in the central part of Amhara regional state (see figure 1.3). The district has a total population of 200,000 and the capital of the district is Addis Zemen (CSA 2007). Addis Zemen town has a health centre providing in- and outpatient services. The district is one of the VL endemic districts in the region. The health care centre is staffed with three health care officers, 17 nurses, three laboratory professionals, four pharmacy professionals, one environmental health worker and 17 support staff members. The centre has been providing leishmaniasis treatment for the people of the district and the neighbouring districts since 2005. The major economic activity of the district is agriculture.

Kafta-Humera district (Humera) is one of the districts in the western part of Tigray regional state (see figure 1.3). The total population according to the 2007 census was 92,000 (CSA 2007). Humera is bordered by Sudan in the west and Eritrea in the north. It is semi-arid area with fertile land attracting large-scale agricultural investment for harvesting sesame and sorghum. For this, a large number of seasonal migrant workers travel to the area from the highlands of the country. Humera town is the capital of the district and has a district hospital staffed with five medical doctors, including one Internist, two Health Officers, 48 nurses, 10 laboratory professionals and 8 pharmacy professionals. The hospital has 60 beds for medical wards in addition to the *kala azar* shelter. The district is endemic for malaria and VL and has provided VL treatment since 1997.

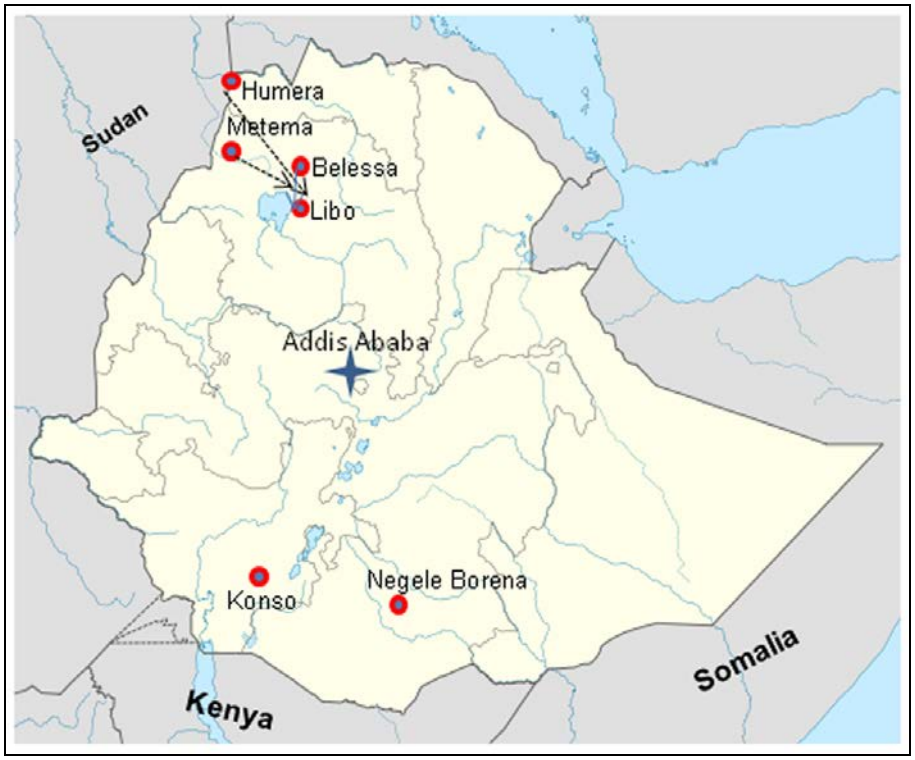


Figure 1.3 Main foci of VL in Ethiopia

Source: Gelanew, Cruz, Kuhls, Alvar, Caňavate, Hailu and Schönian (2011:596)

1.7 PHASES OF THE STUDY

This study consisted of two phases. Phase 1 comprised a retrospective analysis by means of a structured audit tool to collect data from patient files who reported at the two clinics under study.

Phase 2 collected data using a structured questionnaire to determine whether health care professionals who deal with the diagnosis of VL in the two clinics under study were equipped to diagnose VL.

1.8 RESEARCH DESIGN AND METHODOLOGY

A research design is the overall structure or plan of the research activity (Bowling 2002:143). A research design is an overall plan for obtaining answers to research questions (Polit & Beck 2008:66).

A research design is “a blueprint for conducting a study and maximizes control over factors that could interfere with the validity of the study” (Burns & Grove 2009:218). The overall purpose of the research design is to aid in the systematic solution of research questions or hypotheses and to maintain control study uniform and avoid impingements (LoBiondo-Wood & Haber 2010:158). The researcher selected a quantitative, descriptive and explorative design for the study (see chapter 3). Burns and Grove (2001:26) describe quantitative research as “a formal, objective, systematic process in which numerical data are used to obtain information about the world”.

The researcher considered this design appropriate since he wished to obtain complete and accurate information about the clinical manifestations and nutritional status of VL patients in the selected clinics through observation, description and classification. The design would also help to identify the common clinical manifestations of VL in Ethiopia and factors affecting treatment outcome of patients.

Bowling (2002:143) refers to research methodology as the scientific method and procedures followed to collect and analyse the data, including the population and sample, data-collection instrument and data analysis.

Table 1.1 summarises the research design and methodology of phases 1 and 2 of the study.

Table 1.1 Summary of the research design and methodology of Phases 1 and 2 of the study

Phase	Research design	Research instrument	Population	Sample and sampling	Reliability/ Validity	Time frame
Phase 1: Retrospective descriptive phase	Quanti-tative, retrospective	Audit	All patients presenting at two clinics under study in Ethiopia (Total 2,981)	Sample: 10% of population (files) adhering to inclusive criteria N=298 patients Sampling:	Presented By colleagues for comments	Date: include for example Files dated from 10 May 2005- 10 January 2009
Phase 2 Explorative phase	Quantitative, explorative	Structured question-naire	All health care workers permanently employed by the two clinics under study (Total 55)	All health care workers willing to participate in the study and adhering to inclusive criteria.	Pre-test of questionnaire	Date Staff employed by the clinics before 31 December 2010.

The selected study design dealt with describing and exploring clinical manifestations and anthropometric profiles for VL patients in the research setting of two VL clinics. It aimed to describe the presence of specific factors associated with the outcome by analysing patient records of the two clinics and in addition to determine the knowledge of health care professionals to diagnose the disease. The study design was preferred as there is a good record of VL treated cases from the two clinics.

In phase 1 of the study, the researcher opted for a quantitative, retrospective, descriptive and cross-sectional approach. This enabled the researcher to provide a detailed description of the significance of the most common clinical manifestations of VL patients and their nutritional status in the selected VL clinics. In phase 2, the researcher used a quantitative, explorative design to explore the knowledge of health care

professionals who deal with patients suffering from VL and report to the two clinics under study (see chapter 3).

1.8.1 Phase 1

1.8.1.1 Quantitative

The quantitative research process involves conceptualizing a research project, planning and implementing that project and communicating the findings (Burns & Grove 2009:37). In quantitative research, the researcher connects evidence according to a carefully predetermined plan under rigorous and controlled circumstances using formal instruments to collect the required information (Somekh & Lewin 2006: 215). In conducting a quantitative research, the most precise instrument is used to measure the study variable by collection of quantitative and numeric data.

According to LoBiondo-Wood and Haber (2010:583), quantitative research is the process of testing relationships; differences and cause-and-effect interactions among and between variables tested either by hypothesis or research questions.

1.8.1.2 Retrospective

In a retrospective study both the proposed cause and the proposed effect have already occurred (Burns & Grove 2009:240, 298; LoBiondo-Wood & Haber 2010:204). Retrospective design is a research technique where the researcher identifies a group of people who have experienced a particular event.

In this study, medical records of VL patients on their clinical manifestations and their nutritional status were investigated in the two selected clinics for the period from 10 May 2005 to 10 January 2009.

1.8.1.3 Descriptive

A descriptive study design is crafted to gain more information about the characteristics within a particular field of study to provide a picture of situations as they naturally happen (Burns & Grove 2009:237).

In this study, the researcher selected a descriptive design to gain more information on the clinical timeous identification of the signs and symptoms of VL in Ethiopia to make recommendations on the identification of deficiencies and justify existing practice for the leishmaniasis control programme. The researcher explored the views, knowledge and training of health workers on VL in the two selected clinics, using a questionnaire.

1.8.1.4 Cross-sectional

In a cross-sectional study, data is collected at one point in time with the same subjects rather than with the same subjects on several occasions (LoBiondo-Wood & Haber 2010:202). A cross-sectional study design is suitable for measuring the prevalence of disease and is typically descriptive in nature where it provides quantitative estimate of the magnitude of a problem without measuring the temporal relationship between cause and effect (Friis & Sellers 2009:256).

In this study, a cross-sectional design was used to collect data on leishmaniasis clinical presentations and nutritional status from existing data from two selected VL clinics in Ethiopia for the period from 10 May 2005 to 10 January 2009.

1.8.2 Phase 2

An exploratory research design is used “to search for accurate information about the characteristics of particular subjects, groups, institutions or about the frequency of a phenomenon’s occurrence, particularly when little is unknown about the phenomenon” (LoBiondo-Wood & Haber 2006:240).The aim is to gain a broader understanding of a situation, phenomenon or community (Bless & Higson-Smith 2000:41).

In phase 2, the researcher adopted a quantitative, explorative design to explore the views, knowledge and training of health workers on leishmaniasis in the two selected clinics, using a structured questionnaire (see chapter 3).

1.8.3 Research methodology

The research methodology provides a comprehensive description of the methods used for the study (Joubert & Ehrlich 2007:49). The research methodology includes the population, sample and sampling, and data collection and analysis.

1.8.3.1 Population

The population in a study includes all the elements (people or objects) that meet the criteria that make them typical of a particular population (Burns & Grove 2010:714). Polit and Beck (2006:259) describe a population as “the entire aggregation of cases that meet the requirements of a specified area”. The population represents the entire set of individuals that have common characteristics. The accessible population comprises those individuals who conform to the eligible criteria and are available for participation in a particular study, whether directly or from the evidence of the records of their experience in the hospital (Burns & Grove 2005:342).

In this study, the population in phase 1 consisted of the individuals admitted for VL treatment in the two selected clinics of Libo and Kafta Humera districts of Ethiopia. The rationale for choosing these clinics was that the north-western part of the country is the most endemic area in Ethiopia accounting for the largest burden of disease of leishmaniasis. This part of the country has wide agricultural activities thereby attracting large numbers of migrant populations for daily labour.

The eligible population for phase 1 included all 2 975 VL patients treated from 10 May 2005 to 10 January 2009 in the two clinics under study (see table 1.2). This period was taken because of the availability of data in the specified period. Records of VL patients treated in the two treatment centres for the above period were used. Data was collected from the records of the clinics and of Mèdecine Sans Frontières (MSF), a humanitarian international organization providing leishmaniasis treatment and control in this area.

Table 1.2 Statistics for the treatment for leishmaniasis from 10 May 2005 to 10 February 2009

Period	Number of patients reported at Clinic AZ	Number of patients reported at Clinic KAH	Total patients treated
10 May 05 – 09 May 06	1510	No data	1510
10 May 2006 – 09 May 07	431	307	738
10 May 2007 – 09 May 08	74	439	513
10 May 2008 – 10 Jan 09	No data	214	214
	2015	960	2975

Source: Libo and Kafta Humera District Health Offices (2005-2009); Mèdecine Sans Frontièrs (2005-2009)

Table 1.2 indicates that a total of 2 975 cases were reported between 10 May 2005 and 10 February 2009. The period 10 May 2005 to 09 May 2006 had the largest number of cases reported and in AZ Clinic during the Libo outbreak of VL. The periods 10 May 2005 to 09 May 2006 and 10 May 2008 to 10 January 2009 lacked VL data for AZ and KAH Clinics, respectively.

For the purposes of this study, only the records of VL patients older than 6 years at the time of admission, with complete data, and during the period 10 May 2005 to 10 January 2009 were considered.

The population for phase 2 included all the health care professionals permanently employed by the two clinics under study. The eligible population for the study were all 75 health care professionals permanently employed by the two VL clinics under study and had at least one year's experience in the selected clinic. The health care professionals could be nurses, health officers or physicians.

1.8.3.2 Sample and sampling

Sampling is the process of selecting a portion of the designated population to represent the entire population whose main purpose is to increase the efficacy of a research study (LoBiondo-Wood & Haber 2010:224). Proper sampling allows for drawing inferences

and generalisations about the population through the use of a sampling plan which enhances representativeness, reducing systematic bias, and decreasing sampling error (Burns & Grove 2009:348).

A sample is a subset of the study population that is selected for a particular study (Burns & Grove 2009:42). It is a set of elements that make up the population (LoBiondo-Wood & Haber 2010:224).

In phase 1, the entire population could not be utilized and a sample was thus selected by means of systematic sampling. Burns and Grove (2009:352) refer to systematic sampling as "the process of selecting every k^{th} individual on the list, using a starting point selected randomly". In this study, every tenth patient record from the VL data base of the two clinics was used to identify the sample.

Sample size refers to the number of elements that are included in the sample and a large sample size is no guarantee for an increased degree of accuracy (Brink et al 2006:135). In this study, the sample size was 297, which was 10% of the total patients treated between 10 May 2005 and 10 January 2009 in the two clinics under study.

In phase 2, the sample was selected by means of random selection from the clinics' attendance registers.

1.8.4 Data collection

Burns and Grove (2009:43) define data collection as "the precise, systematic gathering of information relevant to the research purpose or the specific objectives, questions or hypotheses of a study. In this study, the researcher collected data by using an audit tool (phase 1) and structured questionnaire (phase 2) (see chapter 3).

In phase 1, the researcher made a case-by-case summary, using an audit tool consisting of six sections (see annexure C):

- Section 1: Demographic profile, including patient's gender, in-patient record number, address

- Section 2: Patient's duration of illness, date of admission, date of discharge, date of death, form of VL at admission, other concomitant infections diagnosed
- Section 3: Patient's infectious status, including fever, abdominal pain and swelling, diarrhoea, bleeding tendency, splenomegaly, hepatomegaly, lymphadenopathy, anaemia and oedema
- Section 4: Patient's co-morbidities associated with VL and nutritional status
- Section 5: Patient's treatment and outcome of treatment
- Section 6: Endorsements by the research assistant.

In phase 2, the researcher developed and used a structured questionnaire (referred to as tool B) to compile the level of knowledge of health care workers in the two VL clinics. The questionnaire consisted of the following five sections:

- Section 1: Clinic name, administrative region, district, date of data collection, health worker's professional qualifications and training
- Section 2: Health care worker's knowledge of VL transmission and epidemiology
- Section 3: Health care worker's knowledge of symptoms and signs of VL
- Section 4 and 5: Health care worker's knowledge and perception of the leishmaniasis services in Ethiopia.

The data-collection tools were submitted to the researcher's supervisor and statistician for comment and approval.

1.8.5 Data analysis

Descriptive statistics were used to investigate and describe the clinical manifestations of VL and its correlation with anthropometric measures. The dependent or outcome variables were severe acute malnutrition and mortality while the independent or predictor variables were age, sex, duration of illness, distance from VL clinic, and HIV. The data was carefully scrutinized for accuracy before it was entered on a data sheet. The data was analysed using the Statistical Package for Social Sciences (SPSS) version 17.0 program and Epi Info version 3.5.1 (see chapter 3).

1.9 VALIDITY AND RELIABILITY

The quality of research is determined by its validity and reliability.

1.9.1 Validity

Validity refers to the extent to which an empirical measure reflects the real meaning of the concept under consideration (Babbie & Mouton 2001:122). The validity of a measurement instrument measures accuracy (De Vos, Strydom, Fouche & Delport 2002:166). The validity of an instrument is the extent to which it actually reflects or measures what it is supposed to measure (Burns & Grove 2009:380).

In this study, the researcher submitted the questionnaire to the study supervisor, the statistician and an independent expert to evaluate the face validity, content validity and construct validity and to check for conceptual and investigative bias (see chapter 3).

1.9.2 Reliability

Reliability is concerned with the consistency of the measurement technique providing the same result in subsequent measurements (Burns & Grove 2009:222). Reliability of a research instrument is the extent to which the instrument yields the same results on repeated measures (LoBiondo-Wood & Haber 2010:295).

The reliability of the questionnaire was ensured by accurate and careful phrasing of each question to avoid ambiguity. In addition, the researcher conducted a pilot study or pre-test to ensure accuracy and dependability.

1.10 ETHICAL CONSIDERATIONS

Ethics deals with matters of right and wrong. *Collins English Dictionary* (1991:533) defines ethics as “a social, religious, or civil code of behaviour considered correct, esp. that of a particular group, profession, or individual”. Research that involves human beings as subjects should be conducted in an ethical manner to protect their rights. Polit and Beck (2008:167) emphasise that when people are used as study respondents, “care must be exercised in ensuring that the rights of the respondents are protected”.

The most important requirements for this study included carrying out the research competently; managing the resources honestly; acknowledging the role of those who guided and assisted with the study; the accurate and unbiased communication of the results and careful consideration of the impact of that the research would make on society in general (Brink et al 2006:3).

Accordingly, the researcher obtained permission to conduct the study, upheld the principle of respect, and respected the respondents' right to self-determination, privacy, anonymity, confidentiality, fair treatment, and protection from harm and discomfort
The researcher obtained written permission to conduct the study from the Research and Ethics Committee of the Department of Health Studies, University of South Africa, the Regional Health Bureau, and the board of the VL clinics.

The ethical principle of beneficence is the most fundamental ethical principle and it refers to at least "doing no harm", or the ability of the researcher to refrain from exploiting the study participants, but to rather promote both individual and societal benefits (Stommel & Wills 2004:377).

The information collected was treated as confidential and was never made available to any unauthorised individuals who were not directly involved in the study. The ethical considerations for this study are discussed in detail in chapter 3

1.11 SCOPE AND LIMITATIONS OF THE STUDY

The study was conducted in two selected clinics in two highly VL endemic regions in the north-western part of Ethiopia. The study was therefore limited by resource constraints, including time, human resources and finance to cover more VL clinics.

Despite the researcher's best efforts to eliminate and minimize errors by using a structured audit tool, the information obtained from a number of patient records was incomplete. The incompleteness of the records made the process of data collection vulnerable to research biases, to some extent, especially in cases where the diagnosis had not been well written or where the information in the records was incomplete or omitted.

1.12 DEFINITION OF KEY TERMS

In this study, the following terms were used as defined below.

- **Visceral leishmaniasis (VL).** Visceral leishmaniasis (VL) is a systemic disease characterised by a range of symptoms, including fever, (hepato)splenomegaly, lymphadenopathy, weight loss, weakness and, if left untreated death (Murray et al 2005:1570)

- **Clinical manifestation.** Clinical means "relating to the observation and treatment of a disease or condition; causing observable and recognizable symptoms" *(Oxford English Dictionary* 2009:268). *Melloni's Pocket Medical Dictionary* (2006:434) defines clinical as "relating to the bedside observation of course and symptoms of a disease".

  Melloni's Pocket Medical Dictionary (2006:1490) defines manifestation as "the display of characteristic signs and symptoms of a disease".

  Clinical manifestation refers to the bedside observation of patients, the course of their disease, or the observation and treatment of patients directly. In scientific terms, clinical manifestation is an indication of the existence, reality, or presence of illness.

  In this study, clinical manifestation refers to the identification of signs and symptoms that contribute to the identification of VL patients in Ethiopia.

- **Nutritional status.** The *Oxford Advanced Learner's Dictionary of Current English* (2006:1003) defines nutrition as "the process by which living things receive the food necessary for them to grow and be healthy".

  Status refers to "the situation at a particular time during a process" (*Oxford Advanced Learner's Dictionary of Current English* 2006:1445).

Nutritional status refers to the condition of the body in those respects influenced by diet; levels of nutrients in the body, and the ability of those levels to maintain normal metabolic integrity (*Oxford Food and Nutrition Dictionary* 2005:279).

For adults, general nutritional status is assessed by measuring weight and height; the result is commonly expressed as the body mass index, the ratio of weight (kg) to height^2 (m). For children, weight and height for age are compared with standard data for adequately nourished children.

In this study, nutritional status refers to the nutritional condition of the VL patient on admission, based on the standard anthropometric measures.

- **Malnutrition.** The *Oxford Dictionary of English* (2009:864) defines malnutrition as "lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things, or being unable to use the food eaten".

  Malnutrition is "a poor condition of health caused by a lack of food or a lack of the right type of food" (*Oxford Advanced Learner's Dictionary of Current English* 2006:894).

  In this study, malnutrition refers to a significant weight loss due to unknown origin. Severe malnutrition is defined as severe wasting (< 70% weight for length or < -3 Z-score) and/or oedema or for those <= 14 years and BMI < 16 for those above 14 years of age (Briend, Prudhan, Prinzo, Daelmans & Mason 2006:27; Mueller, Ritmeijer, Balasegaram, Koummuki, Santana & Davidson 2006:3).

- **Anthropometry** refers to body measurements used as an index of physiological development and nutritional status; a non-invasive way of assessing body composition (*Oxford Dictionary of Food and Nutrition* 2009:18).

  Anthropometry is "the scientific study of the measurements and proportions of the human body" (*Oxford Dictionary* of *English* 2009:27).

In this study, anthropometry refers to the measure of the body as nutritional status of the VL patients in the two selected clinics. Body mass index (BMI) and weight-for-height values are used for assessing the nutritional status.

- **Clinic/VL Clinic.** A clinic is “a building or part of a hospital where people can go for special medical treatment or advice (*Oxford Advanced Learner’s Dictionary of Current English* 2006:264).

  According to the *Oxford Dictionary of English* (2009:209), a clinic is “a special place or time at which specialized medical treatment or advice is given to visiting patients”.

  In this study, a clinic refers to a health care facility (hospital or health centre) in Ethiopia where patients receive treatment for visceral leishmaniasis (VL).

1.13 OUTLINE OF THE STUDY

Chapter 1 outlines the research problem; the setting, purpose, objectives and significance of the study; research design and methodology, and ethical considerations, and defines key terms.

Chapter 2 discusses the literature review conducted for the study.

Chapter 3 discusses the research design and methodology.

Chapter 4 describes the data analysis and interpretation.

Chapter 5 presents the conclusions, limitations and recommendations of the study.

1.14 CONCLUSION

This chapter described the research problem, purpose and significance of the study, research design and methodology, data collection and ethical considerations, and defined key terms.

Chapter 2 discusses the literature review.

CHAPTER 2

Literature review

2.1 INTRODUCTION

Chapter 1 provided the orientation to the study. This chapter discusses the literature review conducted for the study. The literature review focused on the transmission of leishmaniasis; the vector, parasite and host factors, and clinical presentations of VL patients.

The purpose of a literature review is to critically examine and discuss existing research on a particular topic. The researcher therefore consulted periodicals, books, abstracts, web pages and comments on the topic of the study. According to Roberts (2004:763), a literature review

- Helps to bring a study into proper focus by relating it to what is already known about the topic.
- Identifies key variables for research; suggests the relationships that might exist between them, and suggests how previous research on the topic could be usefully extended by means of further research and study.
- Identifies the exact way in which the study topic relates to present and past studies and findings.
- Provides a basis for determining the significance of the study.
- Helps the researcher to make logical and contextual links between the findings and procedures of the present study and previous studies in the field.

For the purpose of this study, a literature review was conducted to examine the strength of the evidence and to identify studies that provide evidence of a particular intervention, to critique the quality of the study and synthesise evidence (Burns & Grove 2009:90). The researcher reviewed studies on leishmaniasis to investigate clinical manifestations, malnutrition and treatment outcomes for VL.

The literature review gave the researcher a more refined and in-depth insight into the intricacies of the disease and provided additional information about the morbidity and trends in other countries where VL is also found. The literature review indicated developments and achievements in reducing the morbidity and mortality of VL patients and measures to combat and prevent the spread of the disease.

2.2 SCOPE OF THE LITERATURE REVIEW

The literature review covered clinical manifestations of VL. The scope of the review was broad enough to allow the researcher to become familiar with the research problem and narrow enough to cover mainly sources with direct bearing on the problem studied (Burns & Grove 2003:110). Hence, the review focused on the leishmania parasite, VL disease transmission, clinical manifestations and the rate of severe acute malnutrition.

Table 2.1 summarises the key words used to search for information related to clinical manifestations of VL.

Table 2.1 Summary of key concepts used during the literature search

Key concepts	Data base
1. Leishmaniases	Google, WHO website, WHO Ethiopia country office library search
2. The leishmania parasite	PubMed, Google
3. Visceral leishmaniasis	WHO website, Google, PubMed,
4. Epidemiology of leishmaniasis	WHO website, PubMed, Google, United Nation Economic Commission for Africa Library search
5. Transmission of leishmaniasis	WHO website, PubMed, Google,
6. Diagnosis of leishmaniasis	WHO website, PubMed, Google
7. Treatment of visceral leishmaniasis	WHO website, PubMed
8. Prevention and control of leishmaniasis	WHO website, PubMed
9. Integrated vector control	WHO website, PubMed

The literature review indicated limited information on the clinical presentations and nutritional status of VL patients specifically in Ethiopia.

2.3 INCIDENCE OF VISCERAL LEISHMANIASIS (VL)

Anthroponotic VL is primarily restricted to east Africa and the Indian subcontinent (WHO 2010a:107, 109). Individuals who are untreated VL cases or cases with post kala-azar dermal leishmaniasis are the sole reservoirs for the disease. The priority therefore for intervention of the disease is based on early case detection and prompt treatment.

Lack of leishmaniasis disease surveillance and misdiagnosis underestimates the true incidence of the disease in most of the VL endemic countries. Failure to diagnose VL leads to increased fatality rates. Numerous VL cases are undiagnosed, misdiagnosed or underreported, especially in settings where there is lack of access to leishmaniasis services, case detection is passive and the disease is not notifiable, which results in absent or poor quality data (Desjeux 2004:307). This scarcity of reliable data and sparse empirical data on leishmaniasis incidence, as well as geographical clustering of the disease, makes estimation difficult, and results in considerable underestimation of the real burden of VL (WHO 2010a:105). The extent of underreporting in VL endemic countries is substantial ranging from two- to 40-fold (WHO 2010a:105).

Prevalence and incidence data on leishmaniasis is unreliable with lack of objective data as transmission of the disease often occurs in remote and rural areas. Most patients are not diagnosed because they do not receive medical care and the disease is notifiable in only 33 of the endemic countries (World Health Assembly 2007:2).

2.3.1 Global incidence of VL

Of the estimated 1.5 to 2 million annual new cases of all forms of leishmaniases, the visceral form alone accounts for 0.5 million of the cases. It is estimated that 90% of the VL burden occurs in the poorest areas of Bangladesh, Brazil, Ethiopia, India, Nepal and Sudan (WHO 2009:92). Globally, over 200 million people are at risk of contracting VL (Boer & Davidson 2006:187).

According to the WHO (2007:2), VL is prevalent in 70 countries with the largest foci being south-east Asia with an estimated 300,000 cases reported in 2006. The Indian subcontinent accounts for more than 50% of the global VL burden followed by east Africa. In this region, cross-border migration for socio-economic reasons is an important

risk factor for anthroponotic VL dissemination (Desjeux 2001:242). About 4,000 cases were reported from the Americas. New VL foci are appearing at an alarming rate in East Africa thereby increasing the VL incidence (Ngure, Kimutali, Tonui & Ng'ang'a. 2009:6; WHO 2007:2).

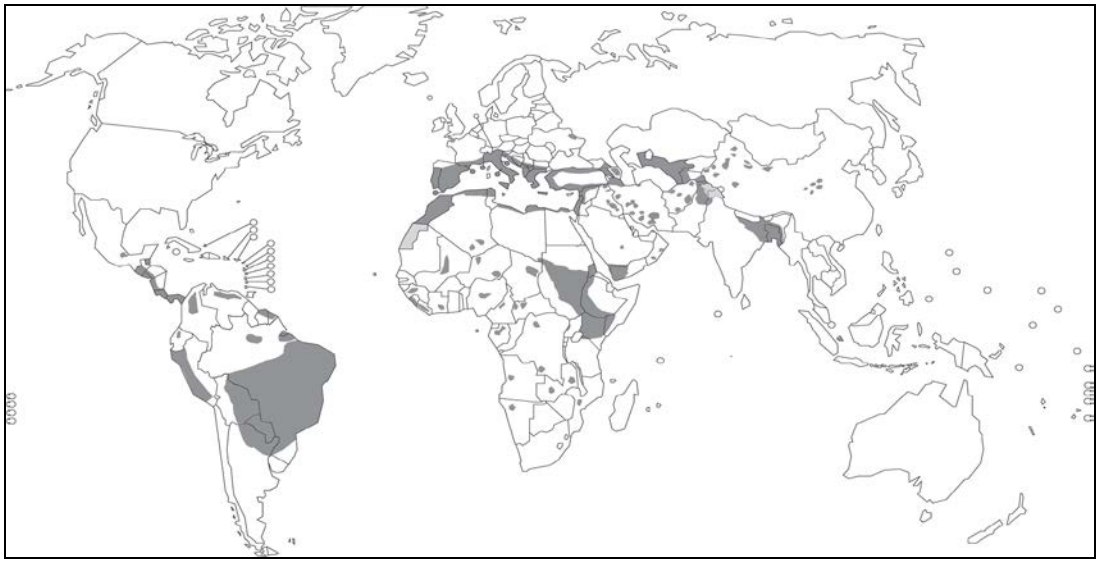
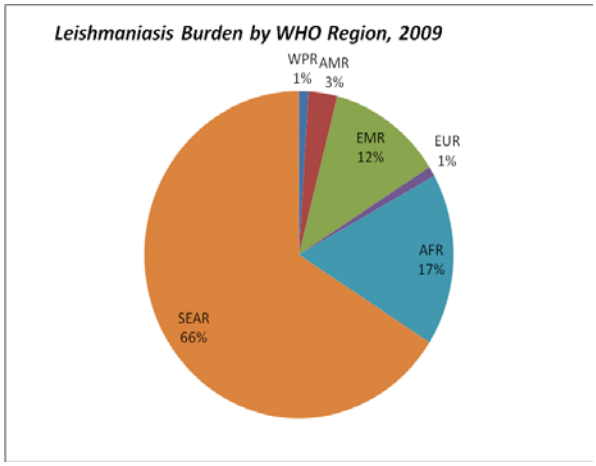


Figure 2.1 Global geographical distribution of VL

Source: WHO (2010a:108)

From figure 2.1, it is evident that visceral leishmaniassis is widely distributed in the world. It affects countries in the five continents with variable degrees of endemicity. The highest burden of VL is on the Asian continent affecting India, Bangladesh and Nepal most among the others. African harbours the second largest foci of VL patients, where Sudan, Ethiopia, Uganda, Kenya and Somalia are affected.



Keys

AFR-African

AMR-American

EMR- eastern Mediterranean

EUR-European

SEAR-Southeast Asia

WPR-west Pacifi

Figure 2.2 Leishmaniasis disease burden by WHO region

Source: WHO (2010b:94)

From figure 2.2 above, it can be seen that 66% of the leishmaniasis disease burden occurs in Southeast Asia, 17% in Africa, 12% in the Eastern Mediterranean region and 3% in the Americas region of the WHO. The smallest burden of leishmaniasis is reported from the Western Pacific and European regions of the WHO, each comprising of 1% of the total burden.

The global VL mortality is estimated at 50,000 annually, a rate surpassed by malaria only among parasitic disease (WHO 2010:104a; 2010:94b). Access to VL treatment is often poor in most of the endemic countries (Bern, Adler-Moore, Berenguer, Boelaert, Boer, Davidson & Murray 2004:787; WHO 2010b:129). VL is a mandatory reportable disease only in one-third of all the endemic countries (WHO 2010b:129). The disease burden is calculated at 2,357,000 disability-adjusted life years lost (WHO 2010b:104).

2.3.2 Incidence of VL in Africa

According to the WHO (2010a:105,106), the estimated annual reported new VL cases in East Africa is 30,000 making the region the second highest foci for VL. In East Africa, VL is more closely related to the movement of seasonal migrant workers, returnees and refugees due to frequent civil unrest in most of these countries. The overlap in the epidemiology of HIV/AIDS and VL also greatly affects the latter (Desjeux 2004:308). This is due to the susceptibility of these groups when exposed to leishmania-infected sand flies as they do not have natural immunity and rarely practise personal protective measures. Moreover, communities often have reduced immunity due to malnutrition and HIV/AIDS, which increases the susceptibility of individuals (WHO 2010a:38). Poor nutritional status resulting from poor dietary intake increases the chance of leishmania infection progressing to full scale disease.

According to the WHO (2010a: 38), large outbreaks of VL during the south Sudan civil war in the 1980s and 1990s occurred in conditions of massive population movement, destruction of health infrastructure, and increased incidences of other morbidities.

2.3.3 Incidence of VL in Ethiopia

VL is distributed throughout the lowlands of Ethiopia with varying degrees of endemicity. The disease has been reported from at least 40 different localities and new foci are being reported. The spread of the disease may be due to population movement to and from endemic areas (MoH 2006:2). VL usually occurs in the arid or semi-arid areas unlike for Libo which is the new foci located at an altitude of 2000 metres (Bashaye 2009:37). It is caused by the *leishmania donovani* parasite. *P. orientalis, P. martini* and *P. celiae* are the vectors transmitting the parasite from infected people to healthy individuals as transmission is anthroponotic (MoH 2006:3).

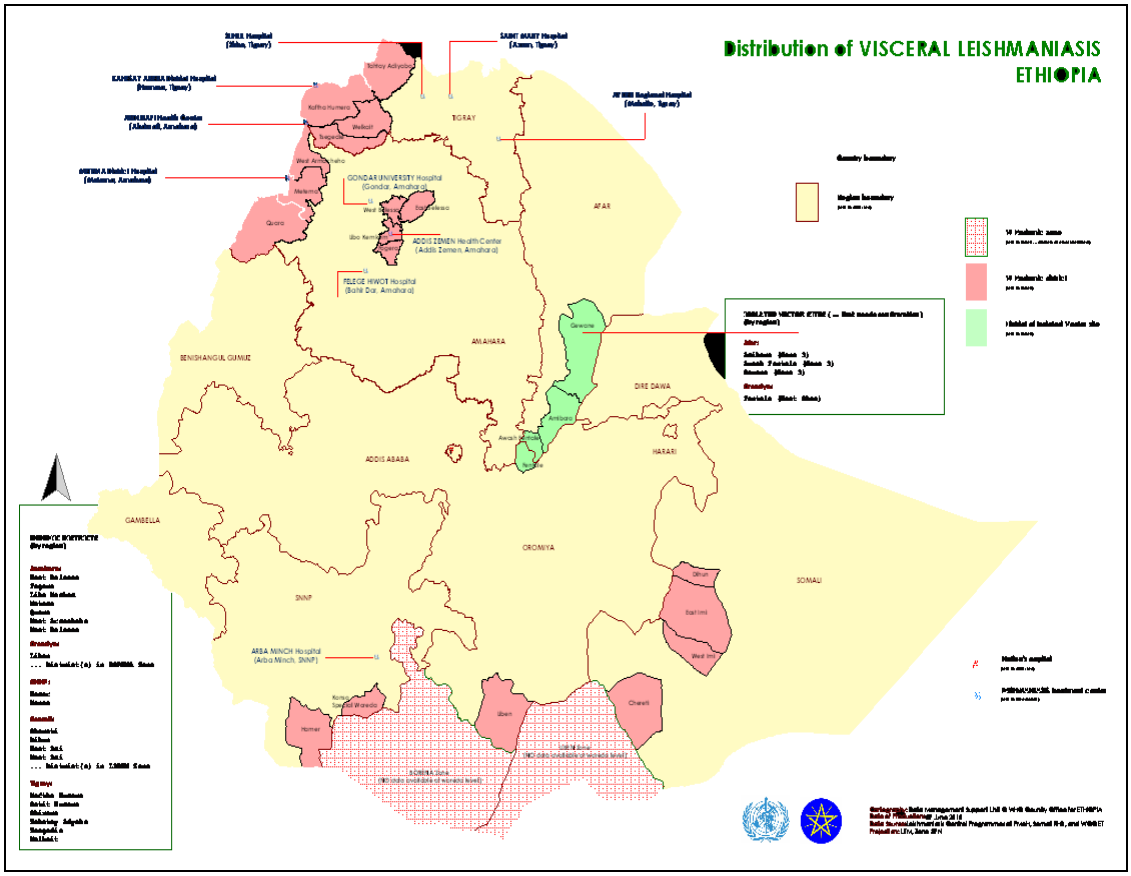


Figure 2.3 VL in Ethiopia

Source: WHO (2010:[n.p.])

Figure 2.3 depicts the major VL foci in Ethiopia affecting five out of the nine administrative regions (depicted in red). The disease is distributed mainly in the north and north western part of the country and, to some extent, in the southern part of the country. Some areas need further exploration to confirm the presence of active transmission (depicted in light green).

According to the MoH (2006:2), the most important VL foci in Ethiopia are the fertile lowlands of Metema and Humera in the north-western part of the country where there is large area of agricultural activity. The Segen Valley and its surroundings in the Konso and Omo plains in the southwest are other important foci of the disease in Ethiopia (MoH 2006:2).

The burden of VL is not well understood in Ethiopia due to underdiagnosis and under-reporting of cases. Around 3 000 people contract the disease every year, with 30% of the patients malnourished (Burki 2009:371, 374).

The median age of VL patients in Ethiopia is 26 years and about 10% of the VL cases are unable to walk unassisted. The mean BMI is 17.3 (Ritmeijer, Dejenie, Assefa, Beyene, Mesure, Boots, Boer & Davidson 2006:371). Rijtmeijer et al found median values for spleen size and haemoglobin of 8.5 cm and 9 gram/decilitre.

Figure 2.4 Patients with VL

Source: WHO (2010b:96)

Table 2.2 Organs affected by leishmaniasis with corresponding signs and symptoms for the different forms of leishmaniasis

Organ infected	Signs and symptoms
Skin	Skin nodule or ulcer for cutaneous leishmaniasis patients Swelling of the skin at the site of bite by the sand fly vector, darkening of the skin, hypo-pigmented skin lesions (usually following VL treatment).
Spleen	Enlargement of the spleen, abdominal discomfort and swelling, early satiety
Liver	Enlargement of the liver, abdominal discomfort, swelling of the body
Lymph node	Enlargement of the lymph nodes
Bone marrow	Bleeding tendency, dizziness, pallor
Gastro-intestinal tract	Abdominal pain, diarrhoea, weight lose (with malabsorption)
Respiratory tract	Cough

Figure 2.4 depicts the clinical manifestation of mild to severe forms of leishmaniases. The photograph was taken of a child waiting for VL treatment during the 2005 disease outbreak in Libo, North Ethiopia (WHO 2010b:96 with permission).

In 2005, a new but major VL outbreak occurred in the Libo Kemkem district of the Amhara Regional State, and 2,543 VL cases were treated in Addis Zemen health centre from 25 May 2005 to December 2007. The case fatality rate was estimated at 4% (Alvar et al 2007:279, 280). The case fatality rate was increased for VL patients who presented with severe malnutrition, HIV co-infection, the frail and the elderly, and those who suffered from severe anaemia.

Table 2.3 VL data for 2010 in selected treatment centres in Ethiopia

Region	Name of Centre	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total
Amhara	Addis Zemen HC	56	31	48	34	**169**
	Gondar Hosp	51	52	48	73	**224**
	Abderafi HC	79	54	123	138	**394**
	Metema Hosp	38	23	26	142	**229**
Tigray	Kahsay Abera Hosp	122	83	100	200	**505**
	Axum Hosp	46	54	35	73	**208**
	Ayder Hosp	9	5	11	14	**39**
	Suhul Hosp	0	20	19	22	**61**
	Total	**401**	**322**	**410**	**696**	**1829**

Source: MoH 2010 (extracted from health facility HMIS reports)

Table 2.3 indicates that a significant number of VL cases have been treated in the mentioned health facilities in Amhara and Tigray regions. Being known as old foci for VL, Kahsay Abera and Metema Hospitals and Abderafi health centres treated the largest number of cases in 2010. From table 2.3, it is also evident that the peak season for VL cases is from October to February because most of the cases were admitted during this period.

2.4 THE SAND FLY VECTOR

This section discusses the sand fly as vector for leishmaniasis, the various species of sand fly and its distribution in the world.

2.4.1 Vector behaviour

According to the WHO (2010a:28), the only proven vector of the leishmania parasite is the female sand fly of the genus phlebotomus. It is a two to three millimetre long blood-sucking insect. The sand fly is widely distributed in the tropics and subtropics of the world. Its larvae require organic matter, heat and humidity for development. Sand flies commonly live in household rubbish, bark and burrows of old trees and inside cracks of houses, soil, and termite mounds. Only 30 of the total 500 species of phlebotomine sand flies are found to transmit leishmania parasites. *P. orientalis* and *P. martini* are the most common sand fly vectors responsible for the transmission of the leishmania parasite in Ethiopia (Gebre-Michael 2004:68).

The female sand fly lays her eggs in the burrows of certain rodents, the bark of old trees, ruined buildings, cracks in the walls of houses and animal shelters where the larvae obtain suitable organic matter, heat and humidity (WHO 2010a:31) In search of blood, the sand fly can cover a distance of several hundred metres around its habitat.

Figure 2.5 Phlebotomus sand fly, vector of leishmaniasis

(Source: Sharma & Singh 2008:260)

2.4.2 Species of sand fly

Table 2.4 provides the various sand fly species and its distribution in the countries where the disease has been reported. For the purpose of this study, P.orientalis, P.celiae and P.martini are the most common sand fly species found in Ethiopia. However, *P.duboscqi*, *P.longipes* and *P.sergenti* are also found.

Table 2.4 Distribution of the different species of sand fly vectors in a few selected countries for selected vectors

Sand fly species	Country(ies) with the sand fly species
P.sergenti	Afghanistan, Azerbaijan, Ethiopia, Greece, Iran, Morocco, Pakistan, Yemen
P.orientalis	Yemen, Ethiopia, Chad,
P.duboscqi	Burkina Faso, Cameroon, Ethiopia, Guinea, Kenya, Nigeria, Sudan
P. longipes	Ethiopia,
P.martini	Somalia, Sudan, Uganda, Ethiopia
P.celiae	Ethiopia, Kenya
P.pedifer	Ethiopia, Kenya
P.papatasi	Algeria, Afghanistan, Egypt, India, Iran, Israel, Libya, Jordan, Oman, Sudan, Tunisia, Yemen
P.argentipes	Bangladesh, India, Nepal
P.neglectus	Greece, Italy, Slovenia, Romania,Turkey
P.perniciosus	Algeria, France, Italy, Malta, Monaco, Morocco, Portugal, Spain,

Source: WHO (2010a:91-98)

2.5 CAUSATIVE AGENT OF LEISHMANIA

This section discusses the causative agent for leishmaniasis with emphasis on the leishmaniasis species that cause VL, including a short description of the life cycle of the leishmania parasite

2.5.1 Leishmania parasite

Leishmania are a group of closely related trypanosomatid parasites that are transmitted to humans by the bite of an infected sand fly vector (WHO 2010b:91). They are protozoa belonging to the *leishmania* taxonomic genus. These parasites are tiny and single celled organisms.

Table: 2.5 Leishmania species found in humans

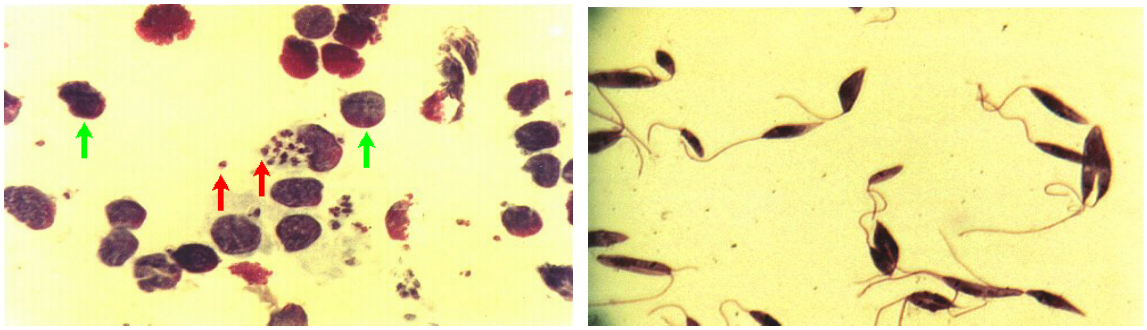
	Principal tropism		
	Viscerotropic	**Dermotropic**	**Mucotropic**
Leishmania subgenus	L.donovani	L.major L Mexicana	L.braziliensis
	L.infantum	L tropica L braziliensis	L.panamensis
		L.aethiopica L.infantum	

Source: WHO (2010a:7)

Table 2.5 lists the different leishmania subgenus causing variable tropism to manifest with different clinical manifestations. L.donovani and L.infantum are viscerotropic and hence cause visceral leishmaniasis (VL). Likewise, L.major, L.tropica, L.aethiopica, L.mexicana, L braziliensis and L.infantum are dermotropic causing cutaneous leishmaniasis, depending on the geographic location. L.braziliensis and L.panamensis are mucotropic affecting mainly the mucous membrane of oropharynx and nasopharynx to cause muco-cutaneous leishmaniasis.

Different species of leishmania parasites are found in different geographic locations and different forms of leishmaniasis are associated with particular leishmania species (WHO 2010a:7). VL is one form of the disease while the other forms are cutaneous and muco-cutaneous leishmaniases. The etiological agents that cause VL belong to *Leishmania donovani complex*, *L.donovani.donovani, L.donovani.infantum* and *L.donovani. archibaldi* in the old world and *L.donovani chagasi* in the new world (Kuhls 2007:334). The leishmania parasite identified to cause visceral leishmaniasis VL in east Africa including Ethiopia is the *L.donovani donovani* species (Jamjoom, Ashford, Battes, Chance, Kemp, Watts & Noyes 2004:401).

a b



Figures 2.6a and b Macrophages infected with leishmania amastigotes (a); flagellated leishmania promastigotes in culture (b)

Source: Atlaw (2011)

Figure 2.6 indicates that the leishmania parasite has two developmental stages, namely the amastigote and promastigote stages. The amastigote stage is an obligate intracellular parasite. As seen in figure 2.6a, the distinctive feature of the promastigate stage of the parasite is that it is flagellated. Identifying the different stages of the leishmania parasite is important as this is vital for parasitological diagnosis of leishmaniasis.

2.5.2 Life cycle of Leishmania

The life cycle of the leishmania parasite is depicted in figure 2.7. All species of the leishmania parasites basically have the same life cycle. Leishmania parasites begin their life cycle in a new human host when the female sand fly bites someone who is already infected by the parasite. When the sand fly takes a blood meal from someone with leishmaniasis, it ingests the amastigote (vertebrate) stage of the parasite. The *amastigote* stage of the parasite, also referred to as Leishman-Donovan bodies, is tiny oval parasites with 3-7 μm in diameter. Inside the sand fly intestine it transforms to the promastigote stage. The promastigote stage is flagellated and the flagella reaches a length of 10-20 μm. Its multiplication is by binary fission. In a period of one week, the promastigotes lodge in the oesophagus of the sand fly to be expelled with another blood meal.

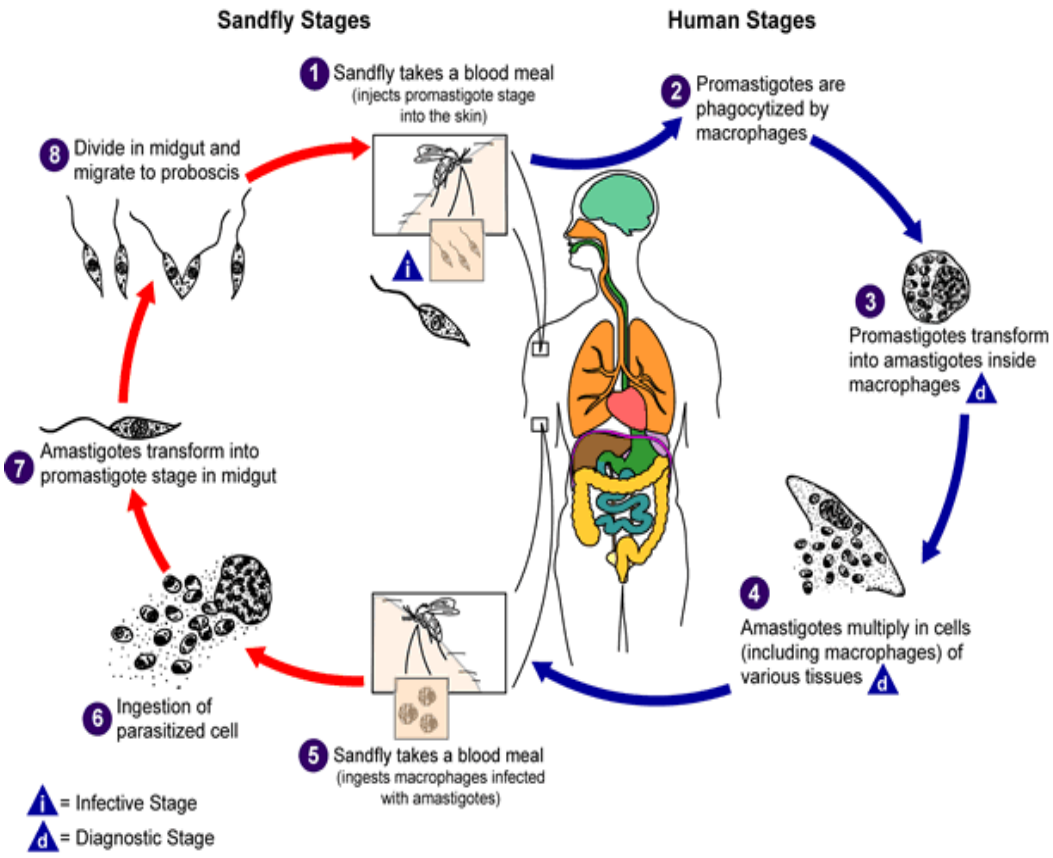


Figure 2.7 Depiction of the leishmania parasite's life cycle

Source: Centres for Disease Control and Prevention (CDC) (2009:6)

The promastigotes then invade host cells, often the macrophages which are active immune cells. It is then transformed to amastigotes where another binary fission occurs inside the macrophages. The parasite filled macrophages will rupture and be destroyed. These amastigotes continue to infect other macrophages and multiply, causing destruction and clinical manifestations (see figure 2.7).

2.5.3 Transmission of disease

Transmission of VL is mainly through the bite of an infected sand fly. However, the leishmania parasite is rarely transmitted through shared syringes among intravenous drug users. The parasite can be transmitted by blood transfusion and congenitally from mother to child (WHO 2010a:36).

2.6 THE HUMAN HOST

This section discusses the human host's susceptibility, pathology, clinical presentation and complications of the disease.

2.6.1 Susceptibility factors for VL

Of all human infections, 80-90% are sub-clinical or asymptomatic due to the strong cell mediated immunity (Blackwell, Fakiola, Ibrahim, Jamieson, Jeronimo, Miller, Mishra, Mohamed, Peacock, Raju, Sundar & Wilson. 2009:254). Various factors make the human host susceptible to the disease, including malnutrition, HIV/AIDS, and socio-economic factors such as poverty.

2.6.1.1 Malnutrition

Lack of proper nutrition increases the risk that leishmania infection will progress to clinical VL with functional failure of the lymph node barrier and increased early visceralisation (WHO 2010a:40).

2.6.1.2 HIV/AIDS

The HIV/AIDS pandemic has modified the natural history of VL. These two diseases comprise a mutually reinforcing cycle of infection where leishmaniasis accelerates the onset of AIDS by encouraging further opportunistic infections and at the same time, HIV-related immunosuppression increases the risk of acquiring VL by 100 to 1000 times in endemic areas (Anema & Ritmeijer 2005:1434). HIV also negatively influences the patient's response to treatment and increases the risk of VL relapse (Cota, De Sousa & Rabello 2008:5; WHO 2007:2). HIV co-infected VL patients have significant lower positive outcome for antileishmanial therapy with the case fatality rate increased by more than 3 times (Hurissa, Gebre-Silassie, Hailu, Tefera, Lalloo, Cuevas & Hailu 2010:851). Both HIV and VL target similar immune cells, causing synergistic damage to the cell mediated immunity. VL promotes HIV disease progression while HIV facilitates VL spread and also complicates its management (MoH 2006:13).

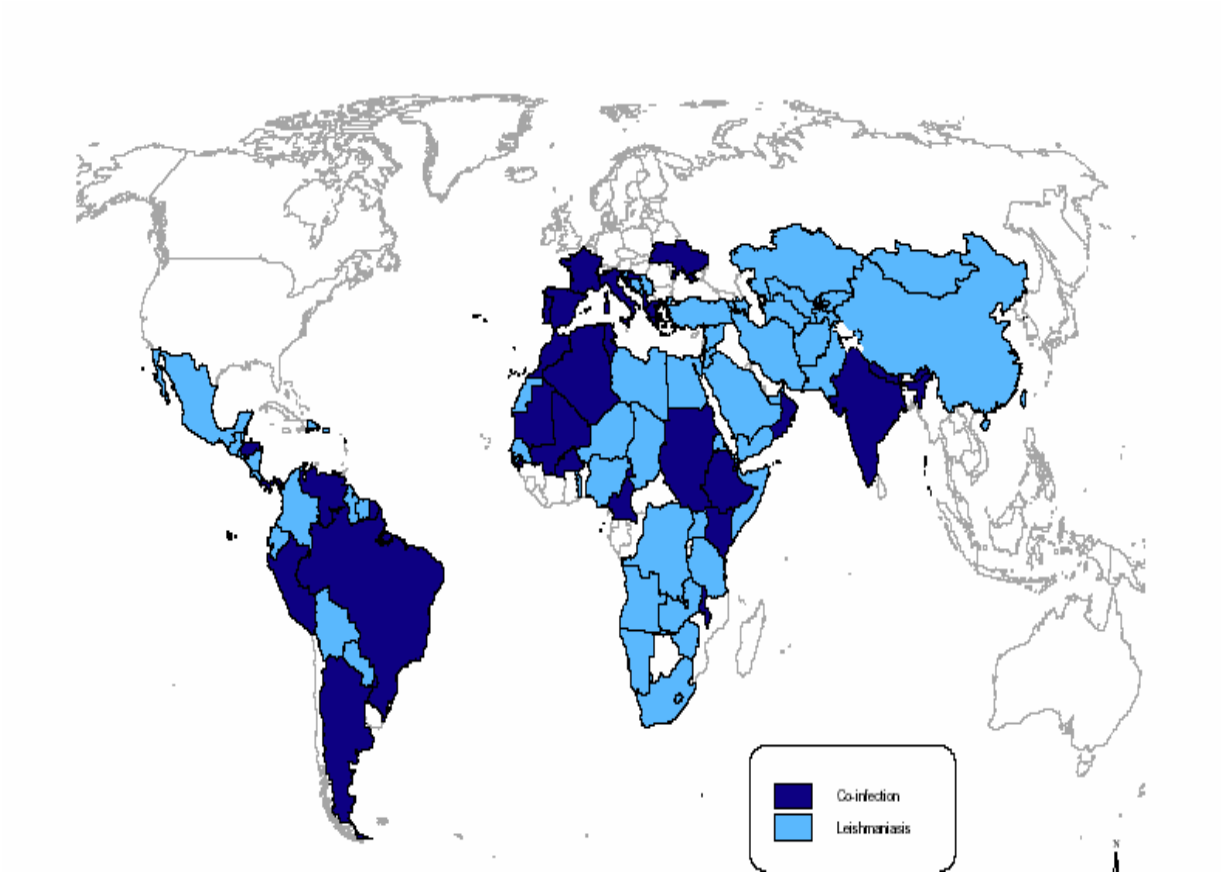


Figure 2.8 Leishmaniasis-endemic countries with VL/HIV co-infection

Source: WHO (2007:9)

Figure 2.8 indicates that Leishmania/HIV co-infection is reported from 34 countries in the world, of which Ethiopia is one. The VL/HIV co-infection rate in Ethiopia is high, reaching up to 40% in some leishmaniasis treatment centres like Kahsay Abera Hospital (WHO 2007:9). According to the WHO (2007:18), seasonal migrant labourers, sex workers, drivers and military people deployed along endemic areas are at risk for VL/HIV co-infection in Ethiopia VL/HIV co-infection is more prevalent in daily migrant workers and relapsed VL patients (Ritmeijer, Dejenie, Assefa, Beyene, Mesure, Boots, Boer & Davidson 2006:361). According to the WHO (2010a:105), the rate of HIV/VL co-infected patients in northern Ethiopia increased from 19% in 1998-1999 to 34% in 2006-2007.

2.6.1.3 Population movement and socioeconomic factors

Poverty increases the risk for VL due to the poor housing and sanitary conditions which favour the sand fly breeding and resting. Economic-driven population movement and

migration of non-immune populations from non-endemic areas to leishmaniasis endemic areas increase the risk of susceptibility to develop the disease (WHO 2010a:40).

2.6.2 Pathology in VL

Infection with L.donovani causes reticuloendothelial hyperplasia affecting the spleen, liver, mucosa of the small intestine, lymph nodes and bone marrow, resulting in paracortical atrophy and reduction in life span of erythrocytes and leucocytes (WHO 2010:13). This may cause anaemia and leucopoenia. Liver involvement may result in hypoalbuminaemia, oedema and other features of malnutrition. In advanced disease, intercurrent infections, including pneumonia, dysentery and tuberculosis, are common (WHO 2010a:13). Figure 2.9 depicts the affected bone marrow caused by leishmania.

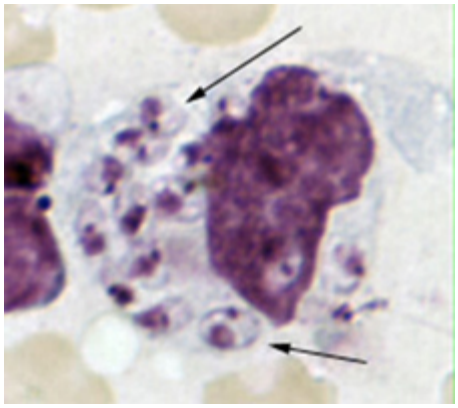


Figure 2.9 Depiction of the bone marrow due to leishamania

Source: CDC (2010:3)

2.6.3 Clinical presentations

The incubation period of VL ranges from 10 days to one year with gradual onset of the disease (WHO 2010a:5). The common symptoms for VL are fever, malaise, shivering, weight loss, anorexia and abdominal discomfort. The common signs are enlarged spleen, wasting and pallor (WHO 2010a:5). Darkening of the skin can occur in Indian VL patients and is hence called kala azar (WHO 2010a:5). In East Africa, a cutaneous nodule or ulcer with or without mucosal lesions containing the leishmania parasite may develop. As the disease progresses, patients develop oedema, and the skin and hair change, suggesting malnutrition (WHO 2010a:5).

a b

Figure 2.10a Patient with typical New World CL ulcer;

Figure 2.10b A marked enlargement of the spleen typical of VL

Source: CDC (2010:6)

Figure 2.10a and 10b depicts clinical manifestations of leishmaniasis: ulcerated skin lesion over the abdominal skin in a Guatemalan, and huge abdominal mass with enlargement of the spleen in a patient from Nepal. The skin lesion due to leishmaniasis usually occurs on the exposed part of the body, mainly the face, but can affect any part of the body as depicted in the picture.

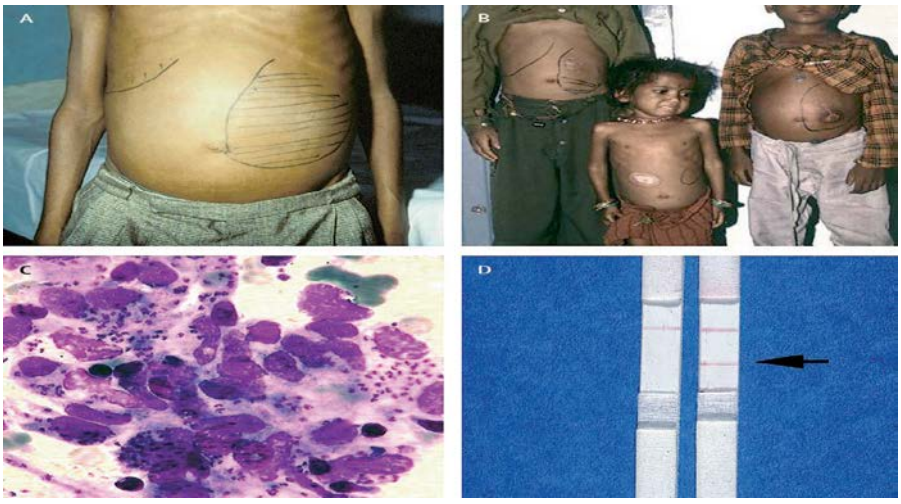


Figure 2.11A Hepatosplenomegaly and wasting in young man

Figure 2.11B Children with burn marks over enlarged spleen or liver

Figure 2.11C Giemsa-stained splenic aspirate smear, showing amastigote stage of the leishmania parasite

Figure 2.11D Serodiagnosis of VL by anti-K39 antibody test

Source: CDC (2010:8)

Figure 2.11 depicts moderate to severe hepatosplenomegaly and wasting of Indian patients suffering from VL. These are the most common clinical manifestations of patients with VL, irrespective of the region. It also depicts two of the commonest methods of laboratory diagnosis of VL: tissue smear and antibody detection test. Direct visualisation of the parasite in clinical specimens (tissue aspirates from spleen, bone marrow and lymph node) is the gold standard diagnosis. Immunochromatographic detection of anti-K39 antibody with fingerstick blood is a rapid, easy and cheap test with 90%-100% sensitivity (Cañavate, Herrero, Nieto, Cruz, Chicharro, Aparicio, Mulugeta, Argaw, Blackstock, Alvar & Bern 2011:104, 105; Murray et al 2005:1570).

2.6.4 Complications

Infiltration of the spleen, bone marrow and lymph nodes can result in atrophy of these organs, causing granulocytopenia and anaemia. Reduction of platelets, in turn, leads to mucosal bleeding. Liver involvement causes hypoalbuminaemia. Diarrhoea can occur due to intestinal parasitisation and ulceration. In advanced stages of the disease, intercurrent infections can occur and these may lead to death (WHO 2010a:13).

2.6.5 Treatment of VL

VL treatment should be provided only after confirmation of the disease and should follow national or regional guidelines (MoH 2006:5; WHO 2010a:54, 55). Ideally, treatment should result in the cure of the patient, reduce the risk for VL relapse, and reduce leishmania drug resistance (WHO 2010a:57). The main aim of treatment is to reduce the parasite load from the body and activate the immune system. In addition to antileishmania therapy, VL patients require management of complications and supportive therapy, including nutritional supplementation and hydration (MoH 2006:7).

Despite VL being the second largest cause of mortality among parasitic diseases, treatment is often unaffordable and not accessible (Boer, Alvar, Davidson, Ritmeijer & Balasegaram 2009:395, 396). Though it needs to become widely available in the poorest endemic localities, several new and less toxic antileishmanial agents became available during the last decade (Maltezou 2008:196).

The drug policy in VL endemic countries and therapeutic decisions is based on the individual benefit-risk ratio of medicines, the health service setting, the availability of medicines and level of drug resistance for leishmaniasis (WHO 2010a:55).

Table 2.6 Recommended treatment regimens for VL for the different geographic regions

Recommended treatment regimens for VL (WHO Expert Recommendations)
1. Anthroponotic Visceral leishmaniasis caused by L.donovani in Bangladesh, Bhutan, India and Nepal: 1.1. Liposomal amphotericin B 1.2. Combination therapy: liposomal ampbotericin B and miltefosine 2. Visceral leishmaniasis caused by L donovani In east Africa (Ethiopia, Eritrea, Kenya, Somalia, Sudan and Uganda) and Yemen: 2.1. Combination therapy: pentavalent antimonials and paromomycine 2.2. Liposaomal amphotericin B (second line therapy) 3. Visceral leishmaniasis caused by L.infantum (Mediterranean basin, Middle East, Central Asia and South America: 3.1. Liposomal amphotericin B 3.2. Pentavalent antimonials

Source: WHO (2010a:66, 67)

Table 2.5 describes the recommended treatment options for the different VL endemic regions of the world. The recommendations are based on available evidence revised by expert groups.

Table 2.7 Antileishmanial drugs in different countries with their potential side effects

Type of Leishmania parasite causing VL	Vector	Country	Medication and dosage	Side effects
L.donovani	*P.orientalis* *P.martini* *P.celiae*	Ethiopia, Sudan	SSG 20 mg/kg/day 30 days	vomiting, myalgia, arthralgia, cardiotoxicity, pancreatisitis,
L.donovani	*P.argentipes*	India	Miltefosine 2.5 mg/kg/day for PO for 28 days	Nausea, vomiting, diarrhoea, teratogenicity
L.infantum	*P.perniciosus*	Spain, Portugal	Liposomal Amphotericin 3-5 mg/kg/day in 3–6 infusions	Infusion related reactions (Fever, chills, rigors) Nephrotoxicity, Anaemia
L.infantum	*Lutzomyia longipalpis*	Brazil	Liposomal Amphotericin 3-5 mg/kg/day in 3–6 infusions	Fever, chills, rigors, Nephrotoxicity

Sources: Desjeux 2004:305-318; Meheus, Balasegaram, Olliaro, Sundar, Rijal, Faiz & Boelaert 2010:6, 7), MoH (Ethiopia) 2006:7; Murray et al 2005:1569; WHO 2010a:67-68, 99-104

Table 2.6 summarises the type of Leishmania parasite causing VL, the vector responsible, the specific country in which the this parasite is usually found as well as the medications, dosage and side effects which the health care professionals should know and watch out for the severe drug toxicities.

Ramesh, Katara, Verma and Salotra (2011:411-414) point out that although there have been significant advances in the treatment of leishmaniasis, there are many challenges regarding treatment. Treatment which is effective in various countries differs and not all areas have the same effective treatment for the disease. Another challenge is the development of safe oral short course treatment for post *kala-azar* dermal leishmaniasis.

Murray et al (2005:1563) state that there have been limited advances for the treatment of leishmaniasis. The main challenge to treating CL is to ensure that this disease is on the research and development agenda, so that new drugs are evaluated or compounds screened in appropriate models, and that the standardization of quality of clinical trials is guaranteed. Antimonials, which include SSG, remain the cornerstone of treatment in all regions except in the Bihar state, India and southern Europe despite the drawbacks of cost, long duration and adverse reactions (Murray et al 2005:1570).

Problems also remain in the treatment of HIV/VL co-infected patients and emergence of resistance (Maltezou 2008:192-198; Meheus, Balasegaram, Olliaro, Sundar, Rijal, Faiz & Boelaert 2010:6, 7; Murray, Berman, Davies & Saravia 2005:1571). There is still some way to go to having the ideal treatments for VL and CL and drug research and development for these diseases must remain focused.

Over 90% of properly treated VL patients show apparent cure and about 5%-10% of individuals do not respond to or die during treatment usually due to advanced illness, intercurrent illnesses or drug toxicities and 5%-10% of apparently cured VL patients relapse most often within 6 months (Murray et al 2005:1970; Collin et al 2004:615).

2.6.5.1 Treatment of VL in Ethiopia

Prior to 2006 there was no leishmaniasis control programme. The driving force for its establishment was the 2005 Libo VL outbreak that affected a large number of people (Alvar et al 2007:275; MoH 2006:2). The increasing burden of the problem was found to be the cornerstone for the establishment of the leishmaniasis control programme in Ethiopia. The control programme is under the Malaria and other Vector-borne Diseases Prevention and Control Team. It mainly focuses on VL as it was found to be a major public health problem in the country (MoH 2006:i).

- **Drug therapy**

VL treatment is provided under supervision because of rare but severe drug toxicities which lead to sudden death (MoH 2006:7). The aim of treatment is to reduce the parasite load, provide nutritional support and appropriate hydration, and treat complications of the disease (MoH 2006:7; WHO 2010a:54).

The case fatality rate for Ethiopian VL patients treated with sodium stibogluconate as first line of therapy is around 11%. If this is stratified by HIV status, it is 11% in the HIV co-infected group and 4.4% in the non-HIV group (Ritmeijer et al 2006:362). The higher tendency to relapse is one of the most prominent features of VL associated with HIV co-infection compared to the immunocompetent individuals, with 36.8% of the co-infected individuals relapsed in the first six months (Hurissa et al 2010:853).

- **Supportive therapy**

Supportive therapy includes nutritional support because 30% of VL patients in Ethiopia present with malnutrition (MoH 2006:15). Therapeutic feeding, balanced diet and vitamin supplementation are required in the management of VL patients. Secondary infections, including gastroenteritis, respiratory tract and skin infections, are common and need proper treatment (WHO 2010a:54).

Poor prognostic factors in antimony-treated VL patients are age >45 years, malnutrition, liver and renal insufficiency, concomitant infections and immunosuppressive conditions (MoH 2010:8; WHO 2010a:57).

2.6.5.2 Follow up

Leishmaniasis patients need appropriate care and follow-up during and after treatment. Upon discharge from treatment, advice should be given and appointments arranged for all VL patients. Appointments at one, three and six months after treatment are given for patients at discharge following proper documentation of clinical findings of the patients. During their clinic visit at follow up, enquiry and examination for fever, spleen size and skin rash must be made (WHO 2007:25).

2.7 PREVENTION AND CONTROL

The World Health Assembly (WHA) (2007:64) recognises leishmaniasis as one of the most neglected tropical diseases (NTDs). The WHO and its partners are working to implement a paradigm shift to an integrated approach for the control of neglected tropical diseases from a disease-oriented one. It has broad coverage of rapid impact

interventions, strengthened vector control to reduce transmission and improved surveillance and high quality care of neglected tropical diseases which includes VL (WHA 2007:64, 65).

The WHO headquarters and regional offices have to support the health ministries of leishmaniasis endemic countries in disease mapping, establishing surveillance and designing leishmaniasis control programmes (WHO 2007:13).

The leishmaniasis control programme in Ethiopia focuses mainly on early case detection and treatment, vector control, personal protection measures, and health education (WHO 2010a:49). Disease diagnosis and treatment, health education, vector control and personal protection measures are the main VL control strategies in Ethiopia (MoH 2006:3-6).

2.7.1 Early case detection and treatment

Suspected VL patients who fulfil the case definition should undergo the diagnostic test(s) for proper diagnosis of the disease. According to the MoH (2007:20), the case definition is as follows:

A **suspected VL case** refers to a person who presents with non-malaria fever of more than two weeks and splenomegaly or lympadenophathy with or without the following clinical features: weight loss, wasting, enlarged liver or pallor.

These signs and symptoms, alone or in combination, are not specific. VL should be suspected in those who live in or have returned from an endemic area and presented with fever and enlarged spleen (WHO 2010a:49).

A **confirmed VL case** refers to a suspected VL case plus parasitological confirmation for leishmania donovani (LD) bodies (or the leishmania parasite from a tissue slide or culture).

Laboratory diagnosis of VL in Ethiopia is done mainly using the immune-chromatographic rapid diagnostic test referred to as ”rk39”, also called “K39 antibody detection test” (MoH 2006:6). This is an important serologic test that is rapid and easy

to perform under field conditions and does not require maintaining a cold chain. Direct agglutination test is the other serologic test for VL diagnosis. The latter test requires maintaining a cold chain and well-trained laboratory professionals, and takes two to three days to obtain the result.

Parasitological testing is done for the diagnosis of VL in only a few selected centres in Ethiopia as it requires an experienced physician and well-equipped hospital settings which also have a blood transfusion service. Both spleen and bone marrow aspirates are practised for parasitological tests. Tissue samples are taken to look for the amastigote stage of the parasite through microscopic examination after proper staining of slides. This is a useful test for the diagnosis of VL relapse cases and for the follow-up of cases and drug resistance monitoring (MoH 2006:14).

Confirmation of VL disease should be followed by prompt treatment, as this is a fatal condition if untreated (De Boer et al 2009:395).

2.7.2 Integrated vector management program

An effective strategy for reducing anthroponotic leishmaniasis is to control sand fly vectors in domestic and peridomestic VL transmissions using chemicals, environmental management and personal protection measures (WHO 2010:79). This requires understanding the ecology of the area, identifying targets, the choice of proper vector control methods, decision-making, quality assurance of the intervention, and monitoring and evaluation (WHO 2010a:79).

Vector control measures employed in Ethiopia for the prevention of VL include the use of indoor residual spray and insecticide-treated nets. Both methods are integrated with the malaria control programme due to epidemiological overlap of the two diseases (MoH 2006:3). Individual protective practices are also important to avoid contact with the vector by proper wearing of clothes covering the extremities in the biting period, use of insecticide-repellent screening, and plastering the walls of houses to avoid being bitten by the sand fly (MoH 2006:3).

2.7.3 Health education on leishmaniasis

According to the MoH (2006:4), health education to prevent leishmaniasis should emphasise the transmission of the disease, detecting the signs and symptoms, and immediate medical attention. Moreover, consistent use of insecticide-treated nets and personal protection measures must be addressed during health education.

2.7.4 Surveillance of leishmaniasis

Leishmaniasis is a neglected tropical disease that affects the poorest of the poor who live in remote rural areas. Most countries identified as endemic for visceral leishmaniasis rely on passive surveillance which is triggered by patient self-reporting of the disease. This often results in underestimation of the disease (WHO 2010a:73).

Active surveillance is an essential component of VL control. In this case, health care personnel need to assess the community and identify and refer all suspected cases that might be infected.

2.7.5 Control of reservoir host

This is important to implement prevention and control measures for VL in areas with zoonotic transmission where there are established animal reservoirs (Alvar et al 2006:280). In these areas, appropriate veterinary control measures are needed to control leishmaniasis (Alvar et al 2007:281; WHO 2010a:112). In Ethiopia, transmission is believed to be anthroponotic with humans being the only reservoirs where prompt diagnosis and treatment is the mainstay of control (MoH 2006:3).

2.8 CONCLUSION

This chapter discussed the literature review on VL; its clinical manifestations; epidemiology; disease transmission and pathophysiology; VL management, and control of this fatal but neglected disease. Chapter 3 describes the research design and methodology.

CHAPTER 3

Research design and methodology

3.1 INTRODUCTION

This chapter describes the overall research design and methodology of the study.

3.2 PURPOSE AND OBJECTIVES OF THE STUDY

The overall purpose of the study was to investigate the clinical manifestations and nutritional status of VL patients in Ethiopia.

To achieve the purpose, the researcher wished to answer the following questions:

- What are the most common clinical manifestations that patients who suffer from VL present with in selected clinics in Ethiopia?
- What is the nutritional status of VL patients in the selected clinics, using the anthropometric variables?
- Are health care professionals equipped to recognise early signs and symptoms of VL? What measures can be applied to promote early case management of VL patients presenting in Ethiopia?

The objectives of the study were, therefore, to:

- Investigate the clinical manifestations of VL in selected treatment centres in Ethiopia.
- Describe the nutritional status using anthropometric variables of VL patients admitted to selected VL clinics in Ethiopia.
- Explore whether health care professionals are sufficiently equipped to recognise the early signs and symptoms of VL.
- Explore measures that would promote early case management of VL patients.

3.3 RESEARCH SETTING

A research setting refers to the physical location and conditions in which data collection Takes place in a study (Burns & Grove 2005:751; Polit & Beck 2008:766). The setting for this study was two state clinics in northern Ethiopia. The two clinics are situated in the Libo Kemkem district of Amhara and the Kafta Humera district of Tigray, administrative regions of Ethiopia.

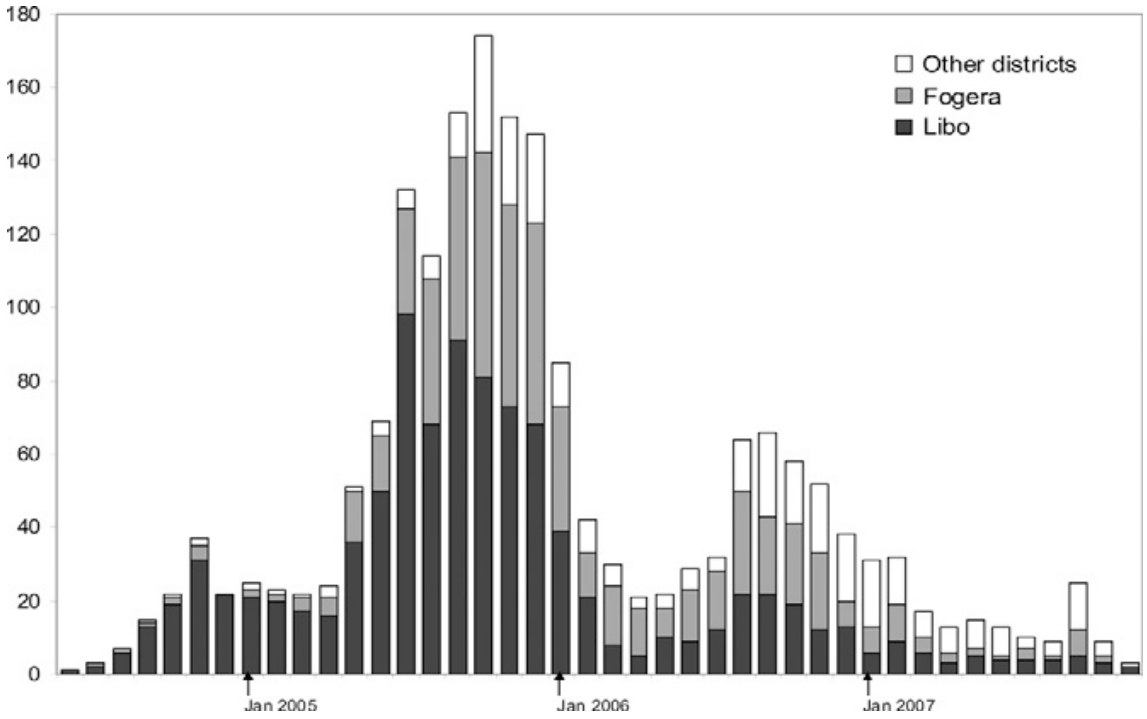


Figure 3.1 Month of onset of illness and residence with onset between June 2004 and December 2007

Source: Herrero, Orfanso,Argaw, Mulugeta, Aparicio, Parreno, Bernal, Rubens, Pedraza, Lima, Flevaud, Palma, Bashaye, Alvar and Bern (2009:375).

Figure 3.1 shows the VL admissions to one of the VL clinics under study in Ethiopia. The majority of cases were seen during 2006 with most of the cases from the Libo Kemkem district and the adjacent Fogera district (see chapter 1, figure 1.3).

3.4 PHASES OF THE STUDY

The study was conducted in two phases:

- Phase 1: Retrospective phase in which audit was performed on patients' files
- Phase 2: Explorative phase, using a structured questionnaire to explore the knowledge of the health care professionals in the two clinics under study.

In both phases the study was quantitative.

3.5 RESEARCH DESIGN

A research design is a blueprint for conducting a study and guides the researcher in planning and implementing the study to achieve the intended goal. It maximizes control over factors that could interfere with the validity of the study findings to help increase the probability that the study results will be accurate reflections of reality (Burns & Grove 2009:280; LoBiondo-Wood & Haber 2010:159). According to Burns and Grove (2009:219), the design of a study is the end result of a series of decisions made concerning how best to implement the intended study. A good study design is one which is appropriate to the purpose of the study, feasible with realistic constraints, and effective in reducing threats to validity (Burns & Grove 2009:226).

Table 3.1 Summary of the research design and methodology of Phases 1 and 2

Phase	Research design	Research instrument	Population	Sample & sampling	Reliability/ Validity	Time frame
Phase 1: Retrospective descriptive phase	Quantitative, retrospective	Audit	All patients presenting at the two clinics under study in Ethiopia (Total 2,981)	Sample: 10% of population (files) adhering to inclusive criteria N=298 patients Sampling:	Presented to colleagues for comments	Date: include for example Files dated from 10 May 2005- 10 January 2009
Phase 2 Explorative phase	Quantitative, explorative	Structured questionnaire	All health care workers permanently employed by the two clinics under study (Total 55)	All health care workers willing to participate in the study and adhering to inclusive criteria.	Pre-test of question-naire	Date Staff employed by the clinics before 31 Decembe r 2010.

3.6 PHASE 1

The researcher used a quantitative, retrospective, descriptive, explorative and cross-sectional research design for phase 1.

3.6.1 Quantitative

Quantitative research is “a formal, objective, systematic process in which numerical data are used to obtain information about the world” (Burns & Grove 2009:23). It is the predominantly used scientific investigation method to describe variables. This research design is unique as it provides the plan for the research, is the vehicle for testing research questions and hypotheses, and involves structure and strategy (LoBiondo-Wood & Haber 2010:159).

Phase 1 was quantitative because the researcher used a structured audit tool for the analysis of numerical data on documents of patients reporting to the two clinics to obtain

factual data (see section 3.2). It determined the average, percentage and proportion of the characteristics of the population by examining a portion or sample of the patients in the two selected clinics. In addition, in phase 2 data was collected by means of a structured questionnaire by which the educational needs of health care professionals were determined.

3.6.2 Retrospective

In retrospective studies, both the proposed cause and the proposed effect have already occurred (Burns & Grove 2009:240,298; LoBiondo-Wood & Haber 2010:204). It is a research technique where the researcher identifies a group of people who have experienced a particular event.

In this study, the medical records of VL patients on their clinical manifestations and their nutritional status were investigated in the two selected clinics for the period 10 May 2005 to 10 January 2009.

3.6.3 Descriptive

A descriptive design is crafted to gain more information about the characteristics in a particular field of study to provide a picture of situations as they naturally happen (Burns & Grove 2009:237).

The researcher selected a descriptive design to gain more information on the clinical the timeous identification of the signs and symptoms of VL in Ethiopia to make recommendations on the identification of deficiencies and justify the existing practice for the leishmaniasis control program. Exploration of the views, knowledge and training of health workers on leishmaniasis in the two selected clinics was made using a questionnaire.

3.6.4 Cross-sectional

In cross-sectional study, data is collected at one point in time with the same subjects rather than with the same subjects at several occasions (LoBiondo-Wood & Haber 2010:202). This study design is suitable for measuring the prevalence of disease and is

typically descriptive in nature where it provides quantitative estimate of the magnitude of a problem without measuring the temporal relationship between cause and effect (Friis & Sellers 2009:256).

In this study, a cross-sectional study design is used to collect data on VL clinical presentations and nutritional status from existing data from two selected VL clinics in Ethiopia for the period from 10 May 2005 to 10 January 2009.

3.7 PHASE 2

and a quantitative explorative design for phase 2 were found to be appropriate for this study.
The research design of phase 2 of this study can be described as quantitative explorative design.

3.7.1 Quantitative

This phase of the research employed a quantitative study design (see section 3.6.1).

3.7.2 Explorative

An exploratory research design is used “to search for accurate information about the characteristics of particular subjects, groups, institutions or about the frequency of a phenomenon’s occurrence, particularly when little is unknown about the phenomenon” (LoBiondo-Wood & Haber 2006:240).The aim is to gain a broader understanding of a situation, phenomenon or community (Bless & Higson-Smith 2000:41). The need for such study could arise from the lack of basic information on a new area of interest, or in order to become acquainted with a situation so as to formulate a problem or develop a hypothesis. In this study the researcher needed to explore whether any deficiencies exists on the diagnosis of patients suffering from leishmaniasis that could influence the severity of the disease with which patients presented at the clinics under study.

3.8 RESEARCH METHODOLOGY

The research methodology includes the population, sample, data collection and data analysis

3.8.1 Population

The *population* refers to all elements of individuals, objects events or substances that meet the criteria for inclusion in a study and the *target population*, a sub set of the population, is the entire set of individuals who meet the sampling criteria (Burns & Grove 2009:714). According to LoBiondo-Wood and Haber (2010:222), the target population, also referred to as the study population, is the entire set of cases about which the researcher would like to make generalisation. The study population was identified through eligibility criteria.

Somekh and Lewin (2005:217) refer to a population as a "complete set of units studied when time, costs and accessibility often prohibit the collection of data from every member or about every item". It is also the entire set of individuals having common characteristics (Polit & Beck 2006:761).

3.8.1.1 Phase 1

In phase 1, the study population was the total number of patients suffering from VL and who had been treated in the two selected clinics in Libo and Kafta Humera districts of Ethiopia between 10 May 2005 and 10 January 2009. The accessible population was the portion of VL patients treated at the two selected clinics during the study period to which the researcher had access to the data with permission of the relevant authorities (Burns & Grove 2009: 344; LoBiondo-Wood & Haber 2010:222) (see Annexure A).

3.8.1.2 Phase 2

In phase 2, the population was the total number of health care professional permanently employed in the two selected clinics.

3.8.2 Sampling frame

The term s*ampling frame* refers to the listing of every member of the study population through the use of sampling criteria to define membership, using a sampling plan (Burns & Grove 2009:348). Brink, Van der Walt and Van Rensburg (2006:124) refer to a sampling frame as “a comprehensive list of the sampling elements in a target population from which the sample is drawn”.

In phase 1, the sampling frame was the VL patient records listed according to the period of admission for treatment in the two treatment centres for the period 10 May 2005 to 10 January 2009.

In phase 2, the sampling frame was the list of health care professionals on the attendance registers of the clinics.

3.8.3 Sampling and sample

Sampling is the process of selecting a portion of the designated study population to represent the entire population whose main purpose is to increase the efficacy of a research study (LoBiondo-Wood & Haber 2010:224). Due to resource constraints, every member of the population could not be examined which made sampling very important. Proper sampling allows for making inferences and generalisations about the population through the use of a sampling plan which enhances representativeness, reducing systematic bias and decreasing sampling error (Burns & Grove 2009:348).

A sample is “a subset of the study population that is selected for a particular study” (Burns & Grove 2009:42). It is a set of elements that make up the population (LoBiondo-Wood & Haber 2010:224).

Sampling strategies are divided into two types: *probability* (where random selection is employed and every member has a higher than zero chance of being selected) and *non-probability* sampling (in which case non-random method is employed and there is no guarantee for inclusion of every one) in choosing the elements (Burns & Grove 2009:349; LoBiondo-Wood & Haber 2010:225).

3.8.3.1 Phase 1

The researcher used probability sampling where every VL patient drawn from the existing patient records in the two selected treatment centres was selected. This ensured that every member of the study population had a probability higher than zero of being selected for the sample (Burns & Grove 2009:348). Systematic sampling was used where every tenth VL patient from the existing facility list was chosen and the starting point was also selected randomly (Burns & Grove 2009:248).

In order for each person in the target or accessible population to have an equal opportunity to be selected for the sample, the respondents' files were identified and listed. The listing of the files was the sampling frame (Burns & Grove 2005:346). The process entailed the following steps:

- Permission was obtained from the Regional Health Bureaus/District Health Offices, and the two health facilities of the VL clinics (see Annexure A).
- Permission was also obtained from the head of the records department where the files would be accessed.
- The researcher then selected ten records of patients who were not included in the study to conduct a pre-test to test the research instrument.
- At the same time, the researcher trained four research assistants who are nurses who volunteered to assist with the data collection.
- The researcher and the research assistants completed the data collection together by using the audit tool and any uncertainties were addressed and the tool was refined.
- The tool was then sent to two colleagues who again assessed the tools and made comments.
- The tool was then sent to the statistician for review.
- The researcher and the research assistants then accessed the electronic files and collected the data.
- The researcher cross-checked the variables from the hard copy of the files in the two clinics.

3.8.3.2 Research variables

Research variables are qualities, properties or characteristics of persons, things or situations that change or vary and are measured, manipulated or controlled (Burns & Grove 2009:727). According to Burns and Grove (2009:165), research variables are conceptually defined based on the study framework, and defined operationally to direct the measurement, manipulation or control in the study. In this study, the researcher used *dependen*t and *independent* variables.

A dependent variable refers to a response, behaviour or outcome that is predicted and measured where changes in the dependent variable are supposed to be caused by the independent variable. It is also known as an effect or outcome variable in research (Burns & Grove 2009:696). In this study, the number of VL admissions aggregated by sex and age and VL treatment outcomes were dependent variables (see chapter 1, section 1.2.2 and chapter 2, section 2.6.5.1).

An independent variable is also called an intervention, treatment or experimental variable that the researcher manipulates to create an effect on the dependent variable (Burns & Grove 2009:177). In this study, the independent variables were the number of patients who presented with the following symptoms and signs: duration of illness before treatment; fever; splenomegaly; anaemia; severe malnutrition; bleeding; diarrhoea, and lymphadenopathy (see chapter 1, section 1.2.1 and chapter 2, section 2.6.3).

Extraneous variables can affect the measurement of study variables and the relationships among them and are the primary concerns in quantitative studies (Burns & Grove 2009:178). In this study, the extraneous variables included the health care professionals' educational level and knowledge of leishmaniasis and nutritional status of the VL patient.

3.8.3.3 Phase 2

In phase 2 of this study, the researcher used random sampling of the health care professionals from the attendance sheet of the administration office to select the respondents/sample for the study.

Permission was obtained from the regional health bureaus of the two clinics to conduct the study. Then permission was also obtained from the two district health offices based on the support letter from the regional health bureaus. Written informed consent was obtained from the respondents.

3.8.4 Eligibility criteria

Burns and Grove (2009:344) describe eligibility criteria as “a list of characteristics essential for membership or eligibility in the target population”. Eligibility criteria define who is included and who is not included in the population for which the study is designed (Polit & Beck 2008:338; Stommel & Wills 2004:305).

3.8.4.1 Phase 1

To be eligible for inclusion in the study, the patient records had to of VL patients who were

- treated in the two VL clinics
- aged 6 years or older during admission for treatment
- treated during the period 10 May 2005 to 10 January 2009

The following patient records were excluded:

- Children under 6 years old as this age group would be difficult to get reliable symptoms.
- Post-kala azar dermal leishmaniasis cases as these patients more often manifest with dermal conditions rather than VL symptoms (WHO 2010a:65).
- Incomplete records because important study variables were missing.

3.8.4.2 Phase 2

To be included in the study, the health care professionals:

- Had to have at least one year's experience working in the selected clinics.
- Could be a nurse, health officer or physician.
- Had to be willing to participate in the study.

3.8.5 Estimation of sample size

Sample size is a major issue in conducting and evaluating quantitative research (Polit & Beck 2006:267). Sample size refers to the number of elements that are included in the sample (Brink et al 2006:135). Complete coverage of the population is seldom possible and even if it was possible, time and cost considerations usually make this a prohibitive undertaking (Saks & Allsop 2007:157). In addition, Saks and Allsop (2007:157) state that "there is no simple rule that can be applied across the board" to determine the sample size. Polit and Beck (2006:135) emphasise that there are "no hard and fast rules that can be applied to determine the sample size". Researchers must, however, consider both scientific and pragmatic factors that influence the sample size to decide on the number of subjects to be included in the study (Polit & Beck 2006:135).

In quantitative studies, the sample size is best determined by a power analysis that is calculated using the level of significance (α), standard power of 0.8 and effect size (Burns & Grove 2009:368)

3.8.5.1 Phase 1

In phase 1, the researcher collected 2 975 records for the period 10 May 2005 to 10 January 2009. Therefore, the researcher with the support of the statistician and the supervisor used a power analysis to determine the sample size. Ten percent of the total study population, namely 297 were assumed to be and appropriate sample size for this study.

3.8.5.2 Phase 2

In phase 2, data was collected from the health care workers in the two clinics selected randomly from the attendance roster and who were willing to participate in the study.

3.9 DATA COLLECTION

Data are facts or information, especially when examined and used to find out things or to make decisions (*Oxford Advanced Learner's Dictionary of Current English* 2006:371). According to Burns and Grove (2009:695), data are "pieces of information that are collected during a study".

Collection refers to an act of taking something away from a place; or an act of bringing things together in one place (*Oxford Advanced Learner's Dictionary of Current English* 2006:371).

Data collection Burns and Grove (2009:43) define data collection as "the precise, systematic gathering of information relevant to the research purpose or the specific objectives, questions or hypotheses of a study".

In phase 1, data was collected from existing clinic files from the two selected VL clinics in north Ethiopia, using a structured audit tool. The researcher used available health facility records for this study. A document analysis checklist was developed to collect the required variables for the study (see Annexure C).

In phase 2, the researcher collected data from healthcare professionals working in the two selected clinics, using a structured questionnaire.

3.9.1 Development of data collection instrument

The researcher developed an audit checklist which was modified from patient records to collect the quantitative data about the clinical manifestation including nutritional status of VL patients admitted and treated in the health facility records (see Annexure C). This instrument ensured uniformity and consistency. The instrument was divided into five sections to address the questions related to the study problems, purpose and research objectives.

Using existing data in the form of records for research could save considerable time and money and reduce problems related to recruitment, access and ethical concerns (LoBiondo-Wood & Haber 2010:284). The variables included in the audit tool were to

ensure the data extracted could fulfil the research objectives. The researcher examined and used the existing data in relation to the research question and selection bias was avoided by using probability sampling through systematic sampling.

In phase 2, the researcher developed a structured questionnaire to collect data from health care professionals working in the two selected clinics.

3.9.2 Structure of the data collection instruments

The researcher reviewed VL patient medical records in the two selected VL clinics for the study period to collect the desired variables. The structured audit tool (A) was developed for collecting existing data on VL disease from the patient records, and the questionnaire (B) developed to collect data on the health care professionals' knowledge and perceptions in the two clinics. Audit tool A consisted of five sections (see Annexure C):

- Section 1 Demographic data, including age, gender, occupation and duration of illness
- Section 2 Clinical manifestations and VL disease category
- Section 3 Co-morbidities
- Section 4 Nutritional status
- Section 5 VL treatment, including treatment outcome

For phase 2, the researcher developed a structured questionnaire based on the research problem, purpose and objective. The respondents from the two clinics completed the questionnaire, which also consisted of five sections:

- Section A Respondent's professional qualifications and training
- Section B Knowledge of epidemiology and transmission
- Section C Knowledge of clinical manifestations of VL
- Section D: Knowledge of the availability of the service
- Section E Perceptions of the programme

According to Polit and Beck (2008:414), when structured questionnaires are used the respondents are asked to answer similar questions, in the same order and with the same set of response opinions.

3.9.3 Pre-testing the instrument

De Vos et al (2005:171,172) stress that newly developed research tools should be thoroughly pre-tested before being used. A pre-test or pilot study of the instrument refers to a smaller version of a proposed study in order to refine the research methodology (Burns & Grove 2001:49). The main aim was to identify problems in the design and test the validity and reliability of the research instruments.

In this study, the pre-test was done to ensure the reliability of the research instruments. For the audit tool, the researcher selected ten records randomly from the files which met the inclusive criteria and these records were not included in the main study.

The questionnaire for phase 2 was pre-tested on three health care professionals who met the inclusion criteria and were not included in the final data collection. Once the suggestions and limitations were reviewed, the final instrument was constructed under the supervision of the study supervisor and with the support of a professional statistician.

3.9.4 Advantages and disadvantages of questionnaires

Advantages of questionnaires	Disadvantages of questionnaires
They minimise researcher bias and enable a more objective comparison of the results.	The development of a structured instrument needs much effort in terms of content, form and wording.
Questionnaires are a quick way of obtaining data from a large group of people	The respondents are unable to elaborate on responses or ask for clarity.
They are less expensive in terms of time and money.	The researcher cannot use probing strategies (Burns & Grove 2001:426; Polit & Beck 2008:414).
Self-administered questionnaires ensure a feeling of anonymity and respondents are likely to provide honest answers.	Respondents may provide socially acceptable answers rather than true answers (Brink et al 2006:147),
The format is standard for all subjects and not dependent on the mood of the interviewer (Brink et al 2006:147).	The response rate may be low.

They enable the researcher to ensure that all items of the questionnaire are considered without omissions (Bless & Higson-Smith 2000:109; Brink et al 2006:147).	Non-verbal behaviours and mannerisms cannot be observed.

3.10 DATA COLLECTION

Burns and Grove (2009:43) state that data collection is the process of identifying subjects and gathering data from these subjects, using a variety of methods (measuring, observing, testing, recording and data mining or combination of these.

Hospital records are a cost-effective source of information (Brink et al 2006:154). Moreover, these records are accessible with no consent needed from the respondents.

In phase 1, data was collected retrospectively from existing health facility records, using the audit tool and in phase 2, data was collected from the respondents, using the questionnaire. The data was collected from the two VL clinics where patient files are kept locked in the record office of the clinics. The researcher obtained permission from the District Health Offices and Records Offices of the two clinics to gain access to these files. It was not possible to remove records from the record office or make copy of the records to keep confidentiality. Informed consent was obtained from the respondents.

In phase 1, the researcher collected data using a standard audit tool. In phase 2, the researcher and two trained research assistants collected data, using a structured questionnaire developed and pre-tested by the researcher. The two instruments were found to be objective (not influenced by the perspectives of the research assistant), systematic (data collected in the same manner by the data collectors) and consistent (data collected in the same way from every file or individual to minimise bias) (LoBiondo-Wood & Haber 2010:164).

3.10.1 Data collection from existing records

After getting permission to access the patient records of the two clinics, the researcher identified and trained four experienced research assistants on how to collect the relevant data from the available patient records. The data collected was checked by the researcher for possible omissions or inconsistencies that required rechecking the

records for completion. The data collection took place over a period of two weeks in January 2011.

All the data from the VL patient files was collected without removing any file out of the record office. The researcher and his assistants accessed the files after obtaining permission from the clinic record officer supervising the process.

3.10.2 Administration of the questionnaire

The data collection took place on a pre-arranged date. A schedule for the dissemination and collection of the instrument was given to the person in charge of each clinic.

- After permission was granted to access the health care professionals, the coordinator on behalf of the researcher met face to face with those who agreed to participate and explained the purpose and benefits of the study, as well as how privacy and confidentiality would be maintained. Those who agreed to participate then signed informed consent forms. A coordinator was provided to distribute the questionnaires and return the completed ones to the researcher.
- The respondents at each clinic assembled in the hospital conference room, where the questionnaires were distributed and collected on the same day.
- The coordinator then handed the completed questionnaires over to the researcher.
- All (100%) of the completed questionnaires were returned.

Following the necessary cleaning and verification, the statistician entered the data using Epi Info data base (version 3.5.1). Further data cleaning was done for missing or incomplete information.

3.11 VALIDITY AND RELIABILITY

The quality of research and research instruments is determined by their validity and reliability. Burns and Grove (2009:380) describe study validity as “a measure of the truth or accuracy of the claim and an important concern throughout the research process”.

Measurement is one of the major concerns of researchers. Both validity and reliability are not “all-or-nothing” phenomena but, rather, a matter of degree (Burns & Grove 2009:380).

3.11.1 Validity

Validity of an instrument is the extent to which an instrument measures the attributes of a concept accurately (LoBiondo-Wood & Haber 2010:288). A valid instrument truly reflects the concept it is supposed to measure. There are three types of validity: content validity, predictive validity and construct validity (Burns & Grove 2009:380). *Content validity* begins with development of the instrument and is the extent to which the measurement method includes all the major elements relevant to the construct being measured.

According to LoBiondo-Wood and Haber (2010:290), *predictive validity* is the degree of correlation between the measure of the concept and some future measure of the same concept, while *construct validity* is the extent to which a test measures a theoretical construct, attribute or trait and attempts to validate the measurement theory by testing the hypothesised relationships. The research instrument is valid if it reflects the concept it is supposed to measure. The important aspects of validity are content, face and construct.

- ***Content validity.*** Content validity represents the universe of content which provides the framework and basis for formulating the items that will be adequate to represent the content (LoBiondo-Wood & Haber 2006:338).

- ***Face validity.*** Face validity is concerned with how the research instrument appears to the respondents (Bless & Higson-Smith 2000:133). According to LoBiondo-Wood and Haber (2006:338), face validity in tool development determines the readability and clarity of the content.

- ***Construct validity.*** Construct validity is concerned with the ability of the research instrument to measure the theoretical constructs it purports to measure (Burns & Grove 2001:230). Content validity was ensured by conducting the literature review on the area under study in order to ensure that all the aspects

were covered in the questionnaire. The study supervisor as well as the professional statistician assisted the researcher in formulating the questionnaire. In addition, an independent expert and a statistician evaluated the face validity, content validity and construct validity and checked for conceptual and investigative bias.

The study supervisor and the statistician assisted the researcher in formulating the questionnaire, and an independent expert and the statistician evaluated the face validity, content validity and construct validity, and checked for conceptual and investigative bias (see section 3.12).

- ***Internal validity.*** Internal validity refers whether the independent variable really made a difference or change in the dependent variable where the researcher rules out other factors as rival explanations of the relationship between the variables (LoBiondo-Wood & Haber 2010:166). According to LoBiondo-Wood and Haber (2010:167,170), the threats for internal validity are history, maturation, testing, instrumentation, mortality and selection bias. In this study, effect of internal validity was less as the patient clinical profiles were recorded by physicians and the patient data database is managed by experienced data staff in the two treatment centres. The respondents also had at least one year's experience. Moreover; the clinical profiles in the database were checked with the patient file. Patient records with incomplete data were excluded from the study.

- ***External validity.*** External validity refers to possible problems of the generalisability of the study findings to additional populations and to other environmental conditions (Wood & Haber 2010:170). These factors are often related to subject selection, study conditions and the type of observations. In this study, the researcher used statistically significant large data to increase the generalisability of the study findings. The researcher used systematic sampling and the respondents who participated were selected randomly.

- ***Content validity.*** Content validity concerns whether the measurement instrument and the items it contains are representative of the content domain that the researcher intends to measure (LoBiondo-Wood & Haber 2010:288). In this study, the components of measurement instrument were identified to measure

the clinical presentations of VL in Ethiopia (phase 1) or the respondents' knowledge and experience of leishmaniasis (phase 2). All the components of the measurement tool were taken from the patient records (phase 1) and from the questionnaires completed by the respondents (phase 2).

The measurement instrument was validated by colleagues who are medical practitioners working in the leishmaniasis control programme in the Ministry of Health and one of the leishmaniasis treatment centres and important suggestions were incorporated.

3.11.2 Reliability

Reliability of an instrument is the extent to which the instrument yields the same measurement results on repeated measures, often expressed in terms of a correlation coefficient which ranges from 0 to 1 (LoBiondo-Wood & Haber 2010:295). De Vos et al (2005:162) add that reliability is stability or consistency of the measurement. If the same variable is measured under the same conditions, a reliable instrument produces identical measurement and the measuring instrument is able to yield consistent numerical results each time it is applied (Burns & Grove 2001:396). A correlation coefficient value of zero indicates as there is no relationship, whereas a correlation coefficient value closer to 1 shows low error variance signifying a more reliable instrument.

Measures used to test reliability are *stability* (the ability of the instrument to produce the same results with repeated testing), *homogeneity* (also called internal consistency, when all the items in an instrument measure the same concept or characteristic) and *equivalence* (instrument produces the same results when equivalent or parallel instruments or procedures are used) (Burns & Grove 2009:295).

In this study the structured questionnaire was pre-tested by nurses working in the two selected clinics and important corrections were incorporated (see section 3.5.3). Reliability of the questionnaire was ensured by accurate and careful phrasing of each question to avoid ambiguity.

Reliability is an indication of the extent of random error in the measurement method and concerned with dependability, consistency, accuracy and comparability. It exists in degrees and is expressed as a form of correlation coefficient of 1.00 indicating perfect reliability and a coefficient of 0.00 indicating no reliability. In general, a reliability coefficient of 0.80 is considered the lowest acceptable coefficient for a well-developed measurement tool but 0.70 is the accepted level for newly developed instruments, as in this case (Burns & Grove 2009:377).

3.12 DATA ANALYSIS

Data analysis is the "systematic organisation and synthesis of research data, and in quantitative studies, the testing of the hypothesis using those data" (Polit & Beck 2008:751). Data analysis is conducted to reduce, organise and give meaning to data and made based on the research objectives, the data to be collected, the research design, the researcher expertise and availability of computer resources (Burns & Grove 2009:43, 695).

Quantitative data analysis involves preparation of the data for analysis (data cleaning, identifying missing data and transforming data), description of the sample (using frequencies, measure of central tendency and measure of dispersion), testing the reliability of measurement and exploratory analysis of the data.

Descriptive statistics allow the researcher to organise data in a way that gives meaning and facilitates insight, using frequency distributions and measure of central tendency and dispersion is used for the study (Burns & Grove 2009:696).

In this study, the researcher used descriptive statistics using graphs and tables to describe and organise data. The various measures were summarised, described and presented clearly in simple, reduced data and easily understandable data.

The statistician analysed the data, using the Statistical Package for Social Sciences (SPSS) version 17.0 with the parametric or distribution free test (two sample t test) to detect differences in clinical presentations and anthropometric measures. Bivariate analysis and multiple linear regression were used to control for confounders or spurious variables. Confounding involves error in the interpretation of what may be an accurate

measurement. Confounders are factors that prognostically linked to the outcome and are unevenly distributed the study groups. A factor is not a confounder if it lies on the causal pathway between the variables of interest. There is a triangular relationship between the risk factor and, the potential confounding factor and the outcome variable. Confounders can distort true relationships between other risk factors and the problem under study and should be considered during the design of data analysis.

The statistical packages used for analysis are Epi-info and Statistical Package for the Social Sciences (SPSS) version 17 to process and analyse the quantitative data in this study. The analysis included descriptive statistics, cross-tabulation and logistic regression. Descriptive statistics allow the researcher to organise the data in ways that give meaning and facilitate insight and to examine a phenomenon from variety of angles. Descriptive statistics include frequency distributions, measurements of central tendency, measurement of dispersion and standardised scores (Burns & Grove 2001:795). Cross-tabulation is a calculation of frequencies for two or more variables considered simultaneously (Polit & Beck 2008:751). According to Burns and Grove (2003:337), logistic regression is used to predict values of a dependent variable measured at the ordinal level.

In this study, descriptive statistics were used to describe and summarise data obtained from the structured questionnaires in order to answer the research question. The results were presented in frequencies, percentages, graphs and tables (see chapter 4).

3.13 ETHICAL CONSIDERATIONS

Ethics deals with matters of right and wrong. *Collins English Dictionary* (1991:533) defines ethics as “a social, religious, or civil code of behaviour considered correct, esp. that of a particular group, profession, or individual”. Ethics is the theory or discipline dealing with principles of moral values and moral conduct (LoBiondo-Wood & Haber 2010:577). Research requires not only expertise and diligence but also honesty and integrity starting from the identification of the study topic and continuing through to the publication of the study (Burns & Grove 2009:185).

The researcher requested and obtained permission from the University of South Africa (UNISA), Department of Health Studies Higher Degree Committee, the two Regional Health Bureaus and the two District Health Offices (see Annexure A).

The letter from the Regional Health Bureau was provided to the board of the VL clinics to obtain permission to access the data and to conduct the study at a specified time and place.

Since the study focused on the medical records of patients, an attitude and principle of respect was maintained through unconditional participation in the study by the district authorities and the clinic management (Brink et al 2006:32).

Participation in this study entailed no risks, penalties or prejudicial treatment and the respondents were informed that they had the right to withdraw from the study at any time without incurring prejudice or penalty and to ask for whatever clarification they needed about the purpose of the study (Brink et al 2006:32).

The ethical principle of beneficence refers to at least “doing no harm”, or the ability of the researcher to refrain from exploiting the study participants, but to rather promote both individual and societal benefits (Stommel & Wills 2004:377).

The information collected was treated as confidential and never made available to any unauthorised individuals who were not directly involved in the study. The researcher never removed, copied or took any part of the patient records from the designated area as agreed by the management of the clinics.

Underlying ethical principles with scientific merit were considered in designing the research and were reviewed by the Ethical Boards at the two Regional Health Bureaus (Tigray and Amhara) where the selected clinics are found. Written permission was obtained from Mèdecine Sans Frontières to use the records on leishmaniasis services in the past.

The National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research was formed in 1978 with the goal of identifying the basic ethical principles and developing guidelines (Burns & Grove 2009:187,188). The Commission

developed The Belmont Report identifies respect for persons, beneficence and justice as the three basic ethical principles relevant to research involving human subjects (Burns & Grove 2009: 188; LoBiondo-Wood & Haber 2010: 251).

Protecting the following five human rights is important in research: right to self-determination, right to privacy and dignity, right to anonymity and confidentiality, right to fair treatment and right to protection from discomfort and harm (LoBiondo-Wood & Haber 2010:251-252).

The researcher obtained ethical clearance and permission from the Research Ethics Committee of the University of South Africa (UNISA), Department of Health Studies to conduct the study. Permission was also requested and obtained from Tigray and Amhara Regional Health Bureaus where the treatment centers are found (see Annexure A).

The researcher protected confidentiality in the use of patient records by removing names, specific localities of individuals, medical record numbers or any other unique identifying factor, for example number, name, address and other information (Burns & Grove 2009:195-6). The patients' identities were not linked to the individual clinical data rather a code number was assigned to each record for identification and cross-check purposes only.

Anonymity was maintained during the study and subjects' identity was not linked with the clinical manifestations and nutritional status. Confidentiality was maintained by using a code number for individual cases and group analysis of data (Burns & Grove 2009:197).

In order for a researcher to maintain high standards of research, expertise and diligence are not enough; integrity and honesty are of the utmost importance (Burns & Grove 2001:191). The research proposal was submitted for approval to the Research and Ethics Committee at the Department of Health Studies at UNISA, as well as to the Research Ethics Committee in the Limpopo provincial Department of Health and Social Development prior to commencement of the study.

The researcher upheld the ethical principles of beneficence, respect for human dignity and justice (Polit & Beck 2008:170). The respondents' rights to self-determination, privacy, anonymity and confidentiality were protected (Burns & Grove 2001:194; Stommel & Wills 2004:373; Holloway & Wheeler 2002:47; De Vos et al 2002:76).

- **Principle of beneficence**

The ethical principle of beneficence is the most fundamental ethical principle and it refers to at least "doing no harm", or the ability of the researcher to refrain from exploiting the study participants, but to rather promote both individual and societal benefits (Stommel & Wills 2004:377).

- ***Right to protection from exploitation***

In this study exploitation appeared to be a very minute risk because the researcher respondents were assured that the information obtained would not be used against them. The risk/benefit ratio of the study was considered, and the concluded that the benefits outweighed the risks. The care provided at the clinics where patients are assessed on a daily basis by health care professionals would especially benefit from the results to confirm the standard and quality of their knowledge.

The researcher ensured that the respondents were briefed prior to commencement of the study in order to allow the respondents to have time to ask any questions. The respondents were further informed that their participation was voluntary and that they were free to withdraw at any time if they so wished without fear of losing any benefits. The respondents did not write their names on the questionnaires and no data could be linked to particular respondents.

- ***Right to freedom from harm and discomfort***

Discomfort and harm may be physical, spiritual, economic, social or legal (Polit & Beck (2006:87). This right was protected by conducting the questionnaire in a safe environment. The questions were carefully framed so that harm of any nature would be avoided.

- **Respect for human dignity**

The researcher upheld the belief that respondents were human beings who had the right to make their own decisions and express their personal opinions (Polit & Beck 2006:88). This principle was maintained by withholding the identities of all respondents. This principle involves the right to self-determination (autonomy) and to self-disclosure. In this study an independent coordinator handed out the questionnaires and placed each in a sealed envelope without identifying which respondent answered it. The researcher was absent during this process to ensure respect for dignity and privacy.

- ***Right to self-determination***

The respondents were informed that their participation was voluntary. The respondents were given the opportunity to consent to take part in the study and were assured that they could withdraw at any time without stating the reasons and without incurring any negative consequences (Polit & Beck 2006:88-89). Anonymity was ensured by stating that the data obtained might be reported in scientific journals, but would not disclose any information that could identify any of the respondents, because code numbers were used instead of names.

- ***Right to full disclosure***

For conducting ethical research it is essential to obtain informed consent from participants (Burns & Grove 2001:206). An informed consent letter was developed by the researcher which contained information on the title, purpose and objectives of the study and the rights of respondents in the study. The respondents were asked to read and sign the letter of consent once they had agreed to participate, but that there would be no discrimination towards those who wished not to participate (Polit & Beck 2006:88). This was stated to ensure that respondents participated voluntarily; and the full nature of the research, the responsibilities of the respondents and the possible risks and benefits were disclosed.

- **Principle of justice**

The principle of justice refers to the right to privacy and fair and equal treatment to all respondents of the research (Polit & Beck 2006:90).

- ***Right to privacy***

The respondents were treated with respect and dignity. In the light of the confidential nature of the information of this study, and the possible legal consequences of any breach of confidentiality, the researcher maintained a high professional standard regarding all issues of confidentiality. Data collected was within the scope of this research. The collected data was not shared with outsiders except people who were involved in this research. The respondents were informed that the research findings would be published without linking the findings to individual respondents.

- ***Right to fair and equitable treatment***

The respondents' right to fair and equitable treatment was ensured by:

- Approaching all health care workers at two selected clinics where patients suffering from leishnaiasis were assessed and treated to participate in the study.
- Using selection criteria which were in line with the purpose and the objectives of the study.

The researcher acknowledged sources and relevant people who participated in the study, secured permission to publish and disseminate the study and report the study findings (both negative and positive ones).

3.14 LIMITATIONS OF THE STUDY

The researcher identified limitations in this study that affect its generalisability. Although the data available in the two health facilities is large and well organised, some of the records were found to be incomplete and accessing some of the patient records (hard copy files) was found to be difficult to read and to analyse. Some of the variables were also subjective and this was regarded as inconsistent with the outcome of the study.

The data was also relatively old as the currently available data is not well organized and not computerized. The large difference in the respondents' levels of experience and qualifications in the two clinics were also limitations of the study.

Despite these limitations, the study findings were invaluable as the researcher regard the findings as evidence to identify the most common clinical manifestations and the extent of malnutrition for VL patients in Ethiopia. The results may be used to provide a guide for health workers assessing patients to take appropriate measures timeously to manage VL cases.

3.15 CONCLUSION

This chapter described the research design and methodology, including the study population, sampling and the sample, data collection and analysis, ethical considerations, and limitations of the study.

Chapter 4 covers the data analysis and interpretation.

CHAPTER 4

Data analysis and interpretation

4.1 INTRODUCTION

This chapter discusses the data analysis and interpretation, and the findings.

The purpose of the study was to investigate the clinical manifestations and nutritional status of VL patients in Ethiopia. This knowledge would assist the researcher to propose measures to promote early and improved case management, including proper nutritional management of VL patients. Retrospective review of patient records of Humera and Addis Zemen VL clinics for the period 10 May 2005 to 10 January 2009 was made. These health facilities are situated in the northwestern part of Ethiopia where VL is prevalent (MoH 2006:2). In addition, the knowledge of the health care providers in the two clinics on leishmaniasis wasexplored.

The objectives of the study were to

- Investigate the clinical manifestations of VL in selected clinics in Ethiopia.
- Describe the nutritional status, using anthropometric variables of VL patients admitted to selected VL clinics in Ethiopia.
- Explore whether health care professionals are sufficiently equipped to recognise the early signs and symptoms of VL.
- Explore measures that would promote early case management of VL.

The leishmaniasis control programme in Ethiopia produced the first national guidelines for the diagnosis and treatment of visceral leishmaniasis for the successful implementation of the prevention and control of the disease (MoH 2006:i).

Health care providers' knowledge of the clinical presentations of VL is essential to identify cases early before the disease is advanced, in which case the treatment outcome is poor (where outcome was default, death or referred/transferred). VL is

complicated with mild to severe degree of malnutrition and different co-morbid conditions including HIV/AIDS.

4.2 DATA COLLECTION

Data was collected using a structured audit tool for the patient records and a structured questionnaire for the respondents in the two clinics. The audit tool consisted of the following sections:

Section 1: Demographic profile of patients
Section 2: Clinical manifestations and VL disease category
Section 3: Co-morbidities
Section 4: Nutritional status of VL patients
Section 5: VL treatment and treatment outcome

The structured questionnaire consisted of the following sections:

Section A: Respondents' professional qualifications and training
Section B: Knowledge of epidemiology and transmission
Section C: Knowledge of clinical manifestations of VL
Section D: Knowledge of the availability of the leishmaniasis services
Section E: Perceptions of the programme

4.3 DATA ANALYSIS

The study reviewed 299 patient records where a few records were missing some variables, but all records were analysed from Humera (total of 80 records, 26.8%) and Addis Zemen (total of 219 records, 73.2%) VL clinics for patients treated during 10 May 2005 to 10 January 2009. In addition, 62 completed structured questionnaires by respondents working in the two clinics were also reviewed. The data was entered to EPi Info (version 3.5.1) and the SPSS (version 17.0) data bases. A statistician analysed the data and presented the results in frequencies, percentages, tables and graphs. The graphic presentation of the study findings facilitated understanding and clarity.

The parameters analysed were VL disease category; duration of illness; demographic characteristics of VL patients; clinical presentations; co-morbidities, and treatment outcome for VL. The respondents' qualifications, qualifications and service experience, and knowledge and perceptions of leishmaniasis were analysed.

The use of descriptive statistics helped to simplify the data into discrete and unrelated events. Chi-square statistical test with a two-by-two contingency table to determine the statistical significance of the association of the variables was done. Significant odds ratios and p value < 0.05 in the bivariate analysis were included in the discussion. The researcher employed bivariate analysis to analyse the relationship between two variables by grouping variables into two or three broader variables to analyse. The researcher investigated the association between variables and this helped to draw possible conclusions and identify potential research .areas.

The results of this study will guide decision-makers in making evidence-based decisions regarding the leishmaniasis control programme; policy makers in making evidence-based decisions on the control of VL in Ethiopia to help early case detection and treatment and curb the disease transmission.

The following conventions were used for data analysis and interpretation:

- N=total number of respondents
- n=total number of responses
- f=frequencies

Table 4.1 Data source and VL clinics for the study

Period of treatment	No of VL patients treated			No of file review (%)[+]
	Addis Zemen	Humera	Total	
10 May 05 – 09 May 06	1510	0	1510	151
10 May 2006- 09 May 07	431	307	738	74
10 May 2007- 09 May 08	74	439	513	52
10 May 2008- 10 Jan 09	0	214	214	22
Total	**2015**	**960**	**2975**	**299**

[+] Sample size for this study was 10% of the total VL patients in the two clinics in the study period.

4.4 RESEARCH FINDINGS

A statistician analysed the data and presented the results in tables, frequencies, graphs and percentages. The results were rounded off when necessary

4.4.1 Patient characteristics

This section describes the patient characteristics including age, sex, treatment site, duration of illness, VL disease category and clinical manifestations.

4.4.1.1 Section 1: Demographical data

Table 4.2 describes the baseline characteristics of patients from the two clinics.

Table 4.2 Patients' baseline characteristics

Variable	Number and (%) of VL patients		Total no. VL patients, N=299 (%)	95% CI, P-value
	Addis Z, n=219	Humera, n=80		
Mean Age ± SD (Range)	21±11.72 (61)	27.9 ±8.82 (49)	22.85 ±11.42 (61)	(-9.729,-4.061), <0.0001
M: F (Male %)	180:39 (82.2)	78:2 (97.5)	258:41 (86.3)	<0.001 **
Mean duration of illness± SD (Range)	3.46±2.632 (3)	2.73 ± 6.14 (23.5)	3.37±3.31 (35.75)	(-0.49,1.95), 0.24
VL diagnosis				
Primary	219 (100%)	62 (77.5%)	281 (94.0%)	<.0001
Relapse	0 (0%)	18 (22.5%)	18(6.0%)	
HIV status				
Positive	10	31	41	<0.0001
Negative	33	37	70	
Unknown	176	12	188	
Mean Spleen Size**	9.14±5.01	9.04±5.08	9.11±5.02	(-1.240,1.435), 0.886
Concomitant infections and complications				
TB	3 (3/219)	15 (15/80)	18 (18/299)	Fish
Malaria	0 (0/217)	1 (1/67)	1 (1/284)	0.236 Fish
Pneumonia	23 (23/217)	2 (2/66)	25 (25/283)	0.058
Bleeding	7 (7/219)	6 (6/80)	13 (13/299)	<0.001
Vomiting	8 (8/219)	17 (17/80)	25 (25/299)	<0.0001
Diarrhea	16 (16/217)	3 (3/65)	19 (19/282)	0.579 Fish
Presence of Severe Malnutrition	81 (81/219)	34 (34/80)	115 (115/299)	0.162
Presence of Edema	28 (28/185)	10 (10/78)	38(38/263)	0.626
Mean Hgb at admission (n=120)	8.37± 2.007	8.31± 2.857	8.34±2.43	0.9
Presence of Anaemia***	58 (90.6%)	48 (85.7%)	106 (88.3%)	

** *Chi-square test value*

*** *Anaemia is defined as Hgb level less than 12 g/dl for females and 13g/dl for males.*

The findings indicated that 86.0% (n=258) of the patients were male (82.2% and 97.5% for Addis Zemen and Humera VL clinics, respectively; P < 0.001). According to Alvar et al (2007:277), 74% of the VL cases seen during the 2005 outbreak were male.

However, Haile (2006:390) found that all the VL cases treated in one of the VL treatment centres known to be non-endemic for the disease in the period between February 2002 and September 2003 were male, and 94% of the cases reported travel to Humera which is one of the highly endemic districts in Ethiopia.

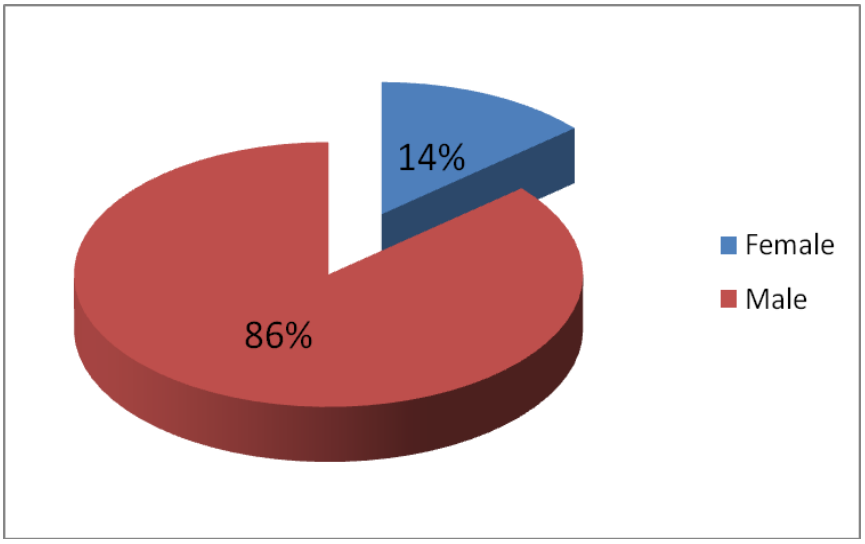


Figure 4.1 Overall sex ratio of patients from Addis Zemen and Humera VL Clinics

The mean age of the VL patients was 22.85 ± 11.42 (i.e. 21±11.72 and 27.9 ± 8.82 for Addis Zemen and Humera clinics respectively (95% CI [-9.729,-4.061]; P- <0.001 showing significant differences). The minimum and maximum ages of the VL patients were 6 and 67 years (range 61), respectively, in the study. Overall, 40% of the VL patients in this study were between 16 and 25 years old, with 68% of the total VL cases at or below 25 years of age (see table 4.2). The median ages of VL patients for the study were 20 years. The difference in the mean age might be due to the different population groups affected in the two areas.

VL being endemic in Humera, the most affected group was young male migrant labourers who were not exposed to the disease in the past. The mean age of the VL patients in this study was comparable to other studies which revealed 23.5 years (Alvar et al 2007:277). Female VL patients were found to be younger than male VL patients (20.6 years vs. 23.3 years) in the study. The mean and median ages were 17.4 and 16

years, with female patients younger than male (14.5 vs 18.6 years) (Alvar et al 2007:277).

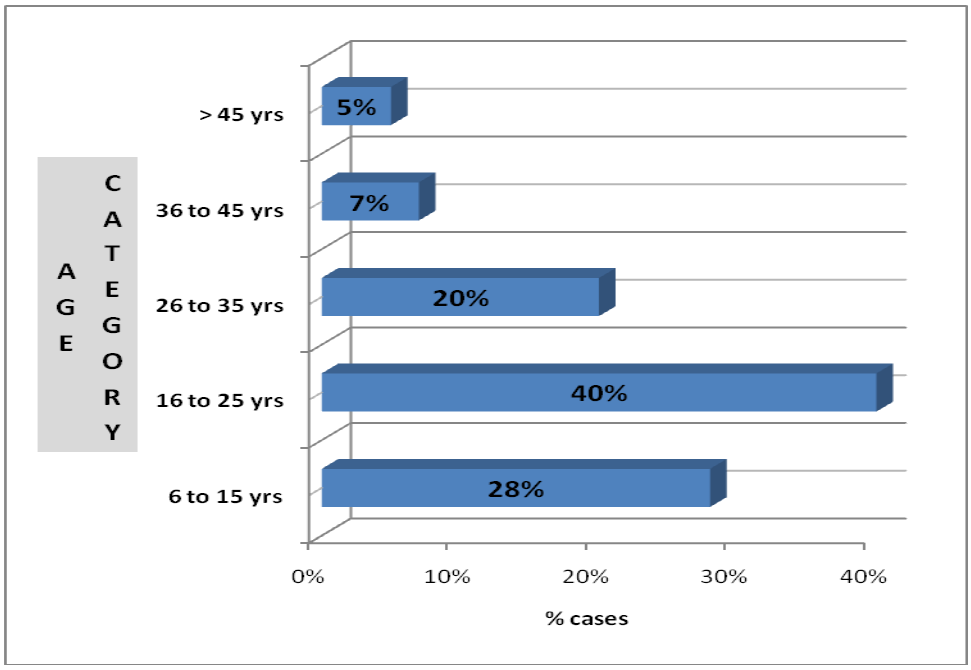


Figure 4.2 Age category of VL patients of Addis zemen and Humera VL clinics

4.4.1.2 Section 2: VL disease category and clinical manifestation

Overall, 94% (n=281) of the VL patients were primary VL **c**ases and only 6% (n=18) of the cases were relapse cases (P < 0.0001). All the VL patients in this study were primary VL cases for Addis Zemen clinic where as only 77.5% (n=62) of the VL cases were primary VL cases, the rest 22.5% being relapse ones (Figure 4.3). VL was new to Addis Zemen area and cases got the disease for the first time in their life.

Data on duration of illness was available for 248 cases (missing for 51 cases). The mean duration of illness was 3.46±2.63 months for Addis Zemen Clinic and 2.73±6.14 months for Humera Clinic with the overall mean duration of illness 3.37±3.31 (with 95% CI [-0.49,1.95] and P = 0.24). The minimum duration of illness recorded was 1week and the maximum was 36 months. The mean duration of illness was 3.2 months for VL (Mengistu & Ayele 2007:56). Haile and Anderson (2006:390) found the median duration of illness prior to presentation for VL treatment to be two months.

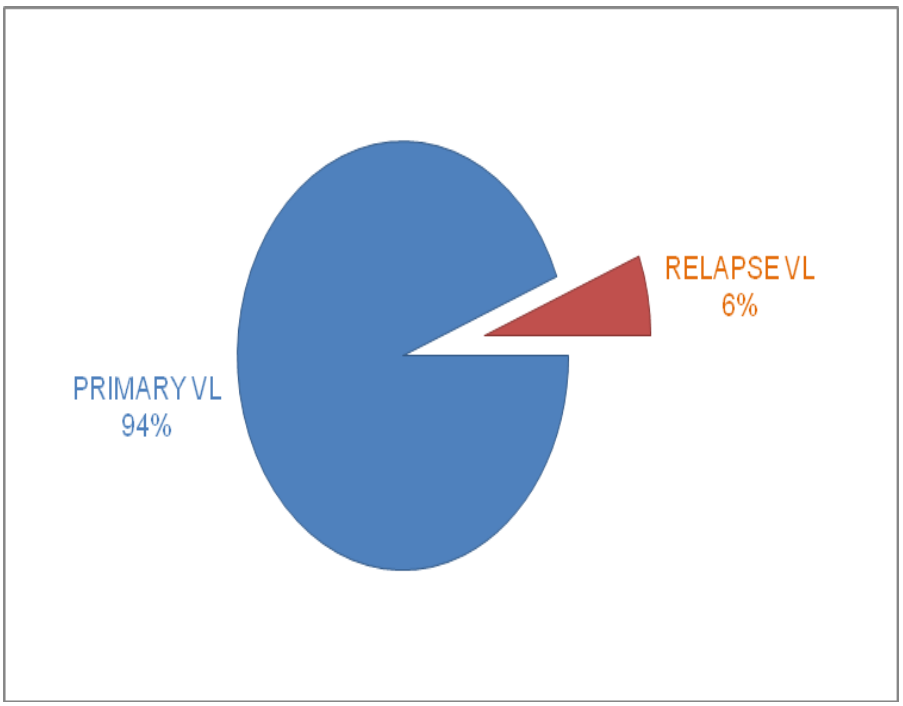


Figure 4.3 VL disease category

The clinical presentations of VL patients in the two clinics found that, in both clinics, data on clinical presentations was not complete; fever, spleen enlargement and anaemia were the commonest clinical presentations for VL; fever and spleen enlargement was recorded in over 95% (n=284) of the VL patients, and over 94% (n=120) of the VL patients in the two clinics presented with anaemia (see table 4.3).

Table 4.3 Patients' clinical presentations

Patient characteristics	Proportion (%)
Fever	100
Severe malnutrition, Z score < -3 SD	38.5
*Splenomegaly	95.4
Bleeding	4.4
**Oedema	14.5
***Anaemia, Hgb < 7 g/dl Hgb < 12 g/dl	26.7 94.2

Souce: Review of Addis Zemen and Humera VL records

- * Data for spleen size available for 284 patients
- ** Data for oedema available for 263 patients
- *** Data available for only 120 patients.

Severe malnutrition with Z score <-3 SD (BMI <16 for above 14 years and Wt/Ht < 70% for those up to 14 years old) was recorded in over 38.5% of the VL patients.

Spleen size measurement data was available for 284 of the cases and data was not available for 15 cases (see table 4.5). The analysis revealed 95.4% (n=27%) of the VL patients in this study presented with enlarged spleen with the overall mean spleen enlargement of 9.11± 5.02 cm. The mean spleen size of VL patients for Addis Zemen and Humera were 9.14±5.01 and 9.04±5.08, respectively (CI (-1.240, 1.435) and P-value 0.886). When the mean spleen size enlargement was aggregated by HIV status, it revealed 11.18±4.460 and 8.64±5.049 for Addis Zemen and Humera, respectively (95% CI [0.604, 4.482] and P < 0.011) and was not significant between the two groups. This result was comparable to other studies where the mean spleen enlargement for VL patients admitted in Humera Hospital was 9.4cm (Ritmeijer et al 2006:361).

Table 4.4 Clinical presentation of patients with VL

Characteristics	Proportion (%)
Fever	100
Weight loss	98
Splenomegaly	95
Cough	37
Oedema	13
Epistaxis	9

Source: Haile (2006:390)

4.4.1.3 Section 3: Co-morbidities

Various co-infections could occur in VL patients and these are described as the major causes of mortality in VL patients. Overall, 6% (n=18) of the VL patients were diagnosed to have tuberculosis at admission or during treatment for VL: 1.4% (n=3) for Addis Zemen and 18.8% (n=15) for Humera clinics (see table 4.5).

Out of the 284 VL records revised for malaria blood film or rapid diagnostic test, only 1 patient from Humera clinic was diagnosed for malaria. Although malaria and VL have

overlapping epidemiology, the finding for malaria-VL co-infection was found to be low (0.4%). As malaria is an acute illness and treatment is widely available, patients might have been treated prior to presentation for VL treatment

Table 4.5 Clinical characteristics and concomitant infections among patients with VL with or without HIV co-infection

Variable	Number and (%) of VL patients			Total, n (%)	p
	HIV +ve	HIV -ve	Unknown		
Mean age (Range)	31.22±8.490 (39)	24.04±8.491 (50)	20.58±12.033 (61)	22.85±11.42 (61)	(3.867,10.486), <0.0001
Mean duration of illness, (range)	5.56±8.559 (35)	2.96±2.377 (12)	3.21±2.093 (12)	3.37±3.308 (36)	(0.0464,5.154), 0.046
VL Diagnosis**					
Primary	25 (25/41)	68 (68/70)	188 (188/188)	281 (281/299)	
Relapse	16 (16/41)	2 (2/70)	0(0/188)	18(18/299)	
Mean Spleen size	11.18±4.460 (16)	8.64±5.049 (24)	8.84±5.035 (24)	9.11±5.016 (24)	(0.604,4.482), 0.011
Concomitant infections					
TB	13 (13/41)	3 (3/70)	2 (2/188)	18 (18(299)	
Malaria	0 (0/34)	1 (1/63)	0 (0/187)	1 (1/284)	
Pneumonia	2 (2/34)	13 (13/62)	6 (6/187)	25 (25/283)	
Diarrhea	5 (5/34)	11 (11/61)	3 (3/187)	19 (19/282)	
Disease and/or treatment complications					
Bleeding	3 (3/41)	7 (7/71)	3 (3/188)	13 (13/299)	
Vomiting	12 (12/41)	11 (11/70)	2 (2/188)	25 (25/299)	
Treatment outcome* **					
Good	35 (35/41)	62 (62/70)	181 (181/188)	278 (278/200)	
Poor	6 (6/41)	8 (8/70)	7 (7/188)	21 (21/299)	
Died	3 (3/41)	3 (3/70)	6 (6/188)	12 (12/299)	

**HIV test was done on 111 of the 299 study VL cases

Pneumonia was diagnosed in 8.4% (n=25) of the VL cases at admission or during treatment for VL. It occurred in 10.6% (n=23) and 3% (n=2) of VL cases in Addis Zemen and Humera clinics and was not significant (P=0.058). Patients had signs of VL

complications or adverse effect of drugs, which included bleeding, vomiting and diarrhoea during the course of the disease (Table 4.5). In this study, 3.2% and 7.5% of the cases had bleeding for Addis Zemen and Humera clinics, respectively and showed significant difference with overall value of 4.3% (P < 0.001). VL disease was complicated with vomiting in 21.3% (n=17) of the VL patients from Humera and 3.7% of Addis Zemen (P < 0.0001). Overall, 6.7% (n=19) VL patients had diarrhoea; with 7.4% and 4.6% for Addis Zemen and Humera, respectively.

Table 4.6 HIV status of VL patients, Addis Zemen and Humera VL clinics

HIV status	Frequency	Percent
Positive	41	13.7
Negative	70	23.4
Not Done	188	62.9
Total	**299**	**100.0**

HIV test results were available only for 37% (n=111) of the VL patients in the two clinics because HIV test was not routinely practised during that period. The overall HIV/VL co-infection rate was 36.9% among 37% (n=111) of the VL patients who underwent HIV test (23.3%% and 45.6% for Addis Zemen and Humera, respectively, P < 0.0001). Haile and Anderson (2006:390) found that 28% of the patients admitted and treated for VL in St Mary's Hospital between February 2002 and September 2003 were found to be HIV positive. A study on patients in the VL endemic north-western Ethiopia revealed 28.5% HIV co-infection rate in VL patients (Ritmeijer et al 2006:361). The mean age for HIV co-infected VL patients in this study was significantly different from those HIV-negative VL patients (31.22$\pm$8.49 vs 24.04$\pm$8.49, P<0.001) (see table 4.5). Mengistu and Ayele (2006:56) found that the mean age of HIV co-infected VL patients was significantly higher than those without co-infection (29.3$\pm$8.8 vs 23.6$\pm$6.1).

Currently, HIV screening is a routine practice for all VL patients in most of the VL clinics in the country.

4.4.1.4 Nutritional status of the VL patients

Nutritional data for VL patients was available for 288 records and patients were categorized as either with severe malnutrition (Z score < -3 with either BMI < 16 or Wt/Ht < 70%) or no severe malnutrition.

Severe malnutrition as complication for VL was found in 38.5% of the VL patients (37.0% and 42.5% for Addis Zemen and Humera VL Clinics In Ethiopia, respectively. The mean ± SD duration of illness for severely malnourished VL patients was 2.33 ±1.04 (P <0.0001).

Moreover, severe malnutrition was found in 37.0% of the primary and 61.1% of the relapse VL cases in the two clinics and this difference was significant (P < 0.0001) (see table 4.7).

Table 4.7 Severe malnutrition in relation to VL diagnosis

			Primary VL	Relapse	Total
Nutritional status	Z score <-3	**n**	104	11	115
		%	37.0%	61.1%	38.5%
	Z score >-3	**n**	177	6	183
		%	63.0%	33.3%	61.2%
	Unknown	**n**	0	1	1
		%	.0%	5.6%	.3%
Total		**n**	281	18	299
		%	100.0%	100.0%	100.0%

The study results indicated that severe malnutrition was more common in HIV-positive than HIV-negative VL patients (50.0% vs 32.9%), but this was not significant (P=0.051). Tuberculosis (TB) (66.7%) and diarrhoea (44.4%) were found to be significantly associated with severe malnutrition in VL patients in this study (P<0.0001) (see table 4.8). Similar studies could not be found.

Table 4.8 Severe malnutrition and concomitant infections/diseases

Variable	Severe malnutrition[a]	Total	P-Value
Mean duration of illness ± SD	2.33±1.042		P<0.0001
VL Diagnosis			
Primary	104 (37.0%)	115 (38.6%)	P<0.0001
Relapse	11 (64.7%)		
*HIV Status			
Positive	20 (50.0%)	115 (38.6%)	P=0.051
Negative	23 (32.9%)		
Concomitant infections and complications			
TB	12 (66.7%)	115 (38.6%)	P<0.0001
Malaria	0 (0%)	115 (38.2%)	P=0.732
Pneumonia	12 (48%)	107 (37.9%)	P=0.527
Bleeding tendency	3 (23.1&)	115 (38.6%)	P=0.801
Vomiting	15 (60%)	115 (38.6%	P=0.222
Diarrhea	8 (44.4%)	107 (38.1%)	P<0.001
Presence of edema	15 (39.5%)	115 (38.6)	P=0.979

*HIV *test done in only 43 of the 115 severely malnourished VL patients.*

[a] *Fisher test calculated*

4.4.1.5 VL treatment and outcome of treatment

Of the VL patients in the study, 73.2% (n=219) were treated in Addis Zemen VL Clinic. Outcome information was available for the 299 patients in the study. Over all, good outcome (improved discharged) was achieved for 93% (n=278) of the VL cases treated in the two clinics (96.0% for Addis Zemen and 85.0% for Humera) whereas 7% (n=21) of the cases had a poor outcome (X^2 = 10.64; P <0.001). Of the VL patients, 4.0% died during treatment, 1.3% defaulted treatment and 1.3% were referred to a better centre). Ritmeijer et al (2006:362) and Mengistu and Ayele (2007:57) found higher fatality rates which were equivalent to or more than 10%.

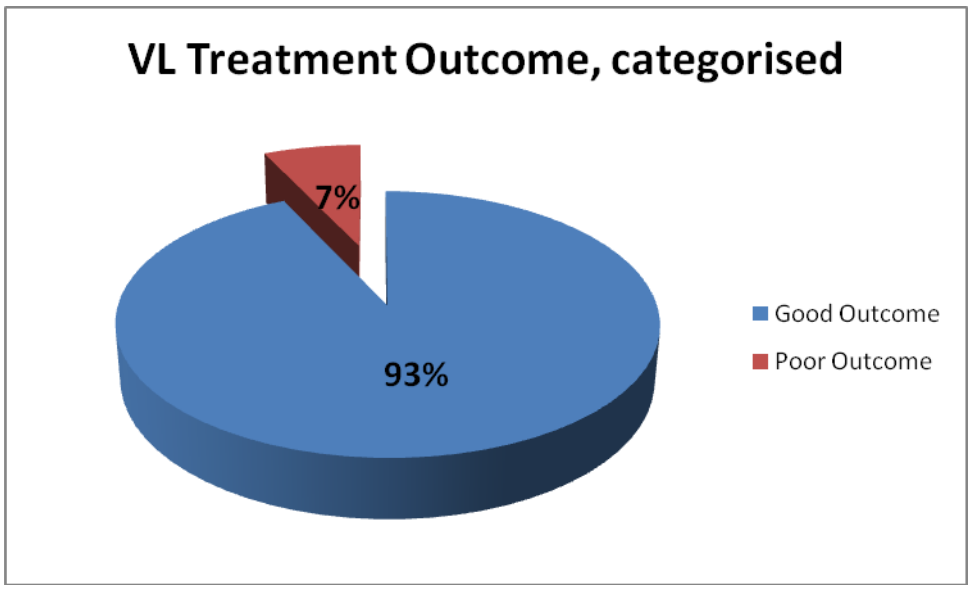


Figure 4.4 Overall VL treatment outcome categorised

When the VL treatment outcome is categorized by health facility (see table 4.8), patients treated in Addis Zemen Clinic had a better outcome compared to those in Humera Clinic (P<0.001).

Table 4.9 Treatment outcome of VL patients, categorised

		Treatment site		Total
		Addis Z	**Humera**	
Treatment outcome	Good outcome	210	68	278
	Poor outcome	9	12	21
Total		**219**	**80**	**299**

The overall treatment outcome for VL patients revealed 93% improved discharged, 1.3% defaulted and 4% case fatality rate, 1.3% of the VL cases were referred to better centres, and treatment outcome was not recorded for one patient (see table 4.9)

Table 4.10 Treatment outcome for VL patients

VL treatment outcome	Frequency (%)
Improved	278 (93.0%)
Defaulted	4 (1.3%)
Referred	4 (1.3%)
Death	12 (4.0)
Unknown	1 (1%)
Total	**299 (100%)**

Bivariate analysis of factors associated with treatment outcome showed only age > 45 years old was associated with poor treatment outcome for VL patients. A logistic regression model showed no independent predictor of poor outcome (.OR=0.24, 95% CI=0.06-0.98, P>0.086). This may be biased with incomplete data on various variables including HIV status, nutritional status and haemoglobin level of the VL patient.

Age ≥ 25 years old, HIV co-infection, diarrhoea, other infections including TB and sepsis were found to be highly associated with higher risk of death for VL patients (Hurissa, Gebre-Silassie, Hailu, Tefera, Lalloo, Cuevas & Hailu 2010:851, 852). HIV co-infection, vomiting, severe malnutrition, anaemia and diarrhoea were significantly associated with higher risk of death (Ritmeijer 2006:361-62). According to a study by Mengistu (2007:59), HIV infection, severe malnutrition and bleeding tendency are factors predicting death in VL patients. Seife, Nohelly, Argaw, Mulugeta, Herrero, Nieto, Chicharro, Caňavate and Bern (2009:374) found a treatment outcome of 4% mortality rate with age above 45 years, HIV infection, severe malnutrition, pneumonia, tuberculosis and vomiting were associated with increased risk of death.

4.2.2 Health care professionals' characteristics

Health care professionals are essential components of the health care system and this is particularly important for VL, which requires close medical follow-up. Regular training of health care workers and improvement of the supply management system for leishmaniasis is believed to improve the leishmaniasis control programme in general. The researcher found few studies conducted on the knowledge and perception of the

health care workers regarding leishmaniasis. According to Gerstl, Amsalu and Ritmeijer (2006:171), the signs, symptoms and mode of transmission for VL were mostly unknown by health care workers in the PHC service.

4.4.2.1 Professional qualifications and training

Data was available for 62 health care professionals from the two VL clinics (40.3%; n=25) from clinic A and 59.7%; n=37) respondents from clinic B). Over 74% of the respondents were nurses, health officers or physicians who were directly involved in the management of VL cases and the rest were laboratory professionals, pharmacists environmental health professionals, and others.

Table 4.11 Respondents' qualifications, Addis Zemen and Humera VL Clinics

Qualification	Frequency	Percent
1. Nurse	42	67.7
2. Physician/Health Officer	4	6.5
3. Laboratory Professional	6	9.7
4. Pharmacist	4	6.5
5. Other	6	9.7
Total	**62**	**100.0**

The study revealed that 66.1% (n=41) of the respondents had formal training for leishmaniasis and over 61% had three or more years' service. Out of the 41 respondents, 48.8% (n= 20) received their leishmaniasis training on site.

Table 4.12 Respondents' years of service

Service years	Frequency	Percent
Less than 1 year	6	9.7
1-2 years	18	29.0
3-4 years	10	16.1
4-5 years	5	8.1
5-6 years	7	11.3
More than 7 years	16	25.8
Total	**62**	**100.0**

Of the respondents, 56.5 % (n=35) were assigned to the VL clinic during their stay in the health facility regardless of their training status. Over 64.5% (n=40) of the respondents attended health education for VL, and 61.2% attended one or more in-service health education sessions.

4.4.2.2 Respondents' knowledge of epidemiology and transmission of VL

Of the respondents, over 96% (n=60) identified their district as endemic for VL; 74.2% (n=46) correctly identified the mode of transmission for VL in Ethiopia as anthroponotic, and 95.2% (n=59) also identified the phlebothomin sandfly as the vector transmitting the infection.

Table 4.13 Respondents' training and knowledge of VL transmission

Trained (formal) for VL(N=62)		
Yes	n=41	66.1%
No	n= 21	33.9%
Assigned in the VL clinic		
Yes	n=35	56.5%
No	n= 27	43.5%
Attended health education on VL		
Yes	n=40	64.5%
No	n= 22	36.5%
Knowledge of endemicity of this district for VL		
Yes	n=60	96.8%
No	n= 1	1.6%
Do not know	n=1	1.6%
Correctly identified mode of transmission		
Yes	n=46	74.2%
No	n= 12	19.4%
Uncertain	n=4	6.4%

Identified the Phlebotomin sandfly as vector		
Yes	n=59	95.2%
No	n= 0	0.0%
Uncertain	n=3	4.8%
Identified at least one VL prevention strategy		
Yes	n=56	90.4%
No	n=2	3.2%
Uncertain	n=4	6.4%
Identified at least two VL prevention strategies		
Yes	n=34	54.9%
No	n= 28	45.1%
Identified forms of leishmaniasis		
Yes	n=53	85.5%
No	n= 9	14.5%

Moreover, of the respondents, 90.4% (n=58) identified at least one of the prevention strategies for VL, and 85.5% (n=53) of the respondents identified the various forms of leishmaniases (see table 4.12).

4.4.2.3 Respondents' knowledge of VL clinical presentation

The respondents' knowledge of the clinical presentations of VL was assessed and the results are summarised in table 4.14.

Table 4.14 Respondents' knowledge of VL clinical presentations

Clinical manifestations	Overall, % (n)	*Clinic A, %	*Clinic B, %
Fever			
Yes	95.2 (59)	92.3	97.2
No	2 (3.2)	7.7	0
Uncertain	1 (1.6)	0.0	2.8
Splenomegaly			
Yes	95.2 (59)	92.3	97.2
No	2 (3.2)	7.7	0
Uncertain	1 (1.6)	0	2.8
Weakness			
Yes	85.5 (53)	96.2	77.8
No	2 (3.2)	38.2	2.8
Uncertain	11.3 (7)	0	19.4
Anaemia			
Yes	85.5 (53)	96.2	77.8
No	2 (3.2)	3.8	2.8
Uncertain	11.3 (7)	0	19.4
Lymph node enlargement			
Yes	72.6 (45)	92.3	58.3
No	14.5 (9)	7.7	19.4
Uncertain	12.9 (8)	0	22.2
Bleeding tendency			
Yes	88.7 (55)	92.3	86.1
No	6.5 (4)	7.7	5.6
Uncertain	4.8 (3)	0	8.3
Weight loss			
Yes	98.4 (61)	96 (24)	100 (37)
No	1.6 (1)	4 (1)	0 (0)
Uncertain	0 (0)	0 (0)	0 (0)
Abdominal discomfort or swelling			
Yes	83.9 (52)	96.0 (24)	75.7 (28)
No	4.8 (3)	4.0(1)	5.4 (2)
Uncertain	11.3 (7)	0 (0)	18.9 (7)
Other clinical manifestation(s)			
Yes	29.0(18)	23.1	33.3
No	25.8(16)	50.0	11.1
Uncertain	43.2(27)	26.9	55.6

* Clinic A is for Addis Zemen and Clinic B is for Humera

4.4.2.4 Respondents' knowledge of availability of VL services

It is essential that health care service providers understand the available VL services in the vicinity to help patients get the services in time before the disease becomes complicated. Of the respondents, over 98% knew the type of VL services (diagnosis, treatment and health education) provided in their clinic. Furthermore, 100% of the respondents (n=25) in Addis Zemen Clinic responded correctly that diagnosis of VL was made using serology test, while 86.5% (n=32) from Humera responded diagnosis was made using serology and parasitology tests (see table 4.13).

Table 4.15 Respondents' knowledge of availability of VL services

	Yes, % (n)	No, % (n)	Uncertain, % (n)
VL services are provided in your clinic			
Diagnosis	98.4 (61)	1.6 (1)	0 (0)
Treatment	98.4 (61)	1.6 (1)	0 (0)
Health rducation	98.4 (61)	1.6 (1)	0 (0)
Uncertain	1.6 (1)	98.4 (61)	0 (0)
Availability of VL diagnosis methods			
Serology for clinic A	100 (25)	0 (0)	0 (0)
Serology and parasitology for clinic B	86.5 (32)	13.5 (5)	0 (0)
Identify first line VL drug in Ethiopia	82.3 (51)	14.5 (9)	3.2 (2)

Overall, 82.3% (n=51) of the respondents answered correctly that Sodium Stboglucanate is the first-line drug for VL (88.0% and 78.4 % from clinic A and B, respectively [data not seen here]). Of the respondents, 14.5% (12.0% for clinic A and 16.2% for clinic B) did not know and 3.2% were uncertain about the first-line drug for VL in Ethiopia.

4.4.2.5 Respondents' perceptions of the existing VL programme

Table 4.16A presents the respondents' perceptions of the existing VL programme. The general condition of the VL service in the two clinics was perceived as either good or excellent by over 80% of the respondents (see table 4.16B).

Table 4.16A Respondents' perceptions of the VL services

Perceptions of the availability of VL services	Overall, % (n)	Clinic A, % (n)	Clinic B, % (n)
Leishmaniasis diagnostics			
Acceptable	9.7 (6)	12.0% (3)	8.1% (3)
Good	59.7 (37)	76.0% (19)	48.7% (18)
Excellent	30.6 (19)	12.0% (3)	43.2% (16)
Leishmaniasis drugs			
Acceptable	9.7 (6)	4% (1)	13.5% (5)
Good	77.4 (48)	95% (23)	67.6% (25)
Excellent	11.3 (7)	4% (1)	16.2% (6)
Blood transfusion services			
Very poor	41.9 (26)	100% (1)	2.7%
Acceptable	43.5 (27)	0% (0)	73.0%
Good	8.1 (5)	0% (0)	13.5%
Therapeutic feeding			
Poor	19.4 (12)	20% (5)	18.9% (7)
Acceptable	50.0 (31)	40% (10)	56.8% (21)
Good	25.8 (16)	32% (8)	21.6% (8)
Supplementary feeding			
Poor	8.1 (5)	4% (1)	10.8% (4)
Acceptable	40.3 (25)	16% (4)	56.8 (21)
Good	40.3 (25)	72% (1)8	18.9% (7)

Overall, 59.7% and 77.4% of the respondents, respectively, rated the availability of leishmaniasis diagnostics and drugs as good. The blood transfusion service was perceived as very poor by 100% for Addis Zemen, but was acceptable for Humera VL clinic. Regarding the availability of supplies for nutritional management (therapeutic and supplementary feeding supplies) of malnourished VL patients, overall 50% of the respondents indicated that it was acceptable (see table 4.16A).

The accessibility of the VL services was assessed as excellent by 61.3% of the respondents (36% for Addis Zemen and 78.4% for Humera). Moreover, the referral system was also rated as excellent by 67.7% (see table 4.16B). But the adequacy of the health care workers (human resources) was assessed as either poor or acceptable by over 45% of the respondents and calling for action (and 73% for Humera). Of the respondents, 95.5% indicated "yes" for the availability of admission beds for VL patients in the two clinics (see table 4.16B).

Table 4.16B Respondents' perceptions of VL services

	Overall, % (n)	Clinic A, %	Clinic B, %
Accessibility			
Acceptable	6.5 (4)	8.0% (2)	5.4% (2)
Good	32.3 (20)	56.0% (14)	16.2% (6)
Excellent	61.3 (38)	36.0% (9)	78.4% (29)
Referral system			
Poor	4.8 (3)	12.0% (3)	0.0% (0)
Good	25.8 (16)	48.0% (12)	10.8% (4)
Excellent	67.7 (42)	36.0% (9)	86.5% (33)
Adequacy of health workers			
Poor	22.6 (14)	0% (0)	37.8% (14)
Acceptable	22.6 (14)	4% (1)	35.1% (13)
Good	27.4(17)	44% (11)	16.2 (6)
General condition of the VL service			
Acceptable	8.1 (5)	8% (2)	8.1% (3)
Good	74.2 (46)	84% (21)	67.6% (25)
Excellent	16.1 (10)	8% (2)	21.6% (8)
Availability of admission beds			
Yes	95.2 (59)	100% (25)	91.9% (34)
No	1.6 (1)	0% (0)	2.7% (1)
Uncertain	3.2 (2)	0% (0)	5.4% (2)

Follow-up and support of the leishmaniasis control programme by the respective regional health bureaus or district health offices for the two clinics were assessed. Of the respondents, 100% (n=25) from Addis Zemen and 40.5% (n=15) from Humera indicated that they got support, where the level of collaboration was assessed as either acceptable or good by 72.6% the respondents (see table 4.16C).

Table 4.16C Respondents' perceptions of the health care workers on the VL services

	Overall, % (n)	Clinic A, %	Clinic B, %
Clinic gets support from region or district			
Yes	64.5 (40)	100. (25)	40.5 (15)
No	11.3 (7)	0.0 (0)	18.9 (7)
Uncertain	24.2 (15)	0.0 (0)	40.5 (15)
Collaboration between clinic and district/region			
Acceptable	33.9 (21)	24.0 (6)	40.5 (15)
Good	38.7 (24)	56.0 (14)	27.0 (10)
Excellent	12.9 (8)	12.0 (3)	13.5 (5)
Reporting system			
Acceptable	30.6 (19)	4.0 (1)	48.7 (18)
Good	38.7 (24)	64.0 (16)	21.6 (8)
Excellent	16.1 (10)	32.0 (8)	5.4 (2)
VL under IDSR			
Yes	29 (18)	72.0 (18)	0.0 (0)
No	23 (37.1)	8.0 (2)	56.8 (2)1
Uncertain	33.9 (21)	20.0 (5)	43.2 (16)
Extent of leishmaniasis surveillance			
Acceptable	41.9 (26)	20.0 (5)	56.8 (21)
Good	35.5 (22)	44.0 (11)	29.7 (11)
Excellent	9.7 (6)	4.0 (1)	13.5 (5)
Areas to improve reporting system			
Communication channel	85.5 (53)	80.0 ((20)	89.2 (33)
Formats	16.0 (4)	2.7 (1)	8.1 (5)
Feedback	4.0 (1)	8.1 (3)	6.5 (4)
Need for focal person			
Yes	85.5 (53)	88.0 (22)	83.8 (31)
No	8.0 (2)	10.8 (4)	9.7 (6)
Uncertain	4.0 (1)	5.4% (2)	4.8 (3)

Only 16.1% of the respondents indicated the leishmaniasis reporting system was excellent, and over one-third (34.0%) were not sure whether VL is under IDSR. The surveillance system for leishmaniasis was reported as acceptable, good and excellent by 41.9%, 35.5% and 9.7% of the respondents, respectively. Over 88% of the respondents indicated the communication channel needs to be strengthened to improve the leishmaniasis reporting system. Of the respondents, 83.9% (n=52) indicated he need for a focal person for the leishmaniasis clinic and 51.6% indicated that a nurse should be the focal person. There may be bias on the qualification of the focal person due to the large number of nurses among the respondents.

Table 4.17 Characteristics associated with treatment outcome in VL patients, Addis Zemen and Humera clinics, 2005-2009

Variables	Total	No poor outcomes	Unadjusted odds ratios (95% CI)	P-value
Sex				
Male	258	19	1.55 (0.347 - 6.919)	0.566
Age				
Age > 455	14	3	5.37(1.06- 27.34)	0.042
Duration of Illness				
> 5 months	36	1	0.31 (0.04 -2.75)	0.292
Nutritional status				
Z score < -3	115	14	1	
Z score >=-3	183	7	0.29 (0.11- 0.73)	0.009
HIV status				
Positive	70	6	4.43 (1.41-13.98)	0.011
Negative	188	8	3.34 (1.16 -9.58)	0.025
Tuberculosis				
Yes	13	3	0.97(0.64 -1.45)	0.884
Pneumonia				
Yes	25	2	0.66 (0.14-3.08)	0.597
Diarrhoea				
Yes	19	1	1.01(0.13 -8.14)	0.991
Vomiting				
Yes	25	4	1.15(0.79-1.66)	0.476
Bleeding				
Yes	13	2	1.19 (0.85 -1.69)	0.312
Treatment site				
Humera	80	12	4.12(1.66 -10.19)	0.002

4.5 LEISHMANIASIS CONTROL PROGRAMME IN ETHIOPIA

Ethiopia being endemic to VL has set its national control programme since 2006 with printing of the first national guidelines for the diagnosis and treatment of VL.

4.5.1 Challenges of the leishmaniasis control programme

The national leishmaniasis control programme in Ethiopia has several challenges despite all the efforts made by the government and partners. Due to the low level of attention given to all NTDs, including leishmaniasis, further effort is needed to improve policy makers' awareness.

Government commitment to recognise leishmaniasis and strengthening the national control programme are pivotal. Improving awareness and establishing surveillance systems in the endemic areas are critical challenges to be addressed for improving the VL control programme in Ethiopia.

4.5.1.1 Weak Leishmaniasis control programme

A functioning national control programme for leishmaniasis is a prerequisite for proper planning, implementation and coordination of VL control activities. The national leishmaniasis control programme in Ethiopia is under the Health Promotion and Disease Prevention General Directorate of the Ministry of Health. National VL diagnosis and treatment guidelines were prepared by the MoH of Ethiopia only in 2006 to guide health care workers to provide standard treatment of cases (MoH 2006).

4.5.1.2 Lack of leishmaniasis disease surveillance

Surveillance includes continuous data collection, timely analysis and dissemination and functional capacity to undertake effective prevention and control activities on the basis of this information (WHO TRS 2010). In endemic countries, leishmaniasis notification to public health authorities should be mandatory.

Until recently, most of the VL treatment centres in the endemic regions of the country did not provide regular reports. The exact burden of the disease is not well known and this has also resulted in frequent rupture of supplies as the distribution of these supplies is done with the little data available at national level.

The emergence of a VL epidemic is difficult to predict. Factors that may help in prediction are changes in vector habitat, mass movement of peoples and decreased immunity as in malnutrition (WHO TRS 2010:83). In VL epidemic situations, rapid assessment, epidemic preparedness and outbreak response are important.

4.5.1.3 Lack of surveillance tool

Standardised surveillance tools are lacking for leishmaniasis in general and for VL in particular. Hence, making available a standard recording and reporting tool is a key step in strengthening the leishmaniasis surveillance system in the leishmaniasis endemic localities of the country.

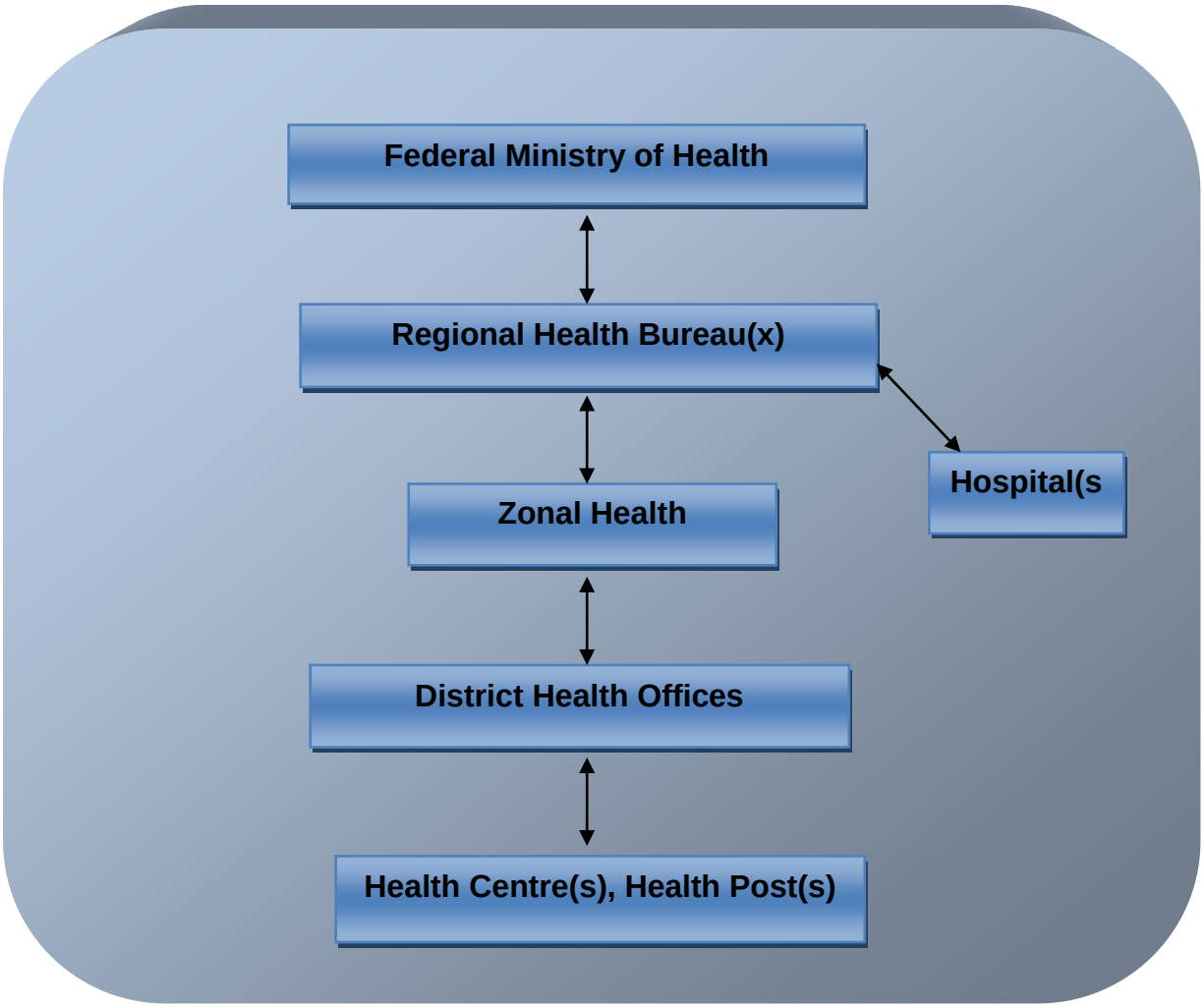


Figure 4.5 The general data flow system in Ethiopia

The surveillance protocol should be designed for monitoring disease burden and trends in VL/HIV co-infection and for evaluating the effectiveness of control measures (WHO TRS 2010:134).

4.5.1.4 Lack of ownership

Effective PHC requires maximum involvement of the community with clear understanding of the advantages they will gain from the control measures (WHO TRS 2010:128/9).

The Federal MoH is the owner of the leishmaniasis control programme, and should take the leader in coordinating all the leishmaniasis activities. Most of the VL activities are done by international NGOs, the perception of the health workers at all levels in the endemic regions and the Federal Ministry of Health be properly guided.

4.5.1.5 Lack of adequate and effective tools (supplies)

Providing support for the health facilities providing leishmaniasis services to ensure the availability of early and accurate diagnostic testing followed by appropriate antileishmania treatment is the mainstay of VL (Alvar et al 2007).

The chemotherapeutic challenges for VL include the availability of few drug options for treatment, and lengthy and expensive treatment with toxic chemicals. There are significant challenges related to infrastructure and access to services in VL endemic countries.

Despite the advances made over the years with the introduction of new drugs, these are not ideal drugs because they are not short-duration therapies and are highly toxic and expensive drugs (Alvar et al 2006:224).

4.5.1.6 Lack of awareness

Despite its catastrophic effect on the affected community and continuous epidemiological spread, modest attention is given to control the disease. The affected

community know very little about the disease and often do not seek medical advice when they become sick.

4.5.1.7 Lack of public awareness

Many VL patients take a long time to access to health care services for VL patients mainly due to lack of awareness and lack of VL services. The mean duration of illness in Ethiopia is two to three months before seeking medical attention (Ritmeijer et al 2006:359).

4.5.1.8 Lack of trained health workers

The 2005 VL outbreak caused significant damage to the local community due to lack of awareness by the public and also by the health care workers which emphasised the need for improved capacity of the local health care workers. PHC services for VL in endemic countries are usually short of skilled staff (human resources).

High turnover of trained staff exacerbated by the remoteness and the harsh nature of the VL endemic localities is one of the major challenges for the control programme in Ethiopia (WHO TRS 2007).

4.5.1.9 Rapid spread of VL disease

The epidemiology of leishmaniasis depends on the parasite characteristics, ecology of transmission sites, and exposure of the human population and human behaviour. Conditions that favour VL transmission are generally low altitude, heavy annual rainfall, high humidity and temperature (WHO TRS 2010:36).

The geographic spread of VL and its rapid and sustained progression make it very difficult to eliminate. In Ethiopia, the disease is spreading to previously non-endemic areas, as seen in the 2005 Libo outbreak. This area is a highland where population movement is considered the major contributing factor (WHO TRS 2007).

4.5.1.10 HIV/VL co-infection

The HIV/AIDS pandemic affected the VL spectra, both its clinical and epidemiological aspects. It has modified the natural history of the disease where the risk of clinical VL following infection is increased by 1000 times, reduces therapeutic responses, and increases the rate of VL relapse. Likewise, VL facilitates the clinical progression of HIV disease. Both HIV and VL cause synergistic damage to the immune system and result in atypical clinical presentations (WHO TRS 2007).

HIV co-infected VL patients had a nine times higher death rate during treatment, and VL relapse rate at 6 months follow-up was eight times higher compared to the non-HIV VL patients (Ritmeijer et al 2001:668).

HIV/AIDS poses great challenges for the leishmaniasis control programme in Ethiopia where a large proportion of VL patients in the north-western part of the country are co-infected with HIV (Lyons 2003; MoH 2006).

The existing opportunities with the expansion and decentralisation of the free ART services, joint effort by the various partners and increased government commitment are vital for the leishmaniasis program in Ethiopia.

4.6 CONCLUSION

This chapter investigated and discussed the clinical manifestations and anthropometric profiles of visceral leishmaniasis in selected centres in Ethiopia. The study identified the factors associated with poor treatment outcome. This research also provided evidence from other studies and more focused research would help to get more adequate information.

Chapter 5 summarises the conclusions, limitations and recommendations of this study.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter concludes the study, discusses the limitations and gives recommendations for leishmaniasis control and further research.

The purpose of the study was to investigate the clinical manifestations and nutritional status of VL in Ethiopia and to explore health care professionals' knowledge and perceptions of VL. The researcher wished to answer the following questions:

- What are the most common clinical manifestations patients who suffer from VL present with in selected clinics in Ethiopia?
- What is the nutritional status of VL patients in the selected VL clinics using the anthropometric variables?
- Are health care professionals equipped to recognise early signs and symptoms of VL? What measures can be applied to promote early case management of VL patients presenting at selected clinics in Ethiopia?

The objectives of this study were to:

- Investigate the clinical manifestations of VL in selected clinics in Ethiopia.
- Describe the nutritional status using anthropometric variables of VL patients admitted to selected VL clinics in Ethiopia.
- Explore whether health care professionals are sufficiently equipped to recognise the early signs and symptoms of VL.
- Explore measures that would promote early case management of VL patients.

The research design was quantitative, retrospective, descriptive and cross-sectional to investigate the clinical manifestations and nutritional status of VL patients from existing records (phase 1). Phase 2 used a quantitative and explorative study design.

5.2 SUMMARY OF THE FINDINGS

This section summarises the findings based on the research objectives and questions.

5.2.1 Demographic characteristics of VL patients

The mean age of the VL patients was 22.85 ± 11.42 (21.00 ± 11.72 for Addis Zemen and 27.90 ± 8.82 for Humera VL Clinics). VL patients in Addis Zemen Clinic were found to be significantly younger than those in Humera Clinic. This might be due to the recent occurrence of the disease in Addis Zemen and the nature of the population affected in Humera, where large numbers of young migrant labourers travel from non-VL endemic localities. The age group most affected by VL in both clinics was between 16 and 25 years.

Males were found to be predominantly affected by VL compared to females (M:F 6.3:1). The researcher observed the proportion was even higher for Humera VL patients compared to those in Addis Zemen (39.0:1 vs 4.6:1).

5.2.2 VL disease category and clinical manifestations

Up to 94.0% (n=281) of the VL patients in the study were primary VL cases and only 6% of the 299 cases were relapse cases. When this was aggregated by clinic, it was found to be 100% for Addis Zemen (n=219) as the disease was a new incident in the area and 77.5% (n=62) for Humera.

The overall mean duration of illness for VL was 3.37 + 3.31 months for the two clinics (3.46 ± 2.632 and 2.73 ± 6.14 for Addis Zemen and Humera, respectively). Fever (100%), spleen enlargement (95.4%) and anaemia (94.2%) were found to be the commonest clinical presentations of VL. The mean spleen enlargement was 9.14± 5.01 cm. Severe anaemia with haemoglobin level below 7 g/dl was found in 26.7% of VL patients. The mean haemoglobin level at admission was 8.34 + 2.43 g/dl for this study, with no significant difference between the two clinics. Understanding these common VL clinical presentations is important for early case detection and patient follow-up during and after treatment.

5.2.3 Nutritional status of the VL patient

Malnutrition was also found to be a common clinical presentation in VL patients because 38.5% (n=114) of the study population had severe malnutrition (z score < -3 SD) at admission for VL treatment; 42.5% and 37.0% of the VL patients had severe malnutrition in Humera and Addis Zemen, respectively. Malnutrition was more common in HIV co-infected VL patients than non-HIV VL patients (50.0% vs. 32.9%). Severe malnutrition was found to be significantly higher in relapse VL cases compared to the primary ones (64.7% vs 37.0% respectively). Hence, management of severe malnutrition should be part and parcel of the VL treatment to speed up patients' recovery.

5.2.4 Co-morbidities

VL disease could be complicated or presented with various co-morbidities. In this study, TB (all forms) was diagnosed in 6.0% of the VL patients at admission or during treatment for VL. Pneumonia was diagnosed in 8.8% (n=25) of the VL cases in the two clinics (10.6% for Addis zemen and 3.0% for Humera).

VL patients also had diarrhoea and vomiting (6.7% and 8.4%) and bleeding was manifested in 4.4% of the VL cases. There was only one case of VL patient diagnosed to have malaria in this study.

HIV being one of the co-morbidities in VL affects VL disease in various ways. The mean age for VL patients varied significantly by HIV status (31.22$\pm$8.490 for HIV positives and 24.04$\pm$8.491 for HIV negatives). VL relapse was found more common in HIV-positive ones compared to the HIV negative (39.0% vs. 2.9%, respectively). TB was also found to be common in HIV co-infected VL patients than non-HIV co-infected ones (31.7% vs. 4.3%, respectively). Vomiting was twice as common in HIV/VL co-infected patients than in non- co-infected VL patients (29.3% vs. 15.8%, respectively).

5.2.5 Treatment outcome of VL patients

While the overall mortality rate in this study was 4.0%, the mortality rate for HIV co-infected VL patients was 7.3% compared to 4.3% for HIV-negative ones. 93.0% of the VL patients in this study had good treatment outcome (discharged improved after treatment) whereas 7.0% of the VL patients had poor outcome (those patients who died, defaulted or referred). Age above 45 years and HIV-positive status were significantly associated with poor treatment outcome.

5.2.6 Respondents' professional qualifications

Over 67.0% (n=42) of the respondents were nurses (52.0% for Addis Zemen and 78.4% for Humera, respectively). Nursing care is an essential aspect of VL in VL clinics. The remainder of the respondents were physicians or health officers (6.5%), laboratory professionals (9.7%), pharmacists (6.5%) and others (9.7%).

5.2.7 Respondents' training and experience

Training of the health care worker in VL diagnosis and management is a critical aspect of the leishmaniasis control programme. The training could be either on-job or hospital-based training. Of the respondents, 66.1% (n=41) received formal VL training; of which 48.8% (n=20) received the training on site. The respondents' service in the two clinics showed that over 61.0% had been assigned to work in the VL clinic and 64.5% health education on leishmaniasis.

5.2.8 Respondents' knowledge of VL transmission, clinical manifestation(s), prevention and treatment

Health care workers' knowledge of leishmaniasis is vital for improving the control programme. This will help in early case detection and management and improve the leishmaniasis control efforts. Leishmaniasis disease forms were correctly classified as cutaneous and visceral by 85.5% of the respondents; 96.8% identified the district as VL endemic; 74.2% correctly identified VL transmission in Ethiopia as human to human, whereas 19.4 % and 4.8% did not identify and were uncertain about disease transmission.

The vector transmitting leishmaniasis was correctly identified as sandfly by 95.2% (n=59) of the respondents, with only 4.8% being uncertain about it. Over 90.0% of the respondents identified one prevention strategy for VL and 54.9% identified two of the prevention strategies.

Fever and spleen enlargement were the most common VL presentations and over 95.0% (n=59) of the respondents correctly identified these presentations. A significant proportion (85.5%) of the respondents knew that weakness and anaemia were clinical manifestations for VL in Ethiopia. Although nymph node enlargement is a rare presentation of VL in Ethiopia, 72.6% of the respondents indicated it as one of the VL clinical manifestations. Weight loss, abdominal discomfort or swelling and bleeding tendency were identified as VL presentations by 98.4%, 83.9% and 88.7% of the respondents, respectively.

Of the respondents, 98.4% correctly identified VL diagnosis, treatment and health education as the leishmaniasis services provided in the two clinics. Though all the respondents correctly identified serology test as the diagnostic service for VL in Addis Zemen, 13.5% (n=5) of the respondents from Humera did not know the VL diagnostic service provided in the clinic. Only 82.3% of the respondents correctly identified the first-line drug for VL in Ethiopia.

5.2.9 Respondents' perceptions of the leishmaniasis services

Of the respondents, 59.7% and 77.4% rated the leishmaniasis diagnostic supplies and drugs as "good", but over 85.0% rated blood transfusion services as either "very poor" or "acceptable". With 38.5% of the VL patients in this study having severe malnutrition, the availability of therapeutic feeding service was perceived as very poor by 19.4% of the respondents although supplementary feeding service was rated "good" by over 40.0% of them.

Both the accessibility of the VL services and the referral system for VL were perceived as either "good" or "excellent" by 94.0% (n=58) of the respondents. Though the general condition of the VL service was rated as "good" or "excellent" by 90.3% of the

respondents, the adequacy of the health care workers in the clinic was rated as “poor” by 22.6% of them.

Only 64.5% (n=) of the respondents reported that the VL clinic got support from the district health office and 52.0% perceived the collaboration between the district or region with the clinics as “good” or “excellent”. Only 55.5% reported that the VL reporting system was “good” or “excellent”. Of the respondents, 85.5% suggested the communication channel needed improvement to improve the reporting system, and 85.5% (n=53) indicated the need for a leishmaniasis focal person in the VL clinics.

5.3 LIMITATIONS OF THE STUDY

- The study was conducted in only two VL clinics located in north-western Ethiopia, therefore, the findings may not be generalised.
- The study was retrospective for the clinical manifestation and nutritional status of VL patients with several missed variables.
- The data collected on VL clinical manifestation and nutritional status was old.
- Data was collected from existing files and there were many missing variables.

However, this study has provided important information on the most common clinical manifestations of VL and the respondents’ knowledge and perceptions of leishmaniasis.

5.4 RECOMMENDATIONS

Based on the findings, the following recommendations are made:

- Patients presented with fever and spleen enlargement should be suspected for VL and screening be made.
- HIV counselling and testing should be part of the leishmaniasis control and every patient diagnosed with VL should be tested for HIV.
- Provide continuous training of the health care professionals on leishmaniasis.
- Strengthen the collaboration between the VL clinics and district health office/regional health bureau.
- Improve the leishmaniasis surveillance, including the reporting system.

- Improve the availability of the different leishmaniasis supplies and services (drugs and diagnostics, blood transfusion, therapeutic feeding supplies) in the VL clinics.
- Advocacy on leishmaniasis to improve knowledge and perception.

Further research should be conducted on the following topics:

- A prospective study on the clinical manifestations of VL.
- Malaria and VL co-infection.

5.5 CONCLUSION

To strengthen the leishmaniasis control programme in Ethiopia, the most common clinical manifestations of the disease, including the nutritional status of the VL patient ,should be known. Continuous capacity building of the health care workers in the VL endemic areas on leishmaniasis clinical presentations, diagnosis and treatment should be done. Improving the supplies for leishmaniasis and availing the leishmaniasis services including blood transfusion and therapeutic feeding supplies are crucial for the leishmaniasis control programme. Moreover, awareness of the leishmaniasis services should be raised for the health workers. The reporting system foe leishmaniasis should be improved and the collaboration between the VL clinics and the district health offices and the regional health bureaus improved.

LIST OF REFERENCES

Alvar, J, Bashaye, S, Argaw, D, Cruz, I, Aparicio, P, Kassa, A, Orfanos, G, Parreno, F, Babaniyi, O, Gudeta, N, Canavate, C & Bern, C. 2007. Kala-azar outbreak in Libo Kemkem, Ethiopia: epidemiological and parasitological assessment. *American Society of Tropical Medicine and Hygiene,* 77(2):275-282.

Alvar, J, Yactao, S & Bern, C. 2006. Leishmaniasis and poverty. *Trends in Parasitology*, 22:552-557.

Anema, A & Ritmeijer, K. 2005. Treating HIV/AIDS and leishmaniasisco-infection in Ethiopia. *Canadian Medical Association Journal*, 172(11):1434-1435.

Atlaw, T. 2011. *Leishmaniasis*. London: University of East London. Available at: http//homepages.uel.ac.uk/d.p.humber/akhter/pics.html. (Accessed 12 July 2011).

Babbie, E & Mouton, J. 2004. *The practice of social research*. 3rd edition. Belmont: Wadsworth.

Bern, C, Hightower, AW, Chowdhury, R, Ali, M, Amann, J, Wagatsuma, Y, Haque, R, Kurkjian, K, Vas, LE, Begum, M, Akter, T, Cetre-Sossah, CB, Ahluwalia, IB, Dotson, E, Secor, WE, Breiman, RF & Maguire, JH. 2005. Risk factors for kala azar in Bangladesh. *Emerging Infectious Diseases* 11(5):655-662.

Bern, C, Adler-Moore, J, Berenguer, J, Boelaert, M, Boer, M & Davidson, R. 2006. Liposomal amphotericin B for the treatment of visceral leishmaniasis. *Clinical Infectious Diseases*, 43:917-24.

Black's Medical Dictionary. 2005. 41st edition. London: Black.

Blackwell, J, Fakiola, M, Ibrahim, M, Jamieson, S, Jeronimo, S, Miller, E, Mishra, A, Mohamed, H, Peacock, C, Raju, M, Sundar, S & Wilson, M. 2009. Genetics and visceral leishmaniasis of mice and man. *Parasite Immunology*, 31:254-266.

Bless, C & Higson-Smith, C. 2000. *Fundamentals of social research methods*. Cape Town: Juta.

Boelaert, M, Criel, B, Leeuwenbur, J, Damme V, Ray & Stuyft, V. 2000. Visceral leishmaniasis control: a public health perspective. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 94: 465-471.

Boer, M & Davidson, R. 2006. Treatment options for visceral leishmaniasis. *Expert Review of Anti-infective Therapy*, 4(2):187-197.

Boer, M, Alvar, J, Davidson, R, Ritmeijer, K & Balasgaram, M. 2009. Developments in the treatment of visceral leishmaniasis. *Expert Opinion on Emerging Drugs,* 14(3):395-410.

Bowling, A. 2002. *Research methods in health: investigation, measurement and analysis*. London: Open University Press.

Briend, A, Prudhan, C, Prinzo, ZW, Daelmans, B & Mason, JB. 2006. Putting the management of severe malnutrition back on the international health agenda: Food and nutrition bulletin. Geneva: WHO.

Brent, NJ. 1990. Legal issues in research: informed consent. *Journal of Neuroscience Nursing*, 22(3):189-191.

Brink, H, Van der Walt, C & Van Rensburg, G. 2006. *Fundamentals of research methodology for health professionals*. Cape Town: Juta.

Burns, N & Grove, SK. 2001. *The practice of nursing research: conduct, critique and utilization*. 4th edition. Philadelphia: Saunders.

Burns, N & Grove, SK. 2003. *Understanding nursing research.* 3rd edition. Philadelphia: Saunders.

Burns, N & Grove SK. 2009. *The practice of nursing research: conduct, critique and utilization*. 6th edition. St. Louis: Mosby.

Burki, T. 2009. East African countries struggle with visceral leishmaniasis. *Lancet,* 374:371-372.

Cañavate, C, Herrero, M, Nieto, J, Cruz, I, Chicharro, C, Aparicio, P, Mulugeta, A, Argaw, D, Blackstock, A, Alvar, J & Bern, C. 2011. Evaluation of two rK39 dipsticks, direct agglutination test and indirect fluorescent antibody test for diagnosis of visceral leishmaniasis in a new epidemic site in highland Ethiopia. *American Journal of Tropical Medicine and Hygiene*, 84(1):102-106.

Central Statistical Agency (CSA) (Ethiopia). 1998. *The 1994 Population and Housing Census of Ethiopia: results at country level*. Addis Ababa*:* Government Printer.

Central Statistical Agency (Ethiopia). 2008. *Ethiopia population and housing census, 2007.* Addis Ababa: Government Printer.

Central Statistical Agency (Ethiopia) and ORC Macro. 2006. *Ethiopia demographic and health survey, 2005*. Addis Ababa Government Printer.
Centres for Disease Control and Prevention (CDC). 2009. *Life cycle of leishmania*. Available at: http://www.dpd.cdc.gov/dpdx.net.com (Accessed: 12 September 2011).

Chappuis, F, Sundar, S, Hailu, A, Ghalib, H, Rijal, S, Peeling, RW, Alvara, J & Boelaert, M 2007*.* Visceral leishmaniasis: what are the needs for diagnosis, treatment and control? *Nature Reviews Microbiology,* 5:873-882.

Collins English Dictionary. 1991. 3rd edition. Glasgow: HarperCollins.

Collins Cobuild Advanced Learner's English Dictionary. 2001. 3rd edition. Glasgow: HarperCollins.

Collin, S, Coleman, P, Ritmeijer, K & Davidson, R. 2006. Unseen kala azar deaths in South Sudan (1999-2002). *Tropical Medicine and International Health*, 11(4):1-4.

Collin, S, Davidson, R, Ritmeijer, K, Keus, K, Melaku, Y, Kipngetich, S & Davies, C. 2004. Conflict and Kala-Azar: determinants of adverse outcomes of Kala-azar among patients in Southern Sudan. *Clinical Infectious Disease*, 38:612-619.

Cota, GF, de Sousa, MR & Rabello A. 2011. Predictors of visceral leishmaniasis relapse in HIV-infected patients: a systematic review. *Public Library of Science,* 5:1-8.

Dereure, J, El-Safi, SH, Bucheton, B, Boni, M, Kheir, MM, Davoust, B, Pratlong, F, Feugier, E, Lambert, M, Dessein, A & Deder, JP. 2003. Visceral leishmaniasis in Eastern Sudan: parasite identification in humans and dogs: host-parasite relationship. *Microbes and Infection*, 5:1103-1108.

Desjeux, P. 2001. The increase in risk factors for leishmaniasis worldwide. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 95: 239-243.

Desjeux, P. 2004. Leishmaniasis: current situation and new perspectives. *Comparative Immunology, Microbiology and Infectious Diseases*, 27: 305-318.

De Vos, AS, Strydom, H, Fouchè, CB & Delport, CSL. 2005. *Research at grass root levels for the social sciences and human service professions*. 3rd edition.Pretoria: Van Schaik.

Dwyer, J. 2004. *Gale nutrition encyclopaedia: dietary assessment*. Available at: http://www.answers.com/dietary-assessment. (Accessed 2 September 2011).

Ethiopis College. 2003. *Map of Ethiopia with administrative regions*. From: http://www.ethiopis.org/centres.html. (Accessed 10 July 2011).

Friis, RH & Sellers, TA. 2009. *Epidemiology for public health practice.* 4th edition. Philadelphia: Jones and Bartlett.

Gebre-Michael, T, Malone, J B, Balkew, M, Ali, A, Berhe, N, Hailu, A & Herzi, A. 2004. Mapping the potential distribution of *Phlebotomus martini* and *P. orientalis* (Diptera: Psychdidae), vectors of *kala-azar* in East Africa by the use of geographic information systems. *Acta Tropica* 90:73-86.

Gelanew, T, Cruz, I, Kuhls, K, Alvar, J, Caňavate, C, Hailu, A & Schönian, G. 2011. Multilocus microsatellite typing revealed high genetic variability of Leishmania donovani strains isolated during and after a kala-azar epidemic in Libo Kemkem district, Northwest Ethiopia. *Microbes and Infection*, 13:595-601.

Gerstl, S, Amsalu, R & Ritmeijer, K. 2006. Accessibility of diagnostic and treatment centres for visceral leishmaniasis in Gedarif State, Northern Sudan. *Tropical Medicine and International Health*11(2):167-175.

Haile, T & Anderson, SD. 2006. Visceral leishmaniasis in Northern Ethiopia. *East African Medical Journal,* 83(7):389-392.

Hailu, A, Musa, AM, Royce, C & Wasunna, M. 2005. *Visceral leishmaniasis: new health tools are needed*. Available at: http://www.plosmedicine .org/neglected tropical diseases/ (Accessed 12 June 2010).

Herrero, M, Orfanso, G, Argaw, D, Mulugeta, A, Aparicio, P, Parreno, F, Bernal, O, Rubens, D, Pedraza, J, Lima, MA, Flevaud, L, Palma, PP, Bashaye, S, Alvar, J & Bern, C. 2009. Natural history of a visceral leishmaniasis outbreak in highland Ethiopia. *American Journal of Tropical Medicine and Hygiene,* 77:275-282.

Holloway, I & Wheeler, S. 2002. *Qualitative research in nursing*. 2nd edition. Oxford: Blackwell.

Hurissa, Z, Gebre-Silassie, S, Hailu, W, Tefera, T, Lalloo, D, Cuevas, L & Hailu, A. 2010. Clinical characteristics and treatment outcome of patients with visceral leishmaniasis and HIV co-infection in northwest Ethiopia. *Tropical Medicine and International Health*, 15(7):848-855.

Jamjoom, MB, Ashford, RW, Bates, PA, Chance, ML, Kemp, SJ, Watts, PC & Noyes, HA. 2004. Leishmania donovani is the only cause of visceral leishmaniasis in East Africa: previous description of L. infantum and ''L. arachibaldi'' from the region are the consequences of convergent evolution in the isoenzyme data. *Parasitology* 129:399-409.

Joubert, G & Ehrlich, R. 2007. *Epidemiology: a research manual for South Africa.* 2nd edition. Cape Town: Oxford University Press.

Kaur, P. 2009. *All India institutes of medical sciences: methods of assessment of nutritional status*.
Available at: http://www.oldagesolutions.org/Health/Methods.aspx. (Accessed: 2 September 2011).

Kuhls, K, Keilonat, L, Ochsenreither, S, Schaar, M, Schewnoch, C, Presber, W & Schönian, G. 2007. Miltilocus microsatellite typing (MLMT) reveals genetically isolated populations between and within the main endemic regions of visceral leishmaniasis. *Microbes and Infection,* 9:334-343.

LoBiondo-Wood, G & Haber, J.2006. *Nursing research: methods, critical appraisal, and utilization.* 6th edition. Philadelphia: Elsevier.

Lyons, S, Veeken, H & Long, J. 2003. Visceral Leishmaniasis and HIV in Tigray, Ethiopia. *Tropical Medicine and International Health,* 8:733-739.

Maltezou, H. 2008. Visceral leishmaniasis: advances in treatment. *Recent Patents on Anti-infective Drug Discovery,* 3:192-198.

Marlet, MV, Sang, DK, Ritmeijer, K, Muga, RO, Onsongo, J & Davidson, RN. 2003. Emergence or re-emergence of VL in areas of Somalia, NE Kenya & SE Ethiopia in 2000-01. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 97: 515-518.

Mengistu, G & Ayele, B. 2007. Visceral leishmaniasis and HIV co-infection in patients admitted to Gondar University Hospital, Northwest Ethiopia. *Ethiopian Journal of Health Development*, 21(1):53-60.

Meheus, F, Balasegaram, M, Olliaro, P, Sundar, S, Rijal, S, Faiz, MdA & Boelaert, M. 2010. Cost-effectiveness analysis of combination therapies for visceral leishmaniasis in the Indian subcontinent. *Public Library of Science Neglected Tropical Diseases,* 4(9):1-9.

Melloni's Pocket Medical Dictionary. 2006. 5th edition. New York: Parthenon.

Ministry of Health (MoH) (Ethiopia). 2006. V*isceral leishmaniasis diagnosis and treatment guidelines for health workers.* Addis Ababa: MoH.

Ministry of Health (MoH) (Ethiopia). 2010. *Health sector development program IV.* Addis Ababa: Ministry of Health (M).

Mueller, M, Ritmeijer, K, Balasegaram, M, Koummuki, Y, Santana, MR & Davidson, R. 2006. Unresponsiveness to Ambisome in some Sudanese patients with kala-azar. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 457:1-6*.*

Murray, HW. 2004. Progress in the treatment a neglected infectious disease: visceral leishmaniasis. *Expert Review of Anti-infectious Therapy*, 2(2):279-292.

Murray, HW, Berman, DJ, Davies, RC & Saravia, GN. 2005. Advances in Leishmaniasis. *Lancet*, 366:1561-1577.
Available at: http://www.thelancet.com/seminar/. (Accessed 15 April 2010).

Negera, E, Gadisa, E, Yamuah, L, Engers, H, Hussein, J, Kuru, T, Hailu, A, Gedamu, L & Aseffa, A. 2008. Outbreak of cutaneous leishmaniasis in Silti Woreda, Ethiopia: risk factor assessment and causative agent identification. *Transaction of the Royal Society of Tropical Medicine and Hygiene*, 102(9):883-890.

Ngure, P, Kimutai, A, Tonui, W & Ng'ang'a, Z. 2009. A review of leishmaniasis in eastern Africa. *Internet Journal of Parasitic Diseases, 3(1):* 1559.

Oxford Advanced Learner's Dictionary of Current English. 2006. 7th edition. New York: Oxford University Press.

Oxford Dictionary of English. 2009. 2nd edition. New York: Oxford University Press.

Oxford Dictionary of Food and Nutrition. 2005. 2nd edition. New York: Oxford University Press.

Oxford Dictionary of Food and Nutrition. 2009. 3rd edition. New York: Oxford University Press.

Polit, DF & Beck, CT. 2006. *Essentials of nursing research: methods, appraisal and utilization*. 6th edition. Philadelphia: Lippincott Williams & Wilkins.

Polit, DF & Beck, CT. 2008. *Nursing research: generating and assessing evidence for nursing practice*. 8th edition. Philadelphia: Lippincott Williams and Wilkins.

Ramesh, V, Katara, KG, Verma, S and Salotra, P. 2011. Miltefosine as an effective choice in the treatment of post-kala-azar dermal leishmaniasis. *British Journal of Dermatology,* 165:411-414.

Ranjit K. 2005. *Research methodology: a step-by-step guide for beginners*. 2nd edition. London: Oliver's Yard.

Ritmeijer, K, Dejenie, A, Assefa, Y, Beyene, T, Mesure, J, Boots, G, Boer, M & Davidson, R. 2006. A comparison of Miltefosine and Sodium Stibogliconate for treatment of visceral leishmaniasis in an Ethiopian population with high prevalence of HIV-infection. *Clinical Infectious Disease*, 43:357-364.

Roberts, C. 2004. *The dissertation journey: a practical and comprehensive guide to planning, writing and defending your dissertation*. San Francisco: Corwin Press.

Rosse, PA & Krebs, LU. 1999. The nurse's role in the informed consent process. *Seminars in Oncology Nursing,* 15(2):116-123.

Saks, M & Allsop, J. 2007. *Researching health: qualitative, quantitative and mixer methods*. London: Sage.

Seife, B, Nohelly, N, Argaw, D, Mulugeta, A, Herrero, M, Nieto, J, Chicharro, C, Caňavate, C & Bern, C. 2009. Risk factors for visceral leishmaniasis in a new epidemic site in Amhara region, Ethiopia. *American Journal of Tropical Medicine and Hygiene,* 81:34-39.

Sharma, U & Singh, S. 2008. Insect vectors of leishmania: distribution, physiology and their control. *Journal of Vector-Borne Diseases*, 45:255-272.

Singh, K. 2006. *Fundamentals of research methodology and statistics.* New Delhi: New Age International.

Somekh, B & Lewin, C. 2006. *Research methods in social sciences*. London: Sage.

Srinivas, R, Usha, DKS, Poorna, C, Prateek, B, Neelam, V & Rakesh, K. 2008. Visceral leishmaniasis associated hemophagocytic lymphohistocytosis: case report and systematic review. *British Infection Society Journal of Infection,* 56:81-388.

Stommel, M & Wills, C. 2004. *Clinical research: concepts and principles for advanced practice nurses*. Philadelphia: Lippincott Williams & Wilkins.

Sundar, S, Mondal, D, Rijal, S, Bhattacharya, S, Ghalib, H, Kroeger, A, Boelaert, M, Desjeux, P, Richter-Airijoki, H & Harmse, G. 2008. Implementation research to support the initiative on the elimination of kala azar from Bangladesh, India and Nepal: the challenges for diagnosis and treatment. *Tropical Medicine and International Health*, 13(1):2-5.

Tustin, DH, Ligtheld, AA, Martins, JH & Van Wyk, TLM (eds). 2005. *Marketing research in practice*. Pretoria: University of South Africa Press.

Wilson, ME, Jeronimo, SM & Pearson, RD. 2005. Immunopathogenesis of infection with visceralizing leishmania species. *Microbial Pathogenesis,* 38(4):147-160.

Winter, R & Munn-Giddings, E. 2001. *A handbook for action research in health and social care*. London: Routledge.

Wit, SW & Seaman, J. 2004. *Kala azar trainers' manual*. Amsterdam: HealthNet International

World Health Organization (WHO). 1996. *Manual on visceral leishmaniasis control*. Geneva: World Health Organization.

World Health Organization (WHO). 2005. *Spanish contribution for the control of Kala-azar in the horn of Africa, 2005-2008*. Geneva: WHO.

World Health Organization (WHO). 2007. *Report of the fifth WHO Consultative Meeting on Leishmania/HIV co-infection*. Geneva: WHO.

World Health Organization (WHO). 2009. *Child growth standards: growth velocity based on weight, length and head circumference*. Geneva: WHO. Available at: http://www.who.int/childgrowth/en/ index/html. (Accessed 7 May 2010).

World Health Organization (WHO). 2010a. *Control of leishmaniasis: report of a meeting of the WHO Expert Committee on the control of leishmaniasis.* Technical report series number 949. Geneva: WHO.

World Health Organization (WHO). 2010b. *First WHO report on neglected tropical diseases: working to overcome the global impact of neglected tropical diseases*. Geneva: WHO.

World Health Organization . 2008. *The use of visceral leishmaniasis rapid diagnostic tests*. Geneva: WHO.

Zanger, P, Kötter, I, Raible, A, Gelanew, T, Schönian, G & Kremsner, P. 2010. Successful treatment of cutaneous leishmaniasis caused by Leishmania aethiopica with liposomal amphotericin B in an immunocompromised traveller returning from Eritrea. *American Journal of Tropical Medicine and Hygiene,* 84(5):692-694.

Zemanová, E, Jirků, M, Mauricio, IL, Miles, MA & Lukes, JL. 2004. Genetic polymorphism within the leishmania donovani complex: correlation with geographic origin. *American Journal of Tropical Medicine and Hygiene*, 70(6):613-617.

Zijlestra, EE & el-Hassen, AM. 2001. Leishmaniasis in Sudan: visceral leishmaniasis. *Royal Society of Tropical Medicine and Hygiene*, 95(1):S27-S58.

Annexure A

Requested and obtained permission to do the study

Annexure B

Consent form to be signed by each participant

Annexure C

Audit tools

Audit Tools

INSTRUCTIONS FOR COMPLETING THE AUDIT TOOL ON "CLINICAL MANIFESTATIONS AND ANTHROPOMETRIC PROFILES OF VISCERAL LEISHMANIASIS IN SELECTED CENTRES IN ETHIOPIA"

This Audit tool is related to the VL patient's recorded data in the two selected clinics. The Audit tool consists of the following sections:

Section A: Demographic data

Section B: Clinical manifestations and disease category

Section C: Co-morbid conditions

Section D: Nutritional status of the VL patient

Section E: Treatment of the VL patient

The data is collected from the patient's file.

Phase 1: Retrospective phase:

Audit tool: To be collected from existing patient record held by the health facility

Audit No. ☐☐☐

Research assistant: ___ (Initials)

Date: --/--/---- (DD/MM/YYYY)

Section A: Demographic information

1. Number of record	
2. Gender	1 = Female ☐ 2 = Male ☐
3. Age in years	1 = 6-15 years ☐ 2 = 16-25 years ☐ 3 = 26-35 years ☐ 4 = 36- 45 years ☐ 5 = above 45 years ☐
4. Duration of illness	1 = 0-1 month ☐ 2 = 2-3 months ☐ 3 = 4-5 months ☐ 4 = More than 5 months ☐

Section B: Clinical manifestations and disease category

5. Fever	1 = Yes ☐ 2 = No ☐ 3 = Unknown ☐
6. Splenomegaly	1 = Yes ☐ 2 = No ☐ 3 = Unknown ☐

7. Anaemia present	1 = Yes ☐ 2 = No ☐ 3 = Unknown ☐
8. Severity of anaemia	1 = None ☐ 2 = Mild ☐ 3 = Severe ☐
9. Diarrhoea	1 = Yes ☐ 2 = No ☐ 3 = Unknown ☐
10. Visceral leishmaniasis type identified	1 = Primary ☐ 2 = Relapse ☐ 3 = Unknown ☐

Section C: Co-morbid conditions	
11. Malaria at admission or during the VL treatment	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
12. Tuberculosis present	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
13. HIV status	1 = Pos ☐ 2 = Neg ☐ 3 = Uncertain ☐
Section D: Nutritional status of the VL patient	
14. What was the score for the nutritional assessment of the patient (BMI or wt/Ht) from the standard?	1 = ≥-3 z ☐ 2 = < -3z ☐ 3 = Uncertain ☐
15. Presence of oedema	1 = Yes ☐ 2 = No ☐ 3=Uncertain ☐

Section E: Treatment of the VL patient	
16. Date of start of VL treatment	--/--/---- (DD/MM/YYYY)
17. Date of completion of VL treatment	--/--/---- (DD/MM/YYYY)
18. Treatment outcome	
21. Side effects (name):	1 = Improved,discharged ☐ 2 = Defaulted ☐ 3 = Relapse ☐ 4 = Died while on treatment ☐ 5 = Unknown ☐

Phase 2: Structured questionnaire to be filled by healthcare professionals

INSTRUCTIONS FOR COMPLETING THE QUESTIONNAIRE ON "CLINICAL MANIFESTATIONS AND ANTHROPOMETRIC PROFILES OF VISCERAL LEISHMANIASIS IN SELECTED CENTRES IN ETHIOPIA"

Your kind collaboration in answering the questions indicated in the questionnaire will be appreciated. Under no circumstances will any information be revealed about you personally and your clinic will not be identified. Please adhere to the following guidelines:

1. Answer each question by indicating the option you chose with a tick mark (√) or fill in the required information in the space provided.
2. Do not include your name or any identification whatsoever on this questionnaire.
3. Provide your option only in the space provided.
4. Complete all the requested information.
5. The questionnaire consists of the following sections:

Section A: Qualification and training of the health care worker

Section B: Knowledge on VL epidemiology and transmission

Section C: Knowledge on VL clinical manifestation

Section D: Knowledge on the availability of VL services

Section E: Perception of the health care worker on the existing VL control programme.

6. It will take you about 20 minutes to complete the questionnaire.

Thank you for participating in the study.

File No | | | |

Research assistant: ___ (Identification number)	
Clinic __A B (Circle one)	
Date recorded (DD/MM/YYYY) Date file.....	
Section A: Professional qualification and training	
1. Profession	1. = Nurse ☐ 2. = Physician ☐ 3. = Laboratory professional ☐ 4. = Pharmacist ☐ 5. = Other (Please specify) .....
2.1. Have you have any formal training on leishmaniasis? 2.2. Where did you receive your formal training?	1 = Yes ☐ 2 = No ☐ 3 = Unknown ☐ ……
3. What is/are your service (s) in years? (Circle one)	1 = Less than one year ☐ 2 = 1-2 years ☐ 3 = 3-4 years ☐ 4 = 4-5 years ☐ 5 = 5-6 years ☐ 6 = More than 7 years ☐
4. Were you ever assigned in a VL clinic to access patients?	1 = Yes ☐ 2 = No ☐
5.1. Were you ever involved in attending health education sessions on leishmaniasis 5.2 Indicate how many in-service educational activities with regard to leashmaniases have you attended the last 12 months	1 = Yes ☐ 2 = No ☐ 1 = None ☐ 2 = 1-2 ☐ 3 = 3-4 ☐ 4 = 5-6 ☐ 5 = More than 7 ☐

Section B: Knowledge on Epidemiology and transmission

6. Can identify endemic localities in the region where you work	1 = Yes ☐ 2 = No ☐
7.1 Is the district you are working in endemic for VL?	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
7.2 If you answer YES to question 7.1, which form of VL vector is found in your area?	1 = Anopheles mosquito ☐ 2 = Aedes mosquito ☐ 3 = Phlebotomine sandfly ☐ 4 = Culex mosquito ☐ 5 = Uncertain ☐
8.1 Can you identify the major mode of transmission for VL in Ethiopia	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
8.2 If you answer YES to question 8.1, please indicate the **major** mode of transmission of VL in Ethiopia	1 = Blood transfusion ☐ 2 = Mother to child ☐ 3 = Human to human through vector ☐ 4 = Zoonotic transmission ☐ 5 = Uncertain ☐
9.1 Can you identify at least two of the prevention strategies for visceral leishmaniasis	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
9.2 Please indicate which preventative strategies you are following in the case of your work and education to patients	....

10.1 Can identify the various forms of leishmaniases?	1 = Yes ☐ 2 = No ☐
10.2 If YES, please indicate the various forms.	.....

Section C: Knowledge on clinical presentations of visceral leishmaniasis

Which in your opinion are the clinical manifestations for VL patients

11. Fever	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
12. Abdominal discomfort, swelling	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
13. Weakness	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
14. Weight lose	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
15. Splenomegaly	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
16. Anaemia	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
17. Lymph node enlargement	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
18. Bleeding tendency	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
19. Other clinical manifestations	.....

Section D: Knowledge and options on availability of leishmaniasis services

20. Which VL services are provided in your facility	1 = Diagnosis ☐ 2 = Treatment ☐ 3 = Health education ☐ 4 = None ☐ 5 = Unknown ☐ 6 = Other ☐
21. Please identify the currently available diagnostic in your facility.	1= Serologic test ☐ 2= Parasitologic test ☐ 3= Both 1 and 2 ☐ 4= None ☐
22.1 Do you know first line drug for VL?	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐
22.2 If you answer YES to 21.1, please indicate which drug(s) are used as the first line drug for VL in your facility.	.....

Section E: perception on the existing VL control programme	
23. What are the conditions and availability of diagnostic facilities in your clinic?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 4 = Excellent ☐
24. Rate the availability of drugs to treat VL patients?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐
25. Are blood transfusion services available?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐
26. Are there therapeutic feeding service available in the clinic	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 6 = Excellent ☐
27. Are there supplementary feeding services in your clinic?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐
28. How is the access to the leishmaniasis services?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐

29. How is the referral system for leishmaniasis in your area?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	
30. Is the number of rained health workers in the facility adequate to provide the leishmaniasis services?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	
31.1 In your opinion, are health care professionals adequately trained to provide services to patients suffering form leishaniasis	1 = Yes ☐ 2 = No ☐	
31.2 If NO, please indicate what information should be covered by in-service education and information	.....	
32.1. What is the condition of the services in the clinic of patients suffering from VL when being admitted	1 = 1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	
32.2. Are beds available in the clinic if patients needs to be admitted?	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐	
33.1. Does your clinic get the support from District or Region on leishmaniasis?	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐	
33.2. Rate the collaboration between your clinic and the District or region on leishmaniasis?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	

34.1 What is the condition of the regular reporting of leishmaniasis data	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	
34.2 What areas of the reporting of regular data should be improved?	1 = Format of forms should be reconstructed ☐ 2 = Communication channels need to be strengthened ☐ 3 = Feedback should be given ☐	
35.1 Does VL fall under the Integrated Disease Surveillance and response list	1 = Yes ☐ 2 = No ☐ 2 = Unknown ☐	
35.2 To what extent do you think Disease Surveilance is done accurately?	1 = Very poor ☐ 2 = Poor ☐ 3 = Acceptable ☐ 4 = Good ☐ 5 = Excellent ☐	
36.1 In your opinion, should an assigned local person be appointed to deal with leishmaniasis	1 = Yes ☐ 2 = No ☐ 3 = Uncertain ☐	
36.2 Who should this person be?	1 = Doctor ☐ 2 = Nurse ☐ 3 = Lab assistant ☐ 4 = Other (please indicate)	
376. In your opinion, what are the problems/deficiencies in your clinic prevent you from delivering optimal services to patiens suffering form leishmaniasis?	1 = Lack of management ☐ 2 = Lack of education ☐ 3 = Poor work relations ☐ 4 = Inadequate medicines ☐ 5 = Lack of staff ☐ 6 = Poor communication between staff members ☐	

	7 = Working hours ☐ 8 = Stress ☐ 9 = None of the above ☐
38. In your opinion which are the problems most experienced with regard to patients in the clinic	1 = Non-compliance to medication 2 = Language problems 3 = Traditional beliefs and cultural practices

26 December 2011

To: Head of the records department to ask for permission to access the file section,

1. Addis Zemen, Addis Zemen town
2. Humera, Humera town

Dear colleague,

Please be informed that I have been given permission by the Amhara / Tigray Regional Health Bureau to utilize the files of patients for research purposes.

The permission is sought to collect data from the record office between 2 January 2012 and 16 January 2012 every day.

No photocopies or any other information of the patients will be revealed as strict ethical guidelines.

Sincerely,

Abate Mulugeta Beshah, Dr
MPH student

ANNEXURE 2

PERMISSION LETTER TO CONDUCT RESEARCH

Abate Mulugeta, Dr
P.O. Box: 7903
Addis Ababa, Ethiopia

TO: 1. Tigray Regional Health Bureau, Mekelle

2. Amhara Regional Health Bureau, Bahir Dar

Dear Sir/Madam,

PERMISSION TO CONDUCT RESEARCH

I am a Medical Doctor working in the leishmaniasis control program in Ethiopia. I am registered MPH student at the University of South Africa (UNISA).

I wish to apply for permission to carry out a study on "clinical manifestations and anthropometric profiles of visceral leishmaniasis in selected centres in Ethiopia" as this is one of the requirements for my study.

To improve early case management of visceral leishmaniasis patients in Ethiopia, it is important to describe the common clinical manifestations including nutritional status of these patients.

It is my hope that the findings from the study will assist in understanding the commonest clinical manifestations and nutritional status of visceral leishmaniasis in Ethiopia. The findings of this study will be disseminated to stakeholders for the leishmaniasis control program to help the control activities and health workers practices for early VL case detection and treatment.

I shall be very pleased if you can grant me the permission to conduct this study. Should you have any queries, please do not hesitate to contact me or my promoter on the contact details provided below.

Regards,

Dr. Abate Mulugeta Beshah (Researcher)
Addis Ababa, Ethiopia
(251) 911 401001 (mobile).

Prof. Susan Hattingh (Promoter)
King Abdulaziz University, Saudi Arabia
0508085171 (mobile).

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AMHARA NATIONAL REGIONAL STATE

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HEALTH BUREAU

Ref No.ARHB-4.o3/1/2400

Date, December 25/2011

To: Libo Kemkem District Health Office
A/Zemen

Subject:- **Request for support**

Dr.Abate Mulugeta Beshah, a MPH student at South Africa/UNISA/ University, is to conduct research at your Health Center on the topic entitled " **Clinical managements and Anthropometric profiles of Visceral Leishmaniasis in selected centers,Amhara Region , Ethiopia**". The protocol has got approval from Ethical Review committee of South Africa University.

The Regional Health Bureau is, therefore, writing this letter to you so as to cooprate the investigator to conduct the study in Addis Zemen Health Center. The Regional Health Bureau is greateful for your support and collaboration to make this study successfull. Finaly, to design approprate intervention RHB needs a copy of this research finding.

Regards,

Wondimu Gebeyehu
Health Research Excution officer

- Research and Technology transfer core process RHB
- Addis Zemen Health Center
- Dr.Abate Mulugeta Beshah

✉ 495 Tell. *058226 2267* Fax. *058 220 1487*
058 220 17 15