COST OF TREATING VISCERAL LEISHMANIASIS IN ETHIOPIA: EXPENSES AND COSTS

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EXECUTIVE SUMMARY

The report provides a brief overview of the financial challenges associated with treating leishmaniasis at VL diagnostic and treatment facilities in Ethiopia. Despite the availability of anti-leishmaniasis treatment and diagnostics provided by organizations like the World Health Organization (WHO) and various non-governmental organizations, managing visceral leishmaniasis (VL) in Ethiopia presents significant financial hurdles for both patients and healthcare providers. The high costs of medication, diagnostic tests, and hospitalization place a considerable strain on the limited resources of primary zonal hospitals. The existing VL control programs do not cover all necessary supplies, necessitating a reliance on primary health care supplies. Therefore; there is a need to get the most accurate cost of diagnosis and treatment to ensure sustainability of the activities. It is also necessary to obtain the total cost of diagnosis and treatment of VL cases to estimate the “extra” costs that are incurred by the health facilities providing VL diagnosis, treatment and management services.

This research was carried out in 2024 at Jinka General Hospital, Ari zone, South Ethiopia. The findings from Jinka General Hospital can be broadly applied to a larger extent. Retrospective patient record analysis was conducted to estimate the direct costs related to medication, laboratory tests, and human resources. Health professionals were interviewed to gain insights into their understanding of the financial burden. Additionally, patients and their family members were interviewed to assess the impact of indirect costs. Trained professionals collected data, and KOBO tool Box was used for data entry and analysis. The findings from the research revealed that the hospital faces a significant financial burden, and patients are required to pay for services and treatments not available in the hospital (due to shortages), such as drugs and medical investigations. This financial burden could affect treatment outcomes, as patients who lack the financial means may choose not to seek treatment.

The impact of this situation is far-reaching, affecting the VL control program and exacerbating disease transmission. Furthermore, it compromises the ability of health facilities to provide other essential services. The economic consequences are significant, leading to a substantial burden and loss of income for affected households. Therefore; its crucial to secure funding to mitigate these challenges and enable hospitals to operate optimally, improving patient care and outcomes. A secured funding plan is vital for the effectiveness of the elimination program.

Key words: visceral leishmaniasis, treatment cost estimation, Ethiopia

BACKGROUND

VL is caused by the protozoan parasite Leishmania donovani and is transmitted to humans through the bite of infected sandflies. If left untreated, VL can lead to severe health complications and death (1). Visceral leishmaniasis (VL) is one of the most significant public health problems in Ethiopia, where it is endemic in several low land areas including Tigray, Amhara, Somali, Oromia, Afar and southern nations and nationalities people (1). Though the exact prevalence is not known, the estimated annual incidence ranges from 2,500 to 4,000 cases, with 3.2 million people at risk in 100 woredas (districts) (2).In Ethiopia, the disease is characterized by stable periods and periodic large-scale outbreaks. The most recent outbreak of VL occurred in the South Omo zone in SNNPR in 2022. In Northern Ethiopia, where the majority of the burden resides, the most affected population includes adult males, accounting for 81.9% of all the reported cases (3).

The primary treatment for VL involves a course of combination of sodium stibogluconate and paromomycin (SSG/PM), which is given in inpatient settings at the VL treating health facility. The secondary treatment is Ambisome, administered through intravenous infusion also in an inpatient setting. Diagnosis is typically established through case definition followed by an antibody test using a rapid testing kit called rk39. Parasitology testing to confirm the diagnosis can only be conducted in well-equipped settings (1).

Due to VL being an immunity suppressing disease, patients with long-term illnesses may experience decreased immunity. This makes them more susceptible to developing various illnesses that require thorough investigation and treatment (eg. pneumonia, sepsis, diarrheal disease etc.). Health facilities must not only fully bear the financial burden of hospitalization, including provisions for bed and food, during anti-leishmaniasis treatment and diagnosis, but also manage these comorbidities.

Despite the availability of anti-leishmaniasis treatment and diagnostics provided by the World Health Organization (WHO) and various partners, managing visceral

leishmaniasis (VL) in Ethiopia continues to pose significant financial challenges for both patients and healthcare providers. The high cost of medication, diagnostic tests, and hospitalization places a substantial strain on the limited resources of primary hospitals. The current VL control programs do not cover all the necessary requirements such as antibiotics, bed and food etc , so health facilities have to rely on primary health care supplies. This uses the resources at these facilities and impacts the ability to manage other diseases. It is essential to calculate the total cost of diagnosing and treating VL cases to understand the additional costs incurred by the health facilities providing VL. The findings from this research will be used for effective planning and budgeting for VL management.

OBJECTIVE

GENERAL OBJECTIVE

To present an overview of the expenses associated with treating VL at Jinka General Hospital in South Ethiopia.

SPECIFIC OBJECTIVES

1. Assess the total cost of VL diagnosis and treatment.
2. Calculate the total expenses borne by the health facility, excluding support from the NGO funded program (anti leishmaniasis diagnostic and treatment).
3. Explore the perception of financial burden among health professionals working at Jinka General Hospital
4. Explore the indirect cost incurred by the patients and/or their caregivers during their treatment.
5. Provide recommendations on possible strategies to cover the costs and alleviate the financial burden on health facilities managing VL.

METHODS

STUDY SETTING

Jinka General Hospital, located in Ari zone, South Ethiopia region, Ethiopia. Jinka is situated in the hills to the north of the Tama Plains, this town serves as the capital of the Ari Zone within South Ethiopia. Jinka currently acts as the administrative center for the town. Its coordinates are 5°47′N 36°34′E, and it sits at an elevation of 1,490 meters above sea level. The hospital is serving a catchment population of 1.5 million from 11 Woredas (third level of the administrative divisions of Ethiopia). The total manpower of the hospital is 46 physicians and 340 including support staff. Malaria is the top cause of morbidity in the outpatient department (OPD)PD visit of the hospital.

In Ethiopia, VL diagnosis and management is usually performed in zonal hospitals such as Jinka hospital where this research was conducted. There are also diagnostic health centers that are able to diagnose the patients and refer them to the zonal hospitals for management. There are three VL diagnostic centers referring patients to Jinka hospital. In Jinka hospital there was an increase in the number of cases from September 2022 and by January 2024 more than 240 VL cases were line listed (a table that contains key information about each case in an outbreak). Majority of the patients presenting with VL were pastoralists. Most (all) of these cases were diagnosed using rK39.

STUDY POPULATION

The study population consisted of VL patients treated in Jinka hospital from January 2023 to January 2024.

We also conducted interviews with healthcare professionals responsible for managing VL and overseeing the Jinka General Hospital's operations. In addition, we spoke with patients, their family members, and those who had returned home after receiving treatment at the VL ward during the specified time frame.

STUDY DESIGN

In this study two study designs were employed. A retrospective cross-sectional study was done for patient record analysis in Jinka General Hospital South Ethiopia.

A qualitative study was conducted to explore the perceived financial burden by health professionals and to explore the indirect cost incurred by the patients and family members using one-on-one interviews.

STUDY PERIOD

The study involved patients who were treated from January 2023 to January 2024.

SAMPLING TECHNIQUE

Convenient sampling was used for both the retrospective patients' charts record analysis between January 2023 and January 2024 at Jinka General Hospital and for the interviews with health professionals and patients and caregivers.

SAMPLE SIZE

The sample for retrospective data analysis comprised all patients treated for VL during this period at the hospital.

For the interviews, the sample included all staff members responsible for patient management and 6 patients and 9 family members who were discharged after treatment during the specified period as there were no admitted patients during the data collection.

DATA COLLECTION

INSTRUMENT

A pre-structured questionnaire was utilized to gather data from patient records, while the same open-ended interview guide was employed to conduct interviews with healthcare professionals, patients, and their family members who were treated during the specified study period.

DATA COLLECTION PROCEDURE

All data collectors underwent training on the study protocol and objectives. The principal investigator, along with the data collectors, pilot tested the questionnaire in Amharic to enhance its validity. Any issues identified were corrected and included in the final data collection tools. Periodic supervision was conducted by an expert in the field to enhance reliability of the findings.

DATA COLLECTED

The data includes both primary and secondary sources. Primary data was collected through a questionnaire administered by the researcher to patients and care givers. Secondary data sources were obtained from hospital records and WHO invoices. The direct costs were obtained from tests conducted, anti-leishmaniasis treatment and diagnosis, additional treatments administered (antibiotic, blood transfusion, IV fluids, etc.), duration of hospitalization, nutritional supplements dispensed, and any other interventions provided to VL patients. The costs of tests, treatments, and personnel salary were obtained from hospital records.

Healthcare professionals were interviewed to investigate the current financial challenges in treating VL and the difficulties they face. During the interview with patients and family members of patients, we also looked into the indirect expenses incurred by the patients. This data covers costs related to transportation, daily earnings, and other expenses accrued while under treatment.

ETHICAL CONSIDERATION

Before the study was started, ethical clearance from the Institutional Review Board (IRB) of the College of medicine and health sciences, Arba Minch University was secured. Before starting data collection, the ethical clearance was submitted to, and permission was obtained from Jinka General Hospital administration. All study participants were provided informed consent, and their identities remain confidential throughout the study. The research team strictly adhered to ethical guidelines and regulations during data collection, analysis, and dissemination of findings.

DATA ANALYSIS

Data was entered into the Kobotool box, and a descriptive analysis was conducted to examine the demographics and frequency of services provided. The average treatment cost per patient was calculated, with direct costs comprising the majority of the financial burden, including expenses for medication, laboratory tests, and hospitalization. Additionally, mean and median values of the direct costs were calculated.

Content analysis was performed using an Excel sheet for the qualitative section, which consisted of interviews with both healthcare professionals and patients along with their family members.

RESULTS

1. DEMOGRAPHY OF THE STUDY

A total of 189 patients who received treatment during the outbreak from January 2023 to January 2024 were included in this study. In table 1 below, it can be seen from the total of 189 patients, 121 (64.02%) were male, and 68 (35.98%) were female. The mean age was 16.34 years, with a median of 12 years. The majority of the patients were pastoralists, accounting for 65 (34.3%), followed by young children 50 (26.46%), students at 49 (25.93%), and animal herder 16 (8.46%).

Table 1. Demography of patients, NA* not applicable

	Description	**No**	**%**
Sex	Male	121	64.02
	Female	68	35.98
age	2-10	84	44.97
	11-20	49	26.45
	21-30	35	19.04
	31-40	15	8.46
	41-50	6	3.17
Occupation	Pastoralist	65	34.3
	Animal herder	16	8.46
	Farmer	9	4.76
	NA* Young children (<10 yrs old)	50	26.46
	NA* (Student)	49	25.93

2. VL DIAGNOSIS AND ANTI-LEISHMANIASIS TREATMENT

Regarding diagnosis and anti-Leishmaniasis treatment undertaken in Jinka general hospital, it was found that diagnosis was predominantly carried out using rk39 in 173 cases (91.53%), while tissue aspiration was performed for 13 patients (6.88%). In our sample, 126 patients (66.67%) were treated with AmBisome, 50 patients (26.46%) took SSG/PM regimen; while 12 patients (6.35%) initially took SSG/PM before receiving AmBisome.

Table 2. Diagnosis and anti-leishmaniasis treatment

Description		**No. patients**	**%**
Diagnosis	RK39	173	91.53
	Spleen/ Bone marrow Aspiration	13	6.88
	DAT	3	1.59
Anti-leishmaniasis treatment			
	Ambisome 5mg/kg 6 days	126	66.67
	SSG/PM 17 days	51	26.98
	Started SSG/PM but discontinued and Ambisome was provided	12	6.35

3. COST OF TREATMENT AND DIAGNOSIS

The finding showed that the costs for anti-leishmaniasis treatments were $162.5 for AmBisome, $136.3 for Paromomycin, $8.02 for sodium stibogluconate, and $68 for a packet of 24 diagnostic rapid test kit (rk39) per the WHO invoice. The average cost of AmBisome for the age group 2-16 years was 162.5 USD, which accounted for the majority of the cases treated and it was 20.05 USD for SSG/PM users within the same age group.

The mean cost of anti-leishmaniasis for patients (all age groups) who were getting SSG/PM was approximately 24.06/23.17 USD and for patients who were receiving AmBisome was 238.33 USD. see *table 3 and 4*. Please note that these prices exclude shipping, distribution, and related expenses.

Table 3. Cost of anti leishmaniasis treatment, diagnosis and nutritional supply (WHO invoice)

Description	**Price $**	**Vial/packet**
Ambisome	162.5	10/1
PM	136.3	100/1
SSG	8.02	1
Rk39 - BioRAD	68	24kit /1
Nutritional supply	0.35	per 1 sachet

Table 4. Cost of anti-leishmaniasis per average weight estimated (based on WHO weight for age curve, measurement under the -3rd centile given the malnutrition in the area and duration of treatment given per person)

Description	**Age distribution**	**Average estimated weight/ duration of treatment**	**Total vial used**	**Total cost $**
Ambisome	1-3	9kg/6 days	6 vials	97.5
	4-6	12kg/6 days	8 vials	130
	7-12	15kg/6 days	9 vials	146.25
	13-16	27kg/6 days	17 vials	276.25
	17-20	35kg/6 days	21vials	341.25
	20-50	45kg/ 6 days	27 vials	438.75
Paromomycin	1-3	9kg/ 17 days	17 vials	23.17
	4-6	12kg/17 days	17 vials	23.17
	7-12	15kg/17 days	17 vials	23.17
	13-16	27kg/17 days	17 vials	23.17
	17-20	35kg/17 days	17 vials	23.17
	20-50	45kg/ 17 days	17 vials	23.17
SSG	1-3	9kg/ 17 days	2 vials	16.04
	4-6	12kg/17 days	2 vials	16.04
	7-12	15kg/17 days	2 vials	16.04
	13-16	27kg/17 days	3 vials	24.06
	17-20	35kg/17 days	4 vials	32.08
	20-50	45kg/ 17 days	5 vials	40.1

(This is based on WHO weight for age curve, measurement under the -3rd centile given the malnutrition in the area and duration of treatment given per person)

4. ADDITIONAL LABORATORY TESTS AND TREATMENTS

Additional laboratory tests included a complete blood count and tests for liver and renal function, 186 (98.41%), 178 (94.18 %), and 181 (95.77%) respectively. It can be seen on table 5, Most of the patients had additional laboratory tests including malaria blood films 168(88.89%), stool exams 144 (76.19%).

Comorbid conditions were treated in all patients, where the majority took antibiotics 161 (85.19%), and analgesics 161 (85.19%). More details on other treatments given can be seen in Annex 4.

Table 5. Service provided

	Description	No. of patients	%
Other investigation			
	CBC	186	98.41
	Renal Function Test	181	95.77
	Liver Function Test	177	93.65
	PICT	173	91.53
	Blood Film/ Malaria test	168	88.89
	Stool Exam	144	76.19
	Ultrasound	142	75.13
	Urine test	126	66.67
	X-ray	88	46.56
	Hematocrit	71	37.57
	PT/PTT/INR	12	6.35
	Serum Electrolyte	10	5.29
	Pleural fluid analysis	2	1.06
	Amylase and Lipase	2	1.06
	CSF analysis	1	0.53
Additional treatment	Antibiotics	161	85.19
	Iv fluid	157	83.07
	Analgesia	161	85.19
	Other (see annex 4)	189	
	Nutritional supplement	71	37.57
	Blood transfusion	103	54.49
	mean (days)	median (days)	SD(days)
Hospitalization	12.19	10	5.69

5. COST ESTIMATED FOR ADDITIONAL TREATMENT AND DIAGNOSIS

After evaluating the overall expenses associated with the diagnosis and treatment of VL, it is evident that there are additional costs incurred for investigating and treating concomitant illnesses. Our mean analysis reveals that laboratory costs amounted to ETB 1585.72/29.63 USD, additional treatment costs totaled ETB 1686.68/31.52 USD, hospitalization expenses, including bed and meal charges, totaled ETB 605.06/11.31 USD. Furthermore, miscellaneous costs for items such as IV cannula, syringes, surgical gloves, catheters, and needles accounted for ETB 799.09/$14.93. The total additional costs per patient spent by the hospital sums up to 87.39USD..

Table 6. Cost of concomitant treatment and investigation costs (excluding anti-leishmaniasis)

	Mean ETB/$	**Median ETB/$**	**Standard deviation**
Laboratory cost	1585.72/29.63	1390.00/24.82	915.58/17.11
Treatment cost	1686.68/31.52	1545.00/28.87	1168.64/21.84
Hospitalization cost	605.06/11.31	500.00 /9.34	283.85/5.31
Other additional cost (needle, Iv cannula catheter, surgical glove, and syringe)	799.09/14.93	742.00/13.87	513.58/9.59
Total mean cost per patients	**5573.39/87.39**		

Note: The conversion rate from Ethiopian Birr (ETB) to US Dollars (USD) is determined by the average exchange rate during the study period, which stands at 53.5 ETB for 1USD.

6. HEALTH PROFESSIONALS

In this study, 32 health professionals participated, with 26 specifically involved in the management of VL cases, while the remaining were responsible for managing VL cases alongside their other duties. Among the participants, there were 11 physicians and 16 nurses.

Table 7. Health professional who are directly involved in the management of VL treatment from sep2022 to Jan 2024

Description	**Number**	**%**
Physician	11	34.38
Nurse	16	50
Laboratory technician	1	3.12
cleaner	1	3.12
Pharmacist	1	3.12
Administrator	2	6.25

Table 8. Supporting staff interviewed

Description	**Number**
Quality unit director	1
Finance coordinator	1
PHEM clinical officer (admin)	1
PHEM coordinator	1
Inpatient director and VL treatment center head	1
Emergency director	1

7. PAYMENT FOR HEALTH PROFESSIONALS

The mean of estimated duty daily payment and monthly salary for physicians were approximately ETB 408.48/7.6 USD and ETB 8169.43/152.69 USD, respectively. For nurses, the duty daily payment and monthly salary were around ETB 393.08/7.34 USD and ETB 7629.85/142.61 USD, respectively. The total cost for the health professionals in the specified study period was found to be 137,459.57 USD. This calculation includes the time spent on duty (Night shift) for both physicians and nurses. However, we were unable to separate the time allocated to regular working hours for each professional, so the salary does not exclude payments for other activities.

Table 9. Cost related to service providers who are directly involved in VL management

Description	**Mean ETB/$**	**Median ETB/$**	**Standard deviation ETB/$**	**Total number of professionals**	**Total for 13 months ETB/$**
Physician duty payment per day	408.48/7.6	426.83/7.97	71.05/1.32	11	861775.2/16,107.94
Physician monthly salary	8169.43/152.69	8536.5/159.56	1420.96/26.56	11	2973672/55,582.65
Nurse duty payment/daily	393.08/7.34	400.85/7.49	64.98/1.21	16	840562.2/15,711,44
Nurses monthly salary	7629.85/142.51	8017/149.85	1754.03/32.78	16	2,678,078/50,057.53
Total payments for all health professionals over 13 months					**7,354,087 ETB/ 137,459.57 USD**

Health professionals who are directly involved in the service and supporting staff were interviewed to have a general understanding of the financial burden. See tables 5 & 6.

During the interview, all participants highlighted the major financial difficulties faced by both the health facility and the patients, which can affect the quality of patient care and limited accessibility. They stressed that there are no other funding options available to ease this burden apart from the government health insurance scheme which has made the VL service one of the exempted services (service provided at no cost to the patient). The health insurance mainly covers hospitalization, including bed service, diagnosis, and treatment supplies, and laboratory investigations offered within the hospital.

Even though VL treatment and diagnosis are free, patients still have to bear the cost of other services. Costs before admission as a VL patient, in the outpatient setting and any tests or medications obtained outside the hospital are not covered by the health

insurance scheme, leading to financial strain on the patients. As per the health professionals, this situation has negatively impacted patient management and treatment outcomes, as not all patients can afford the necessary investigations and treatments from private healthcare facilities.

> *One of the health professionals stated that "Patients are forced to purchase medication and other supplies outside of the hospital when these items are unavailable internally, posing significant difficulties for them. This, in turn, has a substantial impact on the patients' outcomes".*

In addition, health professionals expressed that one of their primary challenges was acquiring an adequate supply of treatment, laboratory reagents, and diagnostic tools. They also highlighted issues related to the lack of nutritional support, blood supply, and a shortage of staff. Furthermore, the facility lacks proper infrastructure, including a designated ward for VL and insufficient accommodation.

> *According to a participant who has firsthand experience working in the facility with VL noted that "There are challenges with the supply of essential medical necessities such as blood, medications, and laboratory investigations, as well as issues with capacity building". And "Shortage of medication for certain diseases, financial constraints among patients, low awareness of specific diseases, and inadequate blood and blood products are some of the pressing issues. Additionally, there is a lack of bone marrow sets, nutritional supplies, and RK 39 kits".*

One interviewee explained that "*Jinka General Hospital has a total budget of 50 million ETB, with 24 million generated from internal revenue and the remaining amount provided by the federal government. Of this allocation, 3 million ETB is designated for drug supplies, while 40 million is set aside for salaries."* The budget of ETB 3 million/ 56,074.76USD falls short considering it needs to cover all of the hospital's drug supply needs, including VL management. The excessive utilization of additional medication

during VL management (during Jan2023-Jan2024) of 14,379.12 USD has significantly depleted the funds, leaving the hospital in a compromised state.

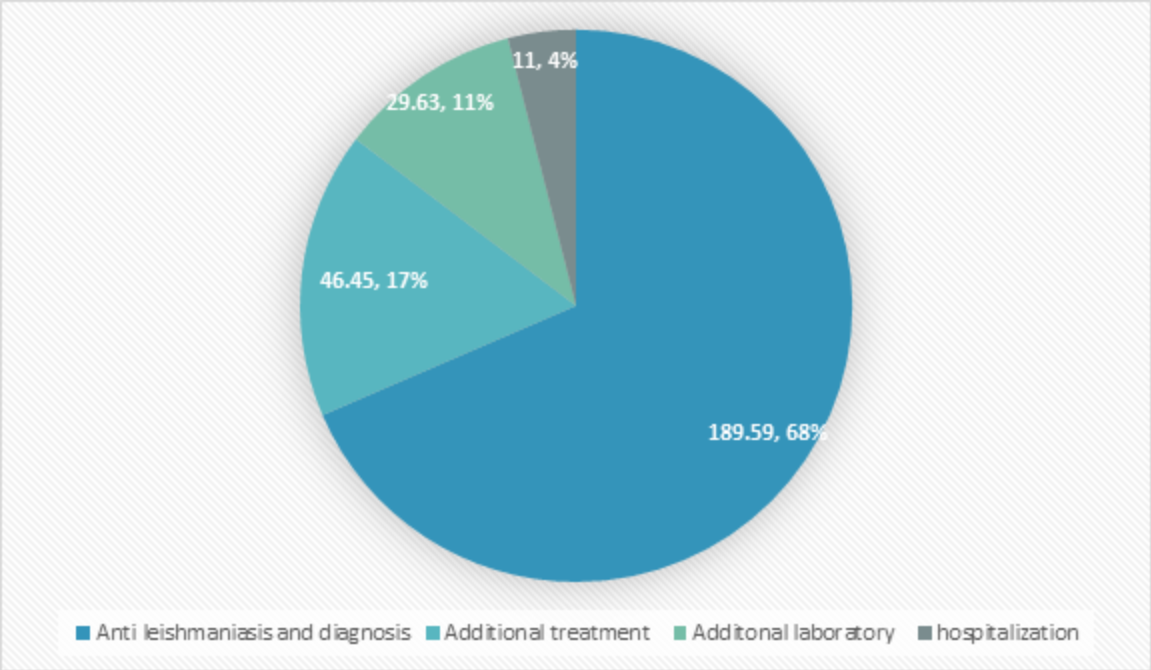
Healthcare facilities also struggled to cover the costs of providing VL care, which in turn affected their ability to maintain quality services and adequate infrastructure. One of the participant's asserted that *"Limited treatment supply is compounded by the unavailability of isolated rooms [in wards specifically for VL patients] due to inadequate hospital infrastructure".*

8. TOTAL COST INCURRED PER PATIENT

Upon evaluating the overall expenses associated with the diagnosis and treatment of VL, it is evident that there are additional costs incurred for investigating and treating concomitant illnesses. Our mean analysis reveals that laboratory costs amounted to ETB 1585.72/29.63 USD, additional treatment costs totaled ETB 1686.68/31.52 USD, hospitalization expenses, including bed and meal charges, totaled ETB 605.06/11.31 USD. Furthermore, miscellaneous costs for items such as IV cannula, syringes, surgical gloves, catheters, and needles accounted for ETB 799.09/$14.93. The total cost sum up of 87.39 USD per patient is paid by the hospital.

In this study the majority of the patients were prescribed with AmBisome and the rest took first line treatment which is SSG/PM therefore a mean of both treatment costs were found to be 189.5USD covered by WHO. Which makes the total cost needed for one patient upon arrival to the health facility is 276.67USD.

Figure 1. Total cost incurred by patients (276.67USD), is the cost needed for each patient to get treated including hospitalization and anti-leishmaniasis once they reach the health facility, but this doesn't included physician and nurse consultation costs.



9. COST INCURRED BY THE PATIENTS

Indirect cost was explored using an interview from patients and family members of VL patients who were treated at Jinka General Hospital. During interviews with 15 patients and their parents who had completed treatment, we explore the indirect costs they incurred in seeking treatment for VL. The expenses for transportation and the income lost during the treatment process added to the economic burden faced by these patients. We used closed-ended questionnaires, which limited our ability to conduct a proper quantitative analysis using economic burden analysis models. As a result, the findings are presented more as a qualitative evaluation with approximate figures, offering only a glimpse into the economic burden faced by the patients.

The majority of the participants reported spending more than ETB2000/ 37.38USD on transportation due to the distance of their homes from the city and the lack of proper transportation options because of poorly constructed roads. Additionally, they stated that their weekly income exceeded ETB5000/93.46USD, and this amount was lost during their VL sickness and treatment each week. Furthermore, their expenditure for other treatments, costs incurred before admission and investigations outside of the

governmental hospital amounted to more than ETB 15,000/280.37 USD. During the interviews, patients and caregivers reported a total loss of ETB 22, 000/411.21USD. The estimated costs varied among the participants, but this amount was the most commonly cited figure.

These findings highlight the substantial economic challenges faced by VL patients and their families, shedding light on the financial impact of seeking treatment for this disease.

Table 10. Indirect costs incurred by patients

Description	**Costs**	**/ETB/USD**
Cost covered by patients		
	Travel	2000/37.38
	Health care service outside of Jinka General hospital and other expenses	15000/280.37
	Lost income per week	5000/93.46
Sub total		22,000/411.21

(This estimation is preliminary, based on data gathered during an interview).

1. TOTAL COSTS INCURRED BY WHO AND JINKA GENERAL HOSPITAL DURING THE STUDY PERIOD.

1.1. COST INCURRED BY WHO

During the study period at Jinka General Hospital, a total of 189 patients were diagnosed with visceral leishmaniasis (VL). The majority of patients were diagnosed with rK39 kits, costing 535.50 USD in total. Additionally, 50 patients received SSG/PM treatment, which incurred a total cost of 2,408.73 USD. The remaining patients were treated with Ambisome, with 12 of them initially started on SSG/PM before switching to Ambisome resulting in a total cost of 32,889.50 USD.

Based on this data, the total cost incurred by the World Health Organization (WHO) for supplying anti-leishmaniasis drugs and diagnostic kits at Jinka General Hospital was 35,833.77USD, accounting for 19% of the total cost for managing VL during the study period. For further details, please refer to Table 11 and Figure 3.

1.2. COST INCURRED BY JINKA HOSPITAL

The total estimated laboratory cost amounts to 5,600.70 USD, while the total cost for managing comorbid conditions and addressing related complications totals 8,779.05 USD. It's crucial to highlight that these estimations do not cover expenses incurred by patients for clinical investigations and treatments received outside the hospital premises due to unavailability or shortage of supplies or for outpatient service before admission. These additional expenses sum up to 14,379.12 USD, representing nearly one third of the annual budget for all the hospital services, including those related to VL cases, one of the many medical conditions treated at the hospital.

During the study period, the hospital covered professional salaries for 11 doctors and 16 nurses who were assigned to VL care alongside their other responsibilities. Table 8 shows that the total payment for doctors' and nurses' salaries and their duty payment was 137,459.57 USD. This calculation includes the time spent on duty for both physicians and nurses. However, we were unable to separate the time

allocated to regular working hours for each professional, so the salary does not exclude payments for other activities.

This makes the total sum of the hospitals cost 153,917.7 USD, representing 81% of the total cost to manage VL. For more details, refer to figures 2 and 3.

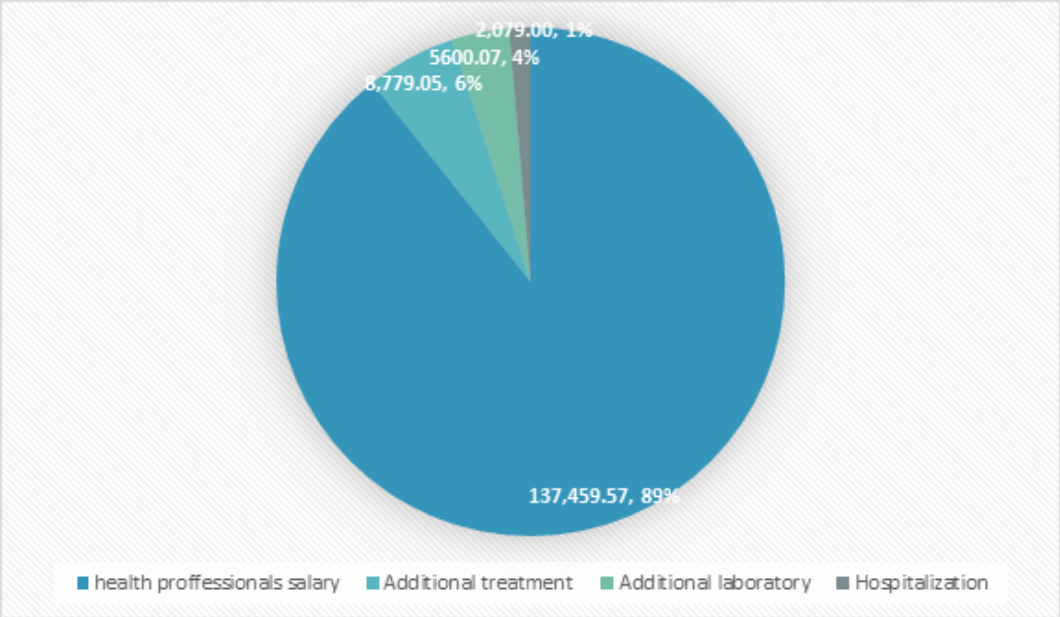
Please note that *Other healthcare professionals and non-professional (eg. laboratory professionals, pharmacists and cleaners etc…) were not included in the table because their services are for the entire hospital, not just for VL.*

Table 11. Total costs incurred by the WHO and Jinka general hospital (summary table)

Description	**Services**	**Mean cost per patient in USD**	**Total cost in USD**
cost of VL diagnosis and treatment by WHO			
	Diagnosis (rk39 kits)	2.83	535.5
	Treatment SSG/PM	24.06/23/17	2408.73
	Ambisome	238.33	32,889.54
Sub total			35,833.77
Cost covered by hospitals			
	Hospitalization	11	2,079.00
	Additional treatment	69.71	13,175.19
	Additional laboratory	29.63	5600.07
	Total annual health professionals payment		137,459.57USD
subtotal			153,917.7 USD

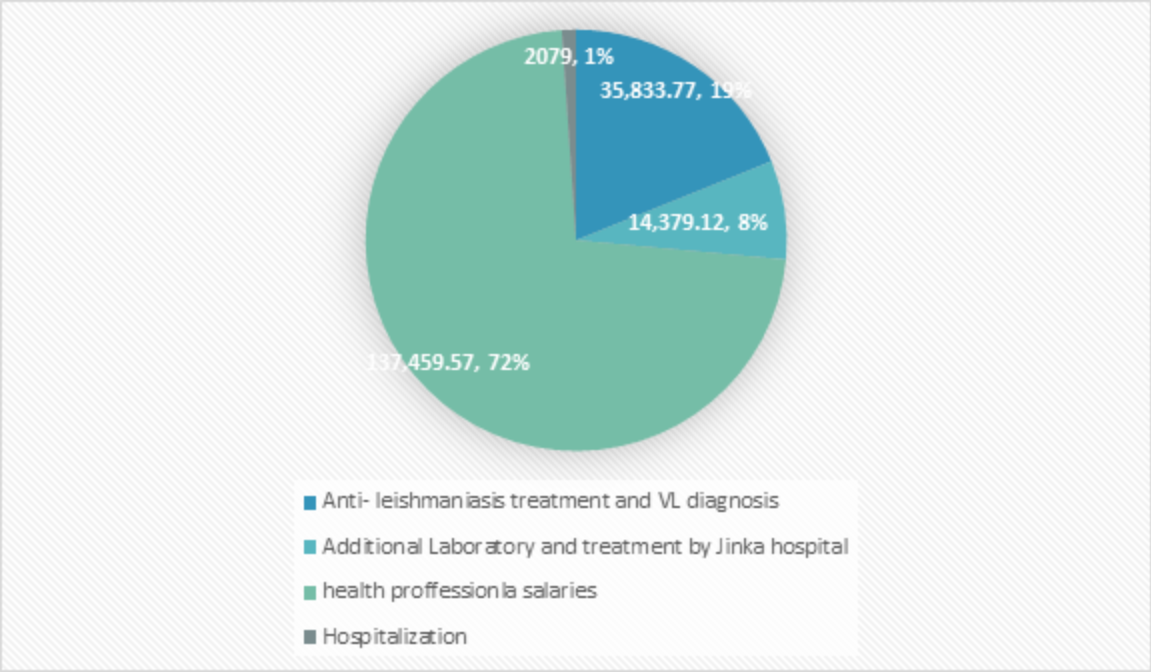
Total	**189,751.5 USD**

Figure 2. Total Cost incurred by Jinka General Hospital, total of 153,917.7USD excluding anti-leishmaniasis medication.



(The healthcare professionals are responsible for more than just the VL patients; they also handle other medical cases. As a result, the total payment may not accurately represent the pay for the specific amount of time spent with VL cases).

Figure 3. The total cost of treating VL at Jinka Hospital over one year amounted to $189,751.50, covered by both WHO and the hospital. (the cost is in USD, %),



CONCLUSION

The total cost of VL treatment for patients at Jinka General Hospital over a 13-month period (Jan 2023 - Jan 2024) amounted to 189,751.5 USD. Of this total, 35,833.77 USD (19%) was provided by the WHO to cover the expenses for anti-leishmaniasis drugs and diagnosis, leaving the hospital to cover the rest of the expenses in the amount of 153,917.7 USD (81%). Here, we've outlined the costs incurred by the hospital for patient treatment, rather than the amount paid by the patients themselves.

The hospital allocated $137,459.57 of its budget to cover the salaries of health professionals. It's important to note that these professionals were not exclusively dedicated to visceral leishmaniasis (VL) care during the study period; they also had other responsibilities, including managing other medical cases. Therefore, the salary payments don't accurately reflect the true cost of human resource designated for VL management separately. The study did not include the costs for other professionals, such as laboratory personnel and pharmacists, because it was not feasible to gather data on the time they spend with VL patients. Such information is not typically recorded for retrospective analysis.

Upon arrival at the facility, the cost to treat each patient with VL is 276.67 USD, not including fees for physician and nurse consultations. SSG/PM is the first line treatment, while AmBisome is the second line treatment. AmBisome is usually prescribed for patients who are thought to have a risk of drug related toxicity, like young children younger than 5 years, severe illness, pregnancy, and malnutrition(1). Hence, the cost of anti-leishmaniasis treatment heavily relies on the specific regimen prescribed. As most patients in the study were children, AmBisome was more frequently administered. The financial burden of treating VL is considerable, especially considering it is just one of the many cases the hospital treats. Anticipated costs are higher in the northern region of Ethiopia, primarily due to a larger percentage of adult patients who require extensive care. Consequently, the program's expenses vary depending on the total drug use per patient.

While proper nutritional support can enhance treatment response and subsequently reduce complications and costs related to VL treatment, only 71 out of 189 patients were given the nutritional supplements donated by a partnering NGO (not part of the program). The patients who received nutritional supplements used an average of 40.93 sachets, resulting in a cost of 14.33 USD per patient, and a total of 1002.78 USD. Although WHO and the hospital did not cover this cost, it is essential to emphasize that nutritional supplements should be a significant part of VL care. Therefore, the cost should be taken into account for future cost predictions.

During the interviews, former patients and family members shared how they faced a significant loss of income while undergoing VL treatment. They also emphasized the considerable financial impact of travel and other expenses beyond hospital care, as well as the earnings they could have had if they were able to work during their illness or while providing care. The majority of the participants have reported that the total estimated cost per patient incurred is around ETB 22,000 / 411.21 USD.

The loss of income and the financial burden of seeking treatment may deter individuals from seeking medical care at the hospital, particularly if they do not have sufficient earnings. Consequently, this could lead to poor healthcare-seeking behavior, prolonged

hospital stays, increased risk of transmission, and could impede the overall effectiveness of prevention, control, and elimination programs**.**

After interviewing healthcare professionals involved in patient care and hospital administration, it is clear that patients continue to struggle with a significant financial burden. Managing treatment expenses, especially those that are not found in the hospitals due to shortage, is proving to be a challenge, impacting the quality of care and patient outcomes. Despite the VL management program providing free anti-leishmaniasis treatment, health facilities still bear the responsibility of covering additional costs such as accommodation, food, and various medical expenses (co-morbidity treatment) which is not fully covered by the program. The overutilization of resources by patients with VL presents challenges and is straining the overall services provided by the hospital. The professionals emphasized that health insurance could potentially ease some of these financial burdens and highlighted the importance of collaborating with funders to address the current financial challenges faced by the hospital.

The financial burden is significant, further exacerbated by the impracticality of the current health insurance scheme, resulting in the facility being unable to receive full reimbursement for the VL exempted services. An unsustainable financial plan at the outset of the new elimination program not only poses a hindrance to the plan's success but also presents a potential risk for the spread of the disease and perpetuates a high caseload. As we move forward with the new elimination program, it is crucial to address these financial considerations to ensure the program's viability and success.

It is important to note that the cases at Jinka General Hospital differ in number and demographics compared to other areas,as the demographic profile for this particular center has shifted to younger children, which contrasts with the northern part of the country, where the majority of treated patients are adults and where we see the highest disease burden. It is crucial to recognize that the financial impact varies in regions where the case load remains consistently high.

LIMITATIONS

It's important to note that the professionals were not exclusively dedicated to visceral leishmaniasis (VL) care during the study period; they also had other responsibilities, including managing other medical cases. Therefore, the salary payments don't accurately reflect the true cost of human resource designated for VL management separately. The study did not include the costs for other professionals, such as laboratory personnel and pharmacists, because it was not feasible to gather data on the time they spend with VL patients. Such information is not typically recorded for retrospective analysis.

RECOMMENDATION

Stakeholders	Proposed actions	Description
MINISTRY OF HEALTH		
	Collaborate with international organizations:	Partnering with international organizations and public health agencies can provide access to funding, resources, and expertise to support cost-saving initiatives for VL treatment. Collaborative efforts can also help leverage global networks and best practices to improve patient outcomes while reducing overall treatment costs.
	Implementing prevention strategies	Preventive measures such as vector control, early diagnosis, and treatment to reduce the overall burden of VL. This can help in minimizing the number of cases requiring extensive and costly treatment.

	Effective health insurance scheme	An efficient health insurance scheme should be implemented to ensure timely reimbursement of costs incurred for patients with health insurance. This is essential to avoid compromising the quality of service provided and to prevent the hospital from incurring significant debt.
	Strengthening surveillance systems	Robust surveillance systems to monitor disease trends and identify high-risk areas can help in targeting resources efficiently and effectively, which leads to long term cost savings.
	Streamlined treatment protocols	Implementing standardized treatment protocols has the potential to minimize unnecessary tests, procedures, and medications, consequently lowering expenses. Adherence to evidence-based guidelines is crucial for healthcare providers

	Increase access to affordable medication	The ministry ought to investigate the availability of discounted or subsidized medication programs provided by local pharmaceutical companies, particularly for managing concurrent illnesses. Utilizing these resources can greatly diminish the expenses associated with treatment.
	Secure nutritional supplements	Put sustainable nutritional supplement supply in place as a standard for VL management.
	Utilization of telemedicine	Telemedicine enables expert healthcare providers to provide remote consultations, monitoring, and follow-up care without the necessity of in-person consultations and could reduce the cost of care. Healthcare professionals with limited knowledge on VL management can also consult experts in VL remotely to meet the standards of care.

	Strengthen healthcare infrastructure	Improve healthcare infrastructure in affected areas to ensure timely diagnosis and treatment of VL. By enhancing diagnostic capabilities and treatment facilities, institutions can reduce the overall cost burden associated with managing severe cases and also control and prevent VL.
REGIONAL HEALTH OFFICES		
	Follow up and regular Reporting	Regional health authorities must consistently monitor health facilities to track treatment costs and any challenges related to supplies. They should regularly report the exact cost of health facilities to forecast future expenditures on VL.
	Support health facilities	The regional health bureau serves as the main point of contact, and as such, they are expected to provide support to healthcare facilities in various ways, such as offering consultations, detecting outbreaks early, and allocating resources for early treatment
SUPPORTING NON-GOVERNMENTAL ORGANIZATION (NGOS)		

	Training	Investing in the training of healthcare professionals on the diagnosis and treatment of VL is crucial to ensure timely detection and proper management. This initiative can result in decreased severity of cases, ultimately lowering treatment expenses and improving patient outcomes.
	Monitoring and Evaluation	Regularly assess and review the financial forecasts and real expenses associated with treating VL. This will aid in detecting any inconsistencies and modifying the prediction model as needed to guarantee precise financial preparation. .
	Develop a cost forecasting model	Create a detailed cost prediction model that considers various cost elements, including medication expenses, diagnostic examinations, hospitalization fees, staff wages, and indirect costs. Ensure that this model is consistently revised to incorporate any alterations in pricing or healthcare procedures.

	Secure funding	NGOs should ensure they have sufficient funding available to cover the forecasted costs of VL treatment. This may involve seeking grants, partnerships with donors, or fundraising efforts specifically targeted towards supporting treatment for this disease.
	Implement cost-effective strategies	NGOs should explore and implement cost-effective strategies to reduce the overall cost of treatment. This could include negotiating lower prices for medications, partnering with pharmaceutical companies for discounts, and investing in training programs to optimize the use of resources
	Advocate for government support	NGOs can also advocate for government support and funding for VL treatment. Collaborating with government health agencies can help in addressing the financial burden.

	Investing in research and development	Encourage research efforts aimed at creating novel and economically viable therapies and diagnostic methods for VL. This may result in groundbreaking solutions that are both more accessible and affordable for a wider demographic.
	Engage with healthcare providers	Non-governmental organizations should establish connections with healthcare providers and medical experts with expertise in treating VL to gain a deeper insight into the present and potential future costs associated with treatment. To detect early disease outbreaks.
INSTITUTIONS		
	Developing a standard treatment protocol	Institutions ought to focus on creating standardized, evidence-based treatment protocols that are both cost-effective and efficient. This may include improving drug regimens, simplifying diagnostic procedures, and encouraging early intervention to minimize complications and treatment expenses

	Raise awareness and advocacy:	Institutions should prioritize raising awareness about VL, its prevention, and treatment options to promote early intervention and reduce the economic burden on affected individuals and health systems. Advocacy efforts also help to mobilize support for cost-effective treatment initiatives at the national and international levels.
HEALTH FACILITY		
	Efficient resource allocation	Proper allocation of resources such as medical supplies including nutritional supplements, equipment, and staff can help maximize efficiency and reduce wastage. Healthcare facilities should conduct regular assessments to identify areas where resources can be

	Patient education and compliance	Educating patients about the importance of adherence to treatment regimens can help prevent treatment failure and the need for costly retreatment. Healthcare providers should emphasize the importance of completing the full course of medications to achieve optimal results.
COMMUNITY		
	Seeking financial support	Individuals should explore various forms of financial support available in their community, such as government healthcare insurance schemes that cover treatment
	Support networks	Establishing community support networks or patient groups can provide emotional and financial assistance to those undergoing VL treatment. These networks can offer a platform for sharing resources, experiences, and advice on managing treatment costs
	Early treatment seeking	Support within the community to encourage each other to seek treatment early to minimize complications and related costs.
MEDIA		

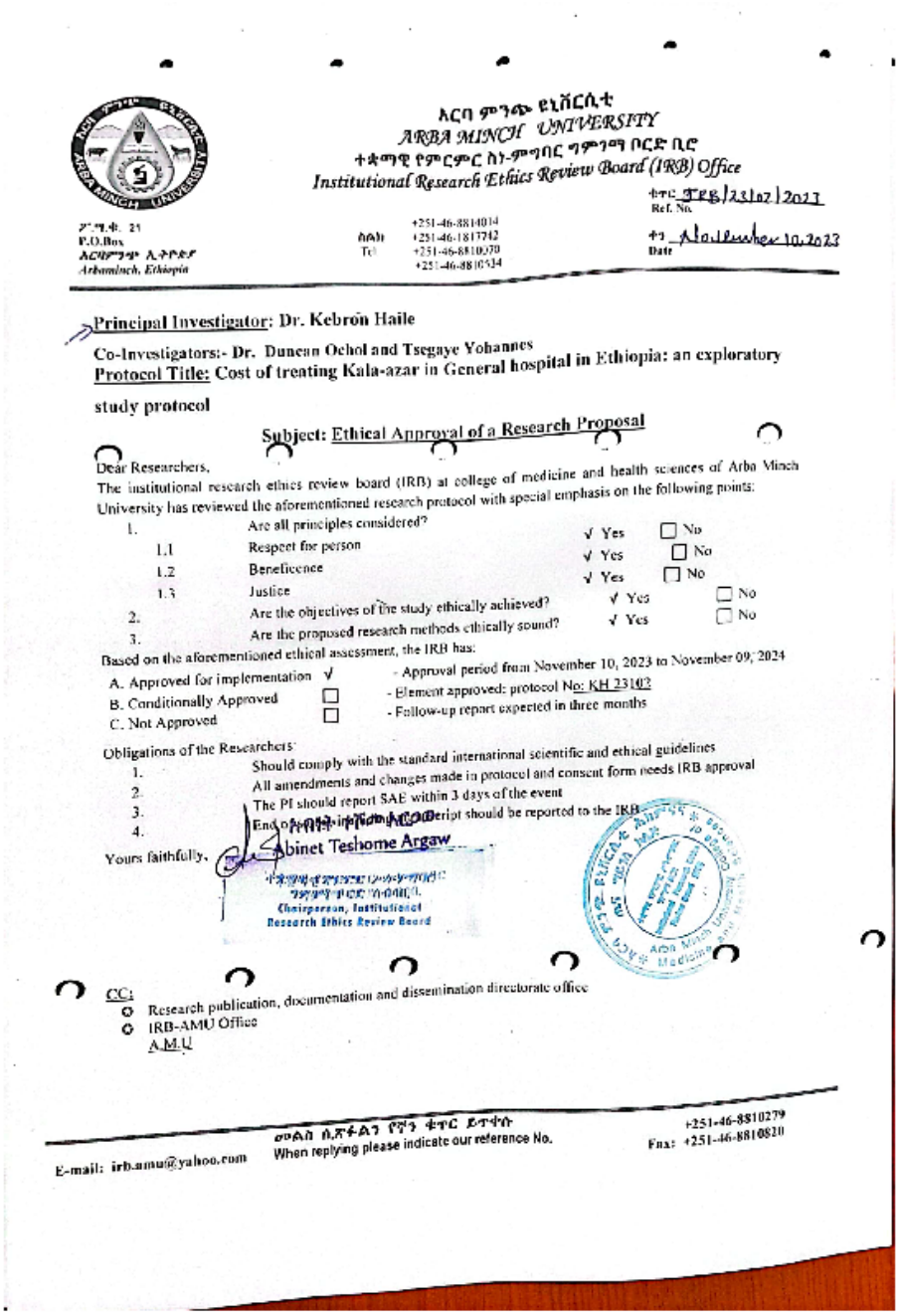
	Documentaries	To enhance awareness and understanding among the general community about VL and appropriate treatments. As well as to bring attention to the financial obstacles experienced by the health facility which might encourage local donors to support VL treatment.
	podcast	Interview with professionals and experts in the field of global health and VL to explore the economic impact of VL treatment and propose solutions to enhance affordability and accessibility.
	Social media campaign	Share informative content and support initiatives that aim to change health seeking behavior and access to treatment

REFERENCE

1. Ethiopian ministry of health. GUIDELINE FOR DIAGNOSIS AND PREVENTION OF LEISHMANIASIS IN ETHIOPIA. Addis Abeba; 2013. 2–3 p.
2. Ministry of Health. The Third National Neglected Tropical Diseases Strategic Plan 2021-2025. Minist Heal -Ethiopia. 2021;2025(November):1–116.
3. Yimer M, Nibret E, Yismaw G. Updates on Prevalence and Trend Status of Visceral Leishmaniasis at Two Health Facilities in Amhara Regional State, Northwest Ethiopia: A Retrospective Study. Biochem Res Int. 2022;2022(January).

APPENDIXES

ANNEX 1- ETHICAL APPROVAL



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Institutional Research Ethics Review Board (IRB) Office

ቁጥር ARB/23107/2023
Ref. No.

ቀን November 10, 2023
Date

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P.O.Box
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Arbaminch, Ethiopia

ስልክ +251-46-8814014
+251-46-1817742
Tel +251-46-8810279
+251-46-8810934

Principal Investigator: Dr. Kebron Haile

Co-Investigators:- Dr. Duncan Ochol and Tsegaye Yohannes

Protocol Title: Cost of treating Kala-azar in General hospital in Ethiopia: an exploratory study protocol

Subject: Ethical Approval of a Research Proposal

Dear Researchers,

The institutional research ethics review board (IRB) at college of medicine and health sciences of Arba Minch University has reviewed the aforementioned research protocol with special emphasis on the following points:

1.	Are all principles considered?	√ Yes	☐ No
1.1	Respect for person	√ Yes	☐ No
1.2	Beneficence	√ Yes	☐ No
1.3	Justice		
2.	Are the objectives of the study ethically achieved?	√ Yes	☐ No
3.	Are the proposed research methods ethically sound?	√ Yes	☐ No

Based on the aforementioned ethical assessment, the IRB has:

A. Approved for implementation	√	- Approval period from November 10, 2023 to November 09, 2024
B. Conditionally Approved	☐	- Element approved: protocol No: KH 23102
C. Not Approved	☐	- Follow-up report expected in three months

Obligations of the Researchers:

1. Should comply with the standard international scientific and ethical guidelines
2. All amendments and changes made in protocol and consent form needs IRB approval
3. The PI should report SAE within 3 days of the event
4. End of study report/publication manuscript should be reported to the IRB

Yours faithfully,

Abinet Teshome Argaw

Chairperson, Institutional Research Ethics Review Board

CC:
- Research publication, documentation and dissemination directorate office
- IRB-AMU Office

A.M.U

E-mail: irb.amu@yahoo.com

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When replying please indicate our reference No.

Fax: +251-46-8810820

CamScanner

ANNEX 2 QUESTIONNAIRE FOR PATIENTS AND CAREGIVERS

For patients and caregivers questionna

ANNEX 3 QUESTIONNAIRE FOR HEALTH CARE PROVIDERS

For Hospital staff and Administrator Questic

ANNEX 4 OTHER ADDITIONAL MEDICATION

Other Additional Medications
Cetraxone,Ampicillin,Artusnate,zinc acetate,Resomal,salbutamol puff,Gentamicin,F-75,lasix,Coartum
ceftriaxone,Vancomicine,AmpicillinAmpcilline, Omeprazole,Miconazole cream,Azitromyicine,Morphine,Paracetamol, Metronidazole,Ciprofloxacine, Ferrous sulfate,Hemup
Azitromycine,ceftriaxone,haem up syrup,
coartem,Augmentin, Multivitamin, ORS
Albendazole,FeSo4,Amoxicilline,Augmentin,Metronidazole,paromomycin
Ceftriaxone,Azitromycine,FeFol,Tinidazole
ceftriaxone,Azitromycine,Augmentin, Hemup syrup
Augmentin, Azitromycine,Multivitamin, Ferrous sulphate
FeSo4,Multivitamin, Azitromycine, Ceftraxone
Ceftriaxone,FeSO4,RTUF, Agumentine,Ceftazidine
ceftriaxone, Artusnate,Vancomycine,Glibenclamide,Vancomycine,ORS,Omeprazole,Hydrocortisone, Metronidazole, Coartum,Vitamin K
Ceftriaxone,Coartem,Bisacodyl,Albendazole,MTS,Artesunate,Augmentin
FeSo4,Multivitamin

pyridoxine,Azitromycine, Albendazole,Lasix,FeSo4,Prednisolone,spironolactone,Omeprazole, Ceftraxone,Artusnate, Coartum,Cimetidine
Cetriaxone,Gentamicin,Furosemide,Coartem,Artesunate,Albendazole,Amoxicillin,Multi vit syrup,Haem
FeSo4, folic acid,Augmentin, Metronidazole, Azitromycine, Ceftraxone, Multivitamin, Hemup syrup
Amoxicillin,Cotrimoxazole,Haem up,Azitromycine,Albendazole,Multi vitamin,FeSO4,FeFol,Coartem
FeSo4, Multivitamin, Albendazole, Folic acid,
Ampicillin,Gentamicin,Ceftriaxone,F75
Bit B complex, folic acid,FeSo4,Multivitamin, 40%glucose
Ceftriaxone,Azitromycine,Plasil,FeFol,Feso4,Multi vitamin
FeFol,FeSO4,Haem up,Praziquantel,Multi vitamin
not specified
Vancomycin, Ceftraxone, cloxacillin IV,40% glucose, Omeprazole, folic acid, FeSo4,Multivitamin, prednisolone,Coartum, Albendazole, Hydrocortisone, Lasix,spironolactone
Azitromycine,MTS,FeFol,FeSO4,Albendazole
ceftriaxone, Azitromycine, FeSo4,Plasil,Albendazole, Augmentin
FeSo4, Ceftraxone, Ciprofloxaclline,Tinidazole,
Ceftazidime,Cetriaxone,Vancomycin,Plasil,Omeprazole,Hydrocortisone ,Azitromycine,
Ceftriaxone,Albendazole,Amoxa,Azitro
Cotrimoxazole,Agumentin,Azitromycine,Albendazole,Tinidazole,Multi vitamin,Heam up
Albendazole,Coartrm,Artesunate,Haem up,Multivitamin,FeFol,Cotrimoxazole,Fe Fumarate,
Ceftriaxone ,Zinc acetate,Azitro,Cipro ear drop,Amoxa
FeSo4,Multivitamin, ciprofloxacin,Tindazole,folic acid
Artesunate, Ceftraxone, Hemup syrup, Multivitamin
Augmentin,Azitro,Multivitamin,FeSO4,Ferrous fumarate,
Ceftriaxone, Azitromycine, Cimetidine,plasil,Heam up syrup,FeSo4,Multivitamin, Augmentin,
FeSo4,folic acid,Multivitamin, Ceftraxone, Azitromycine
Albendazole,Metronidazole,Agumentin,Azitromycine,FeSO4,FeFol,Fe fumarate,Multivitamin,
Haem Up syrup, Ceftraxone, Azitromycine, Coartum
FeSo4, Tinidazole, Cephalexin,Metronidazole, Ceftriaxone Augmentin, Amoxicilline
Ceftriaxone ,Plasil,Omeprazole,Azitro,FeFol,FeSO4,Multi vit,Lasix
Ceftriaxone, Azitromycine, ORS,ferrous fumarate,folic acid,Multivitamin
FeSo4, Multivitamin, cloxacillin,Augmentin, Azitromycine, Tinidazole
Ceftra,Azitro,Albendazole,Haem up,FeFol
FeSo4, Tindazole, Albendazole

ceftriaxone, ORS,Zinc acetate,Azitromycine, Amoxicilline,Coartum
ceftriaxone ,Azitro,Haem up,
plasil,Iron fumarate,Cephalexin,Feso4,Multivitamine
Multivitamin, Feso4,folic acid
Omeprazole,Tinidazole,FeSO4,Plasil,Azitro,Ceftriaxone
ceftriaxone,Azitro,ORS,Tinidazole,Haem up,FeFol
Ceftriaxone,Azitromycine,FeSO4,FeFol
Cephalexin,Multivitamin, FeSo4,Coartum
Ceftra,Azitromycine
ceftriaxone, Azitromycine, Omeprazole, Coartum, FeSo4, folic acid
ceftriaxone,lasix,Tinidazole,Albendazole,FeFol
Ceftriaxone, Gentamicin, Azitromycine, vit B complex, Albendazole, 40%glucose
Haem Up syrup, Ceftraxone, Azitromycine, FeSo4, folic acid, Multivitamin
FeSO4,FeFol,Multi vitamine,Omeprazole,Coartem,Cimetidine,Artesunate
cloxacillin, Omeprazole, FeSo4
Ceftriaxone,Albendazole,Azitromycine,FeFol
Augmentin, Azitromycine, Multivitamin, FeSo4
ceftriaxone, Azitromycine, Multivitamin, frolic acid,Albendazole, zinc oxide,Hemup syrup
Multivitamin, Haem Up syrup, Ceftraxone, Azitromycine, ORS
Haem Up syrup, Albendazole
Ceftriaxone,Gentamicin,Lasix
Tinidazole, FeSo4, Multivitamin, ciprofloxacin
FeSo4 Multivitamin
Lasix, Ceftraxone, ciprofloxacin,Omeprazole, FeSo4, Multivitamin
ceftriaxone, Coartum, Omeprazole, cimetidine,plasil, FeSo4, folic acid,Artusnate, Hemup y
Augmentin, Ceftraxone, Cephalexin, ceftazidime,Coartum, FeSo4, Azitromycine, folic acid
ceftriaxone, Azitromycine, Tinidazole, FeSo4, folic acid, cloxacillin, Multivitamin
Cefixime
ceftriaxone ,Artusnate,Metronidazole, Azitromycine, folic acid, Multivitamin, iron fumerate
Coartem, primaquine,Ceftraxone, ciprofloxacin, 40%glucose
Ceftriaxone,Coartem,Augmentin,Artesunate,FeFol,Tinidazole,Frusemide
Albendazole, Vitamin A,Augmentine, ORS,FeSo4
Amoxicilline, Albendazole, FeSo4

Amoxa,Coartem,FeFol,Multi vitamin ,Albendazole,FeSO4,Primaquine
pyridoxine, Multivitamin, Ceftraxone, Azitromycine
FeFol,FeSO4,Multi vitamin ,Cloxacillin,Albendazole ,Tinidazole
Amoxicilline, FeSo4, Metronidazole, Coartum, Azitromycine
Ceftriaxone,Cimetidine,40% Glucose,Vit B complex ,Plazil,Metronidazole,Azitromycine,Haem up,Multi vitamin,FeFol
Cef,Albendazole, Amoxicilline, Coartum
Adrenaline ,Haem up,Vitamin K
Multivitamin, FeSo4, Augmentin, Azitromycine, folic acid
Amoxicilline, Azitromycine, Coartum, FeSo4, ciprofloxacin, Albendazole
ceftriaxone, Albendazole, FeSo4, Amoxicilline, Multivitamin, Augmentin
Ceftriaxone ,Tinidazole ,Omeprazole,Cimetidine Azitromycine ,Fluconazole,Cotrimoxazole,FeSO4,FeFol,Anti acid
FeSo4, Multivitamin
ceftazidime,ceftriaxone,Artusnate, Vancomycine, vit k,Azitromycine, Albendazole, phenitione
ceftriaxone, ciprofloxacin, Albendazole, FeSo4
Cephalexin,Multivitamin,FeSO4,MTS,
FeSO4
Ceftriaxone ,Azitromycine ,Omeprazole ,Feso4
FeSo4, ORS,Coartum,Albendazole, Multivitamin
ceftriaxone, Azitromycine, Hydrocortisone, Diphdarmine,Hemup syrup, folic acid
Ceftriaxone ,Metronidazole ,Coartem,Plasil,Multi vitamin ,FeFol,Feso4,
Augmentin, Ceftraxone, ORS,Albendazole, Coartum, FeSo4, Azitromycine, folic acid,Heump syrup
ceftriaxone, Azitromycine, Albendazole
Azitromycine ,FeFol ,Feso4,Haem up,
ceftriaxone, Azitromycine, Omprazole, plasil,FeSo4, folic acid
ceftriaxone, Azitromycine, FeSo4, Amoxicilline, Albendazole
Multi vitamin ,Vitamine B complex
pyridoxine, FeSo4, folic acid,Multivitamin, Ceftraxone, Azitromycine, 40%glucose,Vancomycin, Omprazole, Hydrocortisone
Azitromycine ,Ceftriaxone ,Amoxicillin,Albendazole
FeSo4, Multivitamin, Metronidazole, Albendazole, Amoxicilline, Azitromycine
Haem Up syrup, Amoxicillin syrup
Coartum, Ceftraxone, Azitromycine, Hemup syrup, folic acid
ORS, zinc acetate, cotrimoxazole,Haem up syrup, FeSo4, Ceftraxone, Coartum, Albendazole

ceftriaxone, Lasix, FeSo4, Multivitamin, Hydrocortisone, Metronidazole, Azitromycine, Omprazole, cimitidne,ORS,zinc acetate
Amoxicilline, Cephalexin, Albendazole, Hemup syrup
Azitromycine,amoxicillin,FeSo4,folic acid
Augmentin,Azitromycine, Metronidazole,FeSo4,folic acid, Albendazole
FeSo4, Augmentin,Azitromycine, Omprazole,Folic acid
not specified
Amoxicilline, Albendazole,FeSo4
40%glucose,Hemup syrup,Folic acid
Tinidazole,Hemup syrup, ceftriaxone,ORS,zinc acetate,folic acid
FeSo4 multivitamin, cloxacillin,Augmentin
metronidazole,ceftriaxone,Alebendazole,FeSo4, Azitromycine
Ceftriaxone ,Gentamycine,Ampicillin,Lasix,
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cotrimoxazole,Vancomycin,ceftriaxone,FeSo4,Tinidazole,Omprazole,40% glucoses, vit B complex, Ciprofloxaxlline, Artusnate
Haem up,Ceftriaxone ,Metronidazole ,Azitromycine ,artesunate ,coartem,vit k,Ciprofloxacin ,
Feso4,fefol,multi vitamin ,Cimetidine ,vit B complex
Ceftriaxone ,Albendazole ,haem up,
FeSo4, ceftriaxone, azitromycine,Lasix,Tinidazole
FeFol
Azithromycin,Augmentin,Multivitamin, Albemdazole,ceftraxone, 40%glucose

Ceftriaxone ,Omeprazole ,FeFol
ceftriaxone, azitromycine,FeSo4, Multivitamin, augmentone
Ceftriaxone ,Azitromycine ,Ciprofloxacin ,Omeprazole ,ketoconazole cream,multi vitamin ,FeFol
FeSo4, ceftriaxone, Tinidazole
Augmentin,Coartum,Griseofulvin
Multivitamin, FeSo4, MTS,Albendazole,Miconazole,Nystatin,Omeprazole,Ciprofolxaclline
ceftriaxone, azitromycine, FeSo4, Multivitamin
Cimetidine,plasil,Omeprazole, FeSo4, 40%glucose,Vit B complex, coartem,Tinidazole
ciprofloxacin,Tinidazole, FeSo4
ceftriaxone, azitromycine, Omprazole, 40%glucose,Vit B complex, FeSo4, Albendazole
FeSo4, Amoxicillin,Tindazole, Multivitamin
Tindazole, Omeprazole, FeSo4, Multivitamin, Pyradoxine
Cimetidine,ceftriaxone, Azitromycine, Tindazole, FeSo4, Folic acid, 40%glucose,Lasix,Vancomycine
FeSo4, Albendazole,cephalexin
Ciprofloxacin,Metronidazole,FeSo4, Ceftraxone, MTS syrup,
Augmentin,pyridoxine,FeFol,Ciprofloxacin
Albendazole ,Amoxicillin ,haem up
Albendazole ,Lasix,FeFol,Feso4
Tinidazole ,Albendazole ,FeFol,Multi vitamin
40%glucose,vit B complex, Multivitamin, Augmentin,Tinidazole, FeSo4, ORS
ciprofloxacin eye drop,FeSo4, Dexamethasone eye drop,ceftriaxone, Aziteomycine,Ciprofloxaciline po,Augmentin
Metronidazole syrup,Amoxicillin syrup,F-75 andF-100,Ceftraxone, Augmentin,Ampicillin IV,Gentamicin
F-75,Amoxicilline,Ciprofloxacin IV,Tinidazole, Coartum,plasil,Artusnate,ceftriaxone, Azitromicina,Zinc acetate,ORS
Lasix,spironolactone,praziquantel,Ciprofloxacin, FeSo4, folic acid,ceftriaxone, Azitromaxine,
FeSo4, folic acid, Omeprazole,Bisacodyl,Metronidazole po,Ceftraxone, Azitromaycin,Augementine
vancomycin,ceftazidime,F-75,Ciprofloxacin ,Omprazole, ceftriaxone, Tinidazole, MTS,Artusnate, Metrondazole, Coartum,Azitromaycine
Vancomycin,ceftriaxone, Miconazole,Ampicillin,Gentamicin,Ceftazidin
Hydrocortisone cream,FeSo4
Pyridoxine,Ceftraxone, Vancomycin, Ceftazidin,Clindamycin,F-75,Clotrimazole,Tinidazole
Azithromycin,Augmentin,FeSo4, prednisolone,cipro ear drop,Salbutamol puff
40%glucose,Metronidazole IV,ORS,FeSo4, Multivitamin, Haloperidol+Ceftraxone, Augmentin, ciprofloxacin ,lasix,Azitromaycine,Omprazole, spironolactone

ceftriaxone, Azitromaycine, Multivitamin, FeSo4
Ceftriaxone ,coartem,Metronidazole ,Amoxicillin ,haem up,diphenhydramine
FeFol,multi vitamin ,Feso4,Coartem ,primaquine,Albendazole ,
Augmentin,Albendazole ,zinc,Feso4
Ceftriaxone ,lasix,Azitromycine ,augmentin,Tinidazole ,praziquantel,FeFol,Feso4
Ceftriaxone ,Azitromycine ,Omeprazole ,Cloxacillin ,Vit B complex,40 %
F-75,Metronidazole, Coartum, Ampicillin,Gentamicin,Haem up syrup,ResoMal
Metronidazole, Coartum, ORS with zinc,Amoxicilline,Haem up syrup, folic acid
Ceftriaxone, Ampicillin,Omeprazole, Acyclovir,Hydrocortisone, 40%.glucose, Vancomycin, FeSo4, Coartum, Vit K,Vit B complex, Artusnate, plasil,Azitromaycine,Multivitamin, lasix
Haem up syrup, Augmentin, Azitromaycine, Cimetidine,Multivitamin, Cephalexin,FeSo4, Folic acid,cloxacillin po
FeSo4, Haem up syrup, Azitromaycine, folic acid, Multivitamin
Ceftriaxone ,Azitromycine ,Cimetidine ,Lasix ,Omeprazole ,Dexamethasone,Metronidazole ,Ciprofloxacin ,vit c,vit D,
Azitromycine ,Ceftriaxone ,spironolactone,Cimetidine ,lasix,Feso4,
FeFol ,Haem up
Ceftriaxone ,Azitromycine ,coartem,augmentin,multi vit,FeFol,Feso4
Ceftriaxone ,Coartem,Azitromycine ,haem up
Ceftriaxone ,plasil,Azitromycine ,multi vit,FeFol,Feso4
Plasil