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Clinical Pattern and Treatment Outcome of Tegumentary Leishmaniasis in Bahir Dar, Ethiopia (2021-2022)

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Abstract

Background; There are two main types of Leishmaniasis; visceral Leishmaniasis (VL) and Tegumentary Leishmaniasis (TL). Again TL is classified into cutaneous Leishmaniasis (CL), and mucocutaneous Leishmaniasis (MCL). Cutaneous leishmaniasis (CL) is a serious public-health issue that can leave permanent scars or cause severe impairment. MCL can result in deformity with substantial aesthetic morbidity, social stigma, and psychological consequences. Because there are few precise clinical descriptions of CL in Ethiopia, a detailed description of the disease would be useful for early diagnosis.

Objective; Describe the clinical pattern and treatment outcome of patients with Tegumentary Leishmaniasis in AAPH and TGSH in Bahir Dar, Ethiopia (2021-2022).

Methods; A retrospective longitudinal study is undertaken using data from interviewer-administered questionnaires and chart review. TL cases were identified, patient files were collected, and the information was entered into an Epidata database before analyzed with SPSS version 25. Census is used and all TL patients who visited AAPH and TGSH between December 2021 and August 2022 are included in the study.

Result: Between December 2021 and August 2020 we see a total of 103 patients. From this 58.3% (60/103) are LCL, 34% (35/103) are MCL and 7.8% (8/103) are DCL. From the total study 103 participants 87.4% of them had improvement from cutaneous leishmaniasis. The majority of respondents 29 (28.2%) and 27 (26.2%) had plaque and ulcerated lesion morphology, respectively.

Conclusion and recommendation: Physicians should consider TL as a differential diagnosis in patients who have recently traveled to or have visited endemic areas due to the wide range of clinical manifestations of TL. In this study there is good outcome of the patients who had TL.

Keywords; Cutaneous leishmaniasis, treatment outcome, TGSH, AAPH

Lists Abbreviations

AAPH…….Addis Alem Primary Hospital

CL……....Cutaneous Leishmaniasis

DCL…….Diffuse Cutaneous Leishmaniasis

FMOH…….Federal Ministry of Health

LCL…….Localized Cutaneous Leishmaniasis

MCL…….....Mucocutaneous Leishmaniasis

NTD……Neglected Tropical disease

SSG…….Sodium Stibogluconate

TGSH……..Tibebe Ghion Specialized Hospital

TL……...Tegumentary Leishmaniasis

VL……...Visceral Leishmaniasis

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1. Introduction

1.1. Background

Leishmaniasis is a protozoan NTD transmitted by the bite of infected female sandflies (1,2). Phlebotomus, Lutzomyia, and psychodopygus are the three vectors that transmit Leishmania to humans. The majority of the diseases are only transmitted by animals (zoonotic leishmaniasis), but some can be transmitted between humans (anthroponotic leishmaniasis) (3). Italian epidemiologist Martogilo first identified Tegumentary leishmaniasis in Ethiopia in 1913. Leishmaniasis is classified into two types: visceral leishmaniasis (VL) and Tegumentary Leishmaniasis (TL). Again TL is classified into cutaneous leishmaniasis (CL) and mucocutaneous leishmaniasis (MCL). CL is primarily caused by L. aethiopica in Ethiopia, with L. major being a rare exception (2). Mountain hyraxes serve as a reservoir, hence it's mostly found in the mountains (4). The intricate interplay between the pathogenic species and host factors including the immune status causes the varied clinical symptoms of leishmaniasis (5).

TL has different clinical characteristics depending on the Leishmania species that infects the person, but a single species can cause lesions with different characteristics in the same person. TL is also clinically heterogeneous, difficult to diagnose, and treat, according to clinical experience in our country (6). Although the majority of Tegumentary Leishmaniasis lesions are self-limiting and may heal in 1 to 5 years, they heal with scarring after a few months and cause stigmatization and disfigurement (7).

The national guideline for leishmaniasis recommends local treatment for LCL cases less than 5 cm in diameter with no risk of mucosal progression. Treatment options for LCL include Intralesional pentavalent antimonials and cryotherapy. The indications for systemic treatment include MCL, DCL and complicated LCL such as multiple or large lesions, immunosuppression, LCL not suitable for topical treatment and LCL with a risk of expansion to the nearby mucous membrane. The drugs most available for systemic treatment are pentavalent antimonials and to a lesser extent paromomycin. For DCL, combination therapy of pentavalent antimonials with paromomycin is recommended.

1.2. Statement of the problem

The disease is widespread in 98 countries around the world, including Ethiopia, with 350 million people at risk (8). Tegumentary leishmaniasis is the most common type of leishmaniasis, with 0.7 to 1.2 million new cases reported each year around the world (2, 8). Ethiopia is one of the endemic countries, with a case incidence of TL ranging from 20,000 to 30,000 cases per year (9). Cutaneous leishmaniasis (CL), which can be localized (LCL) or diffuse (DCL), is a serious public-health issue that can leave permanent scars or cause severe impairment (5, 6). MCL can cause partial or complete loss of the mucous membranes of the nose, mouth, and throat if the lesion is large and affects the face, resulting in deformity (7, 8).

TL mimics the symptoms of various infectious, inflammatory, and neoplastic illnesses and mislead health professionals leading to delayed diagnosis and disfigurement especially in visible body sites (14). Therefore it can result in substantial aesthetic morbidity, social stigma, and psychological consequences especially in women's and children's (1). For example, from a total of 448 Moroccan high school students, 87% indicated it could possibly or certainly lead to psychological problems, particularly in girls. TL was deemed harmful, serious, and lethal by the pupils, who claimed it occasionally led to strong suicidal ideation (15). Early detection and treatment of tegumentary leishmaniasis minimizes the disease's prevalence, as well as its associated impairments, psychological distress, and social stigma (16).

Some VL medications, such as antimonials and paromomycin, have been shown to be effective against TL outside of Ethiopia (17). Clinicians in Ethiopia who have access to VL medications frequently utilize to treat TL. Generally, in practice treatment is largely determined by the availability of the different treatment options (8). However, there is a scarcity of data on how patients are managed in different facility and the therapeutic outcomes that result. Furthermore, there have been no clinical trials on TL in Ethiopia.

1.3. Significance of the study

The information on thorough clinical description of TL in Ethiopia would be valuable for health care professionals for early diagnosis and initiation of treatment.

Given the country's limited evidence base on TL therapy, such information could be useful in determining which medications should be tested in future clinical trials, as well as in informing health-care leaders, program managers, and policymakers about the situation and considering establishment of a national treatment guideline and allocate resources. The findings of this study will be used as a starting point for other researchers interested in the subject.

2. Literature review

2.1. Clinical pattern

A total of 57 clinically suspected CL patients were recruited from the dermatology clinic at Anuradhapura Teaching Hospital in Sri Lanka for the study. The morphologic findings of this study were papulo-nodular (35.8%), Nodular-ulcerative (45.3%), and Ulcer (18.9%) (18).

A retrospective chart review of TL patients treated at the Leishmania Research and Treatment Center (LRTC) at the University of Gondar was conducted. From a total of 154 CL patients; 80 were LCL, 7 were DCL, and 67 MCL. The majority of the lesions were on the face (n = 121, or 78.6%), with induration, erythema, ulceration, and crusty or patchy lesions being the most common morphologic features (19).

A total of 205 people took part in the study, which took place in Borumeda Hospital in North-East Ethiopia. Approximately 59% of study participants had lesions on their heads, with 60% of patients having a single lesion and 30.2% having two lesions. The most common morphologic form of lesion was indurated plaque (30.7%), followed by nodular (17.1%), papular (14.1%), diffuse induration (13.7%), nodulo-papular (12.2%), and nodulo-ulcerative (12.2%) lesions. However, this study just presents limited morphologic descriptions (2).

2.2. Treatment outcome

In a research with 136 participants in Colombia, 72.06% of the patients were informed as having been cured according to medical standards, 10.29% as having had therapeutic failure, and 17.65% as having no data. Patients who got meglumine antimoniate had disease healing in 64.29% (63/98) of cases, while patients who received pentamidine isethionate had disease healing in 92.1% (35/38) of cases (20).

In a retrospective analysis of 41 CL patients conducted in Spain, 24 (59%) underwent local treatment, whereas 17 (41%) had intravenous systemic treatment with Liposomal Amphotericin B. Within the first year after therapy, all cases treated with Liposomal Amphotericin B were deemed cured, and no relapses were documented at the 12-month follow-up (21).

A retrospective chart review of TL patients treated at the Leishmania Research and Treatment Center (LRTC) at the University of Gondar was conducted. The researchers wanted to see how 154 CL patients responded to treatment (80 LCL, 7 DCL, and 67 MCL). The majority of patients received 30 days of intramuscular antimonial injections, with short-term cure rates of 19% for LCL, 31% for MCL, and 14% for DCL with injectable anti-leishmanial drugs. Of these, 51

(38.3%) of them needed more than a month of treatment. However, no follow-up was done after discharge, and the efficacy of local pentavalent antimonial therapy was not evaluated in this study (19).

Over the course of 18 months, 167 individuals with various kinds of cutaneous leishmaniasis were enrolled in a single trial in northern Ethiopia. Patients were given meglumine antimoniate at first, while resistant cases were given pentamidine isethionate. In relapsed instances, there was a high rate of resistance to meglumine antimoniate (28%) and a less than ideal response to prolonged systemic treatment. Eight patients with severe and resistant forms of the disease were treated with pentamidine isethionate, which had an 87.5% cure rate after six months and is a drug that is scarcely available in the country (22).

In a single-center study in South Wollo, patients with MCL who received Systemic SSG with Intra-Lesional SSG had an 85.7% cure rate, whereas systemic SSG plus allopurinol had a 78.6% cure rate. Patients with DCL who had both systemic SSG and allopurinol had an 80% cure rate, while systemic SSG and local treatment, including cryotherapy and IL SSG, had an 85.7% clinical cure rate. Furthermore, patients diagnosed with LCL who only received cryotherapy had a 92.3% cure rate, whereas patients who received a combination of cryotherapy and IL SSG therapy had a 96.1% clinical cure rate, but this study only included combination therapy and scarcely available medication (7).

Researchers in Silti looked at how L. aethiopica responded to SSG and cryotherapy on 123 patients who were separated into two groups. 80.6% of the 103 patients who received cryotherapy were cured, 14.6% dropped out, and 5.8% did not respond. 85% of the 20 participants who were given SSG were cured, 10% were nonresponsive, and 5% dropped out. The cure rates with cryotherapy and SSG were 93.3% and 89.5%, respectively (23). However, only two treatment alternatives were used in this study to assess the treatment response.

According to a single study in ALERT Hospital, two patients with long-standing, active DCL were treated with paromomycin for 60 days and both experienced complete remission of their skin lesions, but they later relapsed. Then, for the two patients in relapse and a third patient, a combination of paromomycin and SSG was given, and therapy was continued for another two months after parasitological cure. During follow-up periods of 2 to 21 months after therapy, there were no signs of relapse (24). However, this study only included three patients, but they were followed up on well.

3. Conceptual framework

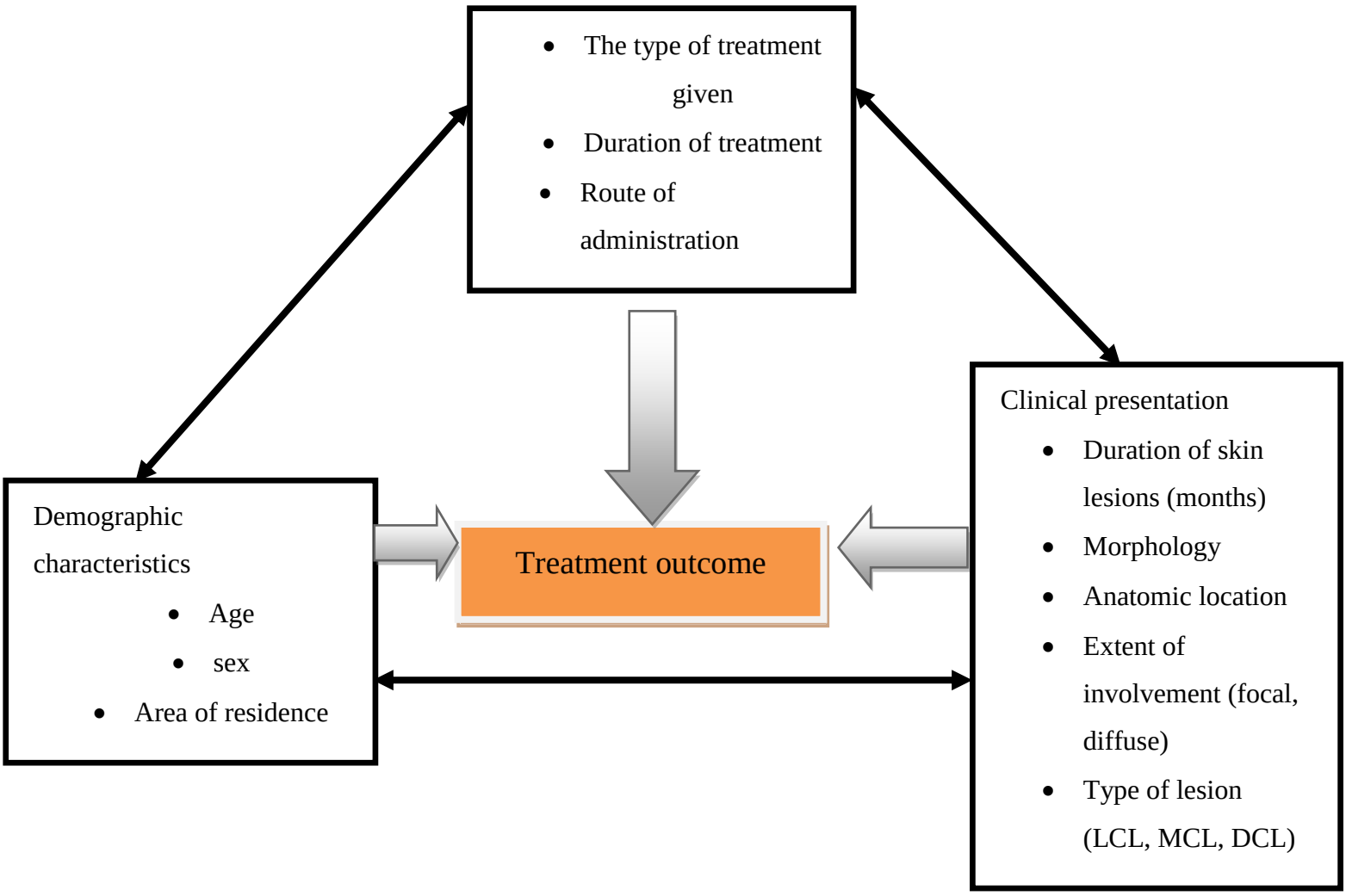


Figure 1: Conceptual framework of treatment outcome of Tegumentary leishmaniasis

4. Objectives

4.1. General objective

Describe the clinical pattern and treatment outcome of patients with Tegumentary Leishmaniasis in AAPH and TGSH in Bahir Dar, Ethiopia (2021-2022).

4.2. Specific objective

- To determine clinical presentation (morphological description, type of lesion, area and extent of involvement) of TL
- To determine the treatment outcome, by type of treatment and TL types (LCL, MCL and DCL)

5. Methods

5.1. Study design

A retrospective longitudinal study is undertaken using data from interviewer-administered questionnaires and using routinely collected data in medical files

5.2. Setting

5.2.1. General setting

Ethiopia is located in the horn of Africa with a population of 95 million (25). Ethiopia is a federal state with eleven regional states and two city administrations. The country has one of the highest NTD burdens in Africa (26). In Ethiopia, more than 75 million people are at risk for NTD (26). Amhara region is one of the eleven regions of the country. It has 15 zones and 161 districts. The population was estimated to be 21.8 million in 2019 (25).

5.2.2. Specific setting

Bahir Dar is the central city of the Amhara region with two specialized and one primary government hospitals. Bahir Dar is located on the southern bank of Lake Tana, the Blue Nile's (locally known as Abay) source. The city is around 578 kilometers (360 miles) north-northwest of Addis Ababa, with a height of 1,840 meters above sea level. The Tibebe Ghion specialized hospital (TGSH) lies about 10 kilometers south of the city center, 7 kilometers from the new bus station on the road to Adet District, and 23 kilometers from the Blue Nile Falls. Addis Alem Primary Hospital (AAPH) is a primary hospital about 6 km north from the city center. These two hospitals (TGSH and AAPH) serve around 1500 outpatients per day and the dermatology clinics in both hospitals providing an average of 60 consultations per day. These two hospitals providing healthcare services to four zones located in the surrounding of Bahir Dar city. These include West Gojjam, East Gojjam, South Gondar and Awi zones. Addis Alem hospital provides skin snip test and all modalities of therapy. The remaining diagnostic methods such as culture and biopsy are available in the nearby diagnostic center in Bahir Dar city.

5.2.2.1. Tegumentary leishmaniasis diagnosis and treatment services

Clinical evaluation of patients suspected for TL is done in the dermatologic clinic by residents and senior dermatologist. In addition to clinical evaluation, skin snips and tissue biopsy can be performed. Skin snips are evaluated by microscopy (after Giemsa staining) and parasite culture is done as well. TL suspects with parasites detected on microscopy (skin snip or biopsy) or culture are defined as parasitologically-confirmed TL cases.

5.2.2.2. Operational definitions of LCL, MCL and DCL

LCL: Regardless of size, a lesion that involves less than three anatomic locations

MCL: Regardless of the number and size of lesions, the mucosa or mucocutaneous borders of the nose and/or lips are damaged and may cause breathing and feeding difficulties.

DCL: Extensive infiltrative and non-ulcerative cutaneous lesion resembling lepromatous leprosy that involves three or more anatomic sites without mucosal involvement.

Cured: Patients who have had clinical response (complete re-epithelialization and flattening of the lesion) and/or become parasitologically positive after treatment completion after three months of treatment completion

Improved: Patients who have had clinical response (re-epithelialization and flattening of the lesion) after three months of treatment completion

Not improved: Patients who do not respond clinically (re-epithelialization and flattening) and/or become parasitologically positive after treatment completion

5.3. Study population and period

The study included all patients diagnosed with TL at AAPH and TGSH between December 2021 and August 2022.

5.4. Inclusion criteria

- All age and sex group who is diagnosed to have TL and on treatment with different anti-leishmanial regimens

5.5. Exclusion criteria

- Not from endemic area, no travel history and not confirmed with parasitologically or histologically
- Not finished the full course of treatment
- Not returned for follow up after 3 months
- Patients who started treatment but transferred to other institution with different reason

5.6. Data variables

5.6.1. Dependent variable

Treatment outcome

Improved or

Not improved

5.6.2. Independent variable

Demographic characteristics

Age

Sex

Area of residence

Clinical presentation

Duration of skin lesions (months)

Morphology

Anatomic location

Extent of involvement (focal, diffuse)

Type of lesion (LCL, MCL, DCL)

The type of treatment given, duration of treatment and route of administration

5.7. Sample size estimation

The sample size was calculated using the following assumptions; The formula for sample size determination is; $\mathbf{n_0=z^2*p*q/e^2}$, $\mathbf{n_0}$ is sample size, **z** is the selected critical value of desired confidence level, **p** is the estimated proportion of an attribute that is present in the population, **q**=1-p, **e** is the desired level of precision.

Assuming Proportion is 50% (p =0.5), 95% confidence level, 5% precision. The calculation for required sample size is; p = 0.5 and hence q =1-0.5 = 0.5; e = 0.05; z =1.96

$n_0 = (1.96)^2(0.5)(0.5)/(0.05)^2 = 384.16 \approx 384$ but the prevalence of CL is unknown so the adjusted sample size is difficult to determine.

Since we have 103 patients, we are going to use all patients diagnosed to have CL.

5.8. Sampling technique

Census is used

5.9. Data collection procedure

Pre-developed data collection format is used to collect data on patient's socio-demographic Characteristics, clinical presentation (morphology, type, area, and extent of the lesion(s)), type of treatment given, and treatment outcomes three months after completion of treatment.

5.10. Data quality assurance

The information was gathered by trained health professionals (one trained nurses who work in Dermatology clinic &14 Dermatology residents). Dermatology residents supervised data collection and were given instructions on how to collect the data.

5.11. Data Processing and Analysis

The Principal investigator reviewed the collected data, entered into the Epidata then transferred into SPSS and any missing data were cleaned, and analyzed using SPSS version 25. Frequencies and proportions are used for categorical data and the results are displayed using tables, bar graphs, and pie charts.

6. Ethical issues

6.1. Ethics approval:

Ethics approval has been obtained from the ethical review board of Bahir Dar University's College of Medicine and Health Sciences in Bahir Dar, Ethiopia. Tibebe Ghion Specialized Hospital has received a letter of support. A letter of support is also sent to Addis Alem Primary Hospital.

6.2. Data confidentiality:

The electronic databases are kept on the password-protected PC of the principal investigator. Personal identification numbers are not stored in the database. Patients' charts are kept in a separate chart room and are only accessible to hospital personnel who work in chart storage. Oral

and written consent and assent are obtained for photographs of TL lesions to be used for educational and research purposes, in addition to monitoring treatment response. Pictures are saved on a dedicated camera that is only accessible to the treating practitioner. There are no images used to identify patients.

7. Result

7.1. Socio-Demographic characteristics of respondents

This study included 103 study participants, making a 100% response rate. The mean age of respondents was 21.9 ± 13.78 years, and the majority of them, 58 (56.3%), were in the age group of <20 years. Nearly one third 74 (71.8%) of the respondents were male. More than half of them, 63(61.3%), were rural residents. (Table1).

Table 1: Shows sociodemographic characteristics of respondents among patients with tegumentary leishmaniasis diagnosed at Tibebe Ghion Specialized Hospital and Addis Alem Primary Hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

Characteristics	Frequency (n)	Percent (%)
Age(year)		
<20	58	56.3
20-29	25	24.3
30-39	8	7.8
≥40	12	11.6
Sex		
Male	74	71.8
Female	29	18.2
Residence		
Rural	63	61.1
Urban	40	38.9

7.2. Clinical pattern of patients with Tegumentary leishmaniasis

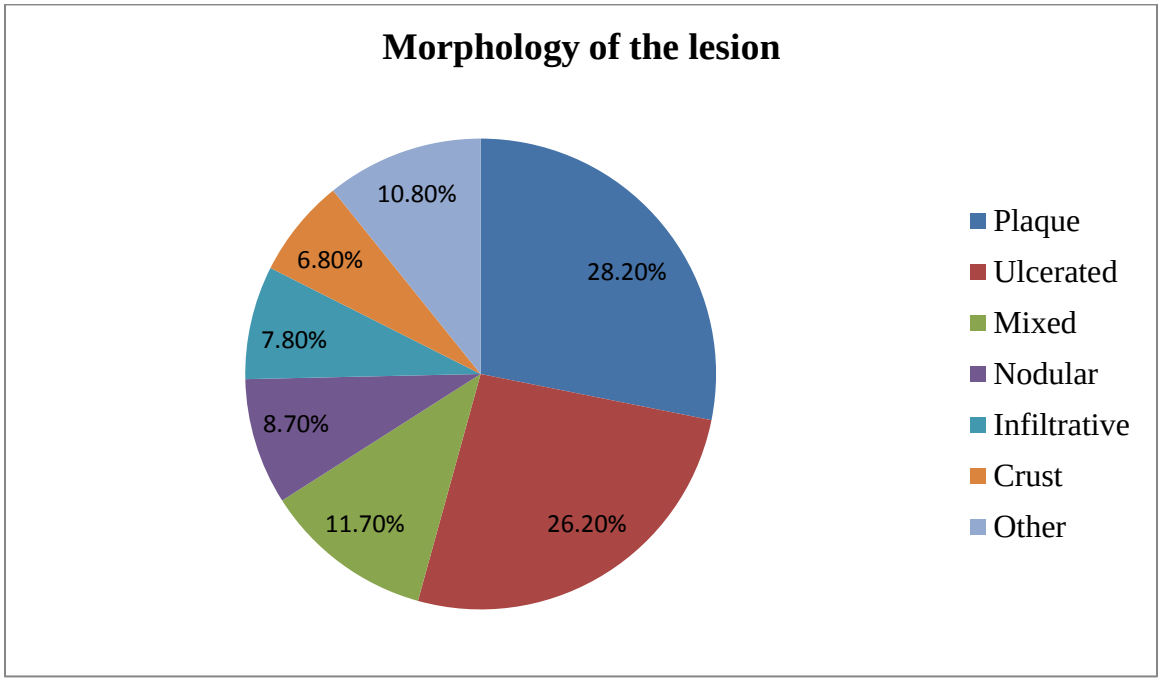
From the total respondents more than half 57 (55.3%) of them had 14-28 months duration of lesion. Almost all 91 (88.3%) of the respondents extent of involvement were local. Nearly one-third of patients 72 (69.9%) had symmetric lesion. More than half of the patients 60 (58.3%) had an LCL type of lesion.

Table 2: Clinical Pattern of respondents among patients with Tegumentary leishmaniasis diagnosed at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

Variables		**Frequency (n)**	**Percent (%)**
Duration of Lesion (months)	≤13	26	25.3
	14-28	57	55.3
	≥29	20	19.4
Extent of involvement	Local	91	88.3
	Diffuse	12	11.7
Symmetry of the lesion	Symmetric	23	22.3
	Asymmetric	80	77.7
Type of lesion	LCL	60	58.2
	DCL	8	7.8
	MCL	35	43

7.3. Morphology of the lesion

The majority of respondents 29 (28.2%) and 27 (26.2%) had plaque or ulcerated lesion morphology, respectively. While 11 (10.80%) of them had another type of lesion morphology. Figure 2

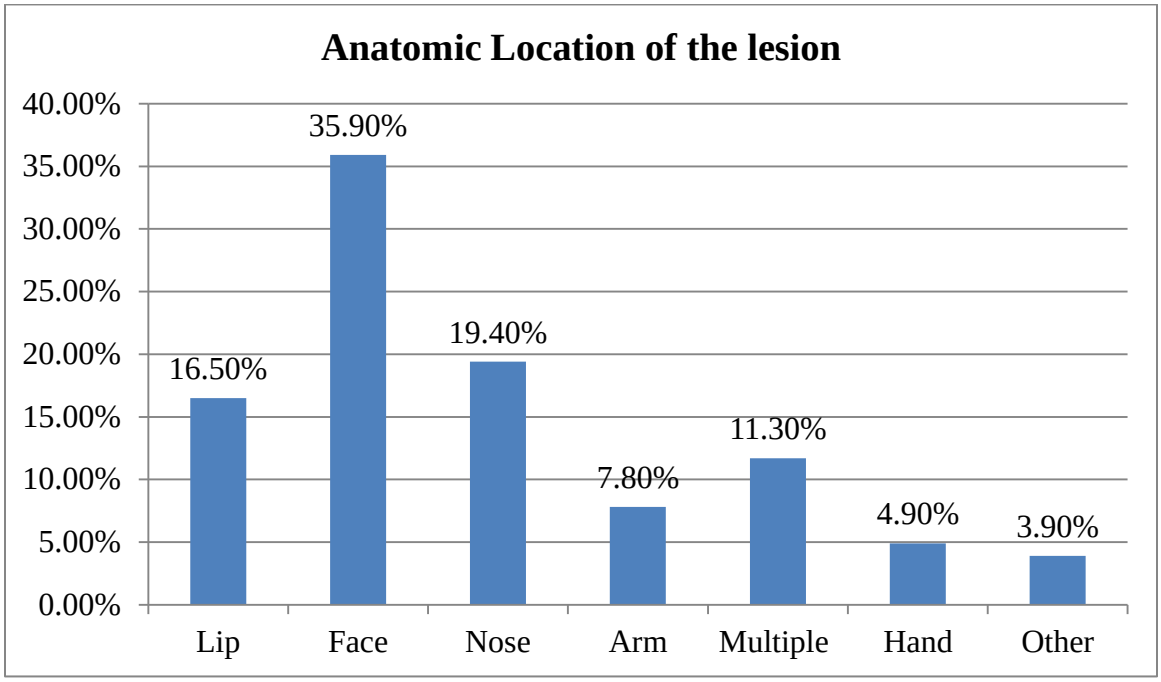


**Other scaly, patchy, scarred, volcanic, edematous, not recorded

Figure 2: Morphology of the lesion among patients with Tegumentary leishmaniasis diagnosis at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

7.4. Anatomic Location of the lesion

The most common anatomic location of the lesion was on the face for 37 (35.9%) of the respondents, followed by the nose for 20 (19.4%), and the ear, lower leg, and neck for 4 (3.9%) of the respondents. Figure2.



* OTHER: EAR, LOWER LEG, NECK; FACE IMPLIES LESIONS OTHER THAN ON THE NOSE AND LIP

Figure 3: Anatomic location of the lesion among patients with Tegumentary leishmaniasis diagnosis at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

7.5. Treatment outcome based on diagnosis and type of treatment

Almost all of the respondents 99 (96.9%) had no prior treatment history. The majority 96 (93.2%) of patients diagnosis was made using microscopy. Almost all 98 (95.1%) of the respondents were taking drug for treatment. The majority of the patients 90 (87.4%) had received SSG treatment. Nearly all 91 (88.3%) of the respondents were taking 28 days of duration of treatment. The majority 94 (91.3%) of respondents had no re-treatment history. Most 90 (87.4%) of the patients had taken the drug one session.

Table 3: Treatment outcome of patients with Tegumentary leishmaniasis diagnosed at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

Variable		**Frequency (n)**	**Percent (%)**
Diagnosis	Microscopy	96	93.2
	Histopathology	7	6.8
Treatment Type	Drug	98	95.1
	Cryotherapy	5	4.9
Name of drug given	SSG	85	86.7
	SSG + Paromomycin	13	13.3
Duration of treatment	28 Days	91	88.3
	Not Recorded	12	11.7
Number of treatment sessions	1 Session	90	87.4
	6 Session	13	12.6
Route of drug administration	Intramuscular	76	84.4
	Intralesional	14	15.6
Re-treatment history	Yes	9	8.7
	No	94	91.3
Treatment response after 3 months	Improved	90	87.4
	Not improved	13	12.6

7.6. Treatment outcome of patients

Majority 90 (87.4%) of the patients had improved from leishmaniasis disease while the rest 13 (12.6%) of them were not improved from the disease.

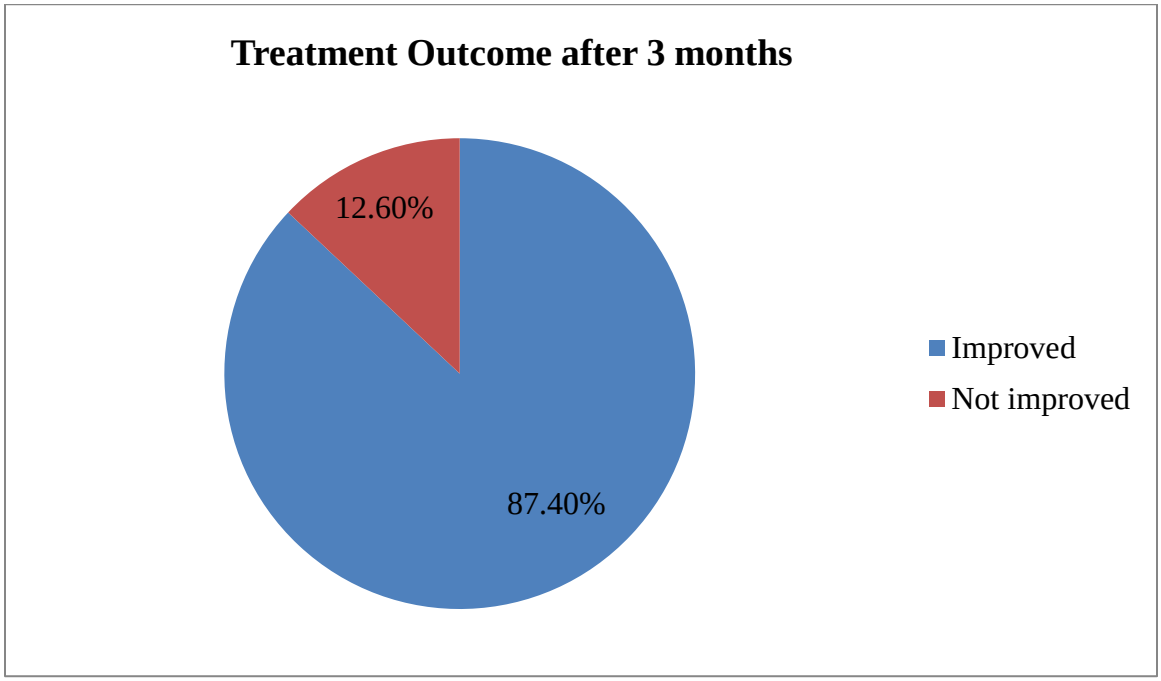


Figure 4: Treatment outcome of patient's with Tegumentary leishmaniasis diagnosed at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021- 2022 (n=103)

7.7. Treatment outcome based on the type of TL

The cure rate for LCL was 90% (54/60), with 3.3% (2/60) showing partial improvement (Table 4). Seven (87.5%) of the eight DCL cases were cured, while one (12.5%) showed no improvement. MCL had a cure rate of 82.9% (29/35) and no improvement in 14.3% (5/35) cases.

Table 4. Treatment outcome of patients with Tegumentary leishmaniasis diagnosed at Tibebe Ghion Specialized hospital and Addis Alem primary hospital Bahir Dar, Ethiopia (2021-2022) (n=103)

Treatment response at three months	**LCL, n (%)**	**DCL, n (%)**	**MCL, n (%)**	**Total n, (%)**
Cured	54 (90)	7 (87.5)	29 (82.9)	90
No change	2 (3.3)	1 (12.5)	5 (14.3)	8
Worsening	1 (1.7)	0 (0)	0 (0)	1
Relapse	0 (0)	0 (0)	1 (2.8)	1
Not recorded	3 (5)	0 (0)	0 (0)	3
Total	60	8	35	103 (100)

8. Discussion

This study described the clinical presentation and treatment outcomes of CL patients who spent a year visiting two hospitals in Bahir Dar, Ethiopia's Amhara region. LCL is the most common type of TL (58.2%), followed by MCL (43%). Plaque was the most common morphologic lesion, followed by ulcerated lesion, and the most common site of involvement was the face. Clinical manifestations in Ethiopia range from localized lesion on exposed body site to generalized involvement (27). As a result, this study helps physicians to consider TL in the differential diagnosis of patients with chronic skin lesions with the aforementioned clinical morphologies who came from an endemic area.

LCL has a comparable treatment response to DCL, with 90% and 87.5%, respectively. This could be because of the small sample size. In line with other studies conducted in Ethiopia, we discovered that one out of every three patients has MCL.

In the current study 87.4% of the patients with Tegumentary leishmaniasis were improved which is higher than study conducted in Colombia (72.06%) (20). Good TL treatment outcomes were found in comparison to other similar studies conducted in Silti, Ethiopia (80.6%) (23). This outcome is also higher than in a study done in northwest Ethiopia (31%) (19). This could be due to differences in study design, setting, sample size, and type of subjects involved. Additionally, this discrepancy may be due to differences in the study subjects, as the previous study was performed on HIV-TL co-infected patients, and TL/HIV co-infection increases the likelihood of poor treatment outcomes. However, the treatment outcome is lower than in a study conducted in Spain (21). This could be attributed to the use of Amphotericin B for the treatment of cutaneous leishmaniasis, the patients' longer duration of follow-up, and the difference in Leishmania species between these two settings.

In this study, SSG is the most commonly used treatment both locally and systemically. Because of the limited supply of liquid nitrogen in our setting, cryotherapy is only used for five patients. Despite the fact that the Ethiopian treatment guideline recommends the use of Thermotherapy, it was not used in this study due to a lack of availability.

There are several limitations to this study that should be considered. First, the sample size is small, and the data was extracted retrospectively from patients' medical records, which means that some important variables may have been overlooked.

9. Conclusion and recommendation

Because of the wide range of clinical manifestations of TL, physicians should consider TL as a differential diagnosis in patients who have recently returned from an endemic area or have a travel history to an endemic area. Furthermore, the patients who had TL had a good outcome in this study. Further studies are needed to support this evidence. I recommend that physicians conduct clinical trials to determine the best treatment modality for TL in Ethiopia, and that policymakers and the FMOH prioritize conducting clinical trials and developing a National treatment guideline based on the results, as well as making available various treatment modalities.

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10. Annexes

10.1. Questionnaire Consent Form

I…….offer Debas Tesfa permission to use my responses in a scientific research work by responding to a questionnaire and quoting them. I understand that their work is for academic purposes.

I also understand that if the researchers ever publish this material in an academic publication or in electronic format online, I waive any claim to copyright to it.

I understand that the Research Title is **clinical pattern and treatment outcome of Tegumentary Leishmaniasis in Bahir Dar, Ethiopia (2021-2022).**

I also accept that these researcher, hereafter referred to as Debas Tesfa, will keep my responses to Questionnaire items anonymous.

Thereby give my permission in the form of my signature below:

Signature……..Date……

Contacts of Researcher: Name: Debas Tesfa

E-mail: debastesfa@gmail.com

Tel: +251921287483

Amharic version

የ ማጠይቅ ፍቃድ ማጠየ ቂያ ቅጽ

እኔ .....የ ተባልኩ ግለ ሰብ በ ማጠይቅ ላይ የ ምሚሳተፍውን ነ ገ ሮች ለ ሳይን ሳዊ ጥና ት ማጠቀም እን ዲሁም ማጣቅስ እን ዲች ል ፈቅጀ ለታ ለሁ።

ተመራ ሚው ጥና ቱን የ ሚያ ሳት ም ወይን ም ደግሞ በ በይነ መረ ብ ቢወል ም የ ቅጂ መበት ጥያ ቄ ማን ሳ ት እን ደሌ ለብኝ ተገ ን ዘቤያ ለሁ።

የ ጥና ቱ ር እስ ም የ ቆን ጮ የ ተለ ያዩ አይነ ት አቀራ ረ ብ እና ከህ ክምን ና በ ኋላ ያ ላ ቸው ወጪ ሞ ኑን ተገ ን ዘቤያ ለሁ።

የ ጥና ቱ ባ ለ ቤት የ ሆነ ው ግለ ሰብ ደባ ስ ተስ ፋ ማጠይቅ ላ ይ የ ምሳ ጠመን ምላ ሾች በ ሚስ ጥር እን ደሚይዛ ቸው እረ ዳ ለሁ።

ይሁን ታዬን በ ታች ባ ለ ው ፊር ሜ አረ ጋግጣ ለሁ፡

ፊር ማ……. ቀን ……..

የ ጥና ቱ ባ ለ ቤት መ ጎ ኛ ዎች፡

ስም፡ ደባ ስ ተስ ፋ

የ ኢ-ሜይል አ ድራ ሻ፡ debastesfa@gmail.com

ስ ልክ ቁጥር፡ +251921287483

10.2. Patient consent form (For Clinical images)

Patient registration number: xx

Title of manuscript: Clinical pattern and treatment outcome of Tegumentary Leishmaniasis in Bahir Dar, Ethiopia (2021-2022).

Name of author: Debas Tesfa

I hereby give my consent for image(s) and clinical information related to me to be reported in the academic publication or in electronic format online.

I understand that my name and identity will be concealed.

Once signed, I cannot revoke my consent.

Name of patient: …….

Date of Birth (DD/MM/YY): ……..

Signature of patient (or signature of the person giving consent on behalf of the patient)

…….

Relationship to the patient in case of other person signing the consent:

……

Address: …….

Amharic version

የ ምር ሚራ ተሳ ታፊዎች ፍ ቃድ ማ ጠየ ቂያ ቅጽ

(ለ ፎቶ)

የ ታካ ሚው መዘገ ብ ቁጥር :……..

የ ጥና ቱ ር እስ ፡ የ ቆን ጮ የ ተለ ያዩ አ ይነ ት አ ቀራ ረ ብ እና ከ ህ ክ ምና በ ኋላ ያ ላ ቸው ወጪ ት

ጥና ቱን የ ሚያ ካሂ ደው ግለ ሰብ ፡ ደ ባ ስ ተ ስ ፉ

እኔ ከ ዚህ ቅጽ ላ ይ ማን ኛ ውም አ ይነ ት የ ህ ክ ምና ም ል ክ ቶ ቼ እና ፎ ቶ ተ ወ ስ ዶ ለ ህ ት ማ ት ወ ይን ም ደ ግ ሞ በ ይነ ሚ ረ ብ ላ ይ ቢ ወ ል ተ ቃ ወ ሞ የ ሌ ለ ኝ መ ሆ ኑ ን ተ ስ ማ ም ቻ ለ ሁ ።

የ ኔ ስ ም ና መ ገ ለ ጫ በ ሚ ኒ ጥር እ ን ደ ሚ ያ ዝ ተ ረ ድ ቻ ለ ሁ ።

ከ ፈ ረ ም ኩ በ ኋላ ስ ም ማ ት ን መ ሻ ር አ ል ች ል ም ።

የ ተሳ ታፊ ው ስ ም ፡ ……

የ ተ ወ ለ ደ በ ት ቀ ን ፡ ……

የ ተሳ ታፊ ው ፊ ር ማ (ወ ይ ም ተ ወ ካ ይ): ……

ም ና ል ባ ት ተ ወ ካ ይ ከ ፈ ረ ሙ ከ ተሳ ታፊ ው ጋ ር ያ ለ ው ግ ን ኙ ነ ት ፡ …….

……..

አ ድ ራ ሻ ፡ ……

10.3. Data collection format

Bahir Dar University College of Public Health and Medical Sciences, Department of Dermatovenereology

Data abstraction format

1. Sociodemographic data
    - Age……
    - Sex…….
    - Area of residence……
2. Clinical presentation
    - Duration of skin lesions (months)
    - Morphology (ulcerated, nodular, patchy, plaque, crusted, scarred, infiltrative, volcanic, pedunculated, sporotrichoid, superinfected, verrucous and edematous)
    - Anatomic location (lip, face, nose, ear, scalp, trunk, genitalia, arm, neck, hand, buttock, upper leg, lower leg,)
    - Extent of involvement (focal, diffuse)
    - Type of lesion (LCL, MCL, DCL)
3. Treatment history
    a. Yes
    b. No
4. Diagnostic test results
    a. Microscopy
    b. Culture
    c. Histopathology
5. HIV status
    a. Negative
    b. Positive
6. The type of treatment given, duration and route of administration
    - Type of treatment
        A. Local
        B. Systemic
    - Drug given (name)
    - Duration of treatment
    - Number of treatment sessions
    - Route of administration (oral, local)
    - Re-treatment
        a. Yes
        b. No
7. The treatment outcome
    - Treatment response at three months after treatment:

a. Cured
b. No improvement
c. Worsening
d. Relapse

10.4. Request Form for Ethical Clearance

Date:……..

To BDU/CMHS Ethics Committee

Subject: To get ethical clearance for my research

I am Dr. Debas Tesfa, a third-year Dermatovenereology in Bahir Dar University, College of medicine and health sciences. I would like to apply to your office to have ethical clearance to conduct a research on Clinical pattern and treatment outcome of Tegumentary Leishmaniasis in Tibebe Ghion specialized hospital, Bahir Dar (2021-2022). Data will be extracted using a prepared questionnaire; confidentiality of records will be kept. The results of this research will show treatment outcome of Tegumentary Leishmaniasis.

With regards

Dr. Debas Tesfa (Year III Dermatovenereology Resident)

10.5. Advisors approval form

Bahir Dar University

College of Medicine and Health Sciences

School of Medicine

Department of Dermatovenereology

Approval of thesis for defense

I hereby certify that I have supervised, read, and evaluated this thesis titled "Clinical pattern and treatment outcome of Tegumentary leishmaniasis in Bahir Dar, Ethiopia (2021-2022)" by Debas Tesfa prepared under my guidance. I recommend the thesis be submitted for oral defense (mock-viva and viva voce).

Wendemagegn Enbiale (MD, MPH, PhD)

_____ _____ 13/03/2015

Signature Date

Habtamu Aleganeh (MPH)

_____ _____ 13/03/2015 E.C

Signature Date

Yared Abebe (M.D, Dermatovenereologsit) _____ 13/03/2015 E.C

Department Head Signature Date

11. Declaration

This is to certify that the thesis "clinical pattern and treatment outcome of Tegumentary leishmaniasis in Bahir Dar, Ethiopia (2021-2022)," submitted in partial fulfillment of the requirements for the specialty program in Department of Dermatovenereology, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to obtain any other degree or certificates. This inquiry would not have been possible without the aid and support I received.

Principal Investigator

Name: **Dr. Debas Tesfa (Year III Dermatovenereology resident)**

Signature: .....

Date: 13/03/15 E.C