
Magnitude and associated factors of cutaneous leishmaniasis; in Mekelle city, Ayder referral hospital, Tigray, Northern Ethiopia, 2014

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Abstract: Introduction; Cutaneous leishmaniasis is a neglected tropical disease strongly associated with poverty with an adverse health effects over the poorest populations of the world. The disease is endemic in 88 countries, 72 of them are developing countries including Ethiopia. It has been estimated that 12million people are infected and 350 million people are at risk with the annual incidence of new cases is estimated between 1.5-2million. Ethiopia has seen new outbreaks in areas previously not known to be endemic often with co-infection by the human immunodeficiency virus with rates reaching 5.6% of the cases and other associated risk factors. As best of my knowledge similar study was not conducted specifically in Mekelle even though other study conducted to the whole region, Tigray. Thus, this preliminary study concerns to determine the magnitude and associated factors of cutaneous leishmaniasis in Mekelle city.Objectives; To assess the prevalence and associated factors of cutaneous leishmaniasis on patients who visit dermatology out patient department in Ayder referral hospital, Mekelle, Tigray, Northern Ethiopia. Methods and subjects; Institutional based cross sectional study was conducted on 478 study population from Ayder referral hospital by using systematic random sampling technique. Data entry and analysis was conducted by using SPSS v-20. The association between different variables in relation to the outcome variable was measured by odds ratio with 95% confidence interval. All variables with $P < 0.05$ in the bivariate analysis were included in the multivariate model, accepting $P \leq 0.05$ as the inclusion level for the independent variables. Result; Prevalence of cutaneous leishmaniasis in this study was nearly six percent (5.6%) with 99% response rate. Sex [AOR 2.1(95% CI); (0.15, 0.79)], income source being farmer [AOR 2.1(95% CI); (0.00,0.248)], location of the home near to both farm and gorge [AOR 10.1 (95% CI); (0.00, 0.574)] and presence of the hyrax [AOR 1.1(95% CI); (0.00, 0.60)] were statistically significant to the presence of cutaneous leishmaniasis in Mekelle city. Conclusion The overall prevalence of cutaneous leishmaniasis in the study area was relatively high (5.6%) having a statistical significant association with sex, income source (farmer), location of the residence near to farm land and gorge and the presence of hyrax. Thus, a continuous health education and awareness creation about the disease, factors and preventive methods of cutaneous should be sought.

Keywords: Magnitude, Cutaneous Leishmaniasis, Mekelle City

1. Introduction

1.1. Background

Leishmaniasis is a group of diseases caused by obligatory and intracellular haemoflagellate protozoan parasites of the genus *Leishmania*. Human leishmaniasis is a complex disease with many clinical forms, which range from mild

self-healing cutaneous lesions to fatal visceral disease. Leishmaniasis, a major global health and economic issue, comprises a group of diseases that transmitted to mammals, including humans, requires the bite of female phlebotomine sand flies (1-3).

Cutaneous leishmaniasis (CL) is a neglected tropical disease strongly associated with poverty with an adverse health effects over the poorest populations of the world which is highly increases its burden as a result of increasing migration, regional climatic change, and impaired immunity resulting from malnutrition and/ or HIV/AIDS (4).

The health situation of Africa continent is characterized by immense disease burden and weak health systems embedded by the context of poverty, under development and conflicts. Ethiopia is not unique in this perspective as the case is testified by its poor health outcomes even by sub-Saharan Africa's standards. Consequently, there is the dissemination of various infectious diseases across the country due to the low spending of the government health care financing and the minimal participation of the private sector. With this regard the category of neglected tropical diseases that affect almost exclusively the poorest populations have been given lesser attention and overshadowed by the major focus of HIV/AIDS, Tuberculosis and Malaria. A case in point, cutaneous leishmaniasis is one of the infections, which share neither the public eye nor better financial returns amongst the neglected tropical diseases (5, 6, and 7).

The disease is endemic in 88 countries, 72 of them are developing countries. It has been estimated that 12million people are infected and 350 million people are at risk with the annual incidence of new cases is estimated between 1.5-2million (8, 9, 10).

The global epidemiology of cutaneous leishmaniasis has changed; which is characterized by emergence and re-emergence in many parts of the world, ascribed to population movement, man-made environmental changes, AIDS and other immunosuppressive conditions. Furthermore, an epidemiological pattern of leishmaniasis is in evolution because of an accumulation of risk factors, like immune-suppression, human and environmental changes and drug resistance. The epidemiology of leishmaniasis in a given area is directly dependent on the behavior of the human and/or animal population in relation to the cycle of transmission. There are a variety of factors that influence the risk of transmission of cutaneous leishmaniasis. Some of these factors include proximity of residence to sand fly breeding, resting sites, type of housing, occupation, extent of exposure to sand fly bites, natural resistance (genetic or acquired) to infection, virulence of the parasite species and others (4,11).

Leishmaniasis has been an ancient public health problem in South-West Asia and the Arab World reported from time immemorial as the pharaohs ruled in Egypt and Assyrians in Mesopotamia. It was extensively described by Arab-Islamic scientists like Avicenna (IbnSina, 980-1037 A.D.) who wrote a complete chapter in his prominent book entitled *AlkanounFi El Tebb* raising the possibility of mosquitoes being involved in the transmission of the disease. He has described cutaneous leishmaniasis (CL) as a disease endemic in Balk (Afghanistan) and Baghdad (2, 4, 12).

Leishmania HIV co-infection has emerged because of the increasing overlap between HIV and Leishmania. Cases of co-infection have been reported from 36 countries and the

co-infection is increasing especially in Southern Europe and Africa. Co-infection with HIV has led to the spread of leishmaniasis, typically a rural disease, into urban areas. By far, it is considered as the fifth opportunistic disease (13-16).

CL was first described in Ethiopia by an Italian epidemiologist Martogilo in 1913. CL is known by different vernacular name in different localities of Ethiopia such as: "Volbo" in Ocholo, "Finchoftu" in central Shoa, "Kunchir" in Gojam, Gonder and parts of Wollo, "Giziwa" in Tigray, "Chewie" in Sodo, "Simbirahalkani" in Wollega and "Shahegne" in north Shewa (4, 17).

Ethiopia is one of the endemic areas for leishmaniasis in the world. The health status in Ethiopia is poor and the population of Ethiopia faces high morbidity and mortality rates (4, 8, 10).

The disease is found mainly in high and mid-altitudes ranging between 1,400 to 2,700 meters above sea level. However, L. tropical isolated from sand flies in low altitude of the Awash Valley (about 900 meters above sea level). From the same area, isolated and described L. tropica from one patient who had lived in the area (11).

Leishmaniasis is a climate-sensitive disease, occupying a characteristic climate space that is strongly affected by changes in rainfall, atmospheric temperature and humidity.

Seasonal labor movements may also spread the disease, with the return of migrants to non-endemic areas, as appears to have occurred in the highlands of Ethiopia in the 2000s. Behavior, such as sleeping outside under acacia trees and living in houses constructed of grassy material, appears to increase risk for the disease (18, 19, 20).

1.2. Statement of the Problem

Cutaneous leishmaniasis is one of the widespread tropical infectious diseases. It affects thousands of people in Ethiopia. Though, the magnitude of the disease in the country is not well documented, recently the presence of CL in Tigray region including Mekelle city has been reported (19, 21). This indicates the need for epidemiological surveillance of the disease in Tigray region, in particular, and in the country in general.

Moreover, a single study was conducted in Tigray region, but to the best of my knowledge there research conducted specifically in Mekelle city. So that I developed the interest to conduct such an open up study to address the gap. Finally, I have explored the major determinant factors with describing the magnitude of the disease in Mekelle city with identifying the possible co-morbidities, socio-economical and socio-demographic aspects of cutaneous leishmaniasis in line of time, person, area and others patterns.

1.3. Significance of the Study

This study provides a basic information on the prevalence and associated factors of CL that have a valuable contribution for the program planners, the academic community, service providers, health care professionals and above all patients suffering from CL will be beneficiary from

this study as prevention and early detection which would to lower morbidity due to this debilitating, preventable and curable disease.

2. Literature Review

Neglected tropical diseases have made adverse health effects over the poorest populations of the world. It is estimated that 1 billion people suffer from these diseases worldwide and most cases are found in Africa (20, 21, and 22).

Magnitude of the Problem

There are 1.0-1.5 million cases of CL each year, with 90% of CL cases occurring in 8 countries: Afghanistan, Algeria, Brazil, Iran, Peru, Saudi Arabia and Syria, showing that the Middle East is a central focus for CL (15, 21).

The ten countries with the highest estimated case counts, Afghanistan, Algeria, Colombia, Brazil, Iran, Syria, Ethiopia, North Sudan, Costa Rica and Peru, together account for 70 to 75% of global estimated CL incidence (4, 21, 22).

Many research reviews showed that the prevalence of cutaneous leishmaniasis was in Ochoallo the overall prevalence of cut leishmaniasis was 3.6-4.0%, in Sebeta, 25 km south west of Addis Ababa and found that the prevalence of CL with active infection was 0.9% (9/1,000), and prevalence of active CL in Siliti woreda was 4.82 % (4,9).

Socio-Demographic Factors

A study in India showed that 75.93% cases were of males, 24.07% cases were of females and the male to female ratio was 3:1. The majority of cases were found to be of patients aged between 15 to 45 years of age i.e., 64.67 and 21.80% cases respectively, children below 14 years of age had the least number of cases where as patients more than 45 years of age i.e., 13.53%. Almost, majority of cases belong to the poor people of rural areas of Bihar, India (24).

Other similar study in Jordan showed that highest infection rate of 72.4% was recorded in males compared to 27.6% in females (25).

A study conducted in America showed no significant difference was found between males and females suggesting that they are equally exposed to infection (13).

A study conducted in Siliti zone, Ethiopia, reveals that the mean age for the CL cases was 17.9 years \pm 1.5 SE (standard error) with a range of 2-70 years. There was no gender difference in the frequency of CL cases, 47.8% (44/92) male vs. 52.2% (48/92) female. Besides, from host factors tested in the analysis, age and the educational status of the head of the household were associated with the risk of development of CL (4).

Similar study which were conducted in Tigray region, reveals that the mean age was 23.7 years (99% CI: 21.8-25.6) and 60% (n = 282) of patients were in the age group 15-44 years; 28% of patients were under 14 years of age with a prevalence of CL in Tigray was 4.8%. Meanwhile, the male to female ratio of patients who have affected was 2.5:1; 71.1% of patients were males. A male prevalence was observed both in children and adults with 73.7% and 68.4%

respectively (17).

Most reviews showed that the affected populations are mainly very poor male seasonal migrant workers that travel in the harvesting season from non-endemic highlands to the cotton, sesame and sorghum fields of Humera and Metema on the Sudanese border (17, 28). Similarly, a review conducted in Bolivia, 25% of the population showed active or healed lesions of cutaneous leishmaniasis within 3 years of travel or movement to somewhere else which is endemic for cutaneous leishmaniasis (20).

A review in Colombia showed from those patients of cutaneous leishmaniasis the use of bed nets estimated 63% (258/409) of people who lived in houses with bed nets slept under a net (23). Similarly WHO reports as well as recommends that cutaneous leishmaniasis can be prevented or could be minimized using appropriate preventive methods such as bed nets, using spray insecticides, repellents and long sleeves (22).

A review from London and American family of physicians (2004) recommend as the use of insecticides in endemic areas is important for travelers. House and space spraying have reduced sand fly populations, and fine-weave pyrethroid-impregnated bed-nets have been used in Burkina Faso, Sudan, and Columbia. Destruction of rodent reservoirs by pumping insecticides into rodent burrows has had limited success (14).

A research conducted in Ecuador memorial institute showed that the socio-economic status was determined to be cement floors (32%, 148/463), tiled floors (19%, 89/463), and ownership of cows (58%, 266/463) horses (24%, 112/463), or pigs (75%, 346/463). Soil floors (29%, 134/463) (12).

Clinical Spectrum CL

A study conducted in India showed that up to 7% of treated and cured kala-azar cases developed PKDL. In some cases PKDL developed without the patient suffering from clinical kala-azar (24). Similar study in Sudan shows that the lesions were found on different parts of the body including the limbs (87.5%), face (1.4%), and trunk (1.4%). Totally, 87.5% of the cases had at least one lesion on the lower or upper limbs (26).

On the other hand, in Palestine reveals that individuals who had skin lesions, 89.1 % (82/92) had the lesions on their face, mostly on the cheek or the nose. The face is the exposed body part that is easily accessible to sand fly bites. In addition, the softness of the skin on the face makes it a preferable site of feeding for the sand fly (27).

A study done in Siliti zone, Ethiopia, reveals that most of the patients, 46.7% (43/92), had single lesions and only 17.4% (16/92) developed three or more. Three quarters of the patients (69/92) had a lesion that had developed six or more months before starting treatment. More than half of the CL cases, 55.4% (51/92), developed lesions on either or both cheeks. Lesions were also common on the nose 13.0% (12/92). Among all the CL confirmed cases 19.2% (14/73) were clinically of the muco-cutaneous type. The presence of a scar was registered in only 0.3% (6/1907) of the

participants (4) where as in Ochello it was found to be 34.4 % (5).

Similar study done in Tigray, Ethiopia states a wide spectrum of clinical presentations was seen; 86% (n = 405; 99% CI: 82.5-89.0) of patients had localized cutaneous leishmaniasis (LCL), mucosal lesions were observed in 11% of cases (n = 52; 99% CI: 8.4-14.2), another 2.3% (n = 11; 99% CI: 1.2-.1) of cases had the clinical pattern of DCL and only 0.7% (n = 3; 99% CI: 0.1-1.9) presented with PKDL (17).

HIV/AIDS co-infection

Co-infection of HIV and Leishmaniasis produces cumulative deficiency of host CMI, a key factor for primary protection against infection, recurrences or spread of parasites. An HIV-infected patient with CL may display an atypical and severe clinical presentation of CL in terms of number (>200), sites and types of lesions. Uncommon sites of infection are more frequent, such as the gastrointestinal tract or the upper respiratory tract (22).

Among CL-infected individuals in Cameroon, 4.8% were co-infected with HIV; both HIV serotypes (HIV-1 and HIV-2) were recorded (22).

A review in Ethiopia showed that out of 186 patients who underwent VCT, 15 patients (8.1%; 99% CI: 4.6-13.0) resulted as co-infected and their clinical appearance was characterized by destroying muco-cutaneous lesions, multiple locations, atypical manifestations and a relapsing course. Besides, leishmania HIV co-infection has emerged because of the increasing overlap between HIV and Leishmania. Cases of co-infection have been reported from 36 countries and the co-infection is increasing especially in Southern Europe and Africa (11, 17).

On otherways, a review in Ethiopia, Sililti zone, showed that the proportion of CL cases in the age group of 11-20 years old was 8.3 % and 44.6% in Ocholo and Silti respectively (4).

Geographical Factors

The geographic spread of CL is due to factors related mostly to development. These include massive rural-urban migration and agro-industrial projects that bring non-immune urban dwellers into endemic rural areas. Man-made projects with environmental impact, like dams, irrigation systems and wells, as well as deforestation, also contribute to the spread of leishmaniasis (4, 28).

A review in Brazil showed that the development of new settlements, intrusion into primary forest, deforestation, massive migration from rural to urban areas, rapid and unplanned urbanization, the building of dams and new irrigation schemes are primary risk factors for the spread of leishmaniasis (14, 29).

Similarly in Ethiopia review points out rainfall have a slight, non significant effect on the disease risk: by matching 'low rain' highlands with 'high rain' highlands, the possibility of being affected by leishmaniasis was only slightly increased. People living in highlands with a high precipitation rate have a 3.6 prevalence risk ratio of leishmaniasis (99% CI: 2.2-5.8) versus those living in the

lowlands, as well as the same ratio of the population living in highlands (5).

Similar study in Silti zone, Ethiopia, reveals that the environmental factors: the distance of the gorge from the participant's house, Acacia spp and hyrax near the participant's house, the use of impregnated bed nets and possessing domestic animals were found to be associated with the development of CL. Forests in general have shrunk from covering 65% of the country and 90% of the highlands to 2.2% and 5.6% respectively. Such changes will undoubtedly influence the profile of vector borne diseases (17, 21).

The presence of the gorge around (<300m) far away from the participant's house had a significant association to acquire CL with the AOD of 1.762 (2.600—5.179)(4). Other study conducted in America, Argentina (Northwest America) reveals the presence of a pond or gorge or woodland within 150 m of the house and an agricultural area within 200m of the house had a significant association to acquire CL, gorge with AOD of 15.1 (6.1–7.3) and cultivating farm with 2.6 (1.2–5.5) (12, 15, 22)

Studies conducted by Edessa, et al. suggest that the disease is found mainly at high and mid altitudes ranging from 1400 to 2700 m above sea level, which is most favorable for the proven vector sand flies species of phlebotomus longipes and P. Pedifer (vectors). A lower level altitudinal limit of 1200m also suspected to be the other potential area of Cutaneous Leishmaniasis distribution. Similarly most of patients (n = 166) were from Mekelle and the nearby villages in the Tembien mountains. The case prevalence was higher in the mountain districts than in the Valleys. Males living at altitudes above 2000m ASL represented the Leishmania cases matched by altitude and gender (4).

2.1. Conceptual Frame Work

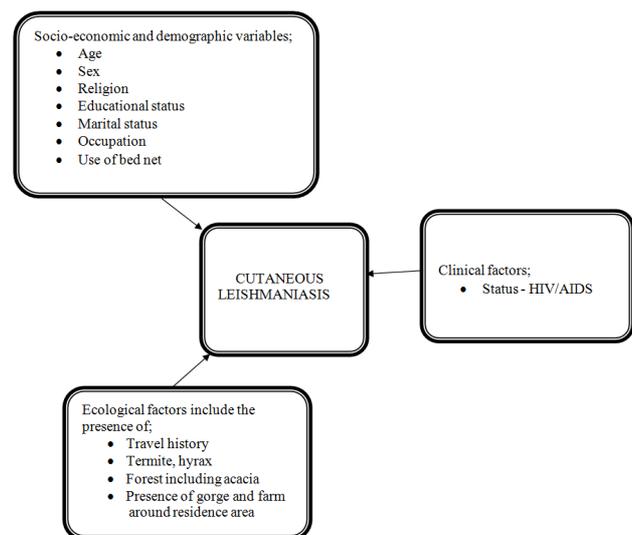


Figure 1. Shows Conceptual framework (Adopted from Dawit G, 2013 & E. Negera et al.2008) (4, 30)

3. Objectives

3.1. General Objective

To assess the prevalence and associated factors of cutaneous leishmaniasis on patients who visit dermatology department in Mekelle city, Ayder referral hospital, Tigray, Ethiopia.

3.2. Specific Objectives

- To assess the prevalence of cutaneous leishmaniasis on patients who visit dermatology department in Ayder referral hospital.
- To determine the possible factors for cutaneous leishmaniasis on patients who visit dermatology department in Ayder referral hospital.

4. Method and Materials

4.1. Study Area and Period

Mekelle, the capital city of the Tigray National Regional State, lies 780 km north of Addis Ababa. The city is located at 39°33'E longitude and 13°32'N latitude, situated in the extension of the central highlands of Ethiopia. The altitude of Mekelle is between 1965 m and 2220m above sea level. The city is bounded by mountain ranges in the east and north with a notable physical feature of hills and valleys (19, 31).

Mekelle city has 4 governmental (1 referral) and 2 private hospitals, 8 governmental health centers, 32 private clinics, 3 dental private clinics, 5 private diagnostic laboratories, 32 private pharmacies, 2 private dermato-venereology clinics and 3 private physiotherapy centers which serves for a total of Mekelle residents 227,505 and the surrounding nearby weredas, zones and region population (Projected population of Mekelle in 2008). These both governmental and private health institutions provides health care services on prevention and control of communicable disease, and numerous activities on non communicable diseases through providing a diagnostic, preventive, therapeutic and rehabilitative services having a coverage 83% since 2009 (19,31).

The Ayder Referral Hospital has been provided services to the 8million population in its catchment areas of the Tigray, Afar and Southeastern parts of the Amhara Regional States. As such, the Hospital can be designated as the most advanced medical facility, by all accounts, in the Northern part of the country and that it stands as the second largest hospital in the nation. With the total capacity of about 500 inpatient beds in four major departments and other specialty units, the Ayder Referral Hospital is also used as a teaching hospital for the College of Health Sciences, Mekelle University (19).

Having above 45 specialists in the various areas of medical specializations and fairly adequate numbers of all the other health professionals constituting the health care team, the Hospital is now emerging as a shining hot spot for advanced medical care and treatment in the Northern parts of

Ethiopia. With the day-by-day rising patient flow that has already exceeded 100,000 per year, the Ayder Referral Hospital has made remarkable achievements in equipping itself with advanced medical equipment, supplies and facilities over the last four years(19).

Situated in the beautiful University campus of Ayder, the Ayder Referral Hospital runs all the specialized/non-specialized hospital services including medical, surgical, emergency, laboratory, pharmacy, X-ray, and pathology while preparations are underway to launch post-mortem/forensic medicine services (19).

The data was collected from June-September/2014.

4.2. Study Design

Institutional based cross sectional study design was undertaken to assess the prevalence and associated factors of CL.

4.3. Population

4.3.1. Source Population

All patients who come to dermatology OPD.

4.3.2. Study Population

All pts who are selected through systemic random sampling methods from those patients come from Mekelle city.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

All patients who comes to the dermatology OPD from Mekelle city during the study period regardless of age and sex.

4.4.2. Exclusion Criteria

All pts. who are;

- Patients who are admitted to dermatology ward before data collection and newly admitted patients after participating in the study as a study subject.
- On follow up after pop up as initial study subjects
- Out of the study area i.e. Mekelle city were excluding from this study.

4.5. Sample Size Calculation and Sampling Procedure

4.5.1. Sample Size Determination

Sample sizes were determined based on previous prevalence of the case (4.82% from Siliti, Ethiopia) with level of significance α 0.05 desire precision and considering 10% of non-respondent rate. $n = Z (\alpha/2)^2 P (1-P) / d^2$, Where:

n = Sample size

d = precision (marginal error)

Z ($\alpha/2$) = critical value (confident limit)

P = previous prevalence of CL

Using a reduced margin of error:

Using a reduced margin of error, the calculated sample size having d=0.02, gives;

Thus $n = (1.96)^2 \times (0.048) (1-0.048) / (0.02)^2$

Total sample size = 437.5 \approx 438

In addition, considering 10% of non-respondent rate =
10 % 438=43.8≈44

Thus, the final sample size were=437 + 44=481

4.5.2. Sampling Procedure

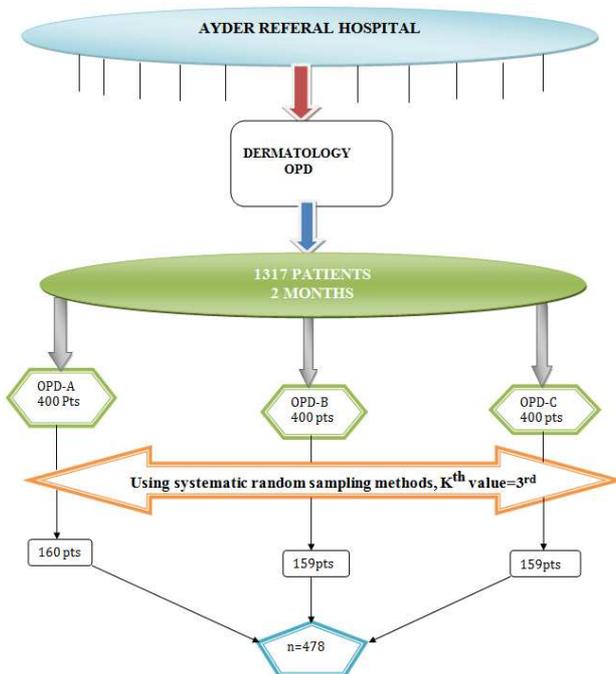


Figure 2. Show techniques of data sampling procedures

Ayder referral hospital is the only regional referral hospital where better number of dermato-venereology field specialist are providing services for the regional population and to the nearby other regions patients. Thus, most patients with CL come to the regional referral hospital where the treatment and field specialist are available there. Therefore, considering this situation, the topic under study was conducted in Ayder referral hospital.

Average numbers of pts flow from Mekelle city in the previous two months were 1317 pts from all dermatology OPDs. I.e. around 400 pts from each dermatology OPD (we have 3 OPDs).

Further, within a data collection period i.e two months (44 working days) I have got around 1317 pts who come to dermatology OPD. Moreover, in order to have the calculated sample size (n=481) within two months from 1200 source population, the study population were selected through systematic probable sampling methods with a value $k = 3$. Thus, this calculation provides 162 study populations from each OPD and final sum up source population that I have conducted the study were 478.

Thus, Systematic sampling technique was implemented to conduct this research.

Data Collection Procedures & Technique

4.6. Data Collection Tools and Techniques

Data collection was undertaken from June-august 2006E.c. through clinical observation using a checklist, standardized

questionnaire and laboratory investigation.

During data collection 13 data collectors (Msc Tropical dermatology students) as a shifted pattern, 3 clinical nurse professional, one laboratory expert and one PI were employed to collect the data from those patients who come from Mekelle city only to Ayder referral hospital dermatology OPD as if selected through systematic sampling methods.

4.7. Study Variables

4.7.1. Dependant Variable

Cutaneous leishmaniasis

4.7.2. Independent Variable

- Socio-demographic variables (sex, age, education status, religion)
- Socio-economic variables (economic status, occupation, Housing condition, travel history, use of bed net)
- Clinical variables (Co-morbidities, duration of the lesion, onset of the lesion after travel to somewhere else, clinical types)
- Ecological variables (Presence of reservoir {Hyrax}, forest condition, presence and absence of gorge and its distance from the house)

4.8. Operational Definitions

- Cutaneous leishmaniasis; Leishmaniasis which only affects skin
- Mucocutaneous leishmaniasis; Leishmaniasis which affects skin and mucosa.
- Diffused CL; Leishmaniasis which is not limited to specific body sites like face, hand, mucosa and the like parts of the body.
- Residence-One who live in Mekelle city at least for the last six (6) months.

4.9. Data Quality Assurance

In order to keep the data quality, the questionnaires first prepared in English and then translated to Tigrigna again in order to check the consistency of the Tigrigna questionnaire it was re-translated to English by other person who knows the local language very well.

After providing orientation to the data collectors, pre-test were conducted on 23(4.8% of the sample size) patients who come to dermatology OPD, but it was not included in the final result, then based the result of the pre test, confusing, leading and questions that should be included were reviewed, reorganized and rewrite and necessary corrections were made with selected data collectors.

During a pre-test data collection, all data collectors (13 tropical dermatology students and 3 clinical nurses) were informed/ aware about the questionnaires' purpose, how to collect and confusing things on questionnaires were well understood.

Besides this, the principal investigator was carefully entered and thoroughly cleaned the data before the

commencements of the analysis.

Ultimately, the PI was review all filled questionnaires and lab findings accordingly.

4.10. Data Analysis Procedure

For all categorical variables frequencies and percentages were calculated. In addition, data entry and analysis was conducted by using SPSS v-20. Then the entered data was edited, cleaned and analyzed. Binary logistic regression analysis was made to obtain odds ratio and the confidence interval of statistical associated variables. All variables with $P < 0.05$ in the bivariate analysis and one which were fit in Hosmer and Lemeshow Test goodness fit model were included in the final model/multivariate analysis, accepting $P \leq 0.05$ as the inclusion level for the independent variables. Finally, the magnitude of association between different variables in relation to the outcome variable was measured by odds ratio with 95% confidence interval.

4.11. Ethical Considerations

Letter of ethical clearance was obtained from Research Ethical Committee of Mekelle University, College of health sciences. Then official letter wrote to the service delivery points/area, i.e. dermatology unit. Moreover, consent was also obtained from the entire study sample after providing brief information about the objectives and the aim of the research. In addition, all study samples were informed about the participation to this study relies on their will no one can enforced them to participate to the study.

Finally, confidentiality of the information gathered were assured to the interviewee via avoiding the name and address of the interviewee in the questionnaire.

4.12. Dissemination of the Report

The result of the study was disseminated to Mekelle University department of Dermatology and Public health.

5. Result

During the study period, a total of 1317 clients were visited the dermatovenereology clinic. Among these, the study was conducted on 486 clients through systematic sampling method with K^{th} value of 3rd. Meanwhile, 28(5.6%) had sign and symptoms of cutaneous leishmaniasis on one or more sites of their bodies.

5.1. Socio-Demographic Characteristics

Most cases 308(63.4%) were aged between 16 and 45 years followed by 1-15years 154(31.7%). The mean (SD) age of the clients was 20.89 ± 12.5 SD years with the age range from 1-72years. The mean age of females and males was 20.8 ± 12 and 20.98 ± 12.92 , respectively. The majority of the respondents were males 258 (53.1%). Most respondents 81.9% (n=398) were educated while 18.1% (n=88) were illiterate that unable to read and write. Besides, most of the respondents 68.3% (n=332) were never married yet and the rest 31.7% (n=154).

Most of the study populations, 94% (n=457) were Orthodox tewahido followed by Muslim 4.7% (n=23) and others (protestants and catholic) constitute 6(1.2%) were participated in the study. Moreover, the majority of the clients 322(66.3%) were come from four (4) kebeles of Mekelle city, i.e.03, 011, 017 and 018 while the rest 164(33.7%) of the patients were from the rest kebeles of the city.

In addition, 36.62% (n=178) of the respondents were civil servants, 27.57% (n=134) merchants, 29.1% (n=141) unemployed including house wife, students and children and only 6.8% (n=33) were farmers who had a farm land near to the home 12(33.33%), near to the gorge 9 (25%) and near to both home and gorge 15 (41.67%).

Table 1. Socio-Demographic Characteristics of respondents in Ayder referral hospital, Tigray, Northern Ethiopia, 2014 (n=478)

Variables & Respondents	Frequency (F)	Percent (%)
Respondents' age	1-15	154
	16-45	308
	46 and above	24
Sex of the respondents	Male	258
	Female	228
	Illiterate	88
Educational status	Grade1-8	164
	Grade9-12	126
	Diploma and above	108
Marital status	Never married	332
	Married	151
	Divorced	3
Religion	Orthodox	457
	Protestants	2
	Catholic	4
Income source	Muslim	23
	Farming	33
	Merchants	134
	Civil servants	178
	Others	141

Mean age=20.89
± 12.5SD
Median=21.00

5.2. Clinical Characteristics of the Respondents

Most of the respondents 446(n=91.8%) had no habit to spent their time near or at the gorge at the morning and/or nights but only 40(8.2%) were had a habit to spent in such areas for feeding a cattle (n=3), guarding the farm (n=6) and both feeding and guarding the farm (n=6).

Most of the study population 97.9% (n=476) had no history of travel to somewhere but only 2.1%(n=10) had history of travel to somewhere with average spent period of less than six months 70%(n=7) and the rest 30%(n=3) more than six months with presence of the lesion 90(n=9) after travel and 10(n=1) before travel somewhere out of Mekelle.

Moreover, 61.9% (n=301) of the respondents' house floor was carpeted with cement and 38.1% (n=185) dusted with cow dung/mud having cracked wall/hall 169(n=34.8%) and no cracked wall 317(65.2%) but 191(39.3%) respondents had animal and animal dung in and/or around their house.

Out of 478 of the study population, 246(50.6%) had acacia and eucalyptus, 106(21.8%) eucalyptus, 8(1.6%) acacia and the rest 126(25.9%) had other types of tree around their home. On other ways, 8.2%(n= 40) of the respondents had a habits sleeping and sitting in the yard and the rest 91.8%(n=446) had no such a habits too but 386(79.4%) of the respondents had no a habits of use of a bed nets whereas the rest 20.6%(n=100) had a habits to use a bed nets during sleeping at anywhere. In addition, 17.9% (n=87) of the respondents had habits of working at the morning whereas the rest 82.1% (n=399) had no such activities.

Among the study population, 28.25% (n=137) were never tested whereas the rest 71.8% (n=349) were tested for HIV/AIDS with 2.1% (n=10) study population reactive for HIV/AIDS and from these 5.7% of the study population had co-infection with cutaneous leishmaniasis but the rest 69.8% (n=339) were non-reactive.

A total of 14% (n=68) of the respondents live in the area

where termite hills are there and the rest 86% (n=418) live in the area free of termite hill. On the other ways, 57 (11.7%) respondents lived in the area rich in hyrax with 11.3% (n=55) increase its population through time and 7.8% (n=38) respondents saw the hyrax, which moves to their residents home, but 429(88.3%) respondents lived in area free of hyrax.

Presence Of Clinically Cutaneous Leishmaniasis

Among the study population, 28(5.6%) of the clients had clinically cutaneous leishmaniasis of which 62.9%(n=22) presented on single body sites and the rest 37.1%(n=13) found on multiple body sites on face other than mucosa 16(45.7%), mucosa (lip, nasal tip, eye) 16(45.7%), and 8.6%(n=3) of the lesion found on the extremities from which 31.4% were positive for slit skin smear the rest 68.6% were negative for SSS even though clinically diagnosed as localized cut leishmaniasis 51.4% (n=18), muco-cutaneous leishmaniasis 25.7% (n=9) and diffused cutaneous leishmaniasis 22.9% (n=8).

Besides, 12 (2.5%) of the respondents had previous scare due to "guzua" whereas the majority of the respondents 474(97.5%) were free.

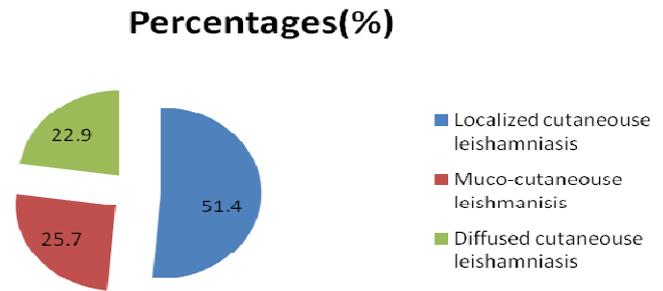


Figure 3. Pie chart show types of cut leishmaniasis on the respondents' Ayder referral hospital, Tigray, 2014(n=478)

Table 2. Clinical factors to the presence of cutaneous leishmaniasis in Ayder Referral Hospitals, Tigray, Northern Ethiopia, 2014(n=478)

Variables and respondents' response	Frequency (F)	Percents (%)
Common trees around home		
Acacia	8	1.6
Eucalyptus	106	21.8
Acacia & eucalyptus	246	50.6
Others	126	25.9
Presence of termite hill		
Yes	68	14.0
No	418	86.0
Presence of hyrax		
Yes	57	11.7
No	429	88.3
Number of the lesion over the respondents		
Single	22	62.86
Multiple	13	37.14
Clinical forms of cutaneous leishmaniasis		
LCL	18	51.4
MCL	9	25.7
DCL	8	22.9
Slit skin smear result		
Positive	11	31.4%
Negative	24	68.6%

5.3. Factors Associated With Presence of Cutaneous Leishmaniasis

Bivariate Analysis

Determination of all independent variables to the factors for the presence of cutaneous leishmaniasis was made by logistic regression model with the assumption that it helps to predict the extent by which this outcome variable could be explained by independent variables. All variables which had $p < 0.05$ on the bivariate analysis after goodness fit model was entered in to multivariate analysis.

Thus, through bivariate logistic regression ten independent variables, i.e., age, sex, income source, location of the home, time of spent near or/and to the gorge, house condition of the floor, wall, working habit at the morning/evening, presence of termite and hyrax were shown a significant association to the presence of cutaneous leishmaniasis.

The odds of having cutaneous leishmaniasis on males with respect to females study population were found to be 2.7 with {COR(95%CI); 2.7(0.167,0.793)}, income source farming {COR(95%CI);13.8(1.044,0.13)}, with respect to daily laborers, house wives and others, location of the home near to both to the gorge and farm land {COR(95%CI); 49.3 (0.029,0.515)} with respect to the residence area far away

from gorge and farm land and presence of hyrax with {COR(95%CI); 2.7(0.005,0.037)} with respect to hyrax free area.

Then, after testing in to the model goodness fitness test these data were re-entered in to the multivariate analysis.

Multivariate Analysis

The odds of having cut leishmaniasis among male participants was 2.11 compared to female participants with {AOR(95%CI); 2.11(0.015,0.793)} whereas the odds of having cut leishmaniasis among respondents whose home situated around/near farm land and/or gorge compared to those who lived far/free from farm and gorge was 10.10 with {AOR (95%CI); 10.11 (0.00, 0.574)}, on other way, the odds of having cutaneous leishmaniasis among farmers were 2.1 (0.00, 0.248), with 95% CI and finally the odds of having cut leishmaniasis among respondents who lived around hyrax population compared to respondents who lived hyrax free area was 1.101 with {AOR(95%CI);1.1(0.00,0.10)}. But presence of termite hill, working time at the morning and/or nights, age and housing conditions (floor and wall) characteristics/variables had not significant association with presence of cut leishmaniasis through Multivariate analysis.

Table 3. Factors associated with the presence of cut leishmaniasis in Ayder referral hospital, Tigray, Northern Ethiopia, 2014 (n=478).

Variables	Cutaneous leishmaniasis		OR (95% CI)		
	Yes	No	COR	AOR	
Sex	Male	26	232	2.72 (0.167, 0.793)	2.108(0.15,0.793)
	Female	9	219	1	—
Location of the home	Near to the farm	6	9	32.84 (0.030,0.276)	6.14(0.00,0.96)
	Near to the gorge	7	9	25.54(0.000,0.17)	0.034 (0.0,0.23.07)
Income source	Near to both 1 & 2	9	6	49.27(0.029, 0.515)	10.10(0.00, 0.574)
	No	13	427	1	—
	Farming	14	19	13.83(1.044,1.14)	2.102(0.00,0.248)
Termite	Merchants	9	125	1.35(7.60, 20.82)	0.13(0.00,0.505)
	Civil servants	9	169	1	—
	Unemployed	11	130	1.59(2.41,10.41)	0.16(0.001,0.40)
Hyrax	Yes	24	44	20.18(0.019, 0.096)	1.36(0.204,9.037)
	No	11	407	1	—
Age	Yes	23	34	23.5(0.005,0.037)	1.101(0.00,0.60)
	No	12	417	1	—
	1-15years	6	150	0.15(2.43, 39.97)	1.70(0.096, 30.33)
Age	16-45years	24	282	0.322(1.99, 8.27)	0.344(0.22, 5.48)
	46 and above	5	19	1	—

6. Discussion

This study was tried to assess the prevalence and associated factors of cutaneous leishmaniasis in institutional level. It was aimed to determine the prevalence and identify associated factors of cutaneous leishmaniasis with specific socio-demographic data of the study population such as sex, source of income, place of residence, educational status, occupation and the likes. Thus, the prevalence of cutaneous leishmaniasis in the study area was 5.6% with associated factors of sex, location of the farm, income source, and hyrax.

The prevalence of cutaneous leishmaniasis in the study area was 5.6%, which was relatively higher finding

compared to other similar studies conducted in Tigray regions (4.8%), Siliti (4.82%), Ochollo (3.6-4.0%), and Sebetta (0.9%). This is due to the other similar studies were conducted as a community based (level), most of the population 79.4% of the study population had no a habits to use a bed nets during sleeping at anywhere, the topography of the area is found in higher altitude (more than 2000m above sea level), nature of the soil (clay and sandy) which provides the best habitats for the vectors sand fly, presence of hyrax (13.17%), the difference in diagnostic methods in that this study was determined by using clinically diagnosing methods and/or skin slit smear (which where only 31.4% were positive) but the other study areas were used including multiple sophisticated diagnosing methods like PCR and the

presence of vector habitats to human dwellings, human activities (such as firewood collection, herding domestic animals, land use) and environmental factors, including vegetation type like could be a basic reason that make the study as such out numbered.

In this study gender had significant association to the prevalence of cutaneous leishmaniasis. The odds of having cutaneous leishmaniasis on male gender were {AOR (95%CI); 2.11 (0.015, 0.793)}. This implies the possibility of having cutaneous leishmaniasis was relatively higher more twice fold as males than females. This was similar to the study conducted in Colombia, Siliti (47.8% male; 52.2% female), India (M:F, 75.93%: 24.07%) and Jordan (M:F, 72.40%: 27.60%) (4, 18, 22). This might be due to males appear to have a higher prevalence probably because of environmental exposure to the habitat of the sand fly through occupation and leisure activity, as there is no significant difference in gender attendance to health services and our cultural activities that mostly males are faced with outdoor activities including farming, keeping cattle, stayed around the gorge and/or farm for long period and the presence of endemic site(s) like Humera and Metema that mostly males could travel there for work (19,25). But to the contrary a study conducted in America stats no significant difference was found between males and females (M:F, 52%:48%) suggesting that they are equally exposed to infection. This clearly tells us the variation in source of income (Americans-industry vs Ethio-& the like agriculture) and the nature of the activities that exposes males for sandfly than females. In this study these my findings could be signified by 31.42% of the cases were found on farmers than civil servants or merchants.

Being a farmer had a significant association to the presence of cutaneous leishmaniasis with the odds of {AOR (95%CI); 2.102(0.000, 0.248)}. This meant that being a farmer had a relative higher exposure to acquire cutaneous leishmaniasis as nearly twice (2x) fold to contract the disease than daily workers, house wives and students. This finding was incomparably higher relative to a study conducted in America. This is probably due to the difference in source of income, i.e. in America is mostly the source of income is industry to the contrary of our country but almost similar finding to that of a study conducted in India and Siliti due to a similar in source of income and cultural activities.

The presence of hyrax around the respondents' home had a significant association to the prevalence of cutaneous leishmaniasis. The odd of having cutaneous leishmaniasis in the area with hyrax was {AOR (95%CI); 1.101(0.000, 0.10)}. This result showed that the population they settle in areas where rich in hyrax colony had a relative higher exposure to have cutaneous leishmaniasis than hyrax free areas. This was similar to the study conducted in Kenya, Uganda and Addis Ababa (8, 32, 33) and relatively higher to a study conducted in Siliti this is due to the presence of forests in the city like acacia (1.6%), eucalyptus (21.8%), and both (50.6%), clay soil and sandy area with associated with higher altitude provides a good habitat for the hyrax which is a good harbor for sand fly but to the contrary to the study conducted in

Meta Abo Ethiopia these characteristics had no any significant association (30).

Ultimately, location of the home both to the farm and gorge had a significant association to the presence of cutaneous leishmaniasis with the odds of {AOR (95%CI); 10.11(0.000, 0.574)}. This was relatively higher with the previous reports from America (Argentina) with {AOR (95%CI):2.6(1.2, 5.5)} to the farm land and {AOR (95%CI):15.1(6.1, 7.3)} to the gorge and Siliti {AOR (95%CI):1.762(2.6, 5.179)} area (4, 15). This could be due to the potential to have an impact on the sandfly population density and provide suitable conditions for sandfly breeding sites (low temperature, moderate humidity, and presence of living organic matter). However, in this study both the presence of gorge and farmland around the respondents' home had a relative weak association with respect to both studies. This might be due to difference in the study population (Siliti-community based study) and study design (Argentina-Cohort study).

6.1. Strength of the Study

In this study the main strengths were; using primary data.

6.2. Limitation of Study

- The study strongly affected by selection bias because the study preferably good if it was conducted as a community level/base.
- Result may not generalizable to other areas outside the study area.
- The study does not show cause and effect relationship.

7. Conclusion and Recommendation

7.1. Conclusion

The finding in this study in relation to the presence of cutaneous leishmaniasis revealed that the prevalence of cutaneous leishmaniasis in the study area was 5.6% which were too high relative to the study conducted yet. Most males and farmers are groups to have relatively higher exposure for cutaneous leishmaniasis with respect to the location of farmland and gorge with the presence of hyrax.

7.2. Recommendations

Based on the findings from this study the following recommendations are made:

To the Health Professionals

Provide regular health education about the factors, mode of transmission and preventive modalities of cutaneous leishmaniasis.

To Mekelle City Health Office

One of the factors for the presence of cutaneous leishmaniasis was the presence of gorge and hyrax. Thus, the city health office should:

- Preferably remove or kill all hyrax from the community.
- Facilitates the health professionals to provide health

education about the factors, mode of transmission and preventive modalities of cutaneous leishmaniasis.

- Make all gorge to be labeled.

References

- [1] Bailey MS, Lockwood DNJ. Cutaneous leishmaniasis. *Clinics Dermatol* 2007; 25:203–11.
- [2] Blum JA, Hots CF. Treatment of cutaneous leishmaniasis in travelers. *J Travel Med* 2009; 16:123–31.
- [3] Postigo JA. Leishmaniasis in the World Health Organization Eastern Mediterranean Region, *Int J Antimicrobial Agents*, 2010; 36: S62–5.
- [4] Negera, Gadisa, Yamuah, et al. outbreak of cutaneous leishmaniasis in Silti woreda, Ethiopia: risk factor assessment and causative agent, transactions of the royal society of tropical medicine and hygiene, 2008, 102, 883–890
- [5] Ashford, R.W. The leishmaniasis as emerging and re-emerging zoonoses. *Internat. J. Parasitol.* 2000. 30: 1269–1281
- [6] Cooke, J.G. Public Health in Africa: A Report of the CSIS Global Health, 2009, Policy Centre. Retrieved from: http://csis.org/files/media/csis/pubs/090420_cooke_pubhealth_africa_web.pdf
- [7] Control of the leishmaniasis: Report of A meeting of the WHO Expert Committee on the Control of leishmaniasis, World Health organization, Geneva, Switzerland, 2010.
- [8] Abyot D, Solomon S, Andargachew K, et al. Modules on leishmaniasis, Carter center Ethiopia, 2005, 11–13.
- [9] Wilkins, H.A. Studies on leishmaniasis in Ethiopia: incidence rates of cutaneous leishmaniasis at Meta Abo. *Ann. Trop. Med. Parasitol.* 1972, 66:457–463
- [10] Gebre-Michael, T., Balkew, M., et al, The isolation of *Leishmania aethiopia* and *Leishmania tropica* from Phlebotoms (paraphlebotomus) species (Diptera: Psychodidae) in Awash Valley, N. Ethiopia. *Transc.R.Soc.Tro.Med.Hyg.* 2004. 98:64–70.
- [11] Hailu, A., Abebe T., Hunegnaw et al Isolation of *Leishmania tropica* from an Ethiopian cutaneous leishmaniasis patient. *Trans. R.Soc. Trop. Med. Hyg.* (2006). 100: 53–58.
- [12] Memórias do Instituto Oswaldo Cruz - Epidemiology of leishmaniasis in Ecuador: current status of knowledge, *Mem. Inst. Oswaldo Cruz* vol.99 no.7 Rio de Janeiro Nov. 2004
- [13] Pedrosa Fde A, et al: Socio-demographic and environmental risk factors for American cutaneous leishmaniasis (ACL) in the State of Alagoas, Brazil. *Am J Trop Med Hyg* 2009, 81(2): 195–201.
- [14] Lane RP. Phlebotomine sandflies. In: Manson P, Cook GC, Zumla A, eds. *Manson's Tropical diseases*. 21st ed. London: Saunders, 2003:1733–41
- [15] Rabello A *Leishmania/HIV* co-infection in Brazil: role of the national network for surveillance. In: *Proc. Third World Congress on Leishmaniasis*, 10–15 April, Palermo-Terrasini, Brazil, 2005.
- [16] Desjeux, P. The increase in risk factors for leishmaniasis world wide. *Trans. R. Soc. trop. Med. and Hyg.* 2001, 54: 239–243.
- [17] Padovese V, Terranova M, Toma L, et al, A Epidemiological and geographical aspects of leishmaniasis in Tigray, northern Ethiopia: a retrospective analysis of medical records, 2005–2008. Royal Society of Tropical Medicine and Hygiene. Published by Elsevier Ltd, Copyright © 2011
- [18] Hattingh, S. P., Dreyer, M., & Roos, S, *Aspects of Community Health*. South Africa: Oxford University Press, 2006, 246.
- [19] WWW.Wikipedia.tigray region
- [20] WHO Control of the leishmaniasis. Report of a meeting of the WHO Expert Committee on the Control of Leishmaniasis, 22–26 March 2010, Geneva 5–88.
- [21] Leishmaniasis. (n.d.). World Health Organization. Retrieved July 9, 2012, from <http://www.who.int/leishmaniasis/en/>
- [22] Raúl H. Pardo, Alexander Carvajal and et al, Effect of knowledge and economic status on sandfly control activities by householders at risk of cutaneous leishmaniasis in the subandean region of Huila department, Colombia, vol.26 suppl.1 Bogotá Oct. 2006
- [23] Bora. The national medical journals of India vol. 12, no.2, 1999/48/ Eshete G, Sonder K, ter Heegde F. Report on the feasibility study of a national program for domestic biogas in Ethiopia. 2006. http://www.snvworld.org/en/Documents/NDBPfeasibility_study_Ethiopia_2006.pdf [accessed 11 February 2011].
- [24] Bashaye S, Nombela N, Argaw et al. Risk factors for VL in a new epidemic site in Amhara region, Ethiopia. *Am J Trop Med Hyg*, 2009, 81: 34–39.
- [25] Khalid FA. et al., Treatment of Cutaneous leishmaniasis with some Local Sudanese Plants (Neem, Garad & Garlic), *Türkiye Parazitoloji Dergisi* 28 (3): 129–132 2004.
- [26] Al-Jawabreh, A., et al, Epidemiology of cutaneous leishmaniasis in endemic area of Jericho, Palestine. *East. Mediterran. J. Heal.* (2003), 9: 805–815.
- [27] Alvar J, Aparicio P, Aseffa A, Den Boer M, Cañavate C et al (2008). The Relationship between Leishmaniasis and AIDS: the Second 10 Years. *Clin Microb Rev* 21(2):334–359.
- [28] WHO report on global surveillance of epidemic-prone infectious diseases, 2000; Retrieved from: <http://www.who.int/emc>
- [29] Zaida E. Yadon, Laura C. Rodrigues, Clive R. Davies, and et al: Indoor and peri-domestic transmission of American cutaneous Leishmaniasis in Northwestern Argentina: a retrospective case-control study: *Am. J. Trop. Med. Hyg.*, 68(5), 2003, pp. 519–526
- [30] Dawit G, Girma Z, Simenew K. A Review on Biology, Epidemiology and Public Health Significance of Leishmaniasis *Bacteriol Parasitol*, 2013.
- [31] Tigray regional state bureau of plan and finance September, 2003 E.c, 28–30.