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Trend Analysis of Visceral Leishmaniasis in Metema Hospital Northwest, Ethiopia

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Abstract

Introduction: Visceral leishmaniasis is a disease caused by protozoan parasites of the genus *Leishmania* which is transmitted by the bite of female sand flies**.** It is usually fatal if undiagnosed and untreated, but if treated usually leads to life-long immunity. Metema area is one of the most important foci of visceral leishmaniasis in Ethiopia; however, its trend is unknown. Therefore, this study aimed to determine trends of visceral leishmaniasis in the study area, which is important to evaluate national visceral leishmaniasis control activities.

Method: A retrospective study was conducted at Metema Hospital from January, 2008 to December, 2012. Data were collected from the medical records of suspected patient who were tested by rK39 antigen kits and entered, cleaned and analyzed by SPSS version 16.0.P-value of ≤ 0.05 was considered as statistically significant.

Result: A total of 5645 visceral leishmaniasis **(VL)** suspected cases were examined at study area**.** Of these, 1277(22.6%) were positive for VL. The highest annual prevalence, 365 (33.2%), of VL was reported in 2012 and the lowest, 171 (19.95%), in 2009.Most of the VL positive individuals were in the age groups of 15-29 years and the higher prevalence of VL was from suspected males and during autumn. Age, gender and season had statistically significant association with VL infection.

Conclusion: The prevalence of VL was high in study area and its trend was fluctuating and gradually has been increased. Moreover, a transmission season coincides with peak periods of agricultural activity which result a negative impact on the nation's economy. Therefore, health planners and administrators should give intensive health education for the community.

Keywords: Visceral leishmaniasis; Trends; Metema hospital

Introduction

Visceral leishmaniasis (also known as kala-azar) is a complex disease caused by protozoan parasites of the *Leishmani donovani* complex, *L.d donovani, L.d infantum,* in the old world and *L.d chagasi* in the new world [1-3]. It is transmitted by the bites of infected sand flies that belong to the Phlebotomus and Lutzomyia genera in the Old and the New World respectively [4]. The sand flies inject the infective stage, metacyclic promastigotes, during blood meals. Metacyclic promastigotes that reach the puncture wound are phagocytized by macrophages and transform in to amastigotes [5,6]. Amastigotes multiply in infected cells and affect different tissues, depending in part on which *Leishmania* species is involved [7].

After 2 to 6 months of incubation period, VL patients present symptoms and signs of persistent systemic infection. The classical symptoms are fever, pallor, food refusal, weight loss, vomiting, hepatosplenomegaly, ecchymosis and gingival bleeding [8]. Fever is usually associated with rigor and chills and can be intermittent. Fatigue and weakness are worsened by anaemia, which is caused by the persistent inflammatory state, hypersplenism (the peripheral destruction of erythrocytes in the enlarged spleen). Parasitic invasion of the blood and reticulo-endothelial system (that is, the general phagocytic system) such as; enlarged lymph nodes, spleen and liver [9].

Visceral leishmaniasis infection can be diagnosed by detection of parasite (i.e. the visualization of the amastigote form of the parasite by microscopic examination of aspirates from lymph nodes, bone marrow or spleen [10]. Moreover, several tests that detect specific anti-leishmanial antibodies have been developed. These are serological tests based on indirect fluorescence antibody (IFA), enzyme-linked immunosorbent assay (ELISA), the direct agglutination test (DAT) and the rK39-based immunochromatographic test (ICT) [11-13].

There are an estimated 500,000 new cases of VL and more than 50,000 deaths from the disease annually [14].More than 90% of cases occur in the Indian sub-continent, East Africa and Brazil [15]. Migration, lack of control measures and HIV–VL co-infection are the three main factors driving the increased incidence of VL [16,17]. In Ethiopia, it is estimated that each year more than 4,000 individuals suffer from visceral leishmaniasis caused by protozoan parasites of the **Leishmania donovani** complex [18]. Highly affected area is north Ethiopia neighboring Sudan which accounts for more than 60% of the reported VL cases that are often related with HIV/AIDS [19, 20].

Visceral leishmaniasisis the most severe form of leishmaniasis and the neglected disease in most of the areas of the world [21]. In the study area there is cases of VL, however, there is no data which shows trend prevalence of this disease in the study area. In this area, there is extensive farming due to the fact that many daily laborers move from other areas to Metema. Therefore, this study was initiated to analyze five years, hospital records which are important sources of VL data, because this data is readily available and can provide useful indicators on the situation of VL at lower

cost. Furthermore, it is useful to evaluate national VL control activities on VL prevalence in the study area. If properly utilized, this information will urge the decision makers to act timely to strengthen visceral leishmaniasis control interventions effectively and efficiently.

Materials and Methods

Study area

This study was conducted at Metema Hospital which is located in North Gondar, on the border of Sudan, 897 Km Northwest of Addis Ababa and 197 km from Gondar town. It has a latitude and Longitude of 12^0 North 36^0E with an elevation of 685 meters above sea level. It has 18 rural and 2 urban Keble's. According to Improving Productivity and Market Successes (IPMS) (2005), out of the total 18 rural Kebele in the district, 16 are under most kola and the remaining two Kebele are dry kola. Mean annual temperature range from 22˚C to 28˚C and daily temperature reaches as high as 43˚C during the month of March to May.

Study design and period

A retrospective study was conducted from patient's record to determine the five years (January 2008 to December (2012) trends of visceral leishmaniasisin Metema Hospital Northwest, Ethiopia.

Study participants and data collection

The study participants were all patients who have been suspected for visceral leishmaniasis infection and tested forrK39-based immune chromatographic test (ICT) at the time of their visit. All VL suspected patients who had tested for rK39 ICT and handful information on the record, variables (age, sex, month and year of study participants) were included in the study. Those who missed at least one of these variables were excluded from the study. Five thousand six hundred forty five (5645) data were collected manually from patents registration book by using work sheet which contains the required information.

Data processing and analysis

Data were checked for completeness, coded, entered, and cleaned manually and analyzed using SPSS version 16.0 software. Descriptive statistics using frequency distribution was done for socio-demographic characteristics of study participants. The results were summarized by using frequency table and graph. Pearson's $\chi 2$ test with 95% confidence interval (CI) is computed as measures of association and $P \leq 0.05$ was considered as statistically significant.

Ethical clearance

The data were collected after ethical clearance was obtained from the School of Biomedical and Laboratory Sciences, College of Medicine and Health Science, University of Gondar.

Result

During the study period, a total of 5645 visceral leishmaniasis suspected patients gave blood for diagnosis of visceral leishmaniasis in Metema Hospital. Of these, 4911(87%) were males and 734(13%) were females. The age of the study participants ranges from 1 to 87 years. Most of the study participants 3373(59.5%) were in the age group of 15-29 years. The high visceral leishmanias is suspected patients 1360 (24.1%) were visited study area in 2010. Most of clinically suspected visceral leishmanias is participants were visited study during winter 2079 (38.8%) followed by autumn1683 (29.8%) (Table1).

From 2008 to 2012, a total of 5645 VL suspected cases were diagnosed by using rK39 rapid diagnostic test at the time of patient visit. Of these, 1277 (22.6%) were positive for VL. The highest prevalence 817(24.2%) of VL was found in the age groups of 15-29 years ($P = 0.002$). The prevalence of VL from suspected males was 1139(23.2%) (P=0.008). The highest prevalence of VL was found during autumn 501(29.8%) (P= 0.000). Age, gender and season had statistically significant association with VL infection (Table 2).

Discussion

Despite well-defined guidelines for the control of visceral leishmanias is, still it is enormous public health problem in terms of morbidity and mortality [22]. It is also a big burden of health care facility throughout the world including Ethiopia. The disease is spreading and the new endemic foci are now being reported in different countries including the study area [23].Therefore, this study investigated the prevalence and trends of visceral leishmaniasis infection among visceral leishmaniasis suspected patients and tried to assess the associated factors.

Variable	Frequency	Percent (%)
Age group		
1-4	89	1.6
5-14	386	6.8
15-29	3373	59.5
30-44	1439	25.5
≥45	358	6.3
Gender		
Male	4911	87.0
Female	734	13.0
Year		
2008	857	15.2
2009	792	14.0
2010	1360	24.1
2011	1537	27.2
2012	1099	19.5
Month		
Autumn	1683	29.8
winter	2079	38.8
Spring	1131	20.0
Summer	752	13.3
Total	5645	100.0

Table 1: Socio-demographic characteristics, years and months wise distribution of the study participants at Metema Hospital, Northwest Ethiopia, from 2008-2012.
Autumn: September to November
Winter: December to February
Spring: March to May
Summer: June to August

Variable	Positive (%)	Negative (%)	Total	P-value
Age group				
1-4	12(13.5)	77(86.5)	89(1.6)	.002
5-14	77(19.9)	309(80.1)	386(6.8)	
15-29	817(24.2)	2556(75.8)	3373(59.8)	
30-44	308(21.4)	1131(78.6)	1439(25.5)	
>45	63(17.5)	295(82.4)	358(6.3)	
Gender				
Male	1139(23.2)	3772(76.8)	4911(87.7)	.008
Female	138(18.8)	596(81.2)	734(13.0)	
Month				
Autumn	501(29.8)	1182(70.2)	1683(29.8)	.000
winter	432(20.8)	1647(79.2)	2079(36.8)	
Spring	199(17.6)	932(82.4)	1131(20.0)	
Summer	145(19.3)	607(80.7)	752(13.3)	
Total	1277(22.6)	4368(77.3)	5645(100)	

Table 2: Percentage of VL in relation to age groups, gender and month at Metema Hospital Northwest Ethiopia, 2008-2012

During the last five years (2008-2012) overall prevalence of visceral leishmanias is in the study area was 22.6% which was higher than similar studies conducted in different countries [24-29]; however, lower than the studies conducted in other parts of Ethiopia [30-33]. This difference might be due to climatic change, biological, and social characteristics that vary according to region and that interact to produce the disease. In the study area, over the years 2008-2012 VL trends has been increased. Since, in the last decade, HIV-VL co-infection and migration has been increased in Ethiopia [2,16,34], these might be two factors to increase VL trends.

According to available data in the Metema Hospital, from 2008 to 2012 the disease was distributed in the various age groups, but occurred most frequently in the age group of 15-29 (24.2%) (Figure 1). This might be associated with their daily activities. This is because, the study area is one of the areas in which extensive farming is conducted due to the fact that young daily laborers move to Metema from different areas for application of herbicide and for gathering of crops. This might have exposed them to the bite of sand flies. Males are proportionally more infected than female (23.2% Vs 18.8%). A similar finding was also reported in other studies [25,33,35].This gender difference might be due to difference in outdoor activity between male and female. As indicated in another study, males are more involved in outdoor activity than female in the study area and this may have expected them more to the bite of sand flies [23,36].

In the study area, VL was observed in almost every month of the year; although there was significant (P<0.05) (Table 2). The highest prevalence of VL was found during autumn (September to November), followed by winter (December to February) and summer (June to August), while low prevalence occurred during spring (March to May).Within the last five years, the trend of VL was fluctuating and gradually has been increased. This was in contrast with the study conducted in Addis Zemen, Ethiopia [33]. This might be due to awareness difference between the two populations in controlling of VL. Variability between seasons is one component which exhibit by VL in which it may reach at peak in one season and low in the other. So, considering the trends by season may have its own vital importance in controlling mechanism.

Conclusion

In the study area, prevalence of visceral leishmaniasis was high and statistically significant with gender, age and seasons. Moreover, its trend has been increased and transmission peaks from September to November, coinciding with the major harvesting seasons in the study area. This has serious consequences for Ethiopia's subsistence economy and for the nation in general. Thus, health planners and administrators need to give intensive health education for the community about the control and prevention of visceral leishmaniasis.

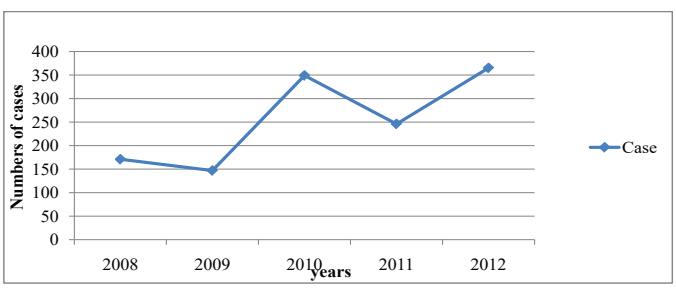

Figure1: Trends of VL by years at Metema Hospital Northwest Ethiopia, 2008-2012
The trend of VL was fluctuating within the last five years and the highest prevalence 365 (33.2%) was found in 2012 and the lowest prevalence 147 (18.6%) was found in 2009. Gradually, the trend has been increased.

Limitation of the Study

This study is limited to the data obtained from the patients' health records, being a secondary data; due to this, we didn't get all the differential diagnosis, drug regimens, and treatment outcomes from the health records. Besides, this study was conducted from suspected patients who were attended health institution and the result of this study may not infer to the general population. Moreover, this study had been done by serological test only which needs further confirmation with gold standard test in different season and years. To fill all these gaps, there is a need for further study with different study design.

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