Field Study of Ecological Factors Influencing Visceral Leishmaniasis Foci

S. A. Salman and H. A. Mohammed
Department of Biology ,College of Sciences , University of Baghdad
College of Medicine Al-Nahrain , University of Al-Nahrian

Abstract

The main elements of traditional foci of visceral leishmaniasis in the endemic area were studied. The complex relationships between biotic and abiotic factor in the study foci. Also the presence of possible reservoirs of disease with density of sandflies were examined.

Introduction

The central region of Iraq is a traditional endemic area with visceral Leishmaniasis [1,2,3,4]. Baghdad is considered as a center of a circle of this disease with a diameter of about 100-km [5,6]. The main traditional foci are Taji, Hooralbasha, in the north of Baghdad. Abougreb, Radwaniya in the west of Baghdad. Moussiab, Latifiya, Mahmodiya, in the southwest of Baghdad. Nomaniya, Azizia, Sowera, Medain, in the south of Baghdad, Jasserdiala, in south east of Baghdad, and Khan Bani sa`ad in the east of Baghdad [1,2,5,7]. Also the cases were reported in many districts in Meesan province in the south east of Iraq, and Thi-Qar province in the south of Iraq [1,5,6,8]. Incidences of cases were reported also in Ninava province in the district of Al-Shikhan in the north of Iraq.

The epidemiological map of Visceral Leishmaniasis may be due to many ecological variables such as the distribution of possible vectors, soil structure, and kind of vegetation, prevalence of possible reservoir, climate, and man activities [8,9,10,11]

The species of Iraqi sandflies are fifteen [1]. Their distribution is widely depending to the geographical features of Iraq [1,10,12,13,14,15]. The fauna of five zoogeographical zones exist in Iraq, this is because the vectors and reservoirs are probably distinct from those of Mediterranean basin [6,7,8,13]. Seven species of sandflies occurred in central region of Iraq [1,2,3]. These species belong to the genera *Phlebotomus* and *Sergentomiya*. The dominant species is *phlebotomus papatasi* with about 95% of the total density of species [1,2,5,6,11,13,14,15,16,17,18].

The species of *P.papatasi* is the first suspected species as a vector of disease in this region [1,3,6,10,13,14]. Also flagellates were isolated from this species[19,20,21,22,23,24]. Recently the *leishmania* sp. was identified from a smear taken from the fore and mid guts of few infected females of the same species collected from traditional focus of infantile leishmaniasis in the central region of Iraq [25].

The central region of Iraq is a wide alluvial plain with elevation varies from 36 – 300 m. a. s.l. The orchards of date palms trees disperse among the area covering many kinds of fruited trees. While the kinds of vegetation varies. Villager's dwellings are mostly near the orchard in-groups or they are scattering in open-land. Dwellings are mostly cements made; those of animal shelters are mainly of mud made. The climate is continental (very dry and hot in summer, wet and cold in winter).

The mean average of annual rain full is about 200 mm. (Iraqi meteorological service) the years of1998, 1999,and 2000 are dry seasons in Iraq (Ministry of Irrigation).In Two large rivers cross Iraq, Tigers and Euphrates; water level was decreased in the last period. Villagers widely used pumps to irrigate their farms and animals from canals and artisan wells.

Many investigators performed studies on possible reservoirs in 20th century the results were negatives. The studies were oriented toward dogs, jackals, foxes and rodents [18].

Spraying insecticides were stopped since 1991.Deficiency in medicaments, health facilities, quality of food and vitamins, deeply influenced the life of children of the study area.

Method and Materials

Two stations were selected during 1998 and 1999 in the endemic area with both visceral and Cutaneous Leishmaniasis. First one was Abougreb about 30-km west of Baghdad; second one was Mahmodiya about 50-km south of Baghdad. The stations were selected because of the followings: 1-The high density of sandflies.

2- The post and present reported cases of Visceral Leishmaniasis.

3-The possible canine Leishmaniasis and high number of Rodents

4- To use all the previous studies, which were conducted in this area as a base line data.

Entomological studies performed by using sticky papers, and CDC light traps of malaria. Sticky traps offered very important information about density, feeding, resting-places, and behavior, in/outdoor. The collection of sand flies was achieved in human dwellings, and animal shelters.

Identifications of male specimens were based on the genitalia; those of female were identified on spermathecae, cibrium, and pharynx. Females passed about 24 h in 1% solution of detergent, to remove fat and ova.

Dissection of females were done to search for possible natural infection with parasites, this technique is long and delicate.

Using 25 live traps, with bread and onion for trapping rodents. Identification, blood, liver, spleen smears were taken off, in addition to small portions of spleen and livers in NNN-media.

Meteorological information was provided from Iraqi meteorology (Baghdad station), in addition to portable thermo-hygrograph meter. Also the main species of vegetation was identified by a specialist.

All children less than 15 years were examined by a physician, also blood samples were taken off from 10% of them during two separated visits. History of one of the focus from 1965 was reported carefully during the visits, in addition to the names and ages of all the positive cases including the dead (unfortunately two new clinical cases were reported in February and March 2000 in two neighbour dwellings in Al-Mahmodiya focus).

Results and Discussion

The complex pathogen (parasite –vector- reservoir) was influenced by the ecological factors in this traditional endemic area of infantile visceral leishmaniasis science 1967[14]. Also the possible biotic and a biotic factors were examined during this study. Variations in temperatures in summer were very wide from day to night, when it passed (45^{o} c) in shaded places during the day of July and August .The variations were also very wide between winter and summer. However the RH% ranged from 10 %to 80%. Also it varies from day to night, the maximum values were (00 h-4h). These extreme variations of temperature select the biota of the area [6,15]. Therefore mesophilic species are found in scatter microclimate area out from these factors [14] only the euyretherme species as *Phlepotomus papatasi* existing in high numbers Table (1) [6,8]. The climate is continental and the rainfall in the area is less than 200 mm. few rainy days were registered during the last three years. Dry season limit the cultivated area across the country. Thus the wild rodents migrated toward the dwellings of villagers, where are a favorable places for survival and breeding. If the reservoirs is one or more of the species of these rodents, its very important to explain the sensible increasing of incidences during 2000 in the area Unfortunately in central Iraq the incidence of visceral leishmaniasis

not influenced by this natural phenomena and the number of cases still high. This is due to the increasing of new artisan wells in the area to grow the plantations and the arbored area with different kinds of fruited trees. As a result of that the numbers of rodent's populations are relatively stable. Also the possible reservoirs in central Iraq may be different from north region Table (2) [1,6,15]. It was found also that the canine populations don't influenced by the dryness. Thus the vectors density (sand flies) stay without change in the study area [2,3]. *Phlepotomus papatasi* can be found with a very high density in the open land (not cultivated) invaded by *Alhagi sp.* and others wild species, where are many new rodents barrows can be seen easily [6,7,14].

Henceforth any epidemiological study concerning this disease in Iraq should take in priority the ecological factors in different regions as a main controlling factor [12,17].

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Table (1) : Sandflies species collected during the study

SPECIES	DENSITY	1NDOOR	OUTDOOR
Phlebotomus papatasi	+++	+	+
P.alexendri	++	+	+
P.sergenti	+	?	+
Sergentomiya sintoni	+	+	+
S. palestinensis	+	+	+
S. baghdadis	++	+	+
S. sequamiploris	+	+	+

Table (2): Species and numbers of Rodents were trapped in this study

Species	**Numbers**	**%**
1-Tatera indica	192	31.3
2-Merionus lybicus	32	5.2
3-M.crusus	29	4.6
4-Rattus rattus	164	26.7
5-R. norvogicus	166	27
6-Nesokia indica	6	0.9
7-Mus musculus	24	3.9
TOTAL	613	100%

دراسة ميدانية للعوامل البيئية المؤثرة في بؤر لمرض اللشمانيا الاحشائية

شهاب احمد سلمان، حميد عبد محمد
قسم علوم الحياة ،كلية العلوم ،جامعة بغداد
كلية طب النهرين ،جامعة بغداد

الخلاصة

درست العوامل البيئية التي تؤثر على العناصر الأساسية في البؤر التقليدية لمرض اللشمانيا الاحشائية . إضافة للعلاقات المعقدة القائمة بين العوامل الحياتية و اللاحياتية لهذه البؤ ر، و العلاقة الموجودة بين القوارض الخازنة و كثافة الحشرات الناقلة له.