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RESEARCH ARTICLE

IDENTIFICATION OF ENVIRONMENTAL FACTORS ASSOCIATED WITH *LEISHMANIA* PARASITES IN MARSHLANDS OF IRAQ.

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Abstract

In marshland there are several factors have been associated with a high risk of transmission of parasitic diseases. Environmental factors in Iraq marshlands play an important role in increasing chance of infection with *Leishmania* parasitic disease. It is an influence on the emergence and proliferation of *Leishmania* parasitic disease. The biological cycle and eco-epidemiological relationships among climatic, ecology, vector, reservoir and human are highly variable. This study about risk factors suggest that climatic and ecologic characteristics, and vector, reservoir and human behaviors together effect on the transmission pattern, vectors and reservoir infection, and prevalence of human infection. The biological cycle and eco-epidemiological relationships among climatic, ecology, vector, reservoir and human are highly variable. Iraqi southern marshes which form a triangle region bound by three major southern cities, Thi-Qar to the west, Maysan to the northeast and Basrah to the south. The three major marshes: Al-Hammar, The Central marshes and Al-Huwaiza marshes form the core of the marshlands of southern Iraq.

Introduction:-

The leishmaniasis are vector borne diseases, most infections of leishmaniasis are transmitted via vector a female phlebotomine sand fly bite. Dogs are most commonly infected with *L. infantum* (*L. donovani* complex) which is responsible for the viscerotropic disease in people (Slappendel and Ferrer, 1998). In many of the endemic areas, dogs are considered the major reservoir for human disease while in other regoins people are the principal reservoir for further human spread . VL is caused by *L. donovani* and *L. infantum* in old world regions while *L. chagasi* is primarily responsible for visceral disease in the new world because *L. infantum* is the primary agent associated with canine leishmaniasis infections in dogs often are regarded as visceral even though they tend to cause both visceral and cutaneous. (Belding, 1965; WHO, 1996; WHO, 2000) The life cycle of *Leishmania* spp is commonly viewed as consisting simply of two different morphological stages: The intracellular amastigote in the vertebrate host including, man and some reptiles and the extracellular promastigotes in the invertebrate host is always a phlebotomine sand fly (WHO, 2000; 2010). Both stages are capable of replication multiplied by binary fission but not within the same host **(**Assaf, *et al* 2004; Chin 2000). Figure (1).

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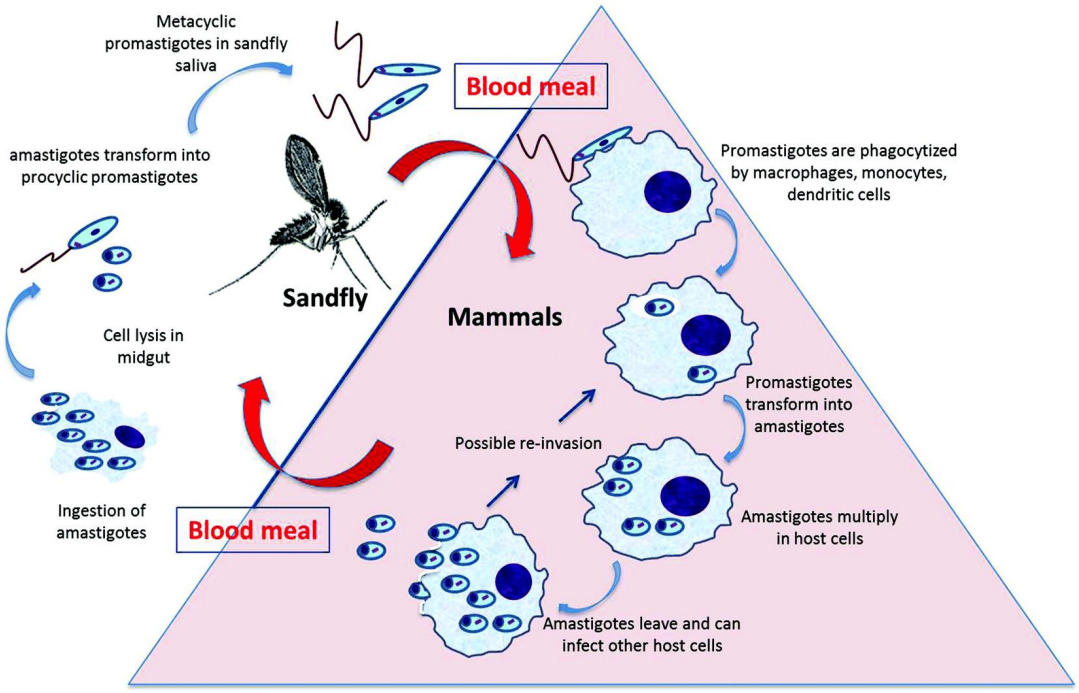

Figure 1:- Life cycle of *Leishmania* parasite
http://www. parasitology/intest-protozoa.htm.

Geographical Distribution:-

Leishmaniasis is one among the six most important vector-borne diseases worldwide. The disease is endemic in warm tropical and subtropical climatic conditions and has been reported from 88 countries of the world, 66 of which being in the old world (Asia, Africa and Europe) and the remaining 22 in the new world, South and Central America (Paredes *et al*., 2003; WHO, 2010). leishmaniasis was an endemic disease in Iraq (Herwaldt , 1999; Jarallah, 2009; Jarallah, 2014). About 1-1.5 million cutaneous leishmaniasis and 500000 visceral leishmaniasis new cases are estimated to occur annually worldwide. The leishmaniasis as a whole is prevalent in 12 million people out of 350 million people at risk. Globally, 57000 people die per year due to leishmaniasis, which has diverse clinical manifestations (WHO, 1990; WHO, 2000; WHO, 2010).

Risk factors and transmission:-

The Leishmaniasis is vector-borne diseases, it has a worldwide distribution, ususually affects the poorest countries. Many foci of the various forms of human leishmaniais have been described in both the new and old world. The diseases are endemic when sutable mammalian reservoirs and phlebotomine vectors are present: both are necessary for the heteroxenous development of flagellated protozoan parasites of the genus *leishmania*. (Herwaldt, 1999; Desjeux, 2001). The studies about risk factors suggest that climatic and ecological characterics, and human, vector and reservoir behaviors together influence the transmission pattern of *leishmania*, vector borne disease (Cox, 2002; WHO, 2010). Figure (2).

Climatic factors:-

Vectors, pathogens, and hosts each survive and reproduce within certain optimal climatic conditions and changes in these conditions can modify greatly these properties of disease transmission. The most influential climatic factors for vector-borne diseases include temperature and humidity of the soil and vegetation which lead to a change in the composition and density of vector (Robertd and Janovy,1996; WHO, 2010). Temperature may modify the growth of disease carrying vectors by altering their biting rates, as well as affect vector population dynamics and alter the rate at which they come into contact with humans (WHO, 1984; WHO,2010).

Ecological Factors:-

Risk factor in the old world is the building of dams with corresponding new irrigation methods and new crops which provoked a sharp change in the reproduction patterns of the animal reservoirs (Desjeux, 2001) dams, can change the temperature and humidity of the soil and vegetation which lead to a change in the composition and density of sand fly species and a change in rodent species , the distribution and prevalence of various species of *Leishmania* parasites differs from region to region because of several environmental, social and geographical factors vegetation which lead to a change in the composition and density of sand fly species and a change in rodent species (Desjeux, 1996). Risk factors associated with the transmission of *Leishmania* infevctions have been demonstrated in several countries (WHO, 2010**)**

Vector & reservoir hosts:-

Human and wild canidae are the reservoir host of *Leishmania* parasite. The dog is the major reservoir of *L. infantum* in the Middle East and the Mediterranean region and *L. chagasi* in South America (Chin, 2000). Dogs are reservoirs for human infection (Baneth, 2006). Leishmaniasis can be transmitted with different methods such as, Vector – borne transmission. Most infections of leishmaniasis are transmitted via vector sand fly through the bite of infected female phlebotomine sand flies. Figure (3). Sand fly vectors are found in rural regions more than the urban regions that is due to need of sand fly to the organic material in the burrows of rodent and wild animals for the feeding their larvae. The better place for sand fly resting is the trunk of tree, debris (waste), mud-house (WHO, 1984; WHO,2010). The sand fly vector is mainly active during the night and the highest risk for contracting the disease from sandfly bites is therefore between dusk and dawn (WHO, 1990; TDR, 2004). In Iraq the Jackal is the principle reservoir (Jarallah, 2015). In other report that the black rat is the reservoir host for *L. tropica* while the domestic dogs are the reservoir host for *L. donovani* (Rahim and Tatar 1966 ; Sukkar, 1985; Marquardt, 2000). The risk factors are different if the transmission is (indoors or peridomestic) or outside the home in (forests or rural areas). In some endemic areas transmission around the home causes about 80% cases. Requires the parasites to be present in the peripheral blood of the donor, preferably asymptomatic, survive processing and storage in the blood bank, and infect the recipient. (Schreiber *et al*., 1996 ; Singh, 1999).

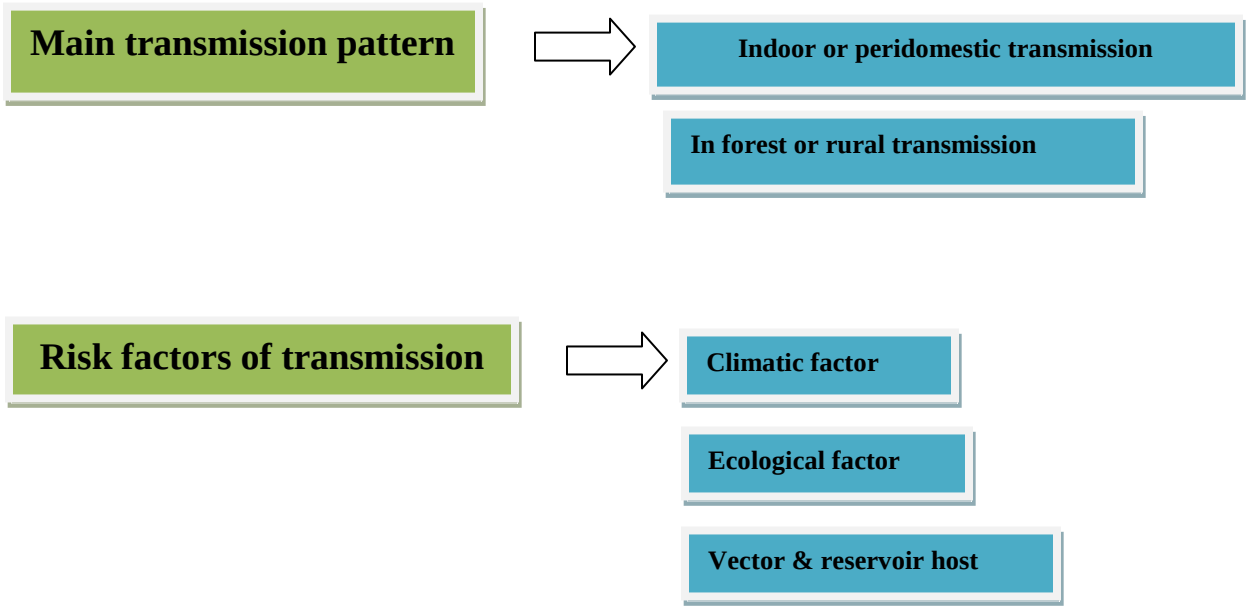

Figure 2:- Diagram illustrate the transmission patterns and risk factor transmission for vector - borne diseases

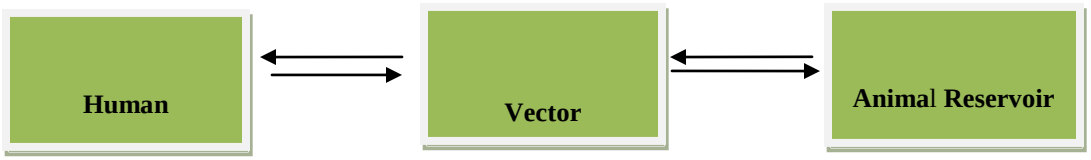

Figure 3:- Leishmaniasis are transmitted via vector (Vector –borne transmission)

Influence of environmental and climatic factors on disease risk:-

The leishmaniasis are vector borne diseases, and are highly complex: they are usually zoonotic, a large number of *Leishmania* species infects human, the biological cycles and epidemiological interrelationship between vector, reservoir, humans, climate and ecology are highly variable (Magill, 1995; Singh, 1999). The distribution of leishmaniasis in Europe is significantly less than the distribution of the sand fly vectors. The occurrence of disease transmission within the range of the vectors depends on vector abundance vector survival, vector biting. Temperature and humidity are the two most important climatic factors for sandfly survival, development and activity (Alvar, 1997; WHO, 2010). Populations at risk include people living in rural and periurban areas where both sandflies and reservoir animals are prevalent (Magill, 1995). Sandflies are sensitive to sudden temperature changes and usually prefer regions with small differences between the maximum and minimum temperature (Desjeux, 2001). Sand fly survival can be reduced if the climate gets too hot and dry, even though the flies may rest in cold, humid place during the daytime (McCarthy *et al*., 2001). The direct association between climate and leishmaniasis transmission, climate has indirect impacts by influencing the distribution of hosts, the local vegetation (important as resting sites and sugar sources) and the patterns of human exposure to sandfly vectors (TDR, 2004).

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